Getting It Right After Delivery:

Five Hospital Practices That Support Breastfeeding

Colorado Department of Public Health and Environment

Prevention Services Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246

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www.cdphe.state.co.us/ps/mch/gettingitright.pdf

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Foreword

With each passing year, mounting evidence increasingly confirms the short- and long-term compelling health benefits of breastfeeding for infants and mothers. Breastfeeding also contributes substantial economic benefits to the health care system, as well as generating substantial cost savings for individual families and in the workplace. For these reasons, diverse professional health organizations—including the American Academy of Pediatrics, the American College of Obstetricians and Gynecologists, the American Academy of Family Physicians, the American Dietetic Association, and the American Public Health Association—have issued strong public endorsements of breastfeeding. Furthermore, the U. S. Department of Health and Human Services, through its Healthy People 2010 goals and objectives, has established national objectives for breastfeeding initiation (75 percent), exclusive breastfeeding at 3 months (60 percent), exclusive and any breastfeeding at six months (25 percent and 50 percent), and continuation of breastfeeding at one year postpartum (25 percent).

Colorado, along with many Western states, has achieved a commendable breastfeeding initiation rate well over 80 percent. However, rates for continuation of breastfeeding, while above the national average, still fall short of national health objectives, preventing Colorado infants and mothers from accruing all the potential health benefits and cost savings of breastfeeding. In Colorado and elsewhere, wide disparities exist in breastfeeding rates by maternal age, socioeconomic status, education, and ethnicity. Prolonging the duration of breastfeeding among mothers who begin nursing their babies remains a universal challenge.

Numerous strategies to promote successful breastfeeding have been examined, including increasing prenatal breastfeeding education, implementing supportive hospital practices, improving professional education, conducting public education and promotion campaigns, expanding community support services, and reducing workplace barriers. Among these interventions, making institutional changes in maternity care practices has been shown to significantly increase breastfeeding initiation and duration rates. While the Baby Friendly Hospital Initiative's (BFHI) *Ten Steps to Successful Breastfeeding* has been touted as the gold standard for maternity practices, a paucity of U.S. hospitals has pursued the Baby-Friendly designation. Insufficient emphasis has been given to the significant value of making incremental changes in maternity practices among the vast majority of hospitals that do not choose to follow all the BFHI *Ten Steps*.

Getting It Right After Delivery: Five Hospital Practices That Support Breastfeeding underscores the critical influence of the hospital experience on breastfeeding success. Recent Colorado survey data have identified five specific hospital maternity practices that significantly increase breastfeeding duration among mothers of healthy infants, regardless of socioeconomic status. While each practice has a significant positive impact on breastfeeding continuation, women who experience all five supportive hospital practices have the longest duration of breastfeeding. Yet, only 19 percent of Colorado mothers of healthy breastfed infants report all five successful hospital breastfeeding practices.

This is the first population-based study documenting the dramatic impact of specific maternity practices on breastfeeding outcome. The evidence-based, five supportive maternity practices described in this report represent tangible, practical, doable interventions that can have a significant positive impact on long-term breastfeeding success. The findings reported here should spur all Colorado maternity hospitals to establish a multi-disciplinary breastfeeding committee to examine their current breastfeeding maternity practices and commit to implementing the five practices that have been shown to promote long-term breastfeeding success. The content of this report provides a clear blueprint for action that could enable Colorado mother–baby pairs to achieve the highest breastfeeding rates in the nation.

Marianne Neifert, MD, FAAP

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Highlights

- Breastfeeding is normal. Breast milk and breastfeeding are recognized as the ideal form of nutrition and the ideal method of feeding for infants, providing numerous health benefits.
- The American Academy of Pediatrics 2005 policy statement on breastfeeding and the use of human milk emphasizes the importance of exclusive breastfeeding and provides specific recommendations for supporting breastfeeding.
- The national objectives for breastfeeding are to increase the proportion of breastfed infants to 75 percent in the early postpartum period, to 50 percent at six months, and to 25 percent at one year of age. Two subobjectives recently added for breastfeeding are to increase the proportion of breastfeeding exclusively through three months to 60 percent and breastfeeding exclusively through six months to 25 percent.
- Colorado has one of the highest breastfeeding initiation rates in the country, with 85 percent of all mothers in Colorado starting breastfeeding in 2003.
- High breastfeeding initiation rates do not necessarily result in mothers continuing to breastfeed their infants for an extended period of time. Fewer than half of all mothers in Colorado breastfeed for three months, and only one-third of mothers are still breastfeeding at four and a half months after delivery. (Data are not available for longer periods.) These duration rates fall far short of meeting the national objective of 50 percent at six months.
- In Colorado, survey data show statistically significant improvements in the length of time a mother breastfeeds when mothers of healthy infants experience a combination of five hospital practices supportive of breastfeeding:
  - Infants are breastfed in the first hour after birth
  - Infants stay in the same room as their mothers
  - Infants are fed only breast milk and receive no supplementation
  - No pacifier is used
  - Staff gives mothers a telephone number to call for help with breastfeeding
- The five successful hospital practices shown above significantly increase breastfeeding duration among Colorado mothers regardless of the mothers' socioeconomic status.
- For mothers of healthy breastfed infants who report all five practices, the breastfeeding duration rate at three months is 70 percent and at four months is 63 percent. These three- and four-month rates support the possibility of meeting the national goals at six months and 12 months when supportive practices are used.
- Only 19 percent of mothers of healthy breastfed infants in Colorado report experiencing the five successful hospital practices that improve breastfeeding duration. Widespread implementation of the five successful practices in hospitals across the state should lead to higher breastfeeding rates that meet national objectives and result in healthier mothers and infants in Colorado.

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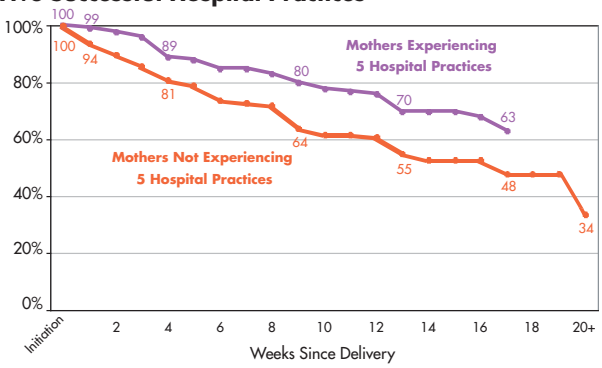
Executive Summary

Getting It Right After Delivery: Five Hospital Practices That Support Breastfeeding presents background information on the benefits of breastfeeding and the characteristics of mothers in Colorado who breastfeed and then provides straightforward hospital-based solutions for greatly improving low breastfeeding continuation rates in the state. Based on results from the Colorado Pregnancy Risk Assessment and Monitoring System survey of mothers who gave birth in 2002 and 2003, the report shows the value of specific practices hospitals can institute to support breastfeeding mothers. While Colorado's breastfeeding initiation rates are high, mothers often give up breastfeeding in the first month or two after delivery.

The report illustrates the exponential effect on breastfeeding duration when hospitals practice at least five of the "Ten Steps to Successful Breastfeeding" promoted by the United States Baby Friendly Hospital Initiative. The five practices found to be associated with significantly higher breastfeeding continuation rates over the long run in Colorado are breastfeeding in the first hour after delivery, giving the infant breastmilk only in the hospital (no water or formula supplementation), keeping the infant in the same room as the mother in the hospital, not allowing pacifier use in the hospital, and providing a telephone number for breastfeeding mothers to call after discharge. The report offers guidance and solutions to lead hospitals through the challenges that may be faced when current practices need to be changed.

The following graph illustrates the magnitude of the impact of the five simple practices. The lines show the percent of breastfeeding mothers (those who initiated breastfeeding) who continued breastfeeding through each week after delivery. The upper line shows the continuation rates of mothers who reported experiencing the five practices, while the lower line shows the continuation rates of mothers who reported not experiencing all the practices. At 17 weeks (four months after delivery), 63 percent of women who experienced the practices were still breastfeeding, compared to 48 percent of women who did not experience the practices. In fact, experiencing the five practices generally resulted in an 8-week extension of the duration of breastfeeding.

Continuation Rates of Breastfeeding Mothers by Five Successful Hospital Practices



Colorado's current breastfeeding rates fall far short of the United States Healthy People 2010 goal of 50 percent of infants being breastfed at 6 months of age. Since 85 percent of mothers begin breastfeeding, but only one in five breastfeeding mothers experiences the five favorable practices and concurrent improved continuation rates, current breastfeeding rates among all Colorado mothers are below 50 percent when their infants reach just four months of age. If hospitals across the state implemented the five practices, providing mothers with the information and skills to establish successful breastfeeding in the early weeks after delivery, the duration of breastfeeding is likely to improve for thousands of women.

Getting It Right After Delivery: Five Hospital Practices That Support Breastfeeding provides the background, research, and practical steps that need to be undertaken for Colorado to meet the national breastfeeding goal. The steps are not difficult, and their impact will be profound. Babies and mothers will benefit greatly by experiencing the best kind of care provided right after birth by the hospital.

Section I. Breastfeeding in Colorado

Background

Benefits of Breastfeeding

Breast milk and breastfeeding are widely recognized to be the ideal form of nutrition and the ideal method of feeding for infants. Breastfeeding is normal; the range of benefits is extensive. According to the American Academy of Pediatrics (AAP), "Breastfeeding ensures the best possible health as well as the best developmental and psychosocial outcomes for the infant."[1]

The superior health outcomes in breastfed infants and their mothers are both remarkable and well documented. Compared to formula-fed infants, breastfed infants have an enhanced immune system and, consequently, a lower incidence or severity of diarrhea, respiratory tract infections, otitis media, pneumonia, urinary tract infections, necrotizing enterocolitis and invasive bacterial infection.[2] Studies also show a possible protective effect of breastfeeding against type I and type II diabetes mellitus, leukemia, Hodgkin's disease, hypercholesterolemia and asthma. Preterm infants fed human milk (including banked human milk) receive significant benefits, with improved developmental and health outcomes compared to formula-fed infants. The AAP 2005 policy statement, "Breastfeeding and the Use of Human Milk," (see Appendix 2) summarizes these findings and cites research that includes the fact that postneonatal infant mortality rates in the United States are reduced by 21 percent in breastfed infants.[1]

A minimum of $3.6 billion would be saved annually in health care costs if the prevalence of exclusive breastfeeding increased from current levels to the levels recommended by the U.S. Surgeon General.

Breastfeeding also may play a role in the prevention of obesity. Studies show the longer a child is breastfed, the less likely the child is to become overweight.[3] Also, the American Academy of Pediatrics statement references studies that show breastfeeding can serve as an analgesia during painful procedures, and that it possibly enhances infant cognitive development.[1]

Mothers also reap benefits by breastfeeding their infants. They have less postpartum bleeding, a reduced risk of ovarian cancer and premenopausal breast cancer, improved bone remineralization postpartum with reduction in hip fractures in the postmenopausal period, and an earlier return to prepregnant weight.[2] In terms of health care savings,

a review of the economic benefits of breastfeeding reported that a minimum of $3.6 billion would be saved annually in this country if the prevalence of exclusive breastfeeding increased from current levels to the levels recommended by the U.S. Surgeon General.[4] Health care savings included expenditures for physician, clinic, hospital and procedural fees and costs of wages lost by parents caring for an ill child. This figure likely underestimates total savings because it assesses cost savings from the treatment of only three childhood illnesses: otitis media, gastroenteritis and necrotizing enterocolitis.

Breastfeeding is good for families and businesses. Breastfeeding costs less money than formula feeding. It is estimated that the cost of food and fluids to meet the increased caloric needs of the lactating mother is about half the cost of purchasing formula.[5] Finally, families and businesses both benefit by lowered health care costs and reduced employee absenteeism related to infant illnesses.[6]

Breastfeeding Guidelines

Given the magnitude of the impact that breastfeeding provides, several national organizations have developed breastfeeding goals and guidelines to reach these goals. Two of these organizations are the United States Department of Health and Human Services (HHS) and the American Academy of Pediatrics. The HHS's national Healthy People 2010 goals for breastfeeding are to increase the proportion of mothers who breastfeed their infants to 75 percent in the early postpartum period, to 50 percent at six months and to 25 percent at one year after birth.[7] Two subobjectives are to increase the proportion of mothers who exclusively breastfeed their infants through three months to 60 percent and through six months to 25 percent.[8]

The AAP's 2005 policy statement, "Breastfeeding and the Use of Human Milk," focuses attention on breastfeeding duration. The policy emphasizes the value of exclusive breastfeeding and recommends that exclusively breastfed infants be the reference model for infant growth and development.

The AAP policy strengthens current recommendations for feeding healthy term infants as well as for high-risk infants. The recommendations for healthy term infants include the following:

- Human milk should be recommended for all infants unless a specific contraindication exists.
- Policies and practices that optimize and support breastfeeding should be encouraged during the time near and immediately after delivery.
- Healthy infants should remain in contact with their mothers immediately after birth, emphasizing direct skin-to-skin contact until the first feeding is accomplished.
- Supplements, including water, glucose water, formula and other fluids, should not be given to breastfeeding newborn infants unless ordered by a physician when a medical condition exists.
- Pacifiers should be avoided during the initiation of breastfeeding and used only after breastfeeding is well established (usually around 3–4 weeks in a healthy newborn).
- Mother and infant should room together throughout the day and night to facilitate initiation of breastfeeding.
- A trained caregiver should formally evaluate breastfeeding at least twice daily and fully document the evaluations in the hospital record during each day in the hospital after birth.
- During the early weeks of breastfeeding, mothers should provide 8–12 feedings at the breast every 24 hours whenever the infant shows feeding cues.
- Pediatricians and parents should be aware that exclusive breastfeeding is sufficient to support optimal growth and development for approximately the first 6 months of life. Exclusive breastfeeding provides continuing protection against diarrhea and respiratory tract infection. Breastfeeding should be continued for at least the first year of life and beyond for as long as mutually desired by mother and child.
- Should hospitalization of the breastfeeding infant be necessary, every effort should be made to maintain breastfeeding.

Baby-Friendly Hospital Initiative

The Baby-Friendly Hospital Initiative (BFHI) reinforces the AAP recommendations and is recognized as an effective approach to increasing

breastfeeding rates. The BFHI is a global program sponsored by the World Health Organization and the United Nations Children's Fund to encourage and recognize hospitals and birthing centers that offer an optimal level of care for lactation. The BFHI assists hospitals in giving breastfeeding mothers the information, confidence and skills needed to successfully initiate and continue breastfeeding their infants and gives special recognition to hospitals that have done so.

The BFHI defines guidelines for successful initiation of breastfeeding, called the "Ten Steps to Successful Breastfeeding" (see box). Hospitals and birthing centers that achieve the 10 steps criteria are given the designation of "Baby-Friendly Hospital," and worldwide, more than 18,000 maternity facilities have the designation. In the United States, 55 hospitals and birthing centers have been designated, and Colorado welcomed its first Baby-Friendly Hospital in 2006. Baby-Friendly USA, a nonprofit organization, is the national authority for the BFHI in the United States. Its informative Web site at www.babyfriendlyusa.org outlines steps to become Baby-Friendly and offers ways to work through the challenges to obtain the designation.

One Colorado hospital has received the "Baby-Friendly" designation.

The Academy of Breastfeeding Medicine is another resource for hospitals wanting to improve their practices to support breastfeeding. The academy is a worldwide organization of physicians dedicated to the promotion, protection and support of breastfeeding and human lactation. It has developed clinical protocols for managing breastfeeding problems that may be used by hospitals to develop policies and trainings to attain the BFHI guidelines.

A vast amount of research supports the BFHI guidelines as an effective approach for increasing breastfeeding rates. The 10 steps to successful breastfeeding have been consistently associated with successful breastfeeding.[9–14] In one study of all Baby-Friendly hospitals and birthing centers in the United States, both breastfeeding initiation and the rate of exclusive breastfeeding in the hospital were higher than state, regional and national rates.[15] The rates remained high in regions with low breastfeeding rates and among populations that do not traditionally breastfeed.

The Ten Steps to Successful Breastfeeding

1. Have a written breastfeeding policy 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 one hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation, even if they are separated from their infants.
6. Give newborn infants no food or drink other than breast milk, unless medically indicated.*
7. Practice rooming-in—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.
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

Source: World Health Organization, United Nation's Children's Fund: Protecting, promoting, and supporting breastfeeding: The special role of maternity services (A joint WHO/UNICEF statement). *International Journal of Gynecology and Obstetrics,* 31:171–183, 1990.

*A hospital must pay fair market price for all formula and infant feeding supplies that it uses and cannot accept free or heavily discounted formula and supplies.

Implementing the BFHI guidelines positively affects breastfeeding duration. One multi-year study of 464,246 infants showed infants born in Baby-Friendly Hospitals were 28 percent more likely to be exclusively breastfed at seven days after birth than infants born in hospitals without the credential.[16] A study of mothers in Switzerland found a beneficial effect of BFHI guidelines on long-term breastfeeding duration for all groups of breastfed infants (exclusively, fully and any breastfeeding).[17] This study found that infants born in Baby-Friendly Hospitals were more likely to be breastfed for a longer period of time than were those born in non-Baby-Friendly hospitals. And among Baby-Friendly Hospitals, breastfeeding duration was positively associated with the hospital's degree of compliance with the BFHI "Ten Steps to Successful Breastfeeding." These findings demonstrate the value of the BFHI guidelines.

Purpose of Report

Detailed data about Colorado mothers and breastfeeding have not been widely available. Information has been limited to the percentage of women breastfeeding and a few characteristics available from formula company surveys. This report uses new, more accurate data that provide breastfeeding initiation and duration rates for mothers by age, race/ethnicity, education, poverty level, smoking status and a host of other characteristics. In addition, the report analyzes the data according to hospital practices experienced by the mother immediately after delivery.

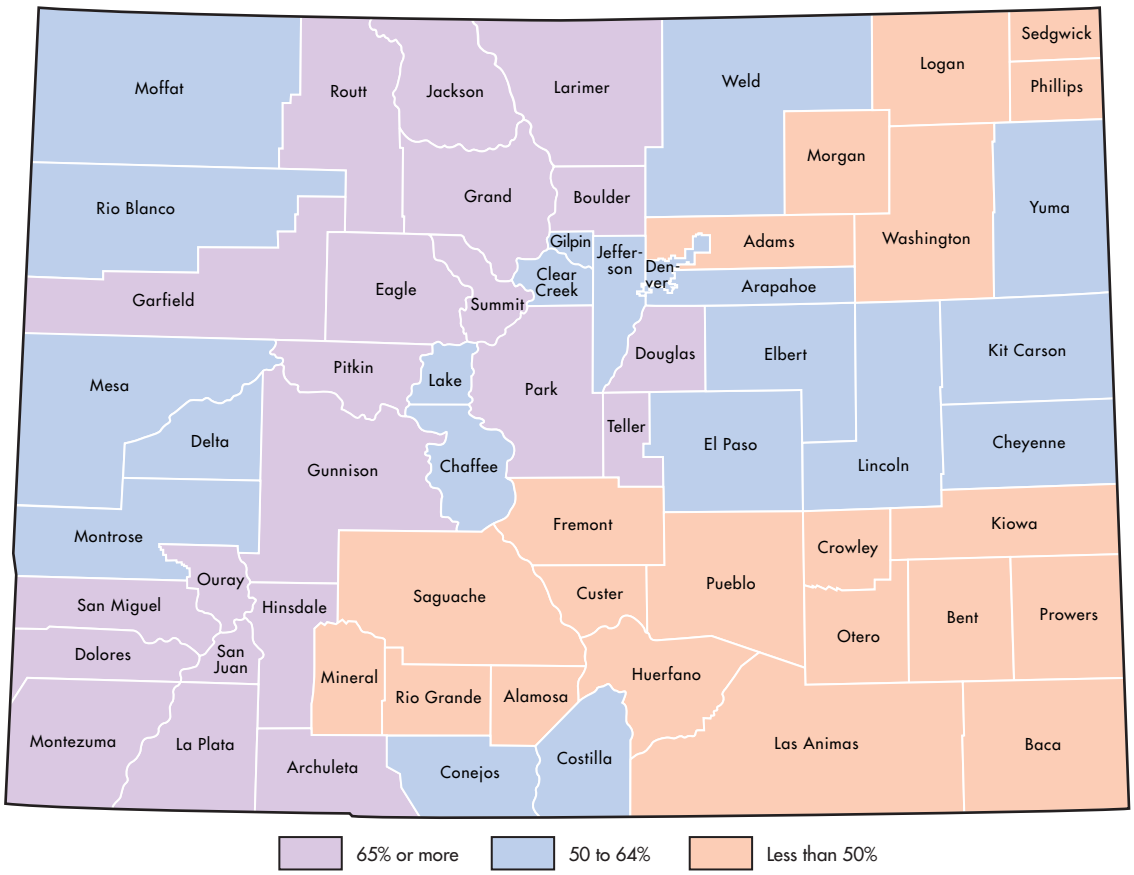
The kind of data and information presented in this report can be used to understand and influence breastfeeding rates and consequently to improve the health of Colorado infants and mothers.

In 2003, Colorado had one of the highest breastfeeding initiation rates in the country. The rate exceeded the Healthy People 2010 goal of 75 percent, with an estimated 85 percent of mothers initiating breastfeeding according to Colorado Pregnancy Risk Assessment Monitoring System (PRAMS) survey data (described in the next section). However, a large percentage of Colorado mothers discontinued breastfeeding within the first few months. In fact, fewer than 50 percent of mothers continued to breastfeed beyond three months postpartum, an indicator that falls far short of achieving the Healthy People 2010 goal of 50 percent breastfeeding at six months. The following map shows the regional variation of breastfeeding duration in Colorado at two months after delivery using combined data for 1997 through 2003. It is clear that many counties do not achieve 50 percent even at two months. (See complete list in Appendix 1.)

Healthy People 2010 breastfeeding goals—
- *75% in the early postpartum period*
- *50% at 6 months*
- *25% at 12 months*

This report describes trends in breastfeeding for all Colorado women by specific maternal characteristics that influence breastfeeding rates and seeks to identify factors that increase breastfeeding duration in Colorado. Although the BFHI ten steps have been

Percent of All Mothers Breastfeeding at Two Months, 1997–2003



shown to increase long-term breastfeeding in other countries, the effects of those hospital practices on duration rates in the United States have not been assessed using a population-based study. The report looks at Colorado hospital practices supportive of breastfeeding, including a number of the BFHI ten steps, and examines if breastfeeding duration rates are influenced by these practices. Finally, the report makes recommendations to increase breastfeeding duration based on the results.

Methodology

Colorado PRAMS Survey

This report uses data from mothers who gave birth to live-born infants in Colorado and responded to the Pregnancy Risk Assessment Monitoring System (PRAMS) survey. PRAMS is a population-based risk factor surveillance system designed to identify and monitor behaviors and experiences of women before, during and after pregnancy. Colorado is one of 38 states participating in the PRAMS project, which is funded through the Centers for Disease Control and Prevention.

> *"This survey asked some good questions about breastfeeding. I was really surprised to find that my hospital no longer employs lactation consultants, which is a real shame. New moms need help with learning the techniques for successful breastfeeding."*
>
> *—PRAMS Survey Respondent, 2003*

Colorado PRAMS survey data are available for the years 1997 through 2003. Comparisons made over time use 1997, the first year of PRAMS data, and 2003. Survey questions regarding hospital practices supportive of breastfeeding were added to the survey during 2002 and 2003. Analysis of information about these hospital practices uses data from the combined years 2002 and 2003.

The PRAMS questionnaire was mailed to a random sample of Colorado mothers each month. Participants completed the surveys two to four months after giving birth and returned them to the state health department where all answers were handled confidentially and combined to provide data for the entire state. PRAMS used a combination of two data collection approaches: statewide mailings of the surveys and telephone follow-up with women who did not return the survey by mail. The written questionnaires and telephone interviews were completed in Spanish when necessary, accounting for about 12 percent of all surveys. Approximately 2,900 women in Colorado received the survey each year, with a response rate of at least 70 percent. Results from the survey were weighted to accurately reflect the experience of all Colorado mothers giving birth, a total of 53,805 mothers in 1997 and 69,304 mothers in 2003. Since data were obtained from mothers two to four months after delivery, data on breastfeeding beyond that point were not available. In addition, data refer to any breastfeeding; no information was available on exclusive breastfeeding.

Survival Analysis

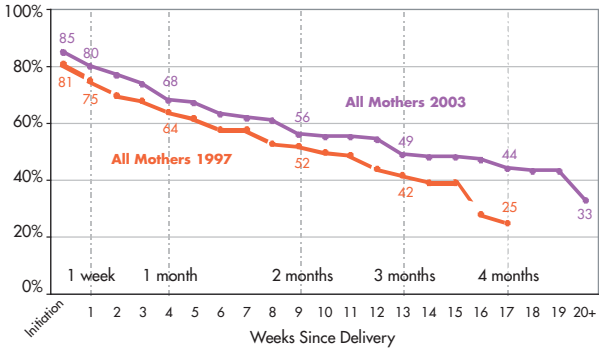
Kaplan-Meier survival analysis was used to determine breastfeeding duration rates for all mothers in Colorado. Survival analysis is a mathematical model that observes the timing of an event (i.e., stopping breastfeeding) for a group of people for as long as the data are available. The software SAS-Callable SUDAAN, release 9.0, was used to run the Kaplan-Meier analyses.[18] Tests of statistical significance were determined using 95 percent confidence intervals, calculated from the standard errors for the Kaplan probability estimates of breastfeeding duration.

Breastfeeding in Colorado 1997–2003

All Mothers 1997 and 2003

Breastfeeding rates rose in Colorado between 1997 and 2003. Figure 1 shows breastfeeding initiation and duration rates for all mothers for the two years. (To interpret the graph, see "How to Make Sense of the Graphs.") Breastfeeding initiation rates of all mothers increased by 4 percentage points, from 81 percent to 85 percent. The percentage of mothers who continued to breastfeed also improved in the postpartum period in 2003 compared to 1997. At three months after delivery, 42 percent of mothers were breastfeeding in 1997, while 49 percent of mothers breastfed in 2003. The increase in the percentage of mothers breastfeeding between 1997 and 2003 at initiation was not statistically significant, however.

Figure 1. Colorado Breastfeeding Initiation and Duration Rates, All Mothers, 1997 and 2003



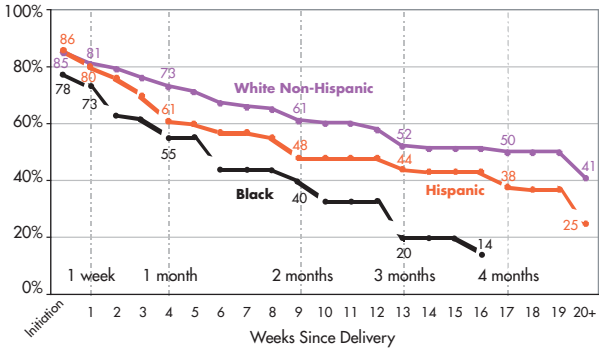
How to Make Sense of the Graphs

- Read the title carefully. Note the type of rates shown and the group and year.
  - Figures 1–11 show initiation and duration rates by characteristics of mothers or infants.
  - Figures 12–23 show duration rates for groups of mothers according to hospital practices. Initiation is shown as 100 percent since all groups begin with mothers of healthy infants who initiate breastfeeding with their infants.
- The "%" values in the graph refer to the mothers described in the figure title.
- The label beneath the graph shows the "Weeks Since Delivery." This label is the same in all graphs.
- How to read "Weeks Since Delivery"
  - Initiation is the first point on the graph; this is the beginning of breastfeeding in the hospital. The next point is 1 week after delivery, 2 weeks, and so on.
  - 4 weeks = 1 month; 9 weeks = 2 months; 13 weeks = 3 months; 17 weeks = 4 months; 20+ weeks is 4.5 months of age or more. No data are available beyond this point.
- Note that rates are shown for as long as adequate data are available. Lines stop when the number of mothers still breastfeeding is insufficient to accurately calculate the duration rate.
- So what is the graph saying? As an example, Figure 1 can be described as follows: Of all mothers in Colorado in 2003, 85 percent initiated breastfeeding. One week later, 80 percent of all mothers were breastfeeding. At one month (4 weeks) 68 percent were breastfeeding. At two months, 56 percent were breastfeeding, and at three months, 49 percent were breastfeeding. At four months, 44 percent were breastfeeding, and at 20 or more weeks, 33 percent were breastfeeding. The rates in 2003 are all higher than the rates in 1997.

Race/Ethnicity

For the major race/ethnicity groups (White Non-Hispanic, Hispanic and Black), breastfeeding initiation rates increased between 1997 and 2003; Figure 2 shows 2003 rates only. White Non-Hispanic mothers generally have the highest breastfeeding rates, yet still showed an increase in initiation to 85 percent in 2003, compared to 82 percent in 1997. Initiation rates for Hispanic mothers increased to 86 percent from 79 percent, and rates for Black mothers increased to 78 percent from 72 percent. Rates for women of other racial and ethnic backgrounds (Asian and Native American) changed little, with 83 percent initiating in 2003 compared to 82 percent in 1997, and are not shown in the figure. Rates at one, two and three months postpartum also were higher for each race/ethnicity in 2003 compared to 1997.

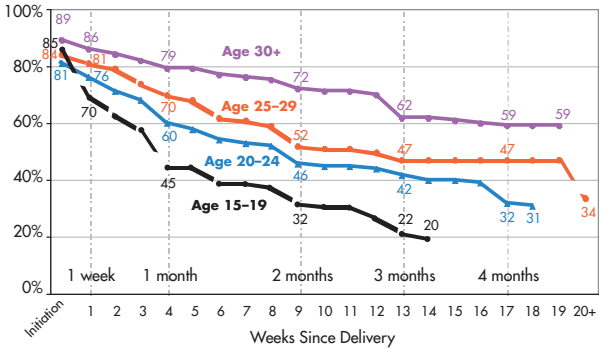
Figure 2. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Race/Ethnicity, 2003



Age

Just as a higher percentage of mothers of all races and ethnicities breastfed in 2003 compared to 1997, so did mothers of all ages. Figure 3 shows breastfeeding rates for all maternal age groups in 2003. The pattern is the same for both years: the older the mother, the higher the breastfeeding initiation and duration rates.

Figure 3. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Age, 2003

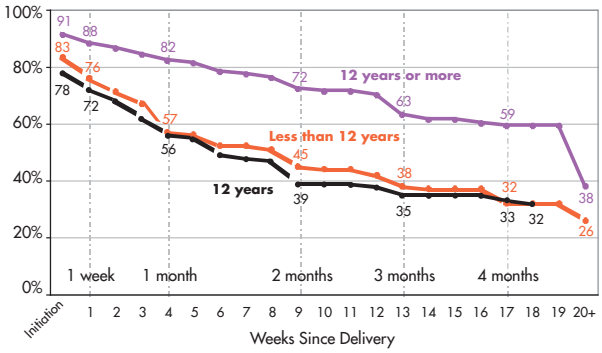


Between 1997 and 2003, initiation increased the most for 15- to 19-year-old mothers, to 85 percent from 71 percent. The increase in continuation of breastfeeding at one month was greatest for 20- to 24-year-old mothers, rising to 60 percent from 49 percent. The older mothers, age 30 and higher, had the highest duration rates in 1997. Nonetheless, their rates rose in 2003, and at four months postpartum, 59 percent continued to breastfeed their infants compared to 35 percent in 1997.

Education

Breastfeeding rates increased for mothers at all educational levels (less than 12 years, 12 years and more than 12 years) between 1997 and 2003. Mothers with more education had higher breastfeeding rates. Figure 4 shows rates for 2003. Ninety-one percent of women with the highest level of education initiated breastfeeding in 2003, and six out of ten (59 percent) continued breastfeeding to 19 weeks postpartum. In 1997, 88 percent of women with the highest level of education initiated breastfeeding, and one out of three (34 percent) continued breastfeeding to 19 weeks after delivery (not shown).

Figure 4. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Educational Level, 2003



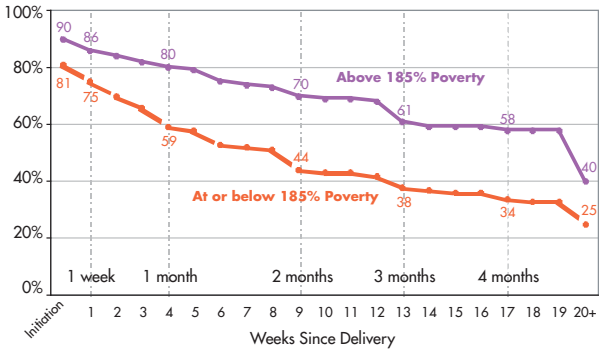
Poverty Status

Federal poverty guidelines provide a way to measure family economic status. Mothers can be divided into two groups according to whether they are at or below 185 percent of the federal poverty line, or above 185 percent of the line.* An increase in breastfeeding was found over time for mothers in Colorado, regardless of poverty level. Between 1997 and 2003, the percentage of mothers who began breastfeeding and continued increased for both groups.

There is a large gap in breastfeeding practices between the two poverty level groups, however. Mothers with incomes greater than 185 percent of poverty had much higher breastfeeding initiation and duration rates compared to mothers at or below 185 percent of poverty. Figure 5 shows breastfeeding rates for all mothers, by poverty level, for 2003. For women at or below 185 percent of poverty, 81 percent initiated breastfeeding. At three months postpartum, 38 percent continued to breastfeed. For women above 185 percent of poverty, the initiation rate was 90 percent; at three months postpartum, the duration rate was 61 percent.

*This division is a common measure of poverty, with the group below 185 percent of the guideline often requiring a higher level of government services. For more information, go to http://aspe.hhs.gov/poverty/.

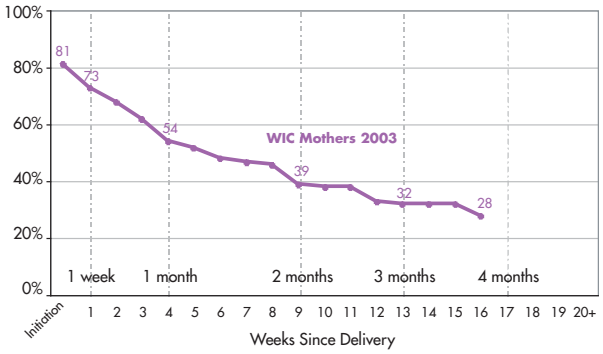
Figure 5. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Poverty Status, 2003



WIC Mothers

Figure 6 shows breastfeeding rates for mothers participating in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) program in 2003. Between 1997 and 2003, the percentage of mothers who began breastfeeding rose by 5 percentage points to 81 percent from 76 percent. This increase demonstrates that an increasing proportion of low-income mothers participating in WIC were willing to breastfeed, although changes in breastfeeding duration were relatively small. Among all states, Colorado is one of the top 10 states in breastfeeding initiation among WIC participants.[19]

Figure 6. Colorado Breastfeeding Initiation and Duration Rates, All WIC Mothers, 2003



> *"The staff at WIC encourages breastfeeding. I would have quit with my second child if WIC hadn't encouraged me to continue."*
>
> *—PRAMS Survey Respondent, 2003*

Mothers eligible for the WIC program face a number of barriers to continuing breastfeeding. Obstacles may include an early return to work or school, lack of support systems that encourage breastfeeding and lack of breastfeeding experience among family and friends. With these factors in mind, the Colorado WIC program has actively focused on breastfeeding promotion and support. Since inception, the WIC program has promoted breastfeeding to all pregnant women as the optimal infant feeding choice, unless medically contraindicated. Breastfeeding mothers are eligible to participate in WIC longer than non-breastfeeding mothers. Mothers who exclusively breastfeed (i.e., receive no WIC formula for their infant) receive a greater variety and quantity of food through the WIC program.

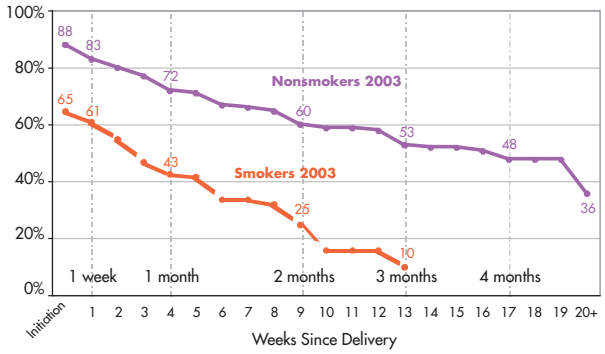
The Colorado WIC program provides regular training for WIC staff on breastfeeding promotion, management and support. Staff members are expected to discuss breastfeeding with all pregnant women to ensure that women have all the information they need to make an informed feeding choice for their infant. Mothers choosing to breastfeed are provided information and counseling to prepare them for breastfeeding. After delivery, WIC staff members are available in the clinic or by phone to assist mothers with breastfeeding concerns. Some mothers with more challenging breastfeeding experiences are referred to community lactation experts. In 2005, five Colorado WIC agencies began offering peer counselors who provide education and support to pregnant women and new breastfeeding mothers.

Breastfeeding mothers also have access to breast pumps to help support the initiation and continuation of breastfeeding. Presently, Colorado WIC loans more than 700 pumps to program participants statewide. Additionally, single-user electric breast pumps are available to be given outright to WIC mothers who are returning to work or school and who meet specific criteria. In a pilot study done by the Colorado WIC program in 2003, owning an electric breast pump was shown to extend breastfeeding duration among participants.

Smoking Status

Mothers who report smoking in the last three months of pregnancy have much lower breastfeeding initiation and duration rates compared to nonsmokers. Figure 7 shows the difference in breastfeeding rates between smokers and nonsmokers in 2003. While fully 88 percent of nonsmokers initiated breastfeeding, only 65 percent of smokers did so. By one month after delivery, fewer than half of

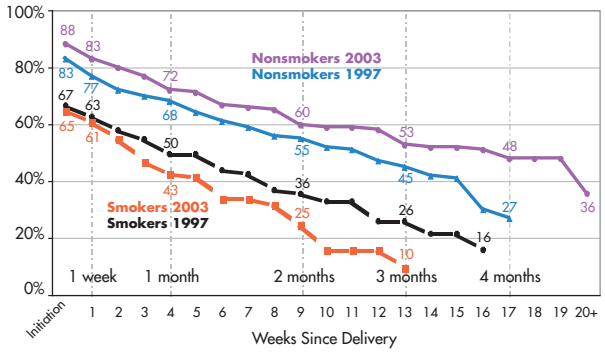
Figure 7. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Smoking Status in the Last Three Months of Pregnancy, 2003



mothers who smoked during pregnancy were breastfeeding their infants. By three months after delivery, one in 10 smokers were breastfeeding, compared to half of nonsmokers (53 percent).

Among smokers, breastfeeding initiation and duration rates decreased between 1997 and 2003, a change that is the opposite of the experience of the other subgroups examined above. Figure 8 shows breastfeeding rates for smokers and nonsmokers for both 1997 and 2003. In 2003, breastfeeding initiation and duration rates were lower for smokers than in 1997, although the differences were not significant. The proportion of women who smoked in 2003 (10.5 percent) compared to 1997 (13.2 percent) is smaller, however. The adverse experience of 2003 smokers may be related to the degree of their dependence on cigarettes; each year as the proportion of all pregnant women who smoke shrinks, those who are left also may be ones who are least willing to quit.

Figure 8. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Smoking Status in the Last Three Months of Pregnancy, 1997 and 2003



Only one-third of all mothers in Colorado were still breastfeeding at four and a half months postpartum in 2003. The national objective is 50 percent at six months.

Breastfeeding rates improved, however, among nonsmokers. From 1997 to 2003, there were consistently higher breastfeeding rates over time for mothers who did not smoke. In both years, close to nine out of ten nonsmokers initiated breastfeeding, and by 2003, half (53 percent) were still breastfeeding three months after delivery.

Summary

Breastfeeding initiation and duration rates increased in Colorado between 1997 and 2003. Improvements in rates were observed for all racial and ethnic groups, for all ages, for all educational levels, for women below and above poverty, for women on WIC, and for nonsmokers. Despite this progress, however, impressive initiation rates did not result in mothers continuing to breastfeed their infants for extended periods of time. Even with the improvements in rates, fewer than half of all mothers breastfed for three months.

The American Academy of Pediatrics recommends exclusive breastfeeding for the first six months, and the national goal is for 50 percent of all mothers to do so by 2010. Colorado women have not yet accomplished this goal. Only one-third of Colorado mothers were still breastfeeding at four and one-half months postpartum in 2003.

Section II. Hospital Practices Supportive of Breastfeeding in Colorado

Introduction

Strategies for Increasing Breastfeeding Duration

To address the issue of Colorado's low rates of breastfeeding duration, evidence-based approaches that help breastfeeding mothers were examined. The Baby-Friendly Hospital Initiative's "Ten Steps to Successful Breastfeeding" have been shown to improve breastfeeding rates. Information is available from the PRAMS surveys for 2002 and 2003 to examine a number of the steps individually. Mothers responding to the survey answered a series of questions that addressed six of the 10 steps specifically (4, 5, 6, 7, 8 and 9).* They reported their experiences in the hospital regarding practices supportive of breastfeeding prior to discharge. Data about these six hospital practices were analyzed to see if they were associated with increased breastfeeding duration. In addition, a summary from a separate 2003 survey of Colorado hospital maternity care practices related to breastfeeding was reviewed. Some of the results of that hospital survey are included in this report and provide information from a hospital perspective.

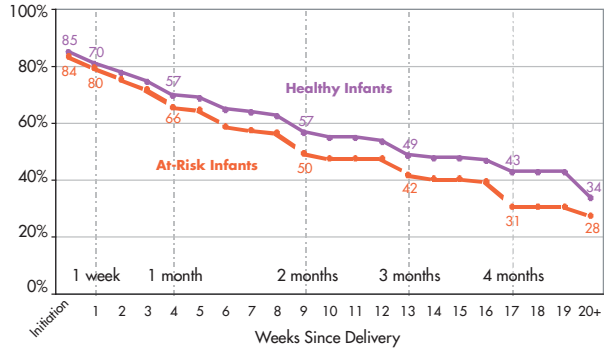
Analysis of All Healthy Infants for Hospital Practices

The analysis of the association between breastfeeding duration and hospital practices supportive of breastfeeding was limited to all healthy infants whose mothers initiated breastfeeding in the hospital. Infants with certain health risks may have special short-term or long-term health needs that could be a barrier to breastfeeding. Inclusion of these infants negatively impacts breastfeeding duration rates and may confound the results for reasons unrelated to hospital practices. Infants considered to be at risk were defined as the following:

- Low birth weight (born weighing 5 pounds, 8 ounces or less)
- Premature (born less than 37 weeks gestation)
- Placed in the neonatal intensive care unit at birth
- A multiple birth (twins or other multiples)

*Steps 1, 2, 3, and 10 were not analyzed in this report because there were no data collected on these practices in the PRAMS Survey. In addition, mothers would not likely know if a breastfeeding policy exists (Step 1) or if health care staff are trained about breastfeeding (Step 2).

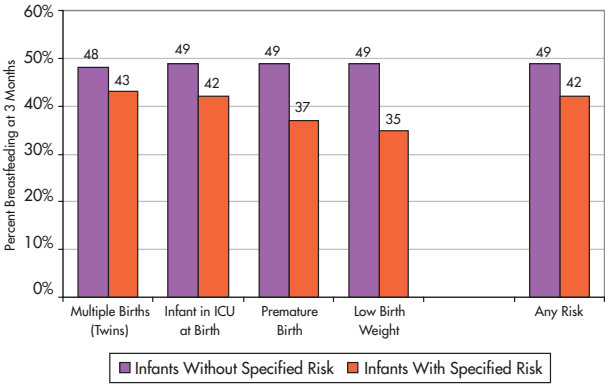
Figure 9. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Healthy and At-Risk Infants, 2002–2003



An analysis of these risks shows a negative effect on breastfeeding duration rates in recent years in Colorado among infants with one or more of the risks (Figure 9). Overall, mothers of at-risk infants had a 7-percentage point lower breastfeeding rate at three months after delivery, for example, compared to mothers of infants who were defined as not at risk (42 percent vs. 49 percent).

When the above health risks are analyzed individually, each contributed to a varying degree to lower breastfeeding duration (Chart 1). Mothers of infants born at a low birth weight had a 14-percentage point lower breastfeeding rate at three months compared to mothers of infants born at an adequate birth weight (35 percent vs. 49 percent). For infants born prematurely, mothers had a 12-point lower breastfeeding rate at three months compared to mothers of term infants (37 percent vs. 49 percent). Mothers of infants who were placed in the neonatal

Chart 1. Breastfeeding Duration Rates at 3 Months of Age by Health Risk Characteristics of Infants, Pregnancy Risk Assessment Monitoring System (PRAMS) Survey, 2002–2003



intensive care unit after birth had a 7-point lower breastfeeding rate at three months (42 percent vs. 49 percent), than those who did not need the neonatal intensive care unit. For mothers of twins, breastfeeding rates were 5 points lower at three months compared to mothers of singletons, with 43 percent of mothers breastfeeding twins at three months compared to 48 percent of mothers of singletons.

All mothers of at-risk infants have lower breastfeeding rates over time compared to all mothers of healthy infants (Figure 9). This difference was significant to 10 weeks after delivery (48 percent vs. 55 percent). As the graph shows, after the first week, the percentage of mothers breastfeeding at-risk infants is lower than the rate for healthy infants.

Infants who were delivered via Cesarean section (C-section) may be perceived as having special challenges that create a barrier to breastfeeding. However, Figure 10 shows rates that were not statistically significantly different. For the 22 percent of mothers who had a C-section, this method of delivery was not a barrier to breastfeeding. Therefore, mothers who delivered via C-section were included in the analysis of hospital practices supportive of breastfeeding.

Figure 10. Colorado Breastfeeding Initiation and Duration Rates, All Mothers by Method of Delivery, 2002–2003

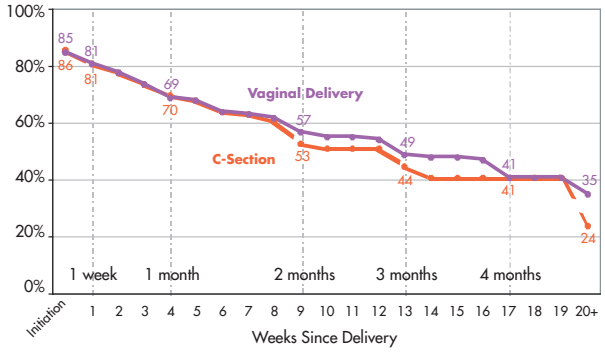
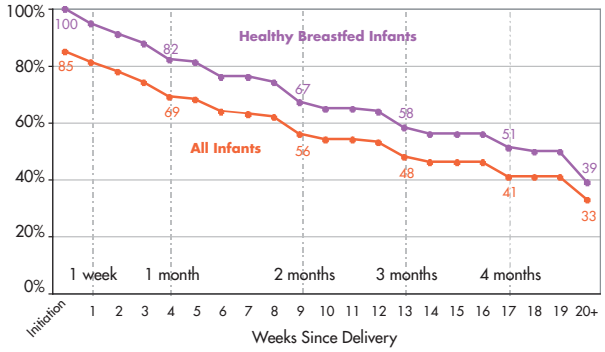


Figure 11 shows breastfeeding duration rates for mothers of healthy breastfed infants, and all infants as a line of reference, for the combined years of 2002 and 2003. There were an estimated 89,800 mothers of healthy breastfed infants, who comprised the vast majority of the 128,747 mothers who gave birth in 2002 and 2003. Sixty-seven percent of healthy breastfed infants were still breastfeeding at two months after delivery, and more than half (51 percent) were still breastfeeding at four months after delivery. Among mothers of all infants, the percent initiating breastfeeding is 85 percent, at two months is 56 percent and at four months is 41 percent. This figure again depicts the increased likelihood of the healthy infant to be breastfed longer.

Figure 11. Colorado Breastfeeding Initiation and Duration Rates, All Mothers of Infants and Mothers of Healthy Breastfed Infants, 2002–2003



Colorado Hospital Practices Supportive of Breastfeeding

This report examines breastfeeding duration by specific events that occurred in the hospital for all healthy infants. Infants with complicating health issues that required additional staff attention for breastfeeding were not included in the analysis. Healthy infants are those without the specific high-risk characteristics that may present a challenge to breastfeeding.* The analysis also was limited to breastfed infants, removing those mothers who never intended to breastfeed and who would not be amenable to hospital practices supporting breastfeeding. The assumption is made that the mothers who breastfed wanted to breastfeed.

While no hospitals in Colorado met the BFHI criteria for the designation of "Baby-Friendly Hospital" during the period of this study (2002 and 2003), mothers may have experienced some Baby-Friendly hospital practices, i.e., practices supportive of breastfeeding. This analysis examined whether mothers who experienced certain hospital practices supportive of breastfeeding had success with breastfeeding. Beginning in 2002, the PRAMS survey began to ask mothers who gave birth to live-born infants in Colorado what happened during their hospital stay regarding breastfeeding, referred to as "hospital practices supportive of breastfeeding." The hospital practice questions in the survey were based on the BFHI guidelines for successful breastfeeding, the "Ten Steps to Successful Breastfeeding."

*Healthy infants were defined as those infants who were born at 37 or more weeks gestation (not premature), weighed more than 5 pounds, 8 ounces (not low birth weight), were singleton births (not twins or other multiples) and were not placed in the intensive care unit after delivery.

Hospital Breastfeeding Practice Questions, Colorado Pregnancy Risk Assessment Monitoring System (PRAMS) Survey, 2002–2003

This questionnaire asks about things that may have happened at the hospital where your new baby was born. For each item, circle Y (Yes) if it happened or circle N (No) if it did not happen.

	No	Yes
1. Hospital staff gave me information about breastfeeding	N	Y
2. My baby stayed in the same room with me at the hospital	N	Y
3. I breastfed my baby in the hospital	N	Y
4. I breastfed my baby in the first hour after my baby was born	N	Y
5. Hospital staff helped me learn how to breastfeed	N	Y
6. My baby was fed only breast milk at the hospital	N	Y
7. Hospital staff told me to breastfeed whenever my baby wanted	N	Y
8. The hospital gave me a gift pack with formula	N	Y
9. The hospital gave me a telephone number to call for help with breastfeeding	N	Y
10. My baby used a pacifier in the hospital	N	Y

Nine of the 10 questions asked on the PRAMS survey were analyzed and seven of the survey questions (questions 1, 2, 4, 5, 6, 7 and 10) addressed seven of the BFHI 10 steps (Steps 3–9). The PRAMS question, "I breastfed my baby in the hospital" was not analyzed, as all breastfed infants were included in the analysis. Additional relevant hospital practice questions (questions 8 and 9) were available from the PRAMS survey and also were included in the analysis. Each of the hospital practice questions was analyzed separately to determine breastfeeding duration rates and whether statistically significant differences occurred between the groups. Data were analyzed using mothers of healthy breastfed infants for the combined years of 2002 and 2003.

Table 1 lists each of the hospital practices supportive of breastfeeding, by the percent breastfeeding at eight weeks after delivery and by the longest number of weeks postpartum that significance is attained, for mothers who responded "yes" to a particular hospital practice compared to the mothers who responded "no." Five hospital practices had a significant effect on continuation: breastfeeding within the first hour after birth, infant fed breast milk only, infant "roomed-in" with mother, no pacifier use, and staff gave mother a telephone number to call for help with breastfeeding. As demonstrated by the significantly greater percentage of mothers who continued to breastfeed, these five hospital practices were critically important for breastfeeding success.

Breastfeeding Within First Hour

Mothers of healthy breastfed infants who breastfed within the first hour after birth had significantly higher breastfeeding duration rates at eight weeks and continuing to 14 weeks postpartum (Table 1) compared to mothers who did not breastfeed in the first hour after birth. At 8 weeks, 77 percent of mothers who breastfed in the first hour were still breastfeeding, compared to 66 percent of mothers who did not breastfeed in the first hour.

At 14 weeks, fully 60 percent of mothers who breastfed in the first hour after birth were still breastfeeding, while 45 percent of mothers who did not breastfed within the first hour continued to

Table 1. Hospital Breastfeeding Practices and Breastfeeding Continuation Among Mothers of Healthy Breastfed Infants, at 8 Weeks and Longer, Pregnancy Risk Assessment Monitoring System (PRAMS) Survey, 2002–2003

Hospital Breastfeeding Practice	Percent of Mothers Continuing to Breastfeed at 8 Weeks		95% Confidence Intervals at 8 Weeks*		Statistical Significance at 8 Weeks**	Statistical Significance to Longest Week***	Percent of Mothers Continuing to Breastfeed at Longest Week		95% Confidence Intervals at Longest Week*	
	Practice Yes	Practice No	Practice Yes	Practice No			Practice Yes	Practice No	Practice Yes	Practice No
Infant breastfed in first hour after birth	77	66	(74,79)	(61,70)	Yes	14	60	45	(56,64)	(39,51)
Infant fed breast milk only in hospital	81	65	(78,83)	(61,68)	Yes	16	65	45	(60,69)	(40,50)
Infant stayed in same room with mother	74	62	(72,76)	(52,71)	Yes	8	74	62	(72,76)	(52,71)
Infant did **not** use pacifier in hospital	78	69	(75,81)	(75,81)	Yes	14	62	50	(57,67)	(45,54)
Hospital gave mother phone number to call for breastfeeding help	75	64	(73,77)	(57,70)	Yes	12	65	52	(62,68)	(45,59)
Hospital staff gave mother information about breastfeeding	74	70	(58,79)	(71,76)	No	NA	NA	NA	NA	NA
Hospital staff helped mother learn how to breastfeed	72	78	(72,82)	(70,75)	No	NA	NA	NA	NA	NA
Hospital staff told mother to breastfeed whenever infant wanted	74	71	(65,76)	(71,76)	No	NA	NA	NA	NA	NA
Hospital did **not** give gift pack with formula	79	73	(71,84)	(70,75)	No	NA	NA	NA	NA	NA

* 95% upper and lower confidence limits for the percent of mothers breastfeeding at eight weeks after delivery. Confidence intervals that do not overlap show statistically significant differences in the percent of mothers breastfeeding at eight weeks, for those who responded "yes" versus "no."

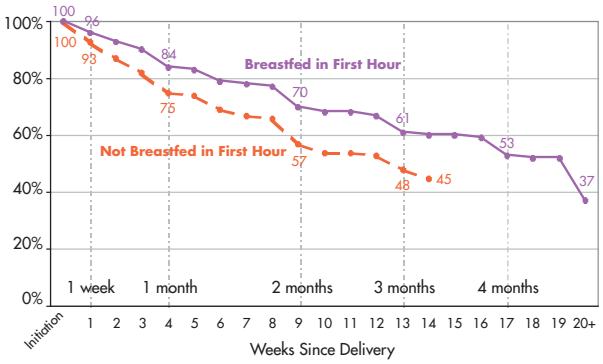
** Statistical significance is determined using 95% confidence intervals for the percent breastfeeding at eight weeks after delivery. Statistical significance was determined for each hospital breastfeeding practice. Those marked "yes" show a significant difference at eight weeks after delivery in the percent of mothers breastfeeding who experienced the hospital breastfeeding practice, compared to those who did not.

*** Statistical significance is determined using 95% confidence intervals for the percent breastfeeding at each week after delivery. The week specified in the table is the latest point postpartum that significance is found.

NA = Not applicable.

breastfeed. Breastfeeding in the first hour after birth contributed to a significant 33 percent higher rate in the proportion of mothers who continued to breastfeed at 14 weeks after delivery. It is important to note that almost three-quarters of mothers (72 percent) were able to breastfeed in the first hour after birth. Figure 12 provides information on the entire postpartum period and shows the pattern of continuation over time.

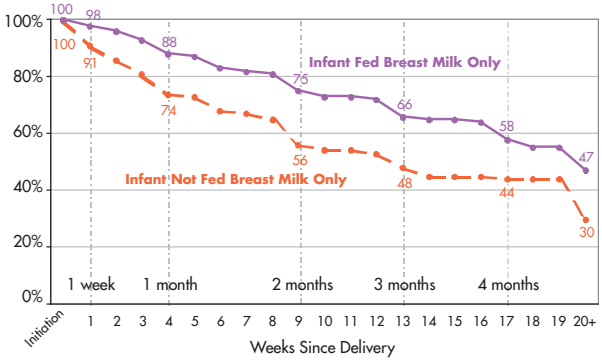
Figure 12. Colorado Breastfeeding Initiation and Duration Rates, Mothers of Healthy Breastfed Infants, by Breastfed in the First Hour After Birth, 2002–2003



Breast Milk Only

Feeding healthy infants formula or water in the hospital has a negative effect on breastfeeding duration. Mothers of healthy breastfed infants who were fed only breast milk while in the hospital were significantly more likely to continue breastfeeding both at eight weeks and as long as 16 weeks postpartum compared to mothers whose infants received either formula or water while in the hospital (Table 1). At eight weeks, the breast milk only group had a higher rate of continuation (81 percent) compared to mothers whose babies received supplementation (65 percent). At 16 weeks, 65 percent of mothers whose infants received only breast milk continued to breastfeed, while 45 percent of mothers whose infants were given supplementation in the hospital continued to breastfeed, a 20-percentage point difference. Figure 13 shows the patterns of duration for both groups. It is important to note that more than half of infants (54 percent) received supplementation.

Figure 13. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Infants Fed Breast Milk Only, 2002–2003

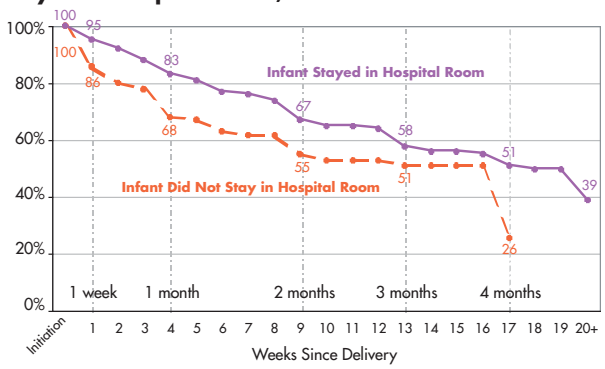


The wide difference in breastfeeding duration rates continued through the 20 plus weeks that data were available, with nearly half (47 percent) of women whose infants received only breast milk in the hospital continuing to breastfeed compared to 30 percent among women whose infants received supplementation. These findings demonstrate the importance of using breast milk as the *only* source of food for a newborn, to establish milk supply and contribute to long-term success with breastfeeding. This suggests as well that routine *unnecessary* supplements can be detrimental to the mother's ability to build milk supply and maintain breastfeeding over time.

Infant Stays in Same Room

Mothers of healthy breastfed infants whose infants stayed in the same room with them in the hospital had higher breastfeeding duration rates than mothers whose infants did not (Table 1). This fact is especially apparent in the first few weeks after delivery (Figure 14). At eight weeks postpartum, 74 percent of mothers of infants who roomed-in were still breastfeeding, compared to 62 percent of infants who did not room-in. This difference was statistically significant. Higher breastfeeding rates (although not significantly higher) were seen for infants who roomed-in at the hospital throughout the 20 plus weeks after delivery for which there is data, demonstrating that this hospital practice contributes to the long-term success of breastfeeding. Most infants (93 percent) roomed-in with their mothers. One of the main reasons an infant is removed from a mother's room is to allow her to get rest. One study found that mothers actually sleep better with their infants in the room.[20]

Figure 14. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Infant Stayed in Hospital Room, 2002–2003



No Pacifier Use

Pacifier use in the hospital reduces breastfeeding duration. As Table 1 shows, at eight weeks 78 percent of breastfeeding mothers of healthy infants whose infants had *not* used a pacifier were still breastfeeding, compared to 69 percent for infants who had used a pacifier. Higher breastfeeding rates continued throughout the 20 weeks when infants had not used a pacifier in the hospital, compared to infants who had used a pacifier (Figure 15). This difference was significantly higher up to and including 14 weeks after delivery, with 62 percent of mothers whose infants were not introduced to a pacifier in the hospital continuing to breastfeed, compared to 50 percent of mothers breastfeeding when the infant did have a pacifier. It is important to note that although use of a pacifier in the hospital was detrimental to breastfeeding, the majority (54 percent) of infants used a pacifier in the hospital.

Figure 15. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Infant Used Pacifier in Hospital, 2002–2003

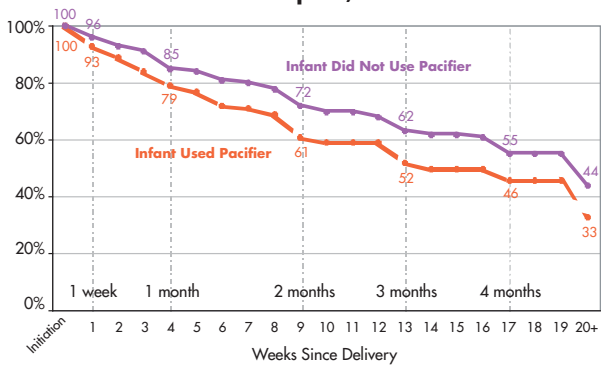
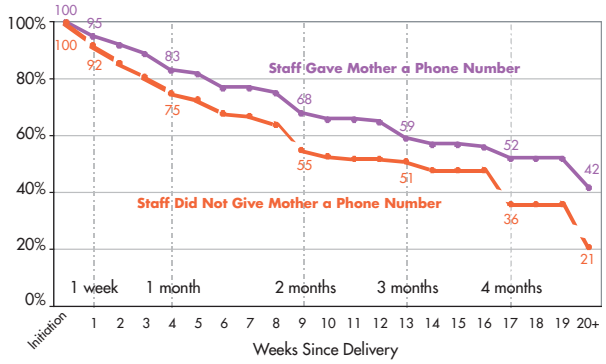


Figure 16. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Hospital Staff Gave Mother Breastfeeding Phone Number to Call, 2002–2003



Breastfeeding Telephone Number

Mothers who were given a phone number to call for help with breastfeeding did significantly better with continuing to breastfeed, compared to mothers who were not given a phone number (Table 1; Figure 16). This difference was significant through 12 weeks after delivery, with a 25 percent higher rate of breastfeeding among mothers who were given a phone number compared to mothers who were not (65 percent vs. 52 percent). Eighty-four percent of mothers reported being given a telephone number.

Breastfeeding Information

Whether the hospital staff gave information about breastfeeding did not make a significant difference in breastfeeding duration (Table 1). Nearly all breastfeeding mothers of healthy infants, 94 percent, received some kind of information from hospital staff about breastfeeding, but the question was not specific enough to be useful in this analysis. It is not known when the mother received the information, during birth preparation classes or after delivery or both. The content and quality of the information also is not known. It seems likely that general breastfeeding information may not be especially related to short-term or long-term success at breastfeeding.

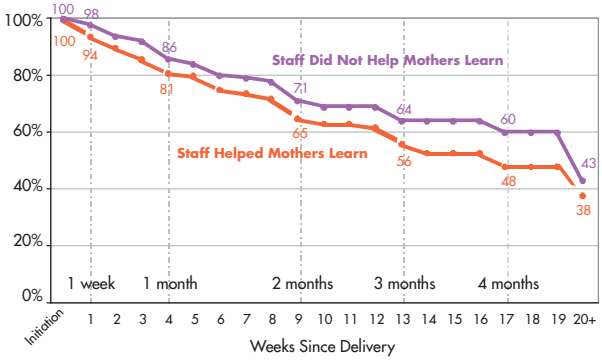
Breastfeeding information and breastfeeding initiation, however, are associated. Among all mothers in Colorado, there was a high rate of *initiation* among the group of mothers reporting that hospital staff gave information about breastfeeding compared to the rate for mothers who did not report

receiving information. Breastfeeding initiation for all mothers given information was 87 percent, compared to 62 percent among mothers who did not receive information. Only 7 percent of all mothers did not receive information about breastfeeding; these mothers may not have been interested in initiating breastfeeding and may have declined the information.

Learning to Breastfeed

When hospital staff helped mothers of healthy breastfed infants learn to breastfeed, the breastfeeding *duration* rate was slightly lower compared to similar mothers who did not receive help (Table 1; Figure 17), although these differences were not statistically significant at any point in time. At first glance, the lower duration rate seems counterintuitive; mothers who receive help should do better than mothers who do not receive help. However, the group of breastfeeding mothers who reported that they did not receive help in learning to breastfeed is composed almost entirely (87 percent) of mothers who had previously had a child, while the group of breastfeeding women who reported that they did receive help is composed equally of mothers with older children and mothers experiencing their first birth. Based on the literature of breastfeeding experience, an assumption can be made that most of the breastfeeding mothers who did not receive help did not feel that they needed help because they had breastfed their previous infant or infants.[19] It is likely that their past experiences with breastfeeding contributed to their success with their new infant.

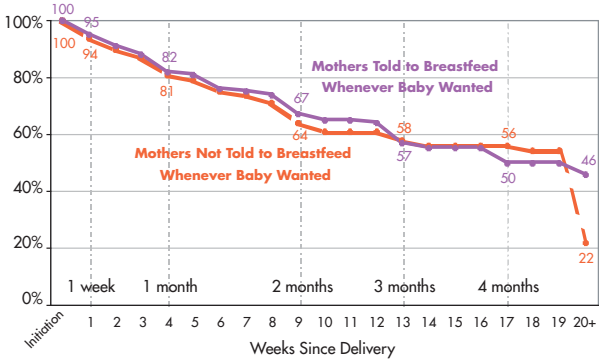
Figure 17. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Hospital Staff Helped Mother Learn to Breastfeed, 2002–2003



When to Breastfeed

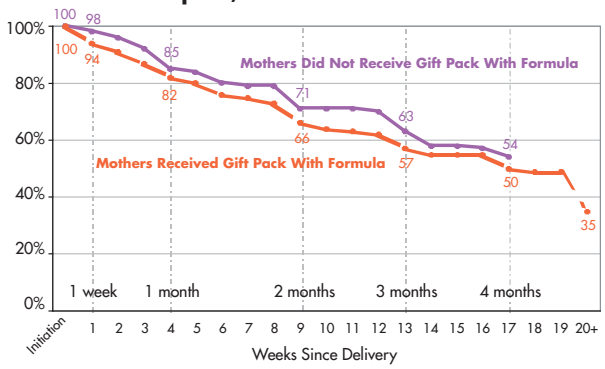
The practice of hospital staff telling mothers to breastfeed whenever the baby wanted, for breastfeeding mothers of healthy infants, did not show any effect on breastfeeding duration in this study (Table 1; Figure 18). The slight differences that appeared in breastfeeding duration rates between mothers who were told to breastfeed whenever the baby wanted and those who were not given that advice were not statistically significant at any point in time. This directive seems to be standard among most Colorado hospitals, and 82 percent of breastfeeding mothers of healthy infants said hospital staff told them to breastfeed whenever the baby wanted.

Figure 18. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Told to Breastfeed Whenever Baby Wanted, 2002–2003



> *"The hospital has a breastfeeding clinic and it is WONDERFUL!! I think every hospital should have one. It has helped me tremendously. For the first two weeks I kept going to them with all my questions. They made my breastfeeding experience a lot easier. I have recommended this clinic to every pregnant female I know."*
>
> *—PRAMS Survey Respondent, 2002*

Figure 19. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Received Gift Pack at Hospital, 2002–2003



Gift Pack With Formula

The vast majority of all mothers in Colorado received a gift pack with formula (92 percent), since this is standard practice among Colorado hospitals. However, among those few who did not receive a gift pack with formula, breastfeeding rates were slightly higher over the postpartum period. At eight weeks after delivery, 73 percent of breastfeeding mothers of healthy infants who received the gift pack with formula were still breastfeeding and 79 percent of mothers who did not receive a gift pack with formula were still breastfeeding (Table 1). Figure 19 shows breastfeeding duration rates for these two groups for the entire 20-week period. At three months, 63 percent of mothers who were not given a gift pack with formula were breastfeeding, while 57 percent of mothers who were given a gift pack with formula were breastfeeding. Although these differences were not statistically significant at eight weeks or at any point in time, the consistently higher duration rate among mothers who did not receive a gift pack with formula suggests some benefit to withholding formula from a gift pack. In December 2005, Massachusetts, as a way to further support breastfeeding and to limit the marketing of formula in hospital institutions, became the first state to try to prohibit hospitals from providing free infant formula company diaper bags to new parents. (For more information, go to http://www.massbfc.org/.) Although this prohibition has been met with resistance, it seems likely that infant formula company diaper bags will be phased out in time.

Conclusion

From the discussion above, it can be concluded that a total of five hospital breastfeeding practices significantly affected long-term success with breastfeeding:

1. Infant is breastfed in the first hour after birth.
2. Infant is fed only breast milk in the hospital.
3. Infant stays in the same room with the mother in the hospital.
4. Infant does not use a pacifier in the hospital.
5. Hospital staff gives mother a telephone number to call for help with breastfeeding.

In the following section, the five successful practices are combined to compare mothers who experienced all successful hospital practices to everyone else (i.e., mothers who did not experience all of the successful practices) to see if the combined successful practices had an increased effect on breastfeeding duration. The combined successful practices are then stratified by markers of maternal socioeconomic status (Medicaid, federal poverty levels) to identify if the effects persisted.

Five Successful Hospital Breastfeeding Practices in Colorado and the Percent of Breastfeeding Mothers Experiencing Each Practice

1. Infant is breastfed in the first hour after birth—72%
2. Infant is fed only breast milk in the hospital—46%
3. Infant stays in the same room with the mother in the hospital—93%
4. Infant does **not** use a pacifier in the hospital—46%
5. Hospital staff gives mother a telephone number to call for help with breastfeeding—84%

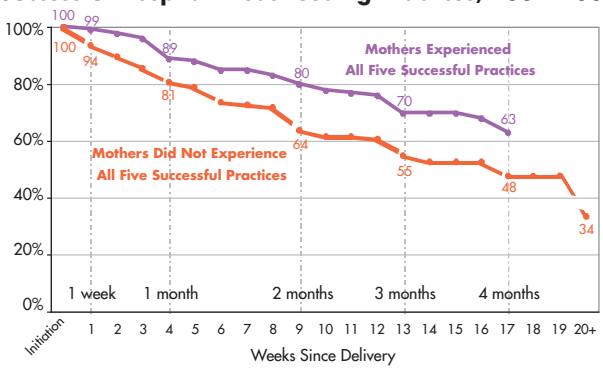
All 5 practices—19%

Five Successful Hospital Breastfeeding Practices

The greatest improvements with breastfeeding were seen when mothers reported all five successful hospital practices, where the hospitals "got it right" after delivery. The percentage of mothers breastfeeding throughout four months is higher for the combination of five successful practices than for any of the successful hospital practices individually, with 89 percent breastfeeding at one month, 80 percent at two months, 70 percent at three months, and 63 percent at four months after birth. Figure 20 shows the breastfeeding duration rate for mothers of healthy breastfed infants, comparing mothers who experienced all the "successful" hospital practices to mothers who did not.* There were significant differences, through 16 weeks, between mothers who experienced all successful practices compared to mothers who did not.

*Mothers who did not experience the successful hospital breastfeeding practices are defined as mothers who responded that they experienced none, one, two, three, or four of the five successful hospital breastfeeding practices shown in Figure 23. A total of 3 percent of mothers experienced none of the five successful practices; 15 percent experienced one of the five; 27 percent experienced two; 34 percent experienced three; and 3 percent experienced four practices. Only 19 percent of all mothers experienced all five of the practices.

Figure 20. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants, by Five Successful Hospital Breastfeeding Practices, 2002–2003



It is instructive to learn that fewer than one in five mothers (19 percent) of healthy breastfed infants experienced all the successful hospital practices. Table 2 shows the percent of mothers who experienced all five successful practices by various maternal characteristics. For each subgroup of mothers (e.g., Medicaid coverage or no Medicaid coverage), 20 percent or fewer experienced all five successful practices. Among all breastfeeding mothers of healthy infants who did not experience all five successful practices, the average number of practices reported was 2.8, and the median was 2.2. These statistics demonstrate the widespread lack of hospital policies and practices that result in successful breastfeeding, regardless of the economic status of the mother.

Table 2. Mothers of Healthy Breastfed Infants Experiencing All Five Successful Hospital Breastfeeding Practices, by Maternal Characteristics, Pregnancy Risk Assessment Monitoring System (PRAMS) Survey, 2002–2003

Maternal Characteristic	Percent Experiencing All Five Successful Practices[a]
All Mothers	19
Medicaid Coverage During Pregnancy*	
Yes	18
No	19
185% Federal Poverty Guideline	
At or Below 185% Poverty	19
Above 185% Poverty	19
Mothers with High Socioeconomic Status**	20

[a] Mothers who experienced all five successful hospital breastfeeding practices during their hospital stay

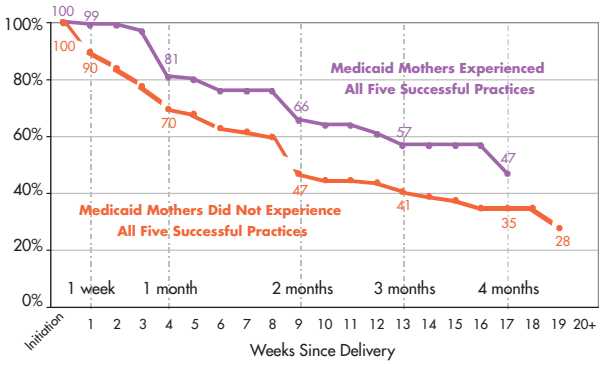
* Includes mothers whose prenatal care was covered by Medicaid; excludes mothers whose deliveries were covered by Emergency Medicaid

** Mothers with high socioeconomic status were defined as 25 years of age or older with more than 12 years of education and with incomes above 185% of the federal poverty guideline.

Successful Hospital Breastfeeding Practices and Medicaid Status

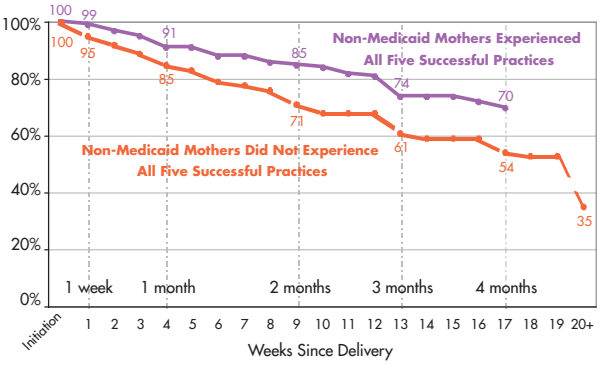
An estimated 28 percent of mothers of healthy breastfed infants were covered by Medicaid during pregnancy in 2002 and 2003. This group of mothers on Medicaid has lower overall breastfeeding rates than women not on Medicaid. Nonetheless, mothers on Medicaid who experienced all five successful practices had consistently higher breastfeeding duration rates, compared to mothers on Medicaid who did not report all successful practices (Figure 21). These differences were significant through 11 weeks after delivery, and demonstrate the beneficial effect of the successful practices. Among this group of women who are at risk for discontinuing breastfeeding earlier than the overall population, a higher percentage breastfed longer when they experienced all of the five successful hospital practices.

Figure 21. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants Covered by Medicaid, by Five Successful Hospital Breastfeeding Practices, 2002-2003



For mothers who were not covered by Medicaid during pregnancy, the percent breastfeeding through four months after delivery was consistently higher when mothers experienced all five successful hospital practices (Figure 22). The difference in breastfeeding duration rates between non-Medicaid mothers who experienced all successful practices and those who did not was statistically significant through 11 weeks after delivery, the same week as for mothers on Medicaid. An estimated 72 percent of mothers of healthy breastfed infants during 2002 and 2003 were not on Medicaid. These mothers generally have high breastfeeding rates, yet they still improve breastfeeding duration significantly when they experience the five successful hospital practices.

Figure 22. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants Not Covered by Medicaid, by Five Successful Hospital Breastfeeding Practices, 2002–2003



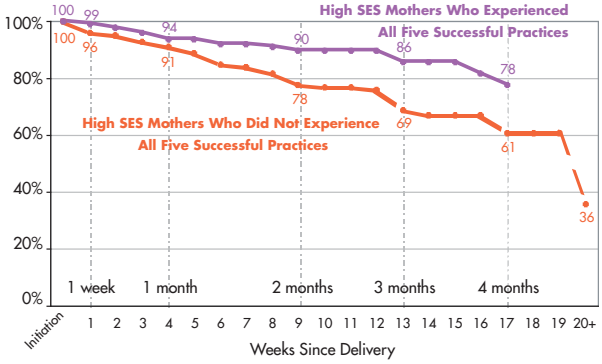
Successful Hospital Breastfeeding Practices and High Socioeconomic Status

Mothers who are older, with more education, and higher incomes (high socioeconomic status) tend to have higher breastfeeding initiation and duration rates compared to younger, less educated and lower-income mothers. Breastfeeding duration rates were calculated to see if this group of breastfeeding mothers of healthy infants, with the highest breastfeeding rates, was positively affected by the five successful hospital breastfeeding practices. Mothers of high socioeconomic status were defined as 25 years of age or older, with more than 12 years of education and with incomes above 185 percent of the federal poverty guidelines.

High socioeconomic status mothers comprise 35 percent of all mothers of healthy breastfed infants. As Figure 23 shows, even mothers of high socioeconomic status experienced increased breastfeeding duration rates when they reported all five successful practices. As with other subgroups of mothers, however, a small percentage actually experienced all successful hospital breastfeeding practices (20.3 percent). Mothers of healthy breastfed infants who experienced all successful practices had significantly higher breastfeeding rates to 12 weeks after delivery compared to mothers who did not experience all successful practices. Furthermore, the gap in the differences widened as time passed in the postpartum period.

Regardless of their socioeconomic status, mothers have significantly higher breastfeeding duration rates when they experience all five successful hospital breastfeeding practices.

Figure 23. Colorado Breastfeeding Duration Rates, Mothers of Healthy Breastfed Infants of High Socioeconomic Status, by Five Successful Hospital Breastfeeding Practices, 2002–2003



Reasons for Stopping Breastfeeding

The top reasons all breastfeeding mothers stop breastfeeding are related to their ability to establish successful breastfeeding. As shown in Chart 2, the top three reasons for stopping were "not producing enough milk," cited by 43 percent of all mothers who stopped; "did not satisfy baby," cited by 40 percent; and "had difficulty nursing," cited by 28 percent. In fourth place was "went back to school or work," cited by 24 percent, and the fifth reason was "nipples were sore," reported by 19 percent. Four of the five top reasons are in fact affected by successful hospital practices supportive of breastfeeding.

Among mothers of healthy infants who stopped breastfeeding, those who experienced all successful practices were significantly less likely to stop due to any of the top three reasons (Chart 3) compared to mothers who did not experience the five successful practices. In fact, just 31 percent of mothers who experienced all successful practices cited "not producing enough milk" as one of the reasons they

Chart 2. Top Reasons Cited for Stopping Breastfeeding Among Mothers Who Stopped Breastfeeding, Pregnancy Risk Assessment Monitoring System (PRAMS), 2002–2003

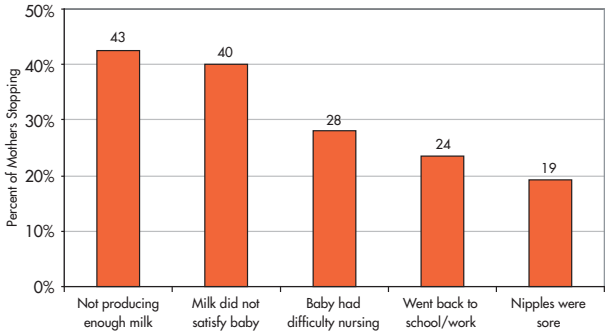
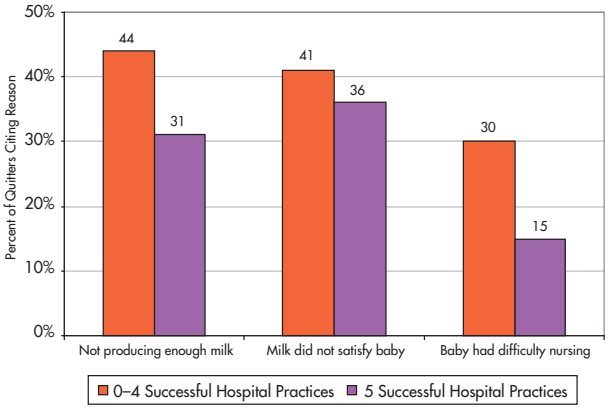


Chart 3. Top Reasons Cited for Stopping Breastfeeding Among Mothers Who Stopped Breastfeeding, by Experience with Five Successful Hospital Breastfeeding Practices, Pregnancy Risk Assessment Monitoring System (PRAMS) Survey, 2002–2003



quit, compared to 44 percent of mothers not reporting all five practices. Further, 36 percent of mothers experiencing all successful practices cited "did not satisfy baby" as a reason for stopping, compared to 41 percent of mothers in the other group. Fifteen percent of mothers experiencing all five practices said "difficulty nursing" was one of the reasons they stopped, compared to 30 percent of mothers in the other group. These findings are all statistically significant and demonstrate the power of the successful hospital practices to reduce the percentage of mothers who stopped breastfeeding due to difficulties with nursing.

Survey of Colorado Hospitals

A separate survey of Colorado hospitals with mother-baby units was administered in 2003 to assess the degree to which hospitals have implemented specific practices and policies that promote and support breastfeeding. The "Survey of Colorado Hospitals-Infant Feeding Policies and Practices" was developed and administered by Colorado State University, the Colorado WIC Program, and the Colorado Breastfeeding Task Force.[21] Ninety-five percent (52/55) of the hospitals returned the surveys.

Results from the survey showed the majority of Colorado hospitals (63 percent) reported having written policies that supported breastfeeding. Of those hospitals, 52 percent stated that more than 75 percent of mothers exclusively breastfed upon discharge. Hospitals with written policies were more likely to have trained breastfeeding specialists. Of hospitals with a written breastfeeding policy, 77 percent had a lactation consultant on staff.

Policies

When it came to implementing recommended breastfeeding policies, Colorado hospitals had difficulty. Just over half (56 percent) of hospitals reported that more than 80 percent of their perinatal staff received standardized training about management of the breastfeeding mother/infant pair. Furthermore, hospitals did not have a policy that defines when infants should be given fluids other than breast milk. Eighty percent of hospitals reported it was their policy to give formula to breastfeeding infants at the mother's request. A shortcoming of the survey was that the common reasons for mothers' requests for formula were not solicited.

Breastfeeding Immediately After Delivery

Many Colorado hospitals also did not have policies for breastfeeding within the first hour after birth. The 2003 survey results identified that only 35 Colorado hospitals (67 percent) reported having a policy for when breastfeeding should be initiated. Of the 35 hospitals with a policy about when breastfeeding should be initiated, 27 (77 percent) had a policy stating that breastfeeding should be initiated within the first hour after delivery. Six hospitals reported that their breastfeeding policy did not have a guideline for when breastfeeding should be initiated.

Rooming-In

Hospitals may not have a policy that adequately defines rooming-in. The Colorado hospital survey found that 28 of 52 hospitals (55 percent) had a written procedure for 24-hour rooming-in. Seventeen of those hospitals reported that more than 80 percent of their mothers participated in rooming-in, while 11 hospitals had 60 percent or fewer of their mothers choosing to room-in with their infants. Some hospitals with a policy still had some mothers who did not choose rooming-in. In the 24 hospitals without a written procedure for 24-hour rooming-in, the majority reported that fewer than 41 percent of mothers chose this practice.

Pacifiers

Hospitals did not have a policy that defines the appropriate use of pacifiers for breastfed infants. Virtually all hospitals (96 percent) responding to the Colorado survey reported that they do not routinely give pacifiers to healthy breastfeeding infants; however, 45 of 51 hospitals (88 percent) will provide a pacifier at the mother's request. One-third of hospitals will give a pacifier at the discretion of the nursing staff, and the majority of hospitals (60 percent) will provide a pacifier during a painful procedure, such as circumcision or blood draw.

Follow-up

Follow-up provided to breastfeeding mothers was inadequate; just 38 percent of hospitals reported that staff routinely called breastfeeding mothers after discharge. Fewer than 20 percent of hospitals reported doing routine postpartum follow-up visits of breastfeeding mothers at any time after delivery. The survey identified that 42 of 52 Colorado hospitals (81 percent) offered a 24-hour telephone number to breastfeeding mothers at discharge and 11 of 52 hospitals (21 percent) offered a hospital-based breastfeeding support group.

Results from this separate survey of Colorado hospitals, and the results of this report, highlight the need for written breastfeeding policies that provide specific guidelines for all hospital staff. In addition, these results emphasize the need for improvements to hospital staff training and the need for spending time with breastfeeding mothers during the critical first days after birth when the breastfeeding mother/infant relationship is established.

Summary

The BFHI's "Ten Steps to Successful Breastfeeding" are evidence-based guidelines for hospitals that will increase breastfeeding rates for mothers. The American Academy of Pediatrics (AAP) policy recommendations for healthy infants complement the ten steps. The analysis of breastfeeding in Colorado in this report confirms the effectiveness of the BFHI and AAP guidelines on breastfeeding, at least for those practices where data were available. In Colorado, when breastfeeding mothers of healthy infants experienced five specific hospital breastfeeding practices, large gains in breastfeeding duration were seen. Significant improvements were observed in breastfeeding duration when mothers experienced all five successful hospital practices, regardless of the mother's income, medical payer or socioeconomic status. Furthermore, the successful hospital practices significantly reduced the likelihood of stopping breastfeeding due to breastfeeding problems.

Only 19 percent of mothers in Colorado experience the five successful hospital practices that improve breastfeeding duration.

This report demonstrates the need to actively change hospital breastfeeding practices in Colorado. What is being accomplished is only a fraction of what could be done. Only 19 percent of mothers of healthy breastfed infants in Colorado experience the five successful hospital practices that improve breastfeeding duration. Only one Colorado hospital has received the "Baby-Friendly" designation. The good news is that Colorado hospitals can make specific changes by implementing the successful hospital practices, and implementation of these five practices should result in higher breastfeeding rates and healthier mothers and infants in Colorado. Furthermore, these five successful hospital practices are part of the necessary criteria for the "Baby-Friendly" hospital designation by the Baby-Friendly Hospital Initiative.

Section III. Recommendations for Colorado Hospitals

Introduction

The Baby-Friendly Hospital Initiative provides guidelines in its "Ten Steps to Successful Breastfeeding" for successful initiation of breastfeeding and for supporting mothers to develop confidence in their ability to breastfeed and nurture their infants. While Colorado hospitals should strive to achieve all ten steps, working toward the five practices discussed in this report would go a long way toward making a real difference in the health of Colorado infants and mothers. These five hospital practices, individually and combined, significantly increased breastfeeding duration for mothers in Colorado:

1. Initiate breastfeeding within the first hour after birth.
2. Avoid giving infants fluids or solids other than breast milk unless medically necessary.
3. Promote 24-hour rooming-in, encouraging the family to recognize and respond to infant's cues.
4. Do not use a pacifier or artificial nipple with infants during the hospital stay.
5. Give mothers a telephone number to call for help with breastfeeding.

It is useful to recognize that hospital factors affect breastfeeding in two separate realms: through hospital staff and hospital routines. Hospital staff must be knowledgeable about breastfeeding and must be skilled in teaching mothers about breastfeeding. Staff members' attitudes also are important; breastfeeding information and support must be provided to parents positively. Correspondingly, hospital routines may need to be re-evaluated to figure out alternative ways of accomplishing necessary tasks while supporting the breastfeeding pair.

> *"I feel that hospital staff should encourage MORE to breastfeed. Mothers need to be reassured that they are making a WISE choice to breastfeed. My source of encouragement DID NOT come from hospital staff, but from friends and family"*
>
> *—PRAMS Survey Respondent, 2002*

Each of the five practices is presented in a grid on the following pages. Challenges or issues presented by the shift to adoption of the practices are shown, as well as appropriate solutions. Policies and procedures must be written, education and training must be carried out and monitoring must take place to ensure compliance.

1. Initiate breastfeeding within first hour

The 2005 American Academy of Pediatrics (AAP) policy statement, "Breastfeeding and the Use of Human Milk," states that, "Healthy infants should be placed and remain in skin-to-skin contact with their mothers immediately after delivery until the first feeding is accomplished." The academy recognizes that the alert, healthy newborn infant is capable of latching onto a breast without specific assistance within the first hour after birth. The AAP also recommends drying the infant, assigning Apgar scores and performing the initial physical assessment while the infant is with the mother. Weighing, measuring, bathing, needle-sticks and eye prophylaxis for newborns should be delayed until after the first feeding is completed.

Challenges/Issues	Solutions		
	Policy/Procedure Development	Education/Training	Monitoring
• Breastfeeding is not viewed as a priority issue by administrators.		• Educate administrators regarding literature and best practices.	
• Hospital lacks policy on breastfeeding in the first hour.	• Write policy for breastfeeding within the first hour; include management, nutrition and lactation staff	• Use ABM Protocol #7 as a template for the policy (Appendix 4). • Publicize and routinely communicate policy to all staff members. Discuss policy in staff meetings, include the policy in the hospital newsletter and in paychecks, post policy in staff common areas and elevators.	• Monitor amount and frequency of publicity.
• Procedures and records must be completed immediately after delivery. • Procedures for care immediately after delivery have been in place a long time.	• Revise procedures to allow breastfeeding initiation to occur first, before other procedures.	• Educate physicians and nursing staff about the importance of immediately seeking to establish breastfeeding. • Educate and train staff regarding changes in procedures.	• Monitor compliance with changed policy.
• Providers are unaware of AAP statements and hospital best practices.		• Educate providers using AAP statement "Breastfeeding and the Use of Human Milk" (Appendix 2). • Educate providers using video "From Bottles to Breasts to Baby-Friendly." • Invite a medical lactation expert to provide an in-service to all staff, administration, physicians, dieticians and mom-baby unit staff. • Train all staff in skills necessary to implement the policy.	

2. Avoid giving infants fluids or solids other than breast milk unless medically necessary

The 2005 American Academy of Pediatrics (AAP) policy statement, "Breastfeeding and the Use of Human Milk," states, "Supplements (water, glucose water, formula, and other fluids) should not be given to breastfeeding newborn infants unless ordered by a physician when a medical indication exists." The use of supplements can prevent mothers from establishing a milk supply, as well as cause breastfeeding problems such as maternal engorgement.

Challenges/Issues	Solutions		
	Policy/Procedure Development	Education/Training	Monitoring
• Hospital lacks policy on supplementation.	• Write policy about giving infants fluids or solids other than breastmilk; define medically necessary supplements.	• Publicize and routinely communicate policy to all staff members.	• Monitor amount and frequency of publicity.
• Some MDs have routine orders to supplement infants within a set number of hours if they have not nursed.	• Write policy (see above)	• Educate providers using 1. AAP statement "Breastfeeding and the Use of Human Milk" (Appendix 2); 2. ABM Protocol #3: Hospital guidelines for the use of supplementary feedings in the healthy term breastfed neonate (Appendix 5); 3. ABM Protocol #10 Breastfeeding the near-term infant (Appendix 7); 4. A medical lactation expert to provide an in-service to all staff, administration and physicians, on guidelines for the indications for supplementation in healthy newborns (Appendix 3).	• Monitor procedures
• Some MDs order routine formula supplements to prevent hyperbilirubinemia.	• Write policy (see above)	• Educate providers using AAP clinical practice guideline, "Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation" (Appendix 8).	
• Some breastfed infants are supplemented with formula at the discretion of nursing staff. • Some Hispanic mothers believe supplementation is good for the infant.	• Write policy (see above)	• Train staff on how to converse with parents about breast milk as the best source of nutrition.	• Require chart documentation, including efforts to dissuade mothers from requesting supplementation.
• Some nurses supplement because mother is fatigued and wants to sleep, especially at night.	• Write policy (see above)	• Train staff that breast milk production is based on removing milk from the breast and that supplementation is not supportive of breastfeeding in the short or long run.	• Require chart documentation.
• Measurement of infant intake is easy with a bottle and provides a tangible measure of intake.	• Write policy (see above)	• Train staff to weigh infant before and after feeding if there are concerns.	• Require chart documentation.

3. Promote 24-hour rooming-in

Twenty-four hour rooming-in facilitates more frequent feedings, as well as discourages the use of supplements. Only by the mother observing and learning her infant's cues of hunger (increased alertness, physical movements, mouthing) will she recognize when to feed and understand that crying is a late stage of hunger. The hungry infant may be harder to calm to feed, while the nondemanding infant should be awakened to feed. Furthermore, mothers should sleep in close proximity to their infants to more likely become aware when the infant is showing signs of arousal and readiness to feed, and to be able to respond to an infant who cluster feeds (feeds more frequently), typically in the evening. The brief hospital stay may be the only time when the mother will have almost no outside distractions (home and family) to learn about her infant and to build her confidence in her abilities to care for her newborn.

Challenges/Issues	Solutions		
	Policy/Procedure Development	Education/Training	Monitoring
• Hospital lacks policy defining rooming-in.	• Write policy for rooming-in; include management, nutrition and lactation staff.	• Publicize and routinely communicate policy to all staff.	• Monitor amount and frequency of publicity.
• Providers are unaware of AAP and ABM statements and protocols and hospital best practices.		• Educate providers using video "From Bottles to Breasts to Baby-Friendly." • Provide AAP statement "Breastfeeding and the Use of Human Milk" (Appendix 2) to administrators and staff. • Provide ABM Protocol #5: Peripartum breastfeeding management for the healthy mother and infant at term (Appendix 6) to hospital administrators and staff. • Invite a medical lactation expert to provide an in-service to all administration, physician and mom-baby unit staff. • Train staff in all skills necessary to implement the policy; train staff to avoid separating mothers and infants unless medically necessary.	
• More than one infant in shared rooms may not appeal to mothers.		• Consider converting shared rooms to rooms for only one mother and infant.	
• Routine care or procedures are provided to infants in the nursery. • Some MDs prefer to examine infants in the nursery.	• Policy should describe how routine procedures, assessments and physician exams can be performed in the mother's room.	• Eliminate the well newborn nursery.	• Monitor where care is provided.
• Some staff perceive the mother will rest better at night with the infant in the nursery.		• Educate providers using AAP statement, "Breast-feeding and the Use of Human Milk" (Appendix 2). • Develop an educational pamphlet for parents on the value of rooming-in; teach parents how to read infant stages of alertness, how to alert sleepy infants to responsiveness to feed, the importance of and how to recognize cluster feedings and how to comfort distressed infants.	

4. Do not use a pacifier or artificial nipple with infants during the hospital stay

The 2005 American Academy of Pediatrics (AAP) policy statement, "Breastfeeding and the Use of Human Milk" describes avoiding pacifier use during the initiation of breastfeeding and only after breastfeeding is well established, usually around three to four weeks postpartum. It is important for mothers, families and staff to understand appropriate use of pacifiers. Early use of a pacifier before breastfeeding is established (in the first month) can interfere with milk production. When an infant sucks a pacifier instead of a breast, less milk will be removed from the mother's breasts, resulting in lowered milk production. For some infants, early use of a pacifier may indicate an underlying breastfeeding problem or a lower motivation to breastfeed.

Challenges/Issues	Solutions		
	Policy/Procedure Development	Education/Training	Monitoring
• Hospital lacks policy defining appropriate use of pacifiers.	• Write policy defining appropriate use of pacifiers and discourage widespread distribution of pacifiers to all mothers or placing them in bassinets.	• Publicize and routinely communicate policy to all staff.	• Monitor amount and frequency of publicity.
• Some hospitals place a pacifier in the bassinet of all infants.	• Address this issue in the policy.	• Train all staff in skills necessary to implement the "no pacifier" policy; discuss how patient education will benefit parents.	• Monitor procedures for setting up bassinets.
• Mothers request pacifiers or bring them to the hospital. • Mothers may use pacifiers to soothe an infant who is hungry. • Staff has limited time to discuss the pros and cons of pacifiers, as well as to soothe infants.	• Address this issue in the policy.	• Inform parents of the risks and benefits associated with pacifiers. • Teach parents who request pacifiers how to use them appropriately and model the behaviors in the hospital. • Teach parents how to allow their infants to suck on a clean finger.	• Monitor early pacifier use as a possible indicator of underlying breastfeeding problem and refer to lactation consultant.
• Some staff members use pacifiers to soothe crying or fussy babies. • Some staff members believe that breastfed infants learn to use their mothers as pacifiers.		• Support rooming-in to avoid pacifier use as a method of soothing infants in the nursery. • Provide an in-service to staff on the use of pacifiers, particularly in the early weeks of an infant's life.	

5. Give mothers a telephone number to call for help with breastfeeding

Shorter hospital stays result in less time available to cover all the breastfeeding information that benefits new parents. Furthermore, if breastfeeding is not progressing well at discharge or after discharge, assistance resources must be provided to fill in the gap. While the AAP statement recommends that a pediatrician or other knowledgeable and experienced health care professional see all newborn infants at 3 to 5 days of age and again at 2 to 3 weeks of age, this opportunity for discussion may not occur at the time the mother needs breastfeeding assistance. A list of phone numbers should be given to the mother to call if she finds herself with breastfeeding challenges and is unable to see the pediatrician or her physician.

Challenges/Issues	Solutions		
	Policy/Procedure Development	Education/Training	Monitoring
• Hospital lacks policy about providing a telephone number.	• Write policy that requires breastfeeding mothers to be offered a resource list, including a phone number to call with breastfeeding concerns.	• Publicize and routinely communicate policy to all staff members.	• Monitor adherence to policy.
• Some hospitals provide a telephone number but lack adequate staff to respond to all calls in a timely and expert manner.		• Employ an International Board Certified Lactation Consultant. • Develop a breastfeeding resource list for your community: list contact information for local lactation consultants, breastfeeding support groups, the U.S. Dept. of Health and Human Services breastfeeding hotline and the local WIC Program. • Offer a free follow-up lactation clinic. • Require staff to be knowledgeable about all aspects of breastfeeding and to provide consistent, positive information to breastfeeding families. • Encourage mothers to breastfeed on demand. • Provide and refer mothers to breastfeeding support groups when discharged from the hospital.	• Survey discharged patients regarding provision of telephone number and access to resources.
• The promotion of infant formula by hospitals undermines the breastfeeding message as the best nutrition for infants.		• Do not advertise infant formulas, pacifiers or feeding bottles to the public. • Replace formula-sponsored discharge packs with breastfeeding support materials.	• Monitor expenditures on formula. • Monitor discharge packs.

Conclusions

Colorado mothers initiate breastfeeding at a high rate, and increasing numbers of mothers initiate breastfeeding. Hospitals play a critical role in the ability of Colorado mothers to successfully breastfeed long term. What occurs in the hospital in the first day or two of life makes a crucial difference in what happens after the mother and infant go home. Support for successful breastfeeding is not limited to helping mothers learn to breastfeed; it must include all five hospital practices that make a significant difference in long-term success with breastfeeding. Never before have we had such concrete, measurable steps identified that can result in successful breastfeeding for so many mothers in Colorado. Yet the small percentage of mothers who actually receive the five supportive hospital breastfeeding practices is proof of the action required among all hospitals in Colorado to change breastfeeding practices and empower mothers to be able to breastfeed longer.

For all the recommendations listed, the key to their successful implementation lies in the quality of staff training of appropriate breastfeeding support of the mother-infant pair, which must be enforced with a written breastfeeding policy. However, a written policy that supports breastfeeding is not enough: it must be communicated strongly to all health care staff and applied throughout the institution. Among hospitals given the Baby-Friendly designation by the Baby-Friendly Hospital Initiative, those hospitals that were fully compliant with the ten steps had significantly higher breastfeeding rates than hospitals with the Baby-Friendly designation that were assessed as without high compliance.[17] Hospitals must, therefore, not only have a written policy with evidence-based practices that support breastfeeding, but they must monitor themselves to ensure full compliance with all the policy guidelines.

By adopting a variety of solutions, hospitals can overcome internal barriers to breastfeeding that currently exist and can play a vital role in promoting breastfeeding in their communities. As more hospitals adopt successful practices and more hospitals and mothers "get it right" after delivery, it is clear that more mothers and infants will be able to initiate and continue breastfeeding longer. As these hospital practices are implemented across the state, many more infants will experience improved health through the exceptional benefits that are associated with breastfeeding. It is clearly within the realm of possibility that Colorado can become one of the states whose breastfeeding duration rates meet the 2010 national objectives.

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Appendix 1

Breastfeeding Duration Rates, All Mothers, Colorado Pregnancy Risk Assessment and Monitoring System (PRAMS) Survey, by County or Group of Counties, 1997–2003

County	Breast-feeding at 2 Months	Grouped With	County	Breast-feeding at 2 Months	Grouped With
Adams	50%		La Plata	71%	Archuleta and San Juan
Alamosa	48%		Lake	58%	
Arapahoe	58%		Larimer	68%	
Archuleta	71%	La Plata and San Juan	Las Animas	46%	Huerfano
Baca	33%	Bent and Kiowa	Lincoln	51%	Cheyenne and Kit Carson
Bent	33%	Baca and Kiowa	Logan	47%	Morgan, Phillips, Sedgwick, Washington
Boulder	69%		Mesa	63%	
Chaffee	64%		Mineral	43%	Rio Grande and Saguache
Cheyenne	51%	Kit Carson and Lincoln	Moffat	61%	Rio Blanco
Clear Creek	62%	Grand	Montezuma	70%	
Conejos	51%	Costilla	Montrose	63%	
Costilla	51%	Conejos	Morgan	47%	Logan, Phillips, Sedgwick, Washington
Crowley	47%	Otero	Otero	47%	Crowley
Custer	47%	Fremont	Ouray	76%	Dolores, Hinsdale, San Miguel
Delta	62%		Park	78%	
Denver	59%		Phillips	47%	Logan, Morgan, Sedgwick, Washington
Dolores	76%	Hinsdale, Ouray, San Miguel	Pitkin	72%	
Douglas	71%		Prowers	44%	
Eagle	71%		Pueblo	42%	
El Paso	55%		Rio Blanco	61%	Moffat
Elbert	64%		Rio Grande	43%	Mineral and Saguache
Fremont	47%	Custer	Routt	76%	
Garfield	71%		Saguache	43%	Mineral and Rio Grande
Gilpin	62%	Clear Creek	San Juan	71%	Alamosa and La Plata
Grand	72%	Jackson	San Miguel	76%	Dolores, Hinsdale, Ouray
Gunnison	84%		Sedgwick	47%	Logan, Morgan, Phillips, Washington
Hinsdale	76%	Dolores, Ouray, San Miguel	Summit	76%	
Huerfano	46%	Las Animas	Teller	68%	
Jackson	72%	Grand	Washington	47%	Logan, Morgan, Phillips, Sedgwick
Jefferson	65%		Weld	61%	
Kiowa	33%	Baca and Bent	Yuma	55%	
Kit Carson	51%	Cheyenne and Lincoln			

Note: Data shown for an individual county that is grouped with other counties are derived from combining survey results for all counties in the group.

Appendix 2

AMERICAN ACADEMY OF PEDIATRICS

POLICY STATEMENT

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

Section on Breastfeeding

Breastfeeding and the Use of Human Milk

ABSTRACT. Considerable advances have occurred in recent years in the scientific knowledge of the benefits of breastfeeding, the mechanisms underlying these benefits, and in the clinical management of breastfeeding. This policy statement on breastfeeding replaces the 1997 policy statement of the American Academy of Pediatrics and reflects this newer knowledge and the supporting publications. The benefits of breastfeeding for the infant, the mother, and the community are summarized, and recommendations to guide the pediatrician and other health care professionals in assisting mothers in the initiation and maintenance of breastfeeding for healthy term infants and high-risk infants are presented. The policy statement delineates various ways in which pediatricians can promote, protect, and support breastfeeding not only in their individual practices but also in the hospital, medical school, community, and nation. *Pediatrics* 2005;115:496–506; *breast, breastfeeding, breast milk, human milk, lactation.*

ABBREVIATIONS. AAP, American Academy of Pediatrics; WIC, Supplemental Nutrition Program for Women, Infants, and Children; CMV, cytomegalovirus; G6PD, glucose-6-phosphate dehydrogenase.

INTRODUCTION

Extensive research using improved epidemiologic methods and modern laboratory techniques documents diverse and compelling advantages for infants, mothers, families, and society from breastfeeding and use of human milk for infant feeding.[1] These advantages include health, nutritional, immunologic, developmental, psychologic, social, economic, and environmental benefits. In 1997, the American Academy of Pediatrics (AAP) published the policy statement *Breastfeeding and the Use of Human Milk*.[2] Since then, significant advances in science and clinical medicine have occurred. This revision cites substantial new research on the importance of breastfeeding and sets forth principles to guide pediatricians and other health care professionals in assisting women and children in the initiation and maintenance of breastfeeding. The ways pediatricians can protect, promote, and support breastfeeding in their individual practices, hospitals, medical schools, and communities are delineated, and the central role of the pediatrician in coordinating breastfeeding management and providing a medical home for the child is emphasized.[3] These recommendations are consistent with the goals and objectives of *Healthy People 2010*,[4] the Department of Health and Human Services' *HHS Blueprint for Action on Breastfeeding*,[5] and the United States Breastfeeding Committee's *Breastfeeding in the United States: A National Agenda*.[6]

This statement provides the foundation for issues related to breastfeeding and lactation management for other AAP publications including the *New Mother's Guide to Breastfeeding*[7] and chapters dealing with breastfeeding in the AAP/American College of Obstetricians and Gynecologists *Guidelines for Perinatal Care*,[8] the *Pediatric Nutrition Handbook*,[9] the *Red Book*,[10] and the *Handbook of Pediatric Environmental Health*.[11]

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THE NEED

Child Health Benefits

Human milk is species-specific, and all substitute feeding preparations differ markedly from it, making human milk uniquely superior for infant feeding.[12] Exclusive breastfeeding is the reference or normative model against which all alternative feeding methods must be measured with regard to growth, health, development, and all other short- and long-term outcomes. In addition, human milk-fed premature infants receive significant benefits with respect to host protection and improved developmental outcomes compared with formula-fed premature infants.[13–22] From studies in preterm and term infants, the following outcomes have been documented.

Infectious Diseases

Research in developed and developing countries of the world, including middle-class populations in developed countries, provides strong evidence that human milk feeding decreases the incidence and/or severity of a wide range of infectious diseases[23] including bacterial meningitis,[24,25] bacteremia,[25,26] diarrhea,[27–33] respiratory tract infection,[22,33–40] necrotizing enterocolitis,[20,21] otitis media,[27,41–45] urinary tract infection,[46,47] and late-onset sepsis in preterm infants.[17,20] In addition, postneonatal infant mortality rates in the United States are reduced by 21% in breastfed infants.[48]

Other Health Outcomes

Some studies suggest decreased rates of sudden infant death syndrome in the first year of life[49–55] and reduction in incidence of insulin-dependent (type 1) and non–insulin-dependent (type 2) diabetes melli-

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tus,[56–59] lymphoma, leukemia, and Hodgkin disease,[60–62] overweight and obesity,[19,63–70] hypercholesterolemia,[71] and asthma[36–39] in older children and adults who were breastfed, compared with individuals who were not breastfed. Additional research in this area is warranted.

Neurodevelopment

Breastfeeding has been associated with slightly enhanced performance on tests of cognitive development.[14,15,72–80] Breastfeeding during a painful procedure such as a heel-stick for newborn screening provides analgesia to infants.[81,82]

Maternal Health Benefits

Important health benefits of breastfeeding and lactation are also described for mothers.[83] The benefits include decreased postpartum bleeding and more rapid uterine involution attributable to increased concentrations of oxytocin,[84] decreased menstrual blood loss and increased child spacing attributable to lactational amenorrhea,[85] earlier return to prepregnancy weight,[86] decreased risk of breast cancer,[87–92] decreased risk of ovarian cancer,[93] and possibly decreased risk of hip fractures and osteoporosis in the postmenopausal period.[94–96]

Community Benefits

In addition to specific health advantages for infants and mothers, economic, family, and environmental benefits have been described. These benefits include the potential for decreased annual health care costs of $3.6 billion in the United States[97,98]; decreased costs for public health programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)[99]; decreased parental employee absenteeism and associated loss of family income; more time for attention to siblings and other family matters as a result of decreased infant illness; decreased environmental burden for disposal of formula cans and bottles; and decreased energy demands for production and transport of artificial feeding products.[100–102] These savings for the country and for families would be offset to some unknown extent by increased costs for physician and lactation consultations, increased office-visit time, and cost of breast pumps and other equipment, all of which should be covered by insurance payments to providers and families.

CONTRAINDICATIONS TO BREASTFEEDING

Although breastfeeding is optimal for infants, there are a few conditions under which breastfeeding may not be in the best interest of the infant. Breastfeeding is contraindicated in infants with classic galactosemia (galactose 1-phosphate uridyltransferase deficiency)[103]; mothers who have active untreated tuberculosis disease or are human T-cell lymphotropic virus type I– or II–positive[104,105]; mothers who are receiving diagnostic or therapeutic radioactive isotopes or have had exposure to radioactive materials (for as long as there is radioactivity in the milk)[106–108]; mothers who are receiving antimetabolites or chemotherapeutic agents or a small number of other medications until they clear the milk[109,110]; mothers who are using drugs of abuse ("street drugs"); and mothers who have herpes simplex lesions on a breast (infant may feed from other breast if clear of lesions). Appropriate information about infection-control measures should be provided to mothers with infectious diseases.[111]

In the United States, mothers who are infected with human immunodeficiency virus (HIV) have been advised not to breastfeed their infants.[112] In developing areas of the world with populations at increased risk of other infectious diseases and nutritional deficiencies resulting in increased infant death rates, the mortality risks associated with artificial feeding may outweigh the possible risks of acquiring HIV infection.[113,114] One study in Africa detailed in 2 reports[115,116] found that exclusive breastfeeding for the first 3 to 6 months after birth by HIV-infected mothers did not increase the risk of HIV transmission to the infant, whereas infants who received mixed feedings (breastfeeding with other foods or milks) had a higher rate of HIV infection compared with infants who were exclusively formula-fed. Women in the United States who are HIV-positive should not breastfeed their offspring. Additional studies are needed before considering a change from current policy recommendations.

CONDITIONS THAT ARE NOT CONTRAINDICATIONS TO BREASTFEEDING

Certain conditions have been shown to be compatible with breastfeeding. Breastfeeding is not contraindicated for infants born to mothers who are hepatitis B surface antigen–positive,[111] mothers who are infected with hepatitis C virus (persons with hepatitis C virus antibody or hepatitis C virus-RNA–positive blood),[111] mothers who are febrile (unless cause is a contraindication outlined in the previous section),[117] mothers who have been exposed to low-level environmental chemical agents,[118,119] and mothers who are seropositive carriers of cytomegalovirus (CMV) (not recent converters if the infant is term).[111] Decisions about breastfeeding of very low birth weight infants (birth weight <1500 g) by mothers known to be CMV-seropositive should be made with consideration of the potential benefits of human milk versus the risk of CMV transmission.[120,121] Freezing and pasteurization can significantly decrease the CMV viral load in milk.[122]

Tobacco smoking by mothers is not a contraindication to breastfeeding, but health care professionals should advise all tobacco-using mothers to avoid smoking within the home and to make every effort to wean themselves from tobacco as rapidly as possible.[110]

Breastfeeding mothers should avoid the use of alcoholic beverages, because alcohol is concentrated in breast milk and its use can inhibit milk production. An occasional celebratory single, small alcoholic drink is acceptable, but breastfeeding should be avoided for 2 hours after the drink.[123]

For the great majority of newborns with jaundice and hyperbilirubinemia, breastfeeding can and should be continued without interruption. In rare instances of severe hyperbilirubinemia, breastfeed-

TABLE 1. Breastfeeding Rates for Infants in the United States: Any (Exclusive)

	Actual: 2001			*Healthy People 2010* Goals[4]		
	Initiation[125]	6 mo[125]	1 y[132]	Initiation	6 mo	1 y
All women	70% (46%)	33% (17%)	18%	75%	50%	25%
Black	53% (27%)	22% (11%)	12%			
Hispanic	73% (36%)	33% (16%)	18%			
Asian	NA	NA	NA			
White	72% (53%)	34% (19%)	18%			

NA indicates that the data are not available.

ing may need to be interrupted temporarily for a brief period.[124]

THE CHALLENGE

Data indicate that the rate of initiation and duration of breastfeeding in the United States are well below the *Healthy People 2010* goals (see Table 1).[4,125] Furthermore, many of the mothers counted as breastfeeding were supplementing their infants with formula during the first 6 months of the infant's life.[5,126] Although breastfeeding initiation rates have increased steadily since 1990, exclusive breastfeeding initiation rates have shown little or no increase over that same period of time. Similarly, 6 months after birth, the proportion of infants who are exclusively breastfed has increased at a much slower rate than that of infants who receive mixed feedings.[125] The AAP Section on Breastfeeding, American College of Obstetricians and Gynecologists, American Academy of Family Physicians, Academy of Breastfeeding Medicine, World Health Organization, United Nations Children's Fund, and many other health organizations recommend exclusive breastfeeding for the first 6 months of life.‡[2,127–130] Exclusive breastfeeding is defined as an infant's consumption of human milk with no supplementation of any type (no water, no juice, no nonhuman milk, and no foods) except for vitamins, minerals, and medications.[131] Exclusive breastfeeding has been shown to provide improved protection against many diseases and to increase the likelihood of continued breastfeeding for at least the first year of life.

Obstacles to initiation and continuation of breastfeeding include insufficient prenatal education about breastfeeding[132,133]; disruptive hospital policies and practices[134]; inappropriate interruption of breastfeeding[135]; early hospital discharge in some populations[136]; lack of timely routine follow-up care and postpartum home health visits[137]; maternal employment[138,139] (especially in the absence of workplace facilities and support for breastfeeding)[140]; lack of family and broad societal support[141]; media portrayal of bottle feeding as normative[142]; commercial promotion of infant formula through distribution of hospital discharge packs, coupons for free or discounted formula, and some television and general magazine advertising[143,144]; misinformation; and lack of guidance and encouragement from health care professionals.[135,145,146]

‡ There is a difference of opinion among AAP experts on this matter. The Section on Breastfeeding acknowledges that the Committee on Nutrition supports introduction of complementary foods between 4 and 6 months of age when safe and nutritious complementary foods are available.

RECOMMENDATIONS ON BREASTFEEDING FOR HEALTHY TERM INFANTS

1. Pediatricians and other health care professionals should recommend human milk for all infants in whom breastfeeding is not specifically contraindicated and provide parents with complete, current information on the benefits and techniques of breastfeeding to ensure that their feeding decision is a fully informed one.[147–149]
   - When direct breastfeeding is not possible, expressed human milk should be provided.[150,151] If a known contraindication to breastfeeding is identified, consider whether the contraindication may be temporary, and if so, advise pumping to maintain milk production. Before advising against breastfeeding or recommending premature weaning, weigh the benefits of breastfeeding against the risks of not receiving human milk.
2. Peripartum policies and practices that optimize breastfeeding initiation and maintenance should be encouraged.
   - Education of both parents before and after delivery of the infant is an essential component of successful breastfeeding. Support and encouragement by the father can greatly assist the mother during the initiation process and during subsequent periods when problems arise. Consistent with appropriate care for the mother, minimize or modify the course of maternal medications that have the potential for altering the infant's alertness and feeding behavior.[152,153] Avoid procedures that may interfere with breastfeeding or that may traumatize the infant, including unnecessary, excessive, and overvigorous suctioning of the oral cavity, esophagus, and airways to avoid oropharyngeal mucosal injury that may lead to aversive feeding behavior.[154,155]
3. 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.[156–158]
   - The alert, healthy newborn infant is capable of latching on to a breast without specific assistance within the first hour after birth.[156] Dry the infant, assign Apgar scores, and perform the initial physical assessment while the infant

is with the mother. The mother is an optimal heat source for the infant.[159,160] 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 effective latch-on.[156] Except under unusual circumstances, the newborn infant should remain with the mother throughout the recovery period.[161]

4. Supplements (water, glucose water, formula, and other fluids) should not be given to breastfeeding newborn infants unless ordered by a physician when a medical indication exists.[148,162–165]
5. Pacifier use is best avoided during the initiation of breastfeeding and used only after breastfeeding is well established.[166–168]
   - In some infants early pacifier use may interfere with establishment of good breastfeeding practices, whereas in others it may indicate the presence of a breastfeeding problem that requires intervention.[169]
   - This recommendation does not contraindicate pacifier use for nonnutritive sucking and oral training of premature infants and other special care infants.
6. During the early weeks of breastfeeding, mothers should be encouraged to have 8 to 12 feedings at the breast every 24 hours, offering the breast whenever the infant shows early signs of hunger such as increased alertness, physical activity, mouthing, or rooting.[170]
   - Crying is a late indicator of hunger.[171] Appropriate initiation of breastfeeding is facilitated by continuous rooming-in throughout the day and night.[172] The mother should offer both breasts at each feeding for as long a period as the infant remains at the breast.[173] At each feed the first breast offered should be alternated so that both breasts receive equal stimulation and draining. In the early weeks after birth, nondemanding infants should be aroused to feed if 4 hours have elapsed since the beginning of the last feeding.
   - After breastfeeding is well established, the frequency of feeding may decline to approximately 8 times per 24 hours, but the infant may increase the frequency again with growth spurts or when an increase in milk volume is desired.
7. Formal evaluation of breastfeeding, including observation of position, latch, and milk transfer, should be undertaken by trained caregivers at least twice daily and fully documented in the record during each day in the hospital after birth.[174,175]
   - Encouraging the mother to record the time and duration of each breastfeeding, as well as urine and stool output during the early days of breastfeeding in the hospital and the first weeks at home, helps to facilitate the evaluation process. Problems identified in the hospital should be addressed at that time, and a documented plan for management should be clearly communicated to both parents and to the medical home.
8. All breastfeeding newborn infants should be seen by a pediatrician or other knowledgeable and experienced health care professional at 3 to 5 days of age as recommended by the AAP.[124,176,177]
   - This visit should include infant weight; physical examination, especially for jaundice and hydration; maternal history of breast problems (painful feedings, engorgement); infant elimination patterns (expect 3–5 urines and 3–4 stools per day by 3–5 days of age; 4–6 urines and 3–6 stools per day by 5–7 days of age); and a formal, observed evaluation of breastfeeding, including position, latch, and milk transfer. Weight loss in the infant of greater than 7% from birth weight indicates possible breastfeeding problems and requires more intensive evaluation of breastfeeding and possible intervention to correct problems and improve milk production and transfer.
9. Breastfeeding infants should have a second ambulatory visit at 2 to 3 weeks of age so that the health care professional can monitor weight gain and provide additional support and encouragement to the mother during this critical period.
10. Pediatricians and parents should be aware that exclusive breastfeeding is sufficient to support optimal growth and development for approximately the first 6 months of life‡ and provides continuing protection against diarrhea and respiratory tract infection.[30,34,128,178–184] Breastfeeding should be continued for at least the first year of life and beyond for as long as mutually desired by mother and child.[185]
    - Complementary foods rich in iron should be introduced gradually beginning around 6 months of age.[186–187] Preterm and low birth weight infants and infants with hematologic disorders or infants who had inadequate iron stores at birth generally require iron supplementation before 6 months of age.[148,188–192] Iron may be administered while continuing exclusive breastfeeding.
    - Unique needs or feeding behaviors of individual infants may indicate a need for introduction of complementary foods as early as 4 months of age, whereas other infants may not be ready to accept other foods until approximately 8 months of age.[193]
    - Introduction of complementary feedings before 6 months of age generally does not increase total caloric intake or rate of growth and only substitutes foods that lack the protective components of human milk.[194]
    - During the first 6 months of age, even in hot climates, water and juice are unnecessary for breastfed infants and may introduce contaminants or allergens.[195]
    - Increased duration of breastfeeding confers significant health and developmental benefits for the child and the mother, especially in delaying return of fertility (thereby promoting optimal intervals between births).[196]

- There is no upper limit to the duration of breastfeeding and no evidence of psychologic or developmental harm from breastfeeding into the third year of life or longer.[197]
- Infants weaned before 12 months of age should not receive cow's milk but should receive iron-fortified infant formula.[198]

11. All breastfed infants should receive 1.0 mg of vitamin K_1 oxide intramuscularly after the first feeding is completed and within the first 6 hours of life.[199]
    - Oral vitamin K is not recommended. It may not provide the adequate stores of vitamin K necessary to prevent hemorrhage later in infancy in breastfed infants unless repeated doses are administered during the first 4 months of life.[200]
12. All breastfed infants should receive 200 IU of oral vitamin D drops daily beginning during the first 2 months of life and continuing until the daily consumption of vitamin D-fortified formula or milk is 500 mL.[201]
    - Although human milk contains small amounts of vitamin D, it is not enough to prevent rickets. Exposure of the skin to ultraviolet B wavelengths from sunlight is the usual mechanism for production of vitamin D. However, significant risk of sunburn (short-term) and skin cancer (long-term) attributable to sunlight exposure, especially in younger children, makes it prudent to counsel against exposure to sunlight. Furthermore, sunscreen decreases vitamin D production in skin.
13. Supplementary fluoride should not be provided during the first 6 months of life.[202]
    - From 6 months to 3 years of age, the decision whether to provide fluoride supplementation should be made on the basis of the fluoride concentration in the water supply (fluoride supplementation generally is not needed unless the concentration in the drinking water is <0.3 ppm) and in other food, fluid sources, and toothpaste.
14. Mother and infant should sleep in proximity to each other to facilitate breastfeeding.[203]
15. Should hospitalization of the breastfeeding mother or infant be necessary, every effort should be made to maintain breastfeeding, preferably directly, or pumping the breasts and feeding expressed milk if necessary.

ADDITIONAL RECOMMENDATIONS FOR HIGH-RISK INFANTS

- Hospitals and physicians should recommend human milk for premature and other high-risk infants either by direct breastfeeding and/or using the mother's own expressed milk.[13] Maternal support and education on breastfeeding and milk expression should be provided from the earliest possible time. Mother-infant skin-to-skin contact and direct breastfeeding should be encouraged as early as feasible.[204,205] Fortification of expressed human milk is indicated for many very low birth weight infants.[13] Banked human milk may be a suitable feeding alternative for infants whose mothers are unable or unwilling to provide their own milk. Human milk banks in North America adhere to national guidelines for quality control of screening and testing of donors and pasteurize all milk before distribution.[206–208] Fresh human milk from unscreened donors is not recommended because of the risk of transmission of infectious agents.
- Precautions should be followed for infants with glucose-6-phosphate dehydrogenase (G6PD) deficiency. G6PD deficiency has been associated with an increased risk of hemolysis, hyperbilirubinemia, and kernicterus.[209] Mothers who breastfeed infants with known or suspected G6PD deficiency should not ingest fava beans or medications such as nitrofurantoin, primaquine phosphate, or phenazopyridine hydrochloride, which are known to induce hemolysis in deficient individuals.[210,211]

ROLE OF PEDIATRICIANS AND OTHER HEALTH CARE PROFESSIONALS IN PROTECTING, PROMOTING, AND SUPPORTING BREASTFEEDING

Many pediatricians and other health care professionals have made great efforts in recent years to support and improve breastfeeding success by following the principles and guidance provided by the AAP,[2] the American College of Obstetricians and Gynecologists,[127] the American Academy of Family Physicians,[128] and many other organizations.[5,6,8,130,133,142,162] The following guidelines summarize these concepts for providing an optimal breastfeeding environment.

General

- Promote, support, and protect breastfeeding enthusiastically. In consideration of the extensively published evidence for improved health and developmental outcomes in breastfed infants and their mothers, a strong position on behalf of breastfeeding is warranted.
- Promote breastfeeding as a cultural norm and encourage family and societal support for breastfeeding.
- Recognize the effect of cultural diversity on breastfeeding attitudes and practices and encourage variations, if appropriate, that effectively promote and support breastfeeding in different cultures.

Education

- Become knowledgeable and skilled in the physiology and the current clinical management of breastfeeding.
- Encourage development of formal training in breastfeeding and lactation in medical schools, in residency and fellowship training programs, and for practicing pediatricians.
- Use every opportunity to provide age-appropriate breastfeeding education to children and adults in the medical setting and in outreach programs for student and parent groups.

Clinical Practice

- Work collaboratively with the obstetric community to ensure that women receive accurate and

sufficient information throughout the perinatal period to make a fully informed decision about infant feeding.
- Work collaboratively with the dental community to ensure that women are encouraged to continue to breastfeed and use good oral health practices. Infants should receive an oral health-risk assessment by the pediatrician between 6 months and 1 year of age and/or referred to a dentist for evaluation and treatment if at risk of dental caries or other oral health problems.[212]
- Promote hospital policies and procedures that facilitate breastfeeding. Work actively toward eliminating hospital policies and practices that discourage breastfeeding (eg, promotion of infant formula in hospitals including infant formula discharge packs and formula discount coupons, separation of mother and infant, inappropriate infant feeding images, and lack of adequate encouragement and support of breastfeeding by all health care staff). Encourage hospitals to provide in-depth training in breastfeeding for all health care staff (including physicians) and have lactation experts available at all times.
- Provide effective breast pumps and private lactation areas for all breastfeeding mothers (patients and staff) in ambulatory and inpatient areas of the hospital.[213]
- Develop office practices that promote and support breastfeeding by using the guidelines and materials provided by the AAP Breastfeeding Promotion in Physicians' Office Practices program.[214]
- Become familiar with local breastfeeding resources (eg, WIC clinics, breastfeeding medical and nursing specialists, lactation educators and consultants, lay support groups, and breast-pump rental stations) so that patients can be referred appropriately.[215] When specialized breastfeeding services are used, the essential role of the pediatrician as the infant's primary health care professional within the framework of the medical home needs to be clarified for parents.
- Encourage adequate, routine insurance coverage for necessary breastfeeding services and supplies, including the time required by pediatricians and other licensed health care professionals to assess and manage breastfeeding and the cost for the rental of breast pumps.
- Develop and maintain effective communication and coordination with other health care professionals to ensure optimal breastfeeding education, support, and counseling. AAP and WIC breastfeeding coordinators can facilitate collaborative relationships and develop programs in the community and in professional organizations for support of breastfeeding.
- Advise mothers to continue their breast self-examinations on a monthly basis throughout lactation and to continue to have annual clinical breast examinations by their physicians.

Society
- Encourage the media to portray breastfeeding as positive and normative.
- Encourage employers to provide appropriate facilities and adequate time in the workplace for breastfeeding and/or milk expression.
- Encourage child care providers to support breastfeeding and the use of expressed human milk provided by the parent.
- Support the efforts of parents and the courts to ensure continuation of breastfeeding in separation and custody proceedings.
- Provide counsel to adoptive mothers who decide to breastfeed through induced lactation, a process requiring professional support and encouragement.
- Encourage development and approval of governmental policies and legislation that are supportive of a mother's choice to breastfeed.

Research
- Promote continued basic and clinical research in the field of breastfeeding. Encourage investigators and funding agencies to pursue studies that further delineate the scientific understandings of lactation and breastfeeding that lead to improved clinical practice in this medical field.[216]

CONCLUSIONS

Although economic, cultural, and political pressures often confound decisions about infant feeding, the AAP firmly adheres to the position that breastfeeding ensures the best possible health as well as the best developmental and psychosocial outcomes for the infant. Enthusiastic support and involvement of pediatricians in the promotion and practice of breastfeeding is essential to the achievement of optimal infant and child health, growth, and development.

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All policy statements from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.

Appendix 3

Training Resources

Videos

From Bottles to Breasts to Baby Friendly: The Challenge of Change. 2001. 15 minutes.
This is a short documentary that reviews the process of change in attitudes and behaviors that took place in a large hospital as it became designated as a Baby-Friendly Hospital. Available through the Breastfeeding Center, Boston Medical Center, Boston Mass. Contact anne.merwood@bmc.org.

Delivery Self Attachment. 1992. 6 minutes.
This is a short video illustrating the work of Dr. Lennart Righard (Lancet 1990; 336:1105–07), which indicates the ability of a normal newborn to self-attach shortly after an unmedicated birth. Available through Geddes Productions www.geddesproduction.com/contact.html.

A Preemie Needs His Mother. First Steps to Breastfeeding Your Premature Baby. 2001. 51 minutes.
This is a good review of breastfeeding as it is promoted in the intensive care environment. Produced by Jane Morton, MD. Contact www.breastmilksolutions.com.

Kangaroo Mother Care I (2001) and II (2002). 26 minutes.
Although this video was filmed in South Africa, the universal benefit of Kangaroo care is well illustrated. Available through Geddes Productions www.geddesproductions.com.

Colorado Medical Lactation Experts

The following individuals are available to provide hospital staff training and in-services. Please contact them individually for information about availability and fees.

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Appendix 4

The Academy Of Breastfeeding Medicine

ABM Protocols

A central goal of **The Academy of Breastfeeding Medicine** is the development of clinical protocols for managing common medical problems that may impact breastfeeding success. These protocols serve only as guidelines for the care of breastfeeding mothers and infants and do not delineate an exclusive course of treatment or serve as standards of medical care. Variations in treatment may be appropriate according to the needs of an individual patient.

Protocol #7: Model breastfeeding policy

BREASTFEEDING POLICY

"Name of institution" and setting(s)
Policy #:
Issued:
Reviewed/Revised:

PURPOSE

To promote a philosophy of maternal infant care that advocates breastfeeding and supports the normal physiological functions involved in the establishment of this maternal infant process. To assist families choosing to breastfeed with initiating and developing a successful and satisfying experience.

This policy is based on recommendations from the most recent breastfeeding policy statements published by the Office on Women's Health of the U.S. Department of Health and Human Services,[1] the American Academy of Pediatrics,[2] the American College of Obstetricians and Gynecologists,[3] the American Academy of Family Physicians,[4] the World Health Organization,[5] the American Dietetic Association,[6] and the Academy of Breastfeeding Medicine,[7] and the UNICEF/WHO evidence-based "Ten Steps to Successful Breastfeeding."[5,8,9]

POLICY STATEMENTS

1. *"Name of institution"* staff will actively support breastfeeding as the preferred method of providing nutrition to infants. A multidisciplinary, culturally appropriate team comprising hospital administrators, physician and nursing staff, lactation consultants and specialists, nutrition staff, parents, and other appropriate staff shall be established and maintained to identify and eliminate institutional barriers to breastfeeding. On a yearly basis, this group will compile and evaluate data relevant to breastfeeding support services and formulate a plan of action to implement needed changes.
2. A written breastfeeding policy will be developed and communicated to all health care staff. The *"name of institution"* breastfeeding policy will be reviewed and updated routinely (biannually) using current research as an evidence-based guide.
3. All pregnant women and their support people as appropriate will be provided with information on breastfeeding and counseled on the benefits of breastfeeding, contraindications to breastfeeding, and risk of formula feeding.
4. The woman's desire to breastfeed will be documented in her medical record.
5. Mothers will be encouraged to exclusively breastfeed unless medically contraindicated. The method of feeding will be documented in the medical record of every infant.

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- Exclusive breastfeeding is defined as providing breast milk as the sole source of nutrition. Exclusively breastfed babies receive no other liquids or solids.

6. At birth or soon thereafter all newborns, if baby and mother are stable, will be placed skin-to-skin with the mother. Skin-to-skin contact involves placing the naked baby prone on the mother's bare chest. Mother-infant couples will be given the opportunity to initiate breastfeeding within 1 hour of birth. Postcesarean-birth babies will be encouraged to breastfeed as soon as possible. The administration of vitamin K and prophylactic antibiotics to prevent ophthalmia neonatorum should be delayed for the first hour after birth to allow uninterrupted mother infant contact and breastfeeding.[10]
7. Breastfeeding mother-infant couples will be encouraged to remain together throughout their hospital stay, including at night (rooming- in). Skin-to-skin contact will be encouraged as much as possible.
8. Breastfeeding assessment, teaching, and documentation will be done on each shift and whenever possible with each staff contact with the mother. After each feeding, staff will document information about the feeding in the infant's medical record. This documentation may include the latch, position, and any problems encountered. For feedings not directly observed, maternal report may be used. Every shift, a direct observation of the baby's position and latch-on during feeding will be performed and documented.
9. Mothers will be encouraged to utilize available breastfeeding resources including classes, written materials, and video presentations, as appropriate. If clinically indicated, the clinician or nurse will make a referral to a lactation consultant or specialist.
10. Breastfeeding mothers will be instructed about
    a. proper positioning and latch on;
    b. nutritive suckling and swallowing;
    c. milk production and release;
    d. frequency of feeding/feeding cues;
    e. expression of breast milk and use of a pump if indicated;
    f. how to assess if infant is adequately nourished; and
    g. reasons for contacting the clinician.

These skills will be taught to primiparous and multiparous women and reviewed before the mother goes home.
11. Parents will be taught that breastfeeding infants, including cesarean-birth babies, should be put to breast at least 8 to 12 times each 24 hours. Infant feeding cues (such as increased alertness or activity, mouthing, or rooting,) will be used as indicators of the baby's readiness for feeding. Breastfeeding babies will be breastfed at night.
12. Time limits for breastfeeding on each side will be avoided. Infants can be offered both breasts at each feeding but may be interested in feeding only on one side at a feeding during the early days.
13. No supplemental water, glucose water, or formula will be given unless specifically ordered by a physician or nurse practitioner or by the mother's documented and informed request. Prior to non-medically indicated supplementation, mothers will be informed of the risks of supplementing. The supplement should be fed to the baby by cup if possible and will be no more than 10 to 15 mL in a term baby.[11–13] Alternative feeding methods such as syringe or spoon feeding may also be used; however, these methods have not be shown to be effective in preserving breastfeeding. Bottles will not be placed in a breastfeeding infant's bassinet.
14. This institution does not give group instruction in the use of formula. Those parents who, after appropriate counseling, choose to formula feed their infants will be provided individual instruction.
15. Pacifiers will not be given to normal full-term breastfeeding infants. The pacifier guidelines at *"name of institution"* state that preterm infants in the Neonatal Intensive Care or Special Care Unit or infants with specific medical conditions may be given pacifiers for non-nutritive sucking. Newborns undergoing painful procedures (circumcision, for example) may be given a pacifier as a method of pain management during the procedure. The infant will not return to the mother with the pacifier. *"Name of institution"* encourages "pain-free newborn care," which may include breastfeeding during the heel stick procedure for the newborn metabolic screening tests.
16. Routine blood glucose monitoring of full term healthy appropriate for gestational age (AGA) infants is not indicated. Assessment for clinical signs of hypoglycemia and dehydration will be ongoing.[14]
17. Antilactation drugs will not be given to any postpartum mother.
18. Routine use of nipple creams, ointments, or other topical preparations will be avoided unless such therapy has been indicated for a dermatological problem. Mothers with sore nipples will be observed for

latch-on techniques and will be instructed to apply expressed colostrum or breast milk to the areola after each feeding.

19. Nipple shields or bottle nipples will not be routinely used to cover a mother's nipple to treat latch-on problems or prevent or manage sore or cracked nipples or when a mother has flat or inverted nipples. Nipple shields will be used only in conjunction with a lactation consultation.

20. After 24 hours of life, if the infant has not latched on or fed effectively, the mother will be instructed to begin breast massage and hand expression of colostrum into the baby's mouth during feeding attempts. Skin-to-skin contact will be encouraged. (Parents will be instructed to watch closely for feeding cues and whenever these are observed to awaken and feed the infant.) If the baby continues to feed poorly, pumping with skilled hand expression or a double set-up electric breast pump will be initiated and maintained approximately every 3 hours or a minimum of eight times per day. Any expressed colostrum or mother's milk will be fed to the baby by an alternative method. The mother will be reminded that she may not obtain much milk or even any milk the first few times she pumps her breasts. Until the mother's milk is available, a collaborative decision should be made among the mother, nurse, and clinician regarding the need to supplement the baby. Each day clinicians will be consulted regarding the volume and type of the supplement. Pacifiers will be avoided. In cases of problem feeding, the lactation consultant or specialist will be consulted.[10]

21. If the baby is still not latching on well or feeding well when going home, the feeding/pumping/supplementing plan will be reviewed in addition to routine breastfeeding instructions. A follow-up visit or contact will be scheduled within 24 hours. Depending on the clinical situation it may be appropriate to delay discharge of the couplet to provide further breastfeeding intervention, support, and education.

22. All babies should be seen for follow-up within the first few days postpartum. This visit should be with a pediatrician or other qualified health care practitioner for a formal evaluation of breastfeeding performance, a weight check, assessment of jaundice and age appropriate elimination:

- For infants discharged at less than 2 days of age (< 48 hours): Follow-up at 2 to 4 days of age
- For infants discharged at more than 2 days of age (> 48 hours): Follow-up at 4 to 5 days of age
- All newborns should be seen by 1 month of age.

23. Mothers who are separated from their sick or premature infants will be

a. instructed on how to use skilled hand expression or the double set up electric breast pump—instructions will include expression at least eight times per day or approximately every 3 hours for 15 minutes (or until milk flow stops, whichever is greater) around the clock and the importance of not missing a pumping session during the night;

b. encouraged to breastfeed on demand as soon as the infant's condition permits;

c. taught proper storage and labeling of human milk; and

d. assisted in learning skilled hand expression or obtaining a double set up electric breast pump prior to going home.

24. Before leaving the hospital,[15] breastfeeding mothers should be able to

a. position the baby correctly at the breast with no pain during the feeding;

b. latch the baby to breast properly;

c. state when the baby is swallowing milk;

d. state that the baby should be nursed approximately 8 to 12 times every 24 hours until satiety;

e. state age-appropriate elimination patterns (at least six urinations per day and three to four stools per day by the fourth day of life);

f. list indications for calling a clinician; and

g. manually express milk from their breasts.

25. Prior to going home, mothers will be given the names and telephone numbers of community resources to contact for help with breastfeeding, including (the support group or resource recommended by *"name of institution"*).

26. *"Name of institution"* does not accept free formula or free breast milk substitutes. Nursery or NICU discharge bags offered to all mothers will not contain infant formula, coupons for formula, logos of formula companies, or literature with formula company logos.

27. *"Name of institution"* health professionals will attend educational sessions on lactation management and breastfeeding promotion to ensure that correct, current, and consistent information is provided to all mothers wishing to breastfeed.

Application

All breastfeeding patients.

Exceptions

Breastfeeding is contraindicated in the following situations:

- HIV-positive mother in developed countries (e.g., United States, Europe)
- Mother using illicit drugs (for example, cocaine, heroin) unless specifically approved by the infant's health care provider on a case by case basis
- A mother taking certain medications. Although most prescribed and over-the-counter drugs are safe for the breastfeeding infant, some medications may make it necessary to interrupt breastfeeding. These include radioactive isotopes, antimetabolites, cancer chemotherapy, and a small number of other medications. The references used at *"name of institution"* are *Medications and Mothers' Milk* by Thomas Hale,[16] *Breastfeeding: A Guide for the Medical Profession* by R. A. Lawrence and R. M. Lawrence,[17] and the American Academy of Pediatrics Statement on the Transfer of Drugs into Human Milk.[18]
- Mother has active, untreated tuberculosis
- Infant has galactosemia
- Mother has active herpetic lesions on her breast(s) —breastfeeding can be recommended on the unaffected breast (the Infectious Disease Service will be consulted for problematic infectious disease issues)
- Mother with varicella that is determined to be infectious to the infant
- Mother has HTLV1 (human T-cell leukemia virus type 1)

Responsibility

RN, LPN, LC, PNP, MD, CNM

Forms:

- Newborn Flow Sheet
- Maternal Flow Sheet

Other related policies:

Policy #:

Other references/resources[17,19–22]

Initiated by:

Contributing departments:

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THE TEN STEPS TO SUCCESSFUL BREASTFEEDING

1. Have a written breastfeeding policy 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 1 hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation, even if they are separated from their infants.
6. Give newborn infants no food or drink other than breast milk, unless medically indicated.*

*A hospital must pay fair market price for all formula and infant feeding supplies that it uses and cannot accept free or heavily discounted formula and supplies.

7. Practice rooming-in—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.
10. Foster the establishment of breastfeeding support groups and refer mothers to them, on discharge from the hospital or clinic.

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Appendix 5

The Academy Of Breastfeeding Medicine

ABM Protocols

A central goal of **The Academy of Breastfeeding Medicine** is the development of clinical protocols for managing common medical problems that may impact breastfeeding success. These protocols serve only as guidelines for the care of breastfeeding mothers and infants and do not delineate an exclusive course of treatment or serve as standards of medical care. Variations in treatment may be appropriate according to the needs of an individual patient.

Protocol #3: Hospital guidelines for the use of supplementary feedings in the healthy term breastfed neonate

DEFINITIONS

Supplementary Feedings: Feedings provided in place of breastfeeding. This may include expressed or banked breast milk. Any foods given prior to 6 months, the recommended duration of exclusive feeding, are thus defined as supplementary.

Complementary Feedings: Feedings provided in addition to breastfeeding. This term is used to describe foods given in addition to breastfeeding after 6 months, a "complement" to breastfeeding needed for adequate nutrition.

BACKGROUND

Given early opportunities to breastfeed, breastfeeding assistance, and instruction, the majority of mothers and babies successfully establish breastfeeding. Some infants may not successfully latch and feed during the first day of life, but they successfully establish breastfeeding with time, appropriate evaluation, and minimal intervention.

Small colostrum feedings are appropriate for the size of the newborn's stomach and are sufficient to prevent hypoglycemia in the healthy, term, appropriate-for-gestational-age infant.[1,16,19] Healthy term infants also have sufficient body water to meet their metabolic needs[11,14,15]; thus, the majority of breastfed infants do not require supplementation. Because some breastfeeding women question the adequacy of colostrum feedings, they may benefit from reassurance, assistance with breastfeeding technique, and education about the physiology of breastfeeding.

Supplementation can prevent the establishment of maternal milk supply, have adverse effects on breastfeeding (e.g., delayed lactogenesis, maternal engorgement), alter infant bowel flora, sensitize the infant to allergens (depending on the content of the feeding and method used), and interfere with maternal-infant bonding.[3] Before supplementary feedings are begun, it is important that a formal evaluation of each mother-baby dyad, including a direct observation of breastfeeding, is completed. The following guidelines address indications for and methods of supplementation for the healthy, term (37–42-week), breastfed infant.

Indications for supplemental feedings

1. Indications for supplementation in term, healthy infants are few[13] (Table P-1).

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TABLE P-1 Indications for supplementation in term, healthy infants

1. Hypoglycemia, unresponsive to appropriate frequent breastfeeding[1]
2. Separation
   a) Maternal illness resulting in separation of infant and mother (e.g. psychosis, eclampsia or shock)
   b) Mother not at the same hospital (e.g. maternal death)
3. Infant with inborn error of metabolism (e.g. galactosemia)
4. Infant who is unable to feed at the breast (e.g. congential malformation, illness)
5. Maternal medications (those contraindicated in breastfeeding)[4]

A few other clinical situations may arise in which supplemental feedings may be indicated. Table P-2 lists possible indications for the administration of such feedings. The physician must decide if the clinical benefits outweigh the potential negative consequences of such feedings.

There are common clinical situations in which evaluation and breastfeeding management may be necessary but supplementation is *not* indicated, including the following:

1. The sleepy infant with fewer than 8 to 12 feedings in the first 24 to 48 hours with less than 7% weight loss and no signs of illness.
2. The infant with bilirubin levels less than 20 mg/dL after 72 hours of age, when the baby is feeding well and stooling adequately and weight loss is less than 7%.[2,6]
3. The infant who is fussy at night or constantly feeding for several hours
4. The sleeping mother.

TABLE P-2 Possible indications for supplementation in term, healthy infants

1) Infant indications
- Hypoglycemia documented by laboratory blood glucose measurement (not bedside screening methods) after infant has had adequate opportunity to breastfeed[1]
- Clinical evidence of significant dehydration
- Weight loss of 8% to 10% accompanied by delayed lactogenesis (day 5 or later)
- Delayed bowel movements or continued meconium stools on day 5
- Insufficient intake despite an adequate milk supply
- Hyperbilirubinemia
  - Breastfeeding jaundice where intake is poor despite appropriate intervention
  - Breastmilk jaundice when levels reach >20–25 mg/dL in an otherwise thriving infant and where a diagnostic interruption of breastfeeding may be helpful
- Low birthweight
  - When sufficient milk is not available
  - When nutrient supplementation is indicated

2) Maternal indications
- Delayed lactogenesis (day 5 or later) and inadequate intake by infant
- Intolerable pain during feedings unrelieved by interventions
- Unavailability of mother due to severe illness or geographic separation
- Primary glandular insufficiency (primary lactation failure), as evidenced by poor breast growth during pregnancy and minimal indications of lactogenesis, breast pathology or prior breast surgery resulting in poor milk production
- Delayed lactogenesis
  - Retained placenta (lactogenesis probably will occur after placental fragments are removed)
  - Sheehan syndrome (postpartum hemorrhage followed by absence of lactogenesis)

Adapted from Powers NG, Slusser W: Breastfeeding update. 2: Clinical lactation management. Pediatr Rev 1997;18:147–161.

RECOMMENDATIONS

1. Healthy newborns do not need supplemental feeding for poor feeding for the first 24 to 48 hours, but babies who are too sick to breastfeed or whose mothers are too sick to allow breastfeeding are likely to require supplemental feedings.[13]
2. Supplemental feedings may require a physician's order and informed consent of the mother. When these feedings are not medically indicated, efforts to dissuade maternal requests for them should be documented by the nursing or medical staff. All supplemental feedings should be documented, including the content, volume, method, and medical indication or reason.
3. When supplementary feeding is necessary, the primary goals are to feed the baby and optimize the maternal milk supply while determining the cause of poor feeding or inadequate milk transfer.

4. Whenever possible, it is ideal to have the mother and infant room-in 24 hours per day to enhance opportunities for breastfeeding and lactogenesis.[13]
5. If mother-baby separation is unavoidable, establishment of milk supply is poor or questionable, or the baby is not removing milk from the breast, the mother needs instruction and encouragement to pump or manually express her milk to stimulate production and provide expressed breast milk as necessary for the infant.
6. Optimally, mothers need to express milk each time the baby receives a supplemental feeding, or about every 2 to 3 hours.[7,13] Mothers should be encouraged to start expressing on the first day or as soon as possible. Maternal breast engorgement should be avoided, as it will further compromise the milk supply and may lead to other complications.[13]
7. All infants must be formally evaluated for position, latch, and milk transfer prior to the provision of supplemental feedings.[17] Most babies who remain with their mothers and breastfeed adequately lose less than 7% of their birth weight. Weight loss in excess of 7% may be an indication of inadequate milk transfer or low milk production.[5,12] Weight loss in the range of 8% to10% may be within normal limits, but if all else is going well and the physical exam is normal, it is an indication for careful assessment and possible breastfeeding assistance.
8. The infant's physician should be notified if
   a. The infant exhibits signs of illness in addition to poor feeding.
   b. The mother-infant dyad meets the clinical criteria in Table P-1.
   c. The infant's weight loss is greater than 7%.

Methods of providing supplemental feedings

When supplemental feedings are needed, one of the following techniques may be used: a supplemental nursing device at breast, cup feeding, spoon or dropper feeding, finger-feeding, or bottle feeding.[8–10,17,18] There is little evidence about the safety or efficacy of most alternative feeding methods and their effect on breastfeeding; however, when cleanliness or refrigeration is sub-optimal, cup feeding may be the best choice.[18] Cup feeding has been shown to be safe for term infants and may help preserve breastfeeding duration among those that require multiple supplemental feedings.[8,9]

Choice of feeding

Expressed human milk is the first choice for supplemental feeding,[17] but expressing sufficient colostrum in the first few days may be difficult. The mother may need reassurance and education if such difficulties occur. If the volume of the mother's colostrum does not meet her infant's feeding requirements, pasteurized donor human milk is preferable to other supplements. The physician must weigh the potential risks and benefits of other supplemental fluids, such as standard formula or protein hydrolysate formula, with consideration given to available resources, the family's history for risk factors such as atopy, the infant's age, the amounts needed, and the potential impact on the establishment of breastfeeding.

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Appendix 6

The Academy Of Breastfeeding Medicine

ABM Protocols

A central goal of **The Academy of Breastfeeding Medicine** is the development of clinical protocols for managing common medical problems that may impact breastfeeding success. These protocols serve only as guidelines for the care of breastfeeding mothers and infants and do not delineate an exclusive course of treatment or serve as standards of medical care. Variations in treatment may be appropriate according to the needs of an individual patient.

Protocol #5: Peripartum breastfeeding management for the healthy mother and infant at term

BACKGROUND

Hospital policies and routines greatly influence breastfeeding success.[1–3] The peripartum hospital experience should include adequate support, instruction, and care to ensure the successful initiation of breastfeeding. Such management is part of a continuum of care and education begun during the prenatal period that promotes breastfeeding as the optimal method of infant feeding and includes information about maternal and infant benefits. The following principles and practices are recommended for care in the peripartum hospital setting.

PRENATAL

All pregnant women must receive education about the benefits and management of breastfeeding to allow an informed decision about infant feeding.[4–6] Prenatal education should include information about the stages of labor, drug-free ways to address labor pain, potential side effects of labor medications, and the benefits to mother and baby of exclusive breastfeeding initiated in the first hour after birth.[4] Educational materials produced by formula manufacturers are inappropriate sources of information about infant feeding.[7]

Maternity care includes an assessment of any medical or physical conditions that could affect a mother's ability to breastfeed her infant. In some cases it may be helpful to obtain a prenatal consultation with the infant's physician or a lactation consultant or specialist and to develop a plan of follow-up to be instituted at the time of delivery.[5] Women will benefit from moderated group discussions or referral to a lay support organization (e.g., La Leche League) prior to delivery.

LABOR AND DELIVERY

Women will benefit from the continuous presence of a close companion (e.g., doula) throughout labor and delivery. The presence of a doula is known to enhance breastfeeding initiation and duration. Many risk factors associated with early breastfeeding termination, including the mean length of labor, the need for surgical intervention, and the use of pain-reducing interventions such as epidurals and other medications, are reduced by the presence of a doula.[8–11]

Immediate postpartum

The healthy newborn can be given directly to the mother for skin-to-skin contact until the first feeding is accomplished. The infant may be dried and assigned Apgar scores and the initial physical assessment performed as the infant is placed with the mother. Such contact provides the infant optimal physiologic stability, warmth, and opportunities for the first feeding.[12,13] Delaying procedures such as weighing,

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measuring, and administering vitamin K and eye prophylaxis (up to an hour) enhances early parent-infant interaction.

Infants are to be put to the breast as soon after birth as feasible for both mother and infant (within an hour of birth).[14] This is to be initiated in either the delivery room or recovery room, and every mother is to be instructed in proper breastfeeding technique.[4,6,15,16]

Mother-baby rooming-in on a 24-hour basis enhances opportunities for bonding and for optimal breastfeeding initiation. Whenever possible, mothers and infants are to remain together during the hospital stay.[16] To avoid unnecessary separation, infant assessments in the immediate postpartum time period and thereafter are ideally performed in the mother's room. Evidence suggests that mothers get the same amount and quality of sleep whether infants room-in or are sent back to the nursery at night.[17,18]

Education about the benefits of 24-hour rooming- in encourages parents to use it as the standard mode of hospital care for themselves and their baby. Adequate nursing personnel must be available to assess and document the status of the infant and infant feeding while the baby is in the family's room.[4,6,19–21]

Women need help to ensure that they are able to position and attach their babies at the breast. Those delivered by cesarean section may need additional help from nursing staff to attain comfortable positioning. A trained observer should assess and document the effectiveness of breastfeeding at least once every 8 hours after delivery until mother and infant are discharged. Peripartum care of the couplet should address and document infant positioning, latch, milk transfer, baby's daily weight, clinical jaundice, and all problems raised by the mother, such as nipple pain or the perception of an inadequate breast milk supply. Infants who are breastfeeding well will feed 8 to 12 times or more in 24 hours, for a minimum of 8 feedings every 24 hours. Limiting the time at the breast is not necessary and may be harmful to the establishment of a good milk supply. Infants usually fall asleep or release the breast spontaneously when satiated.

Supplemental feeding should not be given to breastfed infants unless there is a medical indication for such feedings. Supplementation can prevent the establishment of maternal milk supply and have adverse effects on breastfeeding (e.g., delayed lactogenesis, maternal engorgement). Supplements may alter infant bowel flora, sensitize the infant to allergens (depending on the content of the feeding and method used), and interfere with maternal-infant bonding.[22] Before any supplementary feedings are begun, it is important that a formal evaluation of each mother-baby dyad, including a direct observation of breastfeeding, is completed.[23]

In general, acute infectious diseases, undiagnosed fever, and common postpartum infections in the mother are not a contraindication to breastfeeding, if such diseases can be readily controlled and treated. Infants should not be breastfed in the case of maternal HIV infection (in a developed country), untreated active tuberculosis, or herpes simplex when there are breast lesions.[24] Infectious peripartum varicella may require separation of the mother and newborn, limiting direct breastfeeding. The listing of all contraindications is beyond the scope of this document, but reliable sources of information are readily available and include information about medications and radioactive compounds.[24–26]

PROBLEMS AND COMPLICATIONS

Mother-baby couplets at risk for breastfeeding problems benefit from early identification and assistance. Consultation with an expert in lactation management may be helpful in situations including but not limited to the following:

a) Maternal request/anxiety
b) Previous negative breastfeeding experience
c) Mother has flat/inverted nipples
d) Mother has history of breast surgery
e) Multiple births (twins, triplets)
f) Infant is premature (<37 weeks gestation)
g) Infant has congenital anomaly, neurological impairment, or other medical condition that affects the infant's ability to breastfeed
h) Maternal or infant medical condition for which breastfeeding must be temporarily postponed or for which milk expression is required
i) Documentation, after the first few feedings, that there is difficulty in establishing breastfeeding (e.g., poor latch-on, sleepy baby, etc.)

Early discharge from the hospital (<48 hours) of mothers and babies mandates that risks to successful breastfeeding be identified quickly so that the time spent in the hospital is used to maximal benefit.[27] All breastfed infants should be seen by a health care provider within 48 to 72 hours of discharge to evaluate the infant's well being and the successful establishment of breastfeeding.[6,28]

If a neonate needs to be transferred to an intermediate or intensive care area, steps must be taken to maintain lactation in the mother. When possible, transport of the mother to the intermediate or intensive care nursery to continue breastfeeding is optimal. If breastfeeding is not possible, arrangements can be made to continue human milk feeding for the neonate. Mothers must be shown how to maintain lactation through breast pumping or manual expression when they are separated from their infants.[4,6]

If an infant is not consistently feeding at the breast effectively at the time of hospital discharge, the mother should be shown how to maintain lactation through breast pumping or manual expression. The possible need for supplemental feedings for the infant must be addressed, with consideration given to the choice of supplement to be used and the method of feeding. Expressed breast milk should be used if maternal supply is adequate, and cup feeding may help preserve breastfeeding duration among those that require multiple supplemental feedings.[29] The mother-infant dyad will need referral to a professional competent in lactation management for continued assistance and support.

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Appendix 7

The Academy Of Breastfeeding Medicine

ABM Protocols

A central goal of **The Academy of Breastfeeding Medicine** is the development of clinical protocols for managing common medical problems that may impact breastfeeding success. These protocols serve only as guidelines for the care of breastfeeding mothers and infants and do not delineate an exclusive course of treatment or serve as standards of medical care. Variations in treatment may be appropriate according to the needs of an individual patient.

Protocol #10: Breastfeeding the near-term infant (35 to 37 weeks gestation)

GOALS

1. Promote, support, and sustain breastfeeding in the near-term infant
2. Maintain optimal health of infant and mother

PURPOSE

1. Allow infants born at 35 to 37 weeks of gestation to breastfeed and/or breast-milk feed to the greatest extent possible.
2. Heighten awareness of difficulties near-term infants and their mothers may experience with breastfeeding.
3. Offer strategies to anticipate, identify promptly, and manage breastfeeding problems that the near-term infant and mother may experience in the inpatient and outpatient setting.
4. Prevent medical problems such as dehydration, hypoglycemia, hyperbilirubinemia, and failure to thrive in the near-term infant.
5. Maintain awareness of mothers' needs.

DEFINITION

"Near-term infant" refers to infants born between $35^{0/7}$ to $36^{6/7}$ weeks of gestation. **Many problems of the near-term infant are also found in the larger 34- to 35-week preterm infant and the borderline term infant of $37^{0/7}$ to $37^{6/7}$ weeks gestation and, therefore, the following guidelines may be applicable to these infants as well.**

BACKGROUND

The advantages of breast-milk feeding for premature infants appear to be even greater than those for term infants. Establishing breastfeeding in the near-term infant, however, is frequently more problematic than in the full-term infant. Because of their immaturity, near-term infants may be sleepier and have less stamina; more difficulty with latch, suck, and swallow; more difficulty maintaining body temperature; increased vulnerability to infection; greater delays in bilirubin excretion; and more respiratory instability than the full-term infant. The sleepiness and inability to suck vigorously is often misinterpreted as sepsis, leading to unnecessary separation and treatment. Alternatively, the near-term infant may appear deceptively vigorous at first glance. Physically large newborns are often mistaken for being more developmentally mature than their actual gestational age. (Remember the 3.84 kg baby born at 40 weeks was 3.0 kg at 36 weeks of gestation.) Near-term infants are more likely to be separated from their mother as a result of the infant

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being ill or requiring a screening procedure such as evaluation for sepsis, IV placement for antibiotics, and phototherapy.

Mothers who deliver near, but not at, term are more likely to deliver multiples or have a medical condition such as diabetes, pregnancy-induced hypertension, prolonged rupture of membranes, chorioamnionitis, pitocin induction, or a C-section delivery that may affect the success of breastfeeding. Any one or a combination of these conditions places these mothers and infants at risk for difficulty in establishing successful lactation or for breastfeeding failure.

The potential maternal and infant problems listed above place the near-term breastfeeding infant at increased risk for hypothermia, hypoglycemia, excessive weight loss, dehydration, slow weight gain, failure to thrive, prolonged artificial milk supplementation, exaggerated jaundice, kernicterus, dehydration, fever secondary to dehydration, rehospitalization, and breastfeeding failure. In places where early discharge is the norm, these infants will be sent home soon after delivery. Discussion and parental education become crucial in the proper management of breastfeeding.

Near-term infants have a greater chance of exclusive breastfeeding in hospitals that adhere to the Ten Steps to Successful Breastfeeding. To this end, practitioners should become knowledgeable in the Ten Steps and work with the administration in their maternity hospitals to endorse the guidelines set forth in the Ten Steps (see Protocol #7).

Most of the acute problems encountered in the newborn are managed on the postpartum floor in the first few hours and days after parturition; however, there are times that an infant's condition deteriorates in the interval between discharge and the first office visit. Therefore, timely evaluation of the near-term infant after discharge is critical. Just as many hospitals are becoming breastfeeding friendly, the outpatient office or clinic needs to be not only supportive of the breastfeeding mother, but also able to assist mothers with uncomplicated problems or questions related to breastfeeding. In addition, it is essential to be able to refer mothers and infants in a timely manner to a trained lactation professional for more complicated breastfeeding problems. A lactation referral should be viewed with the same medical urgency as any other acute medical referral.

PRINCIPLES OF CARE

1. Optimal communication
    a. Pathway and order set for breastfeeding the near-term infant
    b. Written feeding plan to follow on hospital discharge
    c. Facilitate communication among physician, nurses, and lactation consultants in the inpatient and outpatient settings
    d. Avoid conflicting advice to mother and family of the near-term infant
2. Assessment/reassessment
    a. Objective assessment of gestational age and associated risk factors
    b. Daily assessment of breastfeeding on the postpartum floor or special care nursery
    c. Careful assessment of breastfeeding issues in the outpatient setting
3. Timely lactation support in the inpatient and outpatient setting
4. Avoid separation of mother and infant
    a. Immediate postpartum period
    b. In cases in which either mother or infant is hospitalized for medical reasons
5. Prevent frequently encountered problems in breastfed near-term infant
    a. Hypoglycemia
    b. Hypothermia
    c. Hyperbilirubinemia
    d. Dehydration or excessive weight loss
6. Education
    a. Ongoing education of staff and care providers of issues specific to breastfeeding the near-term infant in the inpatient and outpatient settings
    b. Have one (or two) outpatient office support person (RN or lactation educator) trained in breastfeeding support, assessment, basic breastfeeding problem solving, and near-term breastfeeding issues
    c. Educate parents about breastfeeding the near-term infant
7. Discharge/follow-up
    a. Develop criteria for discharge readiness
    b. Establish a feeding plan to follow after discharge

c. Facilitate timely and frequent outpatient follow- up to assure effective breastfeeding after discharge
d. Careful outpatient monitoring of mother and near-term infant

Inpatient: implementation of principles of care

1. Initial steps:
   a. Communicate the feeding plan through a prewritten order set that can be easily modified.
   b. Encourage immediate and extended skin-to-skin contact to improve postpartum stabilization of heart rate, respiratory effort, temperature control, metabolic stability, and early breastfeeding.
   c. Assessment of gestational age by obstetrical estimate and Dubowitz scoring. Observe infant closely for 12 to 24 hours to assure physiologic stability (e.g., temperature, apnea, tachypnea, hypoglycemia).
   d. Encourage rooming in 24 hours a day. If the infant is physiologically stable and healthy, allow the infant to remain with the mother while receiving IV antibiotics or phototherapy. Depending on the individual situation, use of the bili-blanket during breastfeeds, as well as limiting time outside more intense phototherapy, may be necessary.
   e. Allow free access to the breast, encouraging initiation of breastfeeding within 1 hour after birth. Encourage continuous skin-to-skin contact as much as possible.
   f. Breastfeeding ad libitum (on demand) should be encouraged. It is very important that the infant be breastfed (or breast-milk fed) *at least* eight times per 24-hour period. Sometimes it may be necessary to wake the baby if he or she does not indicate hunger. A mother may need to express her milk and give it to the baby using a cup or other alternative feeding method. Mothers should be warned that use of bottles at this stage might prevent breastfeeding in some babies.
2. Ongoing care:
   a. Communicate daily changes in feeding plan either directly or with use of written bedside tool such as a crib card.
   b. Formal evaluation from a lactation consultant or other certified health professional with expertise in lactation management should be completed within 24 hours of delivery.
   c. Assess and document breastfeeding at least three times per day by at least two different providers with use of a standardized tool (e.g., LATCH Score,[2] IBFAT,[3] Mother/Baby Assessment Tool.[4]
   d. Educate the mother about breastfeeding her infant (e.g., position, latch, duration, early feeding cues, etc.)
   e. Monitor vital signs, weight change, stool and urine output, and milk transfer. Pre-post feeding weights where available, may be helpful, especially once lactogenesis II has occurred. Monitor for frequently occurring problems (e.g., obtain bilirubin if jaundiced before discharge, glucose screen before feeds for the first three feeds or until stable if hypoglycemia has occurred [see Protocol #1]). It is recommended to routinely screen for hyperbilirubinemia in near-term infants and to use standardized nomograms to assess risk of hyperbilirubinemia as well as plan for follow- up testing.
   f. Avoid excessive weight loss or dehydration. Losses greater than 3% of birth weight by day 1 or greater than 7% by day 3, ineffective milk transfer, or exaggerated jaundice are considered excessive and merit further evaluation and monitoring.
      i. The infant may need to be supplemented after breastfeeding with small quantities (5 to 10 mL per feeding on day 1, 10 to 30 cc per feeding thereafter) of expressed breast milk or formula. Mothers may supplement using a supplemental nursing device at the breast, cup feeds, finger feeds, syringe feeds, or bottle depending on clinical situation and mother's preference. Cup feedings have demonstrated safety in both preterms and term infants.[6] Cup feeding may also preserve breastfeeding duration among both preterm[7] and term[8] infants that require multiple supplemental feeds. However, there is little evidence about the safety or efficacy of other alternative feeding methods or their effect on breastfeeding. When cleanliness is suboptimal, cup feeding may be the best choice.[9]
      ii. If supplementing, the mother should pump or express milk regularly (use of a hospital grade electric pump is recommended when feasible) during the day (e.g., every 3 hours) until the baby is breastfeeding well or if the mother and infant are separated and unable to breastfeed.
      iii. Consider use of an ultrathin silicone nipple shield if there is difficulty with latch or evidence of ineffective milk transfer.[10] The use of nipple shields is controversial and generally requires close supervision of a trained lactation consultant or knowledgeable health care professional. Inappropriate or prolonged nipple shield use can decrease milk supply, and in some situations, nipple shields decrease, rather than increase, milk transfer.

g. Avoid thermal stress by using skin-to-skin (e.g., kangaroo) care or by double wrapping if necessary and by dressing the baby in a shirt and hat. Consider intermittent use of an incubator to maintain temperature. Where it is culturally acceptable, mothers can sleep with their babies to provide warmth.

3. Discharge planning

a. Assess readiness for discharge, including physiologic stability and adequate intake exclusively at breast or with supplements. May use 24-hour test weights, with a scale designed with adequate precision for such weights, for infants with >7% weight loss.[11]

b. Develop discharge-feeding plan. Consider diet, milk intake (mL/kg/day), and method of feeding (breast, bottle, supplemental device, etc.) If supplementing, determine method most acceptable to mother for use after discharge.

c. Make an appointment for follow-up within 48 hours of discharge to recheck weight, feeding adequacy, jaundice.

d. Communicate discharge-feeding plan to pediatric outpatient provider. Written communication is preferred.

Outpatient: implementation of principles of care

1. Initial Visit

a. The first outpatient office or home health visit should be when the infant is 3 to 5 days of life or 1 or 2 days after discharge.

b. Review the inpatient maternal and infant records including prenatal, perinatal, infant and feeding history (e.g., need for supplement in the hospital, problems with latch, need for phototherapy, etc). Gestational age, birth weight, and weight at discharge should be recorded in the outpatient chart.

c. Physician review of breastfeeding since discharge needs to be very specific regarding frequency, approximate duration of feedings, and how baby is being fed (e.g., at breast, expressed breast milk with supplemental device such as supplemental nursing system, finger feeds, or bottle with artificial nipple). Information about stool and urine output, color of stools, baby's state (e.g., crying, not satisfied after a feed, sleepy and difficult to keep awake at the breast during a feed, etc.) should be obtained. If parents have a written feeding record, it should be reviewed.

d. Examination of the infant must include an accurate weight without clothes and calculation of change in weight from birth and discharge, state of alertness, and hydration. Assess for jaundice with cutaneous bilirubin screen and/or serum bilirubin determination if indicated.

e. Assess the mother's breast for nipple shape, pain and trauma, engorgement, and mastitis. The mother's emotional status and degree of fatigue should be considered, especially when considering supplemental feeding routines. Observe the baby feeding at the breast, looking at the latch, suck, and swallow.

2. Problem Solving

a. Poor weight gain (<20 g/day) is most likely the result of inadequate intake. Median daily weight gain of a healthy newborn is 26 to 31 grams per day.[12] The care provider must determine whether the problem is insufficient breast milk production, inability of the infant to transfer enough milk, or a combination of both. The infant who is getting enough breast milk should have six to eight voids and yellow seedy stools daily by day 4, have lost no more than 8% of birth weight, and be satisfied after 20 to 30 minutes of nursing. Consider feeding more frequently or supplementing (preferably with expressed breast milk) after suckling if the mother is not already doing so or increasing the amount of supplement. Consider instituting or increasing frequency of pumping or manual expression. Consider referral to a lactation specialist.

b. For infants with latch difficulties, the baby's mouth should be examined for anatomical abnormalities [e.g., ankyloglossia (tongue-tied),[13] cleft palate], and a digital suck exam performed. A referral to a trained professional lactation specialist or in the case of ankyloglossia a referral to someone trained in frenotomy may be indicated.

c. The jaundiced near-term infant poses more of a problem when considering management of hyperbilirubinemia. Keep in mind all risk factors should be determined, and if the principal factor is lack of milk the primary treatment is to provide milk (preferably through improved breastfeeding or expressed breast milk) to the baby. Institution of phototherapy for breastfeeding jaundice either in the home or in the hospital may actually interfere with the primary treatment of getting increased quantities of milk to the baby.

d. Consider the use of a galactogogue (a medicine or herb that increases breast milk supply) in mothers who have a documented low breast-milk supply (see Protocol # 9).

e. The mother's ability to cope and manage the feeding plan needs to be evaluated. If the mother is not coping well, work with her to find help and or modify the feeding plan to something that is more manageable.

3. Follow-up

The near-term infant should have weekly weight checks until 40 weeks postconceptual age or until it is demonstrated that he or she is thriving with no supplements.

a. Babies who are not gaining well and for whom adjustments are being made to the feeding plan may need a visit 2 to 4 days after each adjustment. A home health provider, preferably trained in medical evaluation of the newborn and in lactation support, who reports the weight to the primary care provider could make this visit.

b. Near-term infants have less vitamin D stored at birth, increasing their risk for later deficiency. Depending on sunlight exposure and skin color, vitamin D supplements (200 IU/day) may be indicated if the infant is exclusively breastfed. Strong consideration should be given to starting these supplements earlier than the 2 months of age recommended for term infants in the United States. Consideration should also be given to supplementing the near-term exclusively breastfed infant with iron, as iron stores in these infants are not those of the full-term infant. The American Academy of Pediatrics Committee on Nutrition recommends 2 mg/kg/day of elemental iron for preterm breastfed infants in the form of iron drops from 1 to 12 months of age.

c. After the first week, infants should be monitored for adequate growth and evidence of normal biochemical indices (See Table P-4 from Protocol #12) Weight gain should average more than 20 g/day, and length and head circumference should each increase by an average of more than 0.5 cm/week.

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APPENDIX

Baby friendly hospital initiative steps for successful breastfeeding:

1. Have a written breastfeeding policy.
2. Train all health care staff in the skills necessary to implement the policy.

3. All mothers should be informed of the benefits of breastfeeding.
4. Help mothers initiate breastfeeding within 1 hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation, even if they are be separated from their infant.
6. Give newborn infants no food or drink other than breast milk, unless medically indicated.
7. Practice rooming-in, allow mothers and infants to remain together, 24 hours a day if medically stable.
8. Encourage breastfeeding on demand.
9. Give no artificial teats or pacifiers to breastfeeding infants.
10. Foster the establishment of breastfeeding support groups and refer mothers to them, on discharge form the hospital or clinic.

Appendix 8

AMERICAN ACADEMY OF PEDIATRICS

CLINICAL PRACTICE GUIDELINE

Subcommittee on Hyperbilirubinemia

Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation

ABSTRACT. Jaundice occurs in most newborn infants. Most jaundice is benign, but because of the potential toxicity of bilirubin, newborn infants must be monitored to identify those who might develop severe hyperbilirubinemia and, in rare cases, acute bilirubin encephalopathy or kernicterus. The focus of this guideline is to reduce the incidence of severe hyperbilirubinemia and bilirubin encephalopathy while minimizing the risks of unintended harm such as maternal anxiety, decreased breastfeeding, and unnecessary costs or treatment. Although kernicterus should almost always be preventable, cases continue to occur. These guidelines provide a framework for the prevention and management of hyperbilirubinemia in newborn infants of 35 or more weeks of gestation. In every infant, we recommend that clinicians 1) promote and support successful breastfeeding; 2) perform a systematic assessment before discharge for the risk of severe hyperbilirubinemia; 3) provide early and focused follow-up based on the risk assessment; and 4) when indicated, treat newborns with phototherapy or exchange transfusion to prevent the development of severe hyperbilirubinemia and, possibly, bilirubin encephalopathy (kernicterus). *Pediatrics* 2004; 114:297–316; *hyperbilirubinemia, newborn, kernicterus, bilirubin encephalopathy, phototherapy*.

ABBREVIATIONS. AAP, American Academy of Pediatrics; TSB, total serum bilirubin; TcB, transcutaneous bilirubin; G6PD, glucose-6-phosphate dehydrogenase; $ETCO_c$, end-tidal carbon monoxide corrected for ambient carbon monoxide; B/A, bilirubin/albumin; UB, unbound bilirubin.

BACKGROUND

In October 1994, the Provisional Committee for Quality Improvement and Subcommittee on Hyperbilirubinemia of the American Academy of Pediatrics (AAP) produced a practice parameter dealing with the management of hyperbilirubinemia in the healthy term newborn.[1] The current guideline represents a consensus of the committee charged by the AAP with reviewing and updating the existing guideline and is based on a careful review of the evidence, including a comprehensive literature review by the New England Medical Center Evidence-Based Practice Center.[2] (See "An Evidence-Based Review of Important Issues Concerning Neonatal Hyperbilirubinemia"[3] for a description of the methodology, questions addressed, and conclusions of this report.) This guideline is intended for use by hospitals and pediatricians, neonatologists, family physicians, physician assistants, and advanced practice nurses who treat newborn infants in the hospital and as outpatients. A list of frequently asked questions and answers for parents is available in English and Spanish at www.aap.org/family/jaundicefaq.htm.

The recommendations in this guideline do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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DEFINITION OF RECOMMENDATIONS

The evidence-based approach to guideline development requires that the evidence in support of a policy be identified, appraised, and summarized and that an explicit link between evidence and recommendations be defined. Evidence-based recommendations are based on the quality of evidence and the balance of benefits and harms that is anticipated when the recommendation is followed. This guideline uses the definitions for quality of evidence and balance of benefits and harms established by the AAP Steering Committee on Quality Improvement Management.[4] See Appendix 1 for these definitions.

The draft practice guideline underwent extensive peer review by committees and sections within the AAP, outside organizations, and other individuals identified by the subcommittee as experts in the field. Liaison representatives to the subcommittee were invited to distribute the draft to other representatives and committees within their specialty organizations. The resulting comments were reviewed by the subcommittee and, when appropriate, incorporated into the guideline.

BILIRUBIN ENCEPHALOPATHY AND KERNICTERUS

Although originally a pathologic diagnosis characterized by bilirubin staining of the brainstem nuclei and cerebellum, the term "kernicterus" has come to be used interchangeably with both the acute and chronic findings of bilirubin encephalopathy. Bilirubin encephalopathy describes the clinical central nervous system findings caused by bilirubin toxicity to the basal ganglia and various brainstem nuclei. To avoid confusion and encourage greater consistency in the literature, the committee recommends that in infants the term "acute bilirubin encephalopathy" be used to describe the acute manifestations of bilirubin

toxicity seen in the first weeks after birth and that the term "kernicterus" be reserved for the chronic and permanent clinical sequelae of bilirubin toxicity.

See Appendix 1 for the clinical manifestations of acute bilirubin encephalopathy and kernicterus.

FOCUS OF GUIDELINE

The overall aim of this guideline is to promote an approach that will reduce the frequency of severe neonatal hyperbilirubinemia and bilirubin encephalopathy and minimize the risk of unintended harm such as increased anxiety, decreased breastfeeding, or unnecessary treatment for the general population and excessive cost and waste. Recent reports of kernicterus indicate that this condition, although rare, is still occurring.[2,5–10]

Analysis of these reported cases of kernicterus suggests that if health care personnel follow the recommendations listed in this guideline, kernicterus would be largely preventable.

These guidelines emphasize the importance of universal systematic assessment for the risk of severe hyperbilirubinemia, close follow-up, and prompt intervention when indicated. The recommendations apply to the care of infants at 35 or more weeks of gestation. These recommendations seek to further the aims defined by the Institute of Medicine as appropriate for health care:[11] safety, effectiveness, efficiency, timeliness, patient-centeredness, and equity. They specifically emphasize the principles of patient safety and the key role of timeliness of interventions to prevent adverse outcomes resulting from neonatal hyperbilirubinemia.

The following are the key elements of the recommendations provided by this guideline. Clinicians should:

1. Promote and support successful breastfeeding.
2. Establish nursery protocols for the identification and evaluation of hyperbilirubinemia.
3. Measure the total serum bilirubin (TSB) or transcutaneous bilirubin (TcB) level on infants jaundiced in the first 24 hours.
4. Recognize that visual estimation of the degree of jaundice can lead to errors, particularly in darkly pigmented infants.
5. Interpret all bilirubin levels according to the infant's age in hours.
6. Recognize that infants at less than 38 weeks' gestation, particularly those who are breastfed, are at higher risk of developing hyperbilirubinemia and require closer surveillance and monitoring.
7. Perform a systematic assessment on all infants before discharge for the risk of severe hyperbilirubinemia.
8. Provide parents with written and verbal information about newborn jaundice.
9. Provide appropriate follow-up based on the time of discharge and the risk assessment.
10. Treat newborns, when indicated, with phototherapy or exchange transfusion.

PRIMARY PREVENTION

In numerous policy statements, the AAP recommends breastfeeding for all healthy term and near-term newborns. This guideline strongly supports this general recommendation.

RECOMMENDATION 1.0: Clinicians should advise mothers to nurse their infants at least 8 to 12 times per day for the first several days[12] *(evidence quality C: benefits exceed harms).*

Poor caloric intake and/or dehydration associated with inadequate breastfeeding may contribute to the development of hyperbilirubinemia.[6,13,14] Increasing the frequency of nursing decreases the likelihood of subsequent significant hyperbilirubinemia in breastfed infants.[15–17] Providing appropriate support and advice to breastfeeding mothers increases the likelihood that breastfeeding will be successful.

Additional information on how to assess the adequacy of intake in a breastfed newborn is provided in Appendix 1.

RECOMMENDATION 1.1: The AAP recommends against routine supplementation of nondehydrated breastfed infants with water or dextrose water (evidence quality B and C: harms exceed benefits).

Supplementation with water or dextrose water will not prevent hyperbilirubinemia or decrease TSB levels.[18,19]

SECONDARY PREVENTION

RECOMMENDATION 2.0: Clinicians should perform ongoing systematic assessments during the neonatal period for the risk of an infant developing severe hyperbilirubinemia.

Blood Typing

RECOMMENDATION 2.1: All pregnant women should be tested for ABO and Rh (D) blood types and have a serum screen for unusual isoimmune antibodies (evidence quality B: benefits exceed harms).

RECOMMENDATION 2.1.1: If a mother has not had prenatal blood grouping or is Rh-negative, a direct antibody test (or Coombs' test), blood type, and an Rh (D) type on the infant's (cord) blood are strongly recommended (evidence quality B: benefits exceed harms).

RECOMMENDATION 2.1.2: If the maternal blood is group O, Rh-positive, it is an option to test the cord blood for the infant's blood type and direct antibody test, but it is not required provided that there is appropriate surveillance, risk assessment before discharge, and follow-up[20] *(evidence quality C: benefits exceed harms).*

Clinical Assessment

RECOMMENDATION 2.2: Clinicians should ensure that all infants are routinely monitored for the development of jaundice, and nurseries should have established protocols for the assessment of jaundice. Jaundice should be assessed whenever the infant's vital signs are measured but no less than every 8 to 12 hours (evidence quality D: benefits versus harms exceptional).

In newborn infants, jaundice can be detected by blanching the skin with digital pressure, revealing the underlying color of the skin and subcutaneous tissue. The assessment of jaundice must be per-

Fig 1. Algorithm for the management of jaundice in the newborn nursery.

formed in a well-lit room or, preferably, in daylight at a window. Jaundice is usually seen first in the face and progresses caudally to the trunk and extremities,[21] but visual estimation of bilirubin levels from the degree of jaundice can lead to errors.[22–24] In most infants with TSB levels of less than 15 mg/dL (257 μmol/L), noninvasive TcB-measurement devices can provide a valid estimate of the TSB level.[2,25–29] See Appendix 1 for additional information on the clinical evaluation of jaundice and the use of TcB measurements.

RECOMMENDATION 2.2.1: Protocols for the assessment of jaundice should include the circumstances in which nursing staff can obtain a TcB level or order a TSB measurement (evidence quality D: benefits versus harms exceptional).

Laboratory Evaluation

RECOMMENDATION 3.0: A TcB and/or TSB measurement should be performed on every infant who is jaundiced in the first 24 hours after birth (Fig 1 and Table 1)[30] (evidence quality C: benefits exceed harms). The need for and timing of a repeat TcB or TSB measurement will depend on the zone in which the TSB falls (Fig 2),[25,31] the age of the infant, and the evolution of the hyperbilirubinemia. Recommendations for TSB measurements after the age of 24 hours are provided in Fig 1 and Table 1.

See Appendix 1 for capillary versus venous bilirubin levels.

RECOMMENDATION 3.1: A TcB and/or TSB measurement should be performed if the jaundice appears excessive for the infant's age (evidence quality D: benefits versus harms exceptional). If there is any doubt about the degree of jaundice, the TSB or TcB should be measured. Visual estimation of bilirubin levels from the degree of jaundice can lead to errors, particularly in darkly pigmented infants (evidence quality C: benefits exceed harms).

RECOMMENDATION 3.2: All bilirubin levels should be interpreted according to the infant's age in hours (Fig 2) (evidence quality C: benefits exceed harms).

Cause of Jaundice

RECOMMENDATION 4.1: The possible cause of jaundice should be sought in an infant receiving phototherapy or whose TSB level is rising rapidly (ie, crossing percentiles [Fig 2]) and is not explained by the history and physical examination (evidence quality D: benefits versus harms exceptional).

RECOMMENDATION 4.1.1: Infants who have an elevation of direct-reacting or conjugated bilirubin should have a urinalysis and urine culture.[32] Additional laboratory evaluation for sepsis should be performed if indicated by history and physical examination (evidence quality C: benefits exceed harms).

See Appendix 1 for definitions of abnormal levels of direct-reacting and conjugated bilirubin.

RECOMMENDATION 4.1.2: Sick infants and those who are jaundiced at or beyond 3 weeks should have a measurement of total and direct or conjugated bilirubin to identify cholestasis (Table 1) (evidence quality D: benefit versus harms exceptional). The results of the newborn thyroid and galactosemia screen should also be checked in these infants (evidence quality D: benefits versus harms exceptional).

RECOMMENDATION 4.1.3: If the direct-reacting or conjugated bilirubin level is elevated, additional evaluation for the causes of cholestasis is recommended (evidence quality C: benefits exceed harms).

RECOMMENDATION 4.1.4: Measurement of the glucose-6-phosphate dehydrogenase (G6PD) level is recommended for a jaundiced infant who is receiving phototherapy and whose family history or ethnic or geographic origin suggest the likelihood of G6PD deficiency or for an infant in whom the response to phototherapy is poor (Fig 3) (evidence quality C: benefits exceed harms).

G6PD deficiency is widespread and frequently unrecognized, and although it is more common in the populations around the Mediterranean and in the Middle East, Arabian peninsula, Southeast Asia, and Africa, immigration and intermarriage have transformed G6PD deficiency into a global problem.[33,34]

TABLE 1. Laboratory Evaluation of the Jaundiced Infant of 35 or More Weeks' Gestation

Indications	Assessments
Jaundice in first 24 h	Measure TcB and/or TSB
Jaundice appears excessive for infant's age	Measure TcB and/or TSB
Infant receiving phototherapy or TSB rising rapidly (ie, crossing percentiles [Fig 2]) and unexplained by history and physical examination	Blood type and Coombs' test, if not obtained with cord blood Complete blood count and smear Measure direct or conjugated bilirubin It is an option to perform reticulocyte count, G6PD, and $ETCO_c$, if available Repeat TSB in 4–24 h depending on infant's age and TSB level
TSB concentration approaching exchange levels or not responding to phototherapy	Perform reticulocyte count, G6PD, albumin, $ETCO_c$, if available
Elevated direct (or conjugated) bilirubin level	Do urinalysis and urine culture. Evaluate for sepsis if indicated by history and physical examination
Jaundice present at or beyond age 3 wk, or sick infant	Total and direct (or conjugated) bilirubin level If direct bilirubin elevated, evaluate for causes of cholestasis Check results of newborn thyroid and galactosemia screen, and evaluate infant for signs or symptoms of hypothyroidism

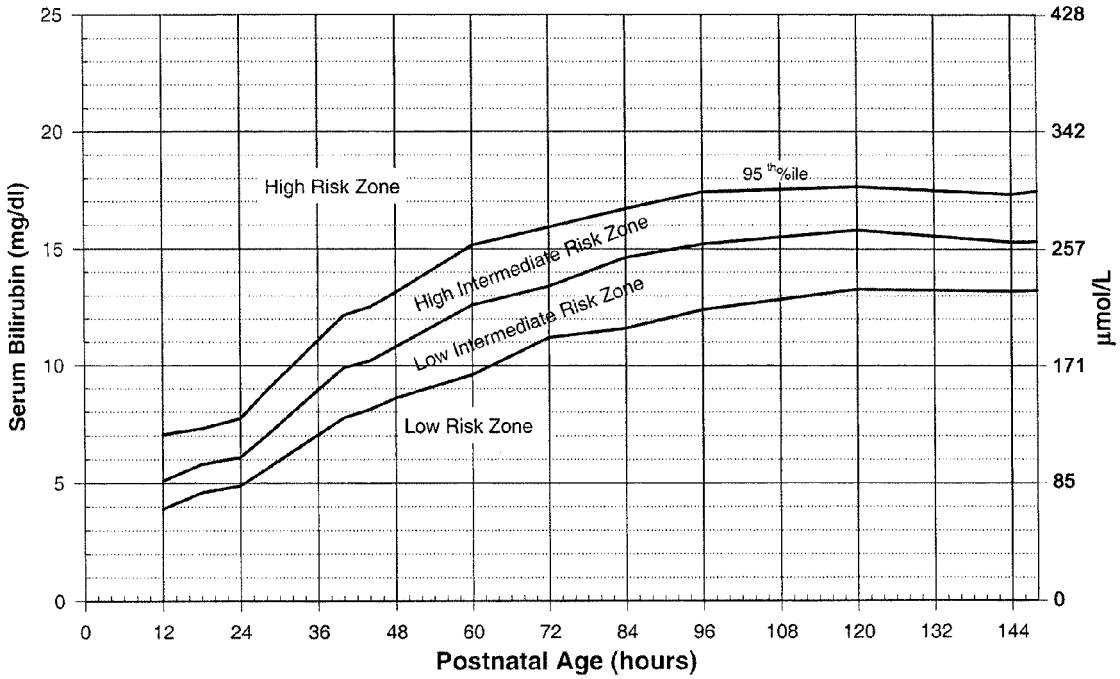


Fig 2. Nomogram for designation of risk in 2840 well newborns at 36 or more weeks' gestational age with birth weight of 2000 g or more or 35 or more weeks' gestational age and birth weight of 2500 g or more based on the hour-specific serum bilirubin values. The serum bilirubin level was obtained before discharge, and the zone in which the value fell predicted the likelihood of a subsequent bilirubin level exceeding the 95th percentile (high-risk zone) as shown in Appendix 1, Table 4. Used with permission from Bhutani et al.[31] See Appendix 1 for additional information about this nomogram, which should not be used to represent the natural history of neonatal hyperbilirubinemia.

Furthermore, G6PD deficiency occurs in 11% to 13% of African Americans, and kernicterus has occurred in some of these infants.[5,33] In a recent report, G6PD deficiency was considered to be the cause of hyperbilirubinemia in 19 of 61 (31.5%) infants who developed kernicterus.[5] (See Appendix 1 for additional information on G6PD deficiency.)

Risk Assessment Before Discharge

RECOMMENDATION 5.1: Before discharge, every newborn should be assessed for the risk of developing severe hyperbilirubinemia, and all nurseries should establish protocols for assessing this risk. Such assessment is particularly important in infants who are discharged before the age of 72 hours (evidence quality C: benefits exceed harms).

RECOMMENDATION 5.1.1: The AAP recommends 2 clinical options used individually or in combination for the systematic assessment of risk: predischarge measurement of the bilirubin level using TSB or TcB and/or assessment of clinical risk factors. Whether either or both options are used, appropriate follow-up after discharge is essential (evidence quality C: benefits exceed harms).

The best documented method for assessing the risk of subsequent hyperbilirubinemia is to measure the TSB or TcB level[25,31,35–38] and plot the results on a nomogram (Fig 2). A TSB level can be obtained at the time of the routine metabolic screen, thus obviating the need for an additional blood sample. Some authors have suggested that a TSB measurement should be part of the routine screening of all newborns.[5,31] An infant whose predischarge TSB is in the low-risk zone (Fig 2) is at very low risk of developing severe hyperbilirubinemia.[5,38]

Table 2 lists those factors that are clinically signif-

TABLE 2. Risk Factors for Development of Severe Hyperbilirubinemia in Infants of 35 or More Weeks' Gestation (in Approximate Order of Importance)

Major risk factors
Predischarge TSB or TcB level in the high-risk zone (Fig 2)[25,31]
Jaundice observed in the first 24 h[30]
Blood group incompatibility with positive direct antiglobulin test, other known hemolytic disease (eg, G6PD deficiency), elevated $ETCO_c$
Gestational age 35–36 wk[39,40]
Previous sibling received phototherapy[40,41]
Cephalohematoma or significant bruising[39]
Exclusive breastfeeding, particularly if nursing is not going well and weight loss is excessive[39,40]
East Asian race[39]*
Minor risk factors
Predischarge TSB or TcB level in the high intermediate-risk zone[25,31]
Gestational age 37–38 wk[39,40]
Jaundice observed before discharge[40]
Previous sibling with jaundice[40,41]
Macrosomic infant of a diabetic mother[42,43]
Maternal age ≥25 y[39]
Male gender[39,40]
Decreased risk (these factors are associated with decreased risk of significant jaundice, listed in order of decreasing importance)
TSB or TcB level in the low-risk zone (Fig 2)[25,31]
Gestational age ≥41 wk[39]
Exclusive bottle feeding[39,40]
Black race[38]*
Discharge from hospital after 72 h[40,44]

* Race as defined by mother's description.

icant and most frequently associated with an increase in the risk of severe hyperbilirubinemia. But, because these risk factors are common and the risk of hyperbilirubinemia is small, individually the factors are of limited use as predictors of significant hyperbilirubinemia.[39] Nevertheless, if no risk factors are present, the risk of severe hyperbilirubinemia is extremely low, and the more risk factors present, the greater the risk of severe hyperbilirubinemia.[39] The important risk factors most frequently associated with severe hyperbilirubinemia are breastfeeding, gestation below 38 weeks, significant jaundice in a previous sibling, and jaundice noted before discharge.[39,40] A formula-fed infant of 40 or more weeks' gestation is at very low risk of developing severe hyperbilirubinemia.[39]

Hospital Policies and Procedures

RECOMMENDATION 6.1: All hospitals should provide written and verbal information for parents at the time of discharge, which should include an explanation of jaundice, the need to monitor infants for jaundice, and advice on how monitoring should be done (evidence quality D: benefits versus harms exceptional).

An example of a parent-information handout is available in English and Spanish at www.aap.org/family/jaundicefaq.htm.

Follow-up

RECOMMENDATION 6.1.1: All infants should be examined by a qualified health care professional in the first few days after discharge to assess infant well-being and the presence or absence of jaundice. The timing and location of this assessment will be determined by the length of stay in the nursery, presence or absence of risk factors for hyperbilirubinemia (Table 2 and Fig 2), and risk of other neonatal problems (evidence quality C: benefits exceed harms).

Timing of Follow-up

RECOMMENDATION 6.1.2: Follow-up should be provided as follows:

Infant Discharged	Should Be Seen by Age
Before age 24 h	72 h
Between 24 and 47.9 h	96 h
Between 48 and 72 h	120 h

For some newborns discharged before 48 hours, 2 follow-up visits may be required, the first visit between 24 and 72 hours and the second between 72 and 120 hours. Clinical judgment should be used in determining follow-up. Earlier or more frequent follow-up should be provided for those who have risk factors for hyperbilirubinemia (Table 2), whereas those discharged with few or no risk factors can be seen after longer intervals (evidence quality C: benefits exceed harms).

RECOMMENDATION 6.1.3: If appropriate follow-up cannot be ensured in the presence of elevated risk for developing severe hyperbilirubinemia, it may be necessary to delay discharge either until appropriate follow-up can be ensured or the period of greatest risk has passed (72-96 hours) (evidence quality D: benefits versus harms exceptional).

Follow-up Assessment

RECOMMENDATION 6.1.4: The follow-up assessment should include the infant's weight and percent change from birth weight, adequacy of intake, the pattern of voiding and stooling, and the presence or absence of jaundice (evidence quality C: benefits exceed harms). Clinical judgment should be used to determine the need for a bilirubin measurement. If there is any doubt about the degree of jaundice, the TSB or TcB level should be measured. Visual estimation of bilirubin levels can lead to errors, particularly in darkly pigmented infants (evidence quality C: benefits exceed harms).

See Appendix 1 for assessment of the adequacy of intake in breastfeeding infants.

TREATMENT

Phototherapy and Exchange Transfusion

RECOMMENDATION 7.1: Recommendations for treatment are given in Table 3 and Figs 3 and 4 (evidence quality C: benefits exceed harms). If the TSB does not fall or continues to rise despite intensive phototherapy, it is very likely that hemolysis is occurring. The committee's recommendations for discontinuing phototherapy can be found in Appendix 2.

RECOMMENDATION 7.1.1: In using the guidelines for phototherapy and exchange transfusion (Figs 3 and 4), the direct-reacting (or conjugated) bilirubin level should not be subtracted from the total (evidence quality D: benefits versus harms exceptional).

In unusual situations in which the direct bilirubin level is 50% or more of the total bilirubin, there are no good data to provide guidance for therapy, and consultation with an expert in the field is recommended.

RECOMMENDATION 7.1.2: If the TSB is at a level at which exchange transfusion is recommended (Fig 4) or if the TSB level is 25 mg/dL (428 μmol/L) or higher at any time, it is a medical emergency and the infant should be admitted immediately and directly to a hospital pediatric service for intensive phototherapy. These infants should not be referred to the emergency department, because it delays the initiation of treatment[54] (evidence quality C: benefits exceed harms).

RECOMMENDATION 7.1.3: Exchange transfusions should be performed only by trained personnel in a neonatal intensive care unit with full monitoring and resuscitation capabilities (evidence quality D: benefits versus harms exceptional).

RECOMMENDATION 7.1.4: In isoimmune hemolytic disease, administration of intravenous γ-globulin (0.5-1 g/kg over 2 hours) is recommended if the TSB is rising despite intensive phototherapy or the TSB level is within 2 to 3 mg/dL (34-51 μmol/L) of the exchange level (Fig 4).[55] If necessary, this dose can be repeated in 12 hours (evidence quality B: benefits exceed harms).

Intravenous γ-globulin has been shown to reduce the need for exchange transfusions in Rh and ABO hemolytic disease.[55–58] Although data are limited, it is reasonable to assume that intravenous γ-globulin will also be helpful in the other types of Rh hemolytic disease such as anti-C and anti-E.

TABLE 3. Example of a Clinical Pathway for Management of the Newborn Infant Readmitted for Phototherapy or Exchange Transfusion

Treatment
Use intensive phototherapy and/or exchange transfusion as indicated in Figs 3 and 4 (see Appendix 2 for details of phototherapy use)
Laboratory tests
TSB and direct bilirubin levels
Blood type (ABO, Rh)
Direct antibody test (Coombs')
Serum albumin
Complete blood cell count with differential and smear for red cell morphology
Reticulocyte count
$ETCO_c$ (if available)
G6PD if suggested by ethnic or geographic origin or if poor response to phototherapy
Urine for reducing substances
If history and/or presentation suggest sepsis, perform blood culture, urine culture, and cerebrospinal fluid for protein, glucose, cell count, and culture
Interventions
If TSB ≥25 mg/dL (428 μmol/L) or ≥20 mg/dL (342 μmol/L) in a sick infant or infant <38 wk gestation, obtain a type and crossmatch, and request blood in case an exchange transfusion is necessary
In infants with isoimmune hemolytic disease and TSB level rising in spite of intensive phototherapy or within 2–3 mg/dL (34–51 μmol/L) of exchange level (Fig 4), administer intravenous immunoglobulin 0.5–1 g/kg over 2 h and repeat in 12 h if necessary
If infant's weight loss from birth is >12% or there is clinical or biochemical evidence of dehydration, recommend formula or expressed breast milk. If oral intake is in question, give intravenous fluids.
For infants receiving intensive phototherapy
Breastfeed or bottle-feed (formula or expressed breast milk) every 2–3 h
If TSB ≥25 mg/dL (428 μmol/L), repeat TSB within 2–3 h
If TSB 20–25 mg/dL (342–428 μmol/L), repeat within 3–4 h. If TSB <20 mg/dL (342 μmol/L), repeat in 4–6 h. If TSB continues to fall, repeat in 8–12 h
If TSB is not decreasing or is moving closer to level for exchange transfusion or the TSB/albumin ratio exceeds levels shown in Fig 4, consider exchange transfusion (see Fig 4 for exchange transfusion recommendations)
When TSB is <13–14 mg/dL (239 μmol/L), discontinue phototherapy
Depending on the cause of the hyperbilirubinemia, it is an option to measure TSB 24 h after discharge to check for rebound

Serum Albumin Levels and the Bilirubin/Albumin Ratio

RECOMMENDATION 7.1.5: It is an option to measure the serum albumin level and consider an albumin level of less than 3.0 g/dL as one risk factor for lowering the threshold for phototherapy use (see Fig 3) (evidence quality D: benefits versus risks exceptional.).

RECOMMENDATION 7.1.6: If an exchange transfusion is being considered, the serum albumin level should be measured and the bilirubin/albumin (B/A) ratio used in conjunction with the TSB level and other factors in determining the need for exchange transfusion (see Fig 4) (evidence quality D: benefits versus harms exceptional).

The recommendations shown above for treating hyperbilirubinemia are based primarily on TSB levels and other factors that affect the risk of bilirubin encephalopathy. This risk might be increased by a prolonged (rather than a brief) exposure to a certain TSB level.[59,60] Because the published data that address this issue are limited, however, it is not possible to provide specific recommendations for intervention based on the duration of hyperbilirubinemia.

See Appendix 1 for the basis for recommendations 7.1 through 7.1.6 and for the recommendations provided in Figs 3 and 4. Appendix 1 also contains a discussion of the risks of exchange transfusion and the use of B/A binding.

Acute Bilirubin Encephalopathy

RECOMMENDATION 7.1.7: Immediate exchange transfusion is recommended in any infant who is jaundiced and manifests the signs of the intermediate to advanced stages of acute bilirubin encephalopathy[61,62] (hypertonia, arching, retrocollis, opisthotonos, fever, high-pitched cry) even if the TSB is falling (evidence quality D: benefits versus risks exceptional).

Phototherapy

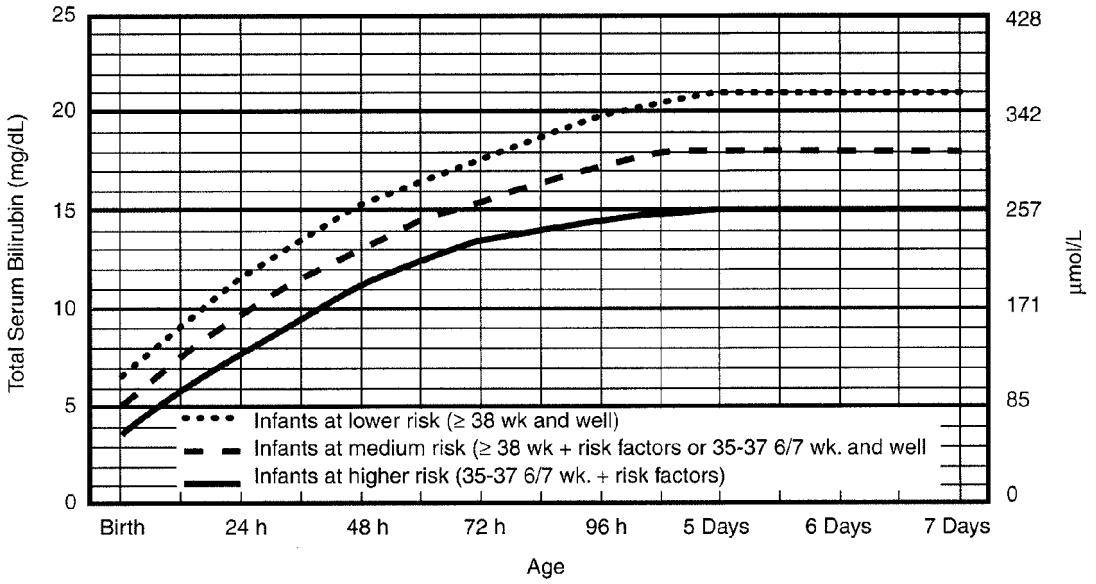
RECOMMENDATION 7.2: All nurseries and services treating infants should have the necessary equipment to provide intensive phototherapy (see Appendix 2) (evidence quality D: benefits exceed risks).

Outpatient Management of the Jaundiced Breastfed Infant

RECOMMENDATION 7.3: In breastfed infants who require phototherapy (Fig 3), the AAP recommends that, if possible, breastfeeding should be continued (evidence quality C: benefits exceed harms). It is also an option to interrupt temporarily breastfeeding and substitute formula. This can reduce bilirubin levels and/or enhance the efficacy of phototherapy[63–65] (evidence quality B: benefits exceed harms). In breastfed infants receiving phototherapy, supplementation with expressed breast milk or formula is appropriate if the infant's intake seems inadequate, weight loss is excessive, or the infant seems dehydrated.

IMPLEMENTATION STRATEGIES

The Institute of Medicine[11] recommends a dramatic change in the way the US health care system



- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors = isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin < 3.0g/dL (if measured)
- For well infants 35-37 6/7 wk can adjust TSB levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 wks and at higher TSB levels for those closer to 37 6/7 wk.
- It is an option to provide conventional phototherapy in hospital or at home at TSB levels 2-3 mg/dL (35-50mmol/L) below those shown but home phototherapy should not be used in any infant with risk factors.

Fig 3. Guidelines for phototherapy in hospitalized infants of 35 or more weeks' gestation.

Note: These guidelines are based on limited evidence and the levels shown are approximations. The guidelines refer to the use of intensive phototherapy which should be used when the TSB exceeds the line indicated for each category. Infants are designated as "higher risk" because of the potential negative effects of the conditions listed on albumin binding of bilirubin,[45–47] the blood-brain barrier,[48] and the susceptibility of the brain cells to damage by bilirubin.[48]

"Intensive phototherapy" implies irradiance in the blue-green spectrum (wavelengths of approximately 430–490 nm) of at least 30 $\mu W/cm^2$ per nm (measured at the infant's skin directly below the center of the phototherapy unit) and delivered to as much of the infant's surface area as possible. Note that irradiance measured below the center of the light source is much greater than that measured at the periphery. Measurements should be made with a radiometer specified by the manufacturer of the phototherapy system.

See Appendix 2 for additional information on measuring the dose of phototherapy, a description of intensive phototherapy, and of light sources used. If total serum bilirubin levels approach or exceed the exchange transfusion line (Fig 4), the sides of the bassinet, incubator, or warmer should be lined with aluminum foil or white material.[50] This will increase the surface area of the infant exposed and increase the efficacy of phototherapy.[51]

If the total serum bilirubin does not decrease or continues to rise in an infant who is receiving intensive phototherapy, this strongly suggests the presence of hemolysis.

Infants who receive phototherapy and have an elevated direct-reacting or conjugated bilirubin level (cholestatic jaundice) may develop the bronze-baby syndrome. See Appendix 2 for the use of phototherapy in these infants.

ensures the safety of patients. The perspective of safety as a purely individual responsibility must be replaced by the concept of safety as a property of systems. Safe systems are characterized by a shared knowledge of the goal, a culture emphasizing safety, the ability of each person within the system to act in a manner that promotes safety, minimizing the use of memory, and emphasizing the use of standard procedures (such as checklists), and the involvement of patients/families as partners in the process of care.

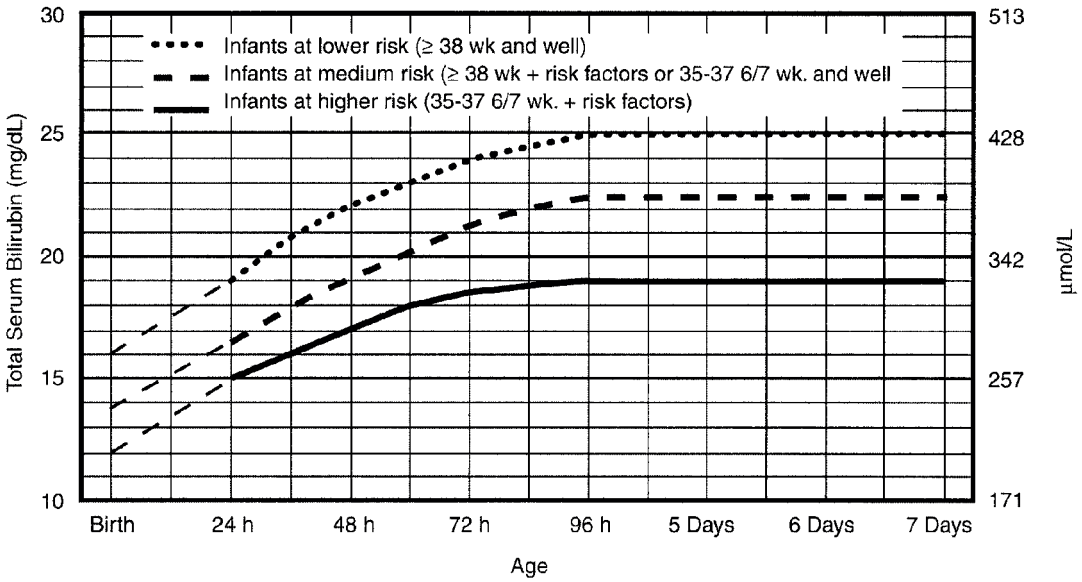
These principles can be applied to the challenge of preventing severe hyperbilirubinemia and kernicterus. A systematic approach to the implementation of these guidelines should result in greater safety. Such approaches might include

- The establishment of standing protocols for nursing assessment of jaundice, including testing TcB and TSB levels, without requiring physician orders.
- Checklists or reminders associated with risk factors, age at discharge, and laboratory test results that provide guidance for appropriate follow-up.
- Explicit educational materials for parents (a key component of all AAP guidelines) concerning the identification of newborns with jaundice.

FUTURE RESEARCH

Epidemiology of Bilirubin-Induced Central Nervous System Damage

There is a need for appropriate epidemiologic data to document the incidence of kernicterus in the newborn population, the incidence of other adverse effects attributable to hyperbilirubinemia and its management, and the number of infants whose TSB levels exceed 25 or 30 mg/dL (428-513 μmol/L). Organizations such as the Centers for Disease Control and Prevention should implement strategies for appropriate data gathering to identify the number of



- The dashed lines for the first 24 hours indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos, fever, high pitched cry) or if TSB is ≥5 mg/dL (85 µmol/L) above these lines.
- Risk factors - isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ratio (See legend)
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin
- If infant is well and 35-37 6/7 wk (median risk) can individualize TSB levels for exchange based on actual gestational age.

Fig 4. Guidelines for exchange transfusion in infants 35 or more weeks' gestation.

Note that these suggested levels represent a consensus of most of the committee but are based on limited evidence, and the levels shown are approximations. See ref. 3 for risks and complications of exchange transfusion. During birth hospitalization, exchange transfusion is recommended if the TSB rises to these levels despite intensive phototherapy. For readmitted infants, if the TSB level is above the exchange level, repeat TSB measurement every 2 to 3 hours and consider exchange if the TSB remains above the levels indicated after intensive phototherapy for 6 hours.

The following B/A ratios can be used together with but in not in lieu of the TSB level as an additional factor in determining the need for exchange transfusion[52]:

Risk Category	B/A Ratio at Which Exchange Transfusion Should be Considered	
	TSB mg/dL/Alb, g/dL	TSB µmol/L/Alb, µmol/L
Infants ≥38 0/7 wk	8.0	0.94
Infants 35 0/7–36 6/7 wk and well or ≥38 0/7 wk if higher risk or isoimmune hemolytic disease or G6PD deficiency	7.2	0.84
Infants 35 0/7–37 6/7 wk if higher risk or isoimmune hemolytic disease or G6PD deficiency	6.8	0.80

If the TSB is at or approaching the exchange level, send blood for immediate type and crossmatch. Blood for exchange transfusion is modified whole blood (red cells and plasma) crossmatched against the mother and compatible with the infant.[53]

infants who develop serum bilirubin levels above 25 or 30 mg/dL (428-513 µmol/L) and those who develop acute and chronic bilirubin encephalopathy. This information will help to identify the magnitude of the problem; the number of infants who need to be screened and treated to prevent 1 case of kernicterus; and the risks, costs, and benefits of different strategies for prevention and treatment of hyperbilirubinemia. In the absence of these data, recommendations for intervention cannot be considered definitive.

Effect of Bilirubin on the Central Nervous System

The serum bilirubin level by itself, except when it is extremely high and associated with bilirubin encephalopathy, is an imprecise indicator of long-term neurodevelopmental outcome.[2] Additional studies are needed on the relationship between central nervous system damage and the duration of hyperbilirubinemia, the binding of bilirubin to albumin, and changes seen in the brainstem auditory evoked response. These studies could help to better identify

risk, clarify the effect of bilirubin on the central nervous system, and guide intervention.

Identification of Hemolysis

Because of their poor specificity and sensitivity, the standard laboratory tests for hemolysis (Table 1) are frequently unhelpful.[66,67] However, end-tidal carbon monoxide, corrected for ambient carbon monoxide ($ETCO_c$), levels can confirm the presence or absence of hemolysis, and measurement of $ETCO_c$ is the only clinical test that provides a direct measurement of the rate of heme catabolism and the rate of bilirubin production.[68,69] Thus, $ETCO_c$ may be helpful in determining the degree of surveillance needed and the timing of intervention. It is not yet known, however, how $ETCO_c$ measurements will affect management.

Nomograms and the Measurement of Serum and TcB

It would be useful to develop an age-specific (by hour) nomogram for TSB in populations of newborns that differ with regard to risk factors for hyperbilirubinemia. There is also an urgent need to improve the precision and accuracy of the measurement of TSB in the clinical laboratory.[70,71] Additional studies are also needed to develop and validate noninvasive (transcutaneous) measurements of serum bilirubin and to understand the factors that affect these measurements. These studies should also assess the cost-effectiveness and reproducibility of TcB measurements in clinical practice.[2]

Pharmacologic Therapy

There is now evidence that hyperbilirubinemia can be effectively prevented or treated with tin-mesoporphyrin,[72–75] a drug that inhibits the production of heme oxygenase. Tin-mesoporphyrin is not approved by the US Food and Drug Administration. If approved, tin-mesoporphyrin could find immediate application in preventing the need for exchange transfusion in infants who are not responding to phototherapy.[75]

Dissemination and Monitoring

Research should be directed toward methods for disseminating the information contained in this guideline to increase awareness on the part of physicians, residents, nurses, and parents concerning the issues of neonatal hyperbilirubinemia and strategies for its management. In addition, monitoring systems should be established to identify the impact of these guidelines on the incidence of acute bilirubin encephalopathy and kernicterus and the use of phototherapy and exchange transfusions.

CONCLUSIONS

Kernicterus is still occurring but should be largely preventable if health care personnel follow the recommendations listed in this guideline. These recommendations emphasize the importance of universal, systematic assessment for the risk of severe hyperbilirubinemia, close follow-up, and prompt intervention, when necessary.

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APPENDIX 1: Additional Notes

Definitions of Quality of Evidence and Balance of Benefits and Harms

The Steering Committee on Quality Improvement and Management categorizes evidence quality in 4 levels:

1. Well-designed, randomized, controlled trials or diagnostic studies on relevant populations
2. Randomized, controlled trials or diagnostic studies with minor limitations; overwhelming, consistent evidence from observational studies
3. Observational studies (case-control and cohort design)
4. Expert opinion, case reports, reasoning from first principles

The AAP defines evidence-based recommendations as follows:[1]

- Strong recommendation: the committee believes that the benefits of the recommended approach clearly exceed the harms of that approach and that the quality of the supporting evidence is either excellent or impossible to obtain. Clinicians should follow these recommendations unless a clear and compelling rationale for an alternative approach is present.
- Recommendation: the committee believes that the benefits exceed the harms, but the quality of evidence on which this recommendation is based is not as strong. Clinicians should also generally follow these recommendations but should be alert to new information and sensitive to patient preferences. In this guideline, the term "should" implies a recommendation by the committee.
- Option: either the quality of the evidence that exists is suspect or well-performed studies have shown little clear advantage to one approach over another. Patient preference should have a substantial role in influencing clinical decision-making when a policy is described as an option.
- No recommendation: there is a lack of pertinent evidence and the anticipated balance of benefits and harms is unclear.

Anticipated Balance Between Benefits and Harms

The presence of clear benefits or harms supports stronger statements for or against a course of action. In some cases, however, recommendations are made when analysis of the balance of benefits and harms provides an exceptional dysequilibrium and it would be unethical or impossible to perform clinical trials to "prove" the point. In these cases the balance of benefit and harm is termed "exceptional."

Clinical Manifestations of Acute Bilirubin Encephalopathy and Kernicterus

Acute Bilirubin Encephalopathy

In the early phase of acute bilirubin encephalopathy, severely jaundiced infants become lethargic and hypotonic and suck poorly.[2,3] The intermediate phase is characterized by moderate stupor, irritability, and hypertonia. The infant may develop a fever and high-pitched cry, which may alternate with drowsiness and hypotonia. The hypertonia is manifested by backward arching of the neck (retrocollis) and trunk (opisthotonos). There is anecdotal evidence that an emergent exchange transfusion at this stage, in some cases, might reverse the central nervous system changes.[4] The advanced phase, in which central nervous system damage is probably irreversible, is characterized by pronounced retrocollis-opisthotonos, shrill cry, no feeding, apnea, fever, deep stupor to coma, sometimes seizures, and death.[2,3,5]

Kernicterus

In the chronic form of bilirubin encephalopathy, surviving infants may develop a severe form of athetoid cerebral palsy, auditory dysfunction, dental-enamel dysplasia, paralysis of upward gaze, and, less often, intellectual and other handicaps. Most infants who develop kernicterus have manifested some or all of the signs listed above in the acute phase of bilirubin encephalopathy. However, occasionally there are infants who have developed very high bilirubin levels and, subsequently, the signs of kernicterus but have exhibited few, if any, antecedent clinical signs of acute bilirubin encephalopathy.[3,5,6]

Clinical Evaluation of Jaundice and TcB Measurements

Jaundice is usually seen in the face first and progresses caudally to the trunk and extremities,[7] but because visual estimation of bilirubin levels from the degree of jaundice can lead to errors,[8–10] a low threshold should be used for measuring the TSB.

Devices that provide a noninvasive TcB measurement have proven very useful as screening tools,[11] and newer instruments give measurements that provide a valid estimate of the TSB level.[12–17] Studies using the new TcB-measurement instruments are limited, but the data published thus far suggest that in most newborn populations, these instruments generally provide measurements within 2 to 3 mg/dL (34–51 μmol/L) of the TSB and can replace a measurement of serum bilirubin in many circumstances, particularly for TSB levels less than 15 mg/dL (257 μmol/L).[12–17] Because phototherapy "bleaches" the skin, both visual assessment of jaundice and TcB measurements in infants undergoing phototherapy are not reliable. In addition, the ability of transcutaneous instruments to provide accurate measurements in different racial groups requires additional study.[18,19] The limitations of the accuracy and reproducibility of TSB measurements in the clinical laboratory[20–22] must also be recognized and are discussed in the technical report.[23]

Capillary Versus Venous Serum Bilirubin Measurement

Almost all published data regarding the relationship of TSB levels to kernicterus or developmental outcome are based on capillary blood TSB levels. Data regarding the differences between capillary and venous TSB levels are conflicting.[24,25] In 1 study the capillary TSB levels were higher, but in another they were lower than venous TSB levels.[24,25] Thus, obtaining a venous sample to "confirm" an elevated capillary TSB level is not recommended, because it will delay the initiation of treatment.

Direct-Reacting and Conjugated Bilirubin

Although commonly used interchangeably, direct-reacting bilirubin is not the same as conjugated bilirubin. Direct-reacting bilirubin is the bilirubin that reacts directly (without the addition of an accelerating agent) with diazotized sulfanilic acid. Conjugated bilirubin is bilirubin made water soluble by binding with glucuronic acid in the liver. Depending on the technique used, the clinical laboratory will report total and direct-reacting or unconjugated and conjugated bilirubin levels. In this guideline and for clinical purposes, the terms may be used interchangeably.

Abnormal Direct and Conjugated Bilirubin Levels

Laboratory measurement of direct bilirubin is not precise,[26] and values between laboratories can vary widely. If the TSB is at or below 5 mg/dL (85 μmol/L), a direct or conjugated bilirubin of more than 1.0 mg/dL (17.1 μmol/L) is generally considered abnormal. For TSB values higher than 5 mg/dL (85 μmol/L), a direct bilirubin of more than 20% of the TSB is considered abnormal. If the hospital laboratory measures conjugated bilirubin using the Vitros (formerly Ektachem) system (Ortho-Clinical Diagnostics, Raritan, NJ), any value higher than 1 mg/dL is considered abnormal.

Assessment of Adequacy of Intake in Breastfeeding Infants

The data from a number of studies[27–34] indicate that unsupplemented, breastfed infants experience their maximum weight loss by day 3 and, on average, lose 6.1% ± 2.5% (SD) of their birth weight. Thus, ~5% to 10% of fully breastfed infants lose 10% or more of their birth weight by day 3, suggesting that adequacy of intake should be evaluated and the infant monitored if weight loss is more than 10%.[35] Evidence of adequate intake in breastfed infants also includes 4 to 6 thoroughly wet diapers in 24 hours and the passage of 3 to 4 stools per day by the fourth day. By the third to fourth day, the stools in adequately breastfed infants should have changed from meconium to a mustard yellow, mushy stool.[36] The above assessment will also help to identify breastfed infants who are at risk for dehydration because of inadequate intake.

Nomogram for Designation of Risk

Note that this nomogram (Fig 2) does not describe the natural history of neonatal hyperbilirubinemia, particularly after 48 to 72 hours, for which, because of sampling bias, the lower zones are spuriously elevated.[37] This bias, however, will have much less effect on the high-risk zone (95th percentile in the study).[38]

G6PD Dehydrogenase Deficiency

It is important to look for G6PD deficiency in infants with significant hyperbilirubinemia, because some may develop a sudden increase in the TSB. In addition, G6PD-deficient infants require intervention at lower TSB levels (Figs 3 and 4). It should be noted also that in the presence of hemolysis, G6PD levels can be elevated, which may obscure the diagnosis in the newborn period so that a normal level in a hemolyzing neonate does not rule out G6PD deficiency.[39] If G6PD deficiency is strongly suspected, a repeat level should be measured when the infant is 3 months old. It is also recognized that immediate laboratory determination of G6PD is generally not available in most US hospitals, and thus translating the above information into clinical practice is cur-

TABLE 4. Risk Zone as a Predictor of Hyperbilirubinemia[39]

TSB Before Discharge	Newborns (Total = 2840), *n* (%)	Newborns Who Subsequently Developed a TSB Level >95th Percentile, *n* (%)
High-risk zone (>95th percentile)	172 (6.0)	68 (39.5)
High intermediate-risk zone	356 (12.5)	46 (12.9)
Low intermediate-risk zone	556 (19.6)	12 (2.26)
Low-risk zone	1756 (61.8)	0

rently difficult. Nevertheless, practitioners are reminded to consider the diagnosis of G6PD deficiency in infants with severe hyperbilirubinemia, particularly if they belong to the population groups in which this condition is prevalent. This is important in the African American population, because these infants, as a group, have much lower TSB levels than white or Asian infants.[40,41] Thus, severe hyperbilirubinemia in an African American infant should always raise the possibility of G6PD deficiency.

Basis for the Recommendations 7.1.1 Through 7.1.6 and Provided in Figs 3 and 4

Ideally, recommendations for when to implement phototherapy and exchange transfusions should be based on estimates of when the benefits of these interventions exceed their risks and cost. The evidence for these estimates should come from randomized trials or systematic observational studies. Unfortunately, there is little such evidence on which to base these recommendations. As a result, treatment guidelines must necessarily rely on more uncertain estimates and extrapolations. For a detailed discussion of this question, please see "An Evidence-Based Review of Important Issues Concerning Neonatal Hyperbilirubinemia."[23]

The recommendations for phototherapy and exchange transfusion are based on the following principles:

- The main demonstrated value of phototherapy is that it reduces the risk that TSB levels will reach a level at which exchange transfusion is recommended.[42–44] Approximately 5 to 10 infants with TSB levels between 15 and 20 mg/dL (257–342 μmol/L) will receive phototherapy to prevent the TSB in 1 infant from reaching 20 mg/dL (the number needed to treat).[12] Thus, 8 to 9 of every 10 infants with these TSB levels will not reach 20 mg/dL (342 μmol/L) even if they are not treated. Phototherapy has proven to be a generally safe procedure, although rare complications can occur (see Appendix 2).
- Recommended TSB levels for exchange transfusion (Fig 4) are based largely on the goal of keeping TSB levels below those at which kernicterus has been reported.[12,45–48] In almost all cases, exchange transfusion is recommended only after phototherapy has failed to keep the TSB level below the exchange transfusion level (Fig 4).
- The recommendations to use phototherapy and exchange transfusion at lower TSB levels for infants of lower gestation and those who are sick are based on limited observations suggesting that sick infants (particularly those with the risk factors listed in Figs 3 and 4)[49–51] and those of lower gestation[51–54] are at greater risk for developing kernicterus at lower bilirubin levels than are well infants of more than 38 6/7 weeks' gestation. Nevertheless, other studies have not confirmed all of these associations.[52,55,56] There is no doubt, however, that infants at 35 to 37 6/7 weeks' gestation are at a much greater risk of developing very high TSB levels.[57,58] Intervention for these infants is based on this risk as well as extrapolations from more premature, lower birth-weight infants who do have a higher risk of bilirubin toxicity.[52,53]
- For all newborns, treatment is recommended at lower TSB levels at younger ages because one of the primary goals of treatment is to prevent additional increases in the TSB level.

Subtle Neurologic Abnormalities Associated With Hyperbilirubinemia

There are several studies demonstrating measurable transient changes in brainstem-evoked potentials, behavioral patterns, and the infant's cry[59–63] associated with TSB levels of 15 to 25 mg/dL (257–428 μmol/L). In these studies, the abnormalities identified were transient and disappeared when the serum bilirubin levels returned to normal with or without treatment.[59,60,62,63]

A few cohort studies have found an association between hyperbilirubinemia and long-term adverse neurodevelopmental effects that are more subtle than kernicterus.[64–67] Current studies, however, suggest that although phototherapy lowers the TSB levels, it has no effect on these long-term neurodevelopmental outcomes.[68–70]

Risks of Exchange Transfusion

Because exchange transfusions are now rarely performed, the risks of morbidity and mortality associated with the procedure are difficult to quantify. In addition, the complication rates listed below may not be generalizable to the current era if, like most procedures, frequency of performance is an important determinant of risk. Death associated with exchange transfusion has been reported in approximately 3 in 1000 procedures,[71,72] although in otherwise well infants of 35 or more weeks' gestation, the risk is probably much lower.[71–73] Significant morbidity (apnea, bradycardia, cyanosis, vasospasm, thrombosis, necrotizing enterocolitis) occurs in as many as 5% of exchange transfusions,[71] and the risks associated with the use of blood products must always be considered.[74] Hypoxic-ischemic encephalopathy and acquired immunodeficiency syndrome have occurred in otherwise healthy infants receiving exchange transfusions.[73,75]

Serum Albumin Levels and the B/A Ratio

The legends to Figs 3 and 4 and recommendations 7.1.5 and 7.1.6 contain references to the serum albumin level and the B/A ratio as factors that can be considered in the decision to initiate phototherapy (Fig 3) or perform an exchange transfusion (Fig 4). Bilirubin is transported in the plasma tightly bound to albumin, and the portion that is unbound or loosely bound can more readily leave the intravascular space and cross the intact blood-brain barrier.[76] Elevations of unbound bilirubin (UB) have been associated with kernicterus in sick preterm newborns.[77,78] In addition, elevated UB concentrations are more closely associated than TSB levels with transient abnormalities in the audiometric brainstem response in term[79] and preterm[80] infants. Long-term

studies relating B/A binding in infants to developmental outcome are limited and conflicting.[69,81,82] In addition, clinical laboratory measurement of UB is not currently available in the United States.

The ratio of bilirubin (mg/dL) to albumin (g/dL) does correlate with measured UB in newborns[83] and can be used as an approximate surrogate for the measurement of UB. It must be recognized, however, that both albumin levels and the ability of albumin to bind bilirubin vary significantly between newborns.[83,84] Albumin binding of bilirubin is impaired in sick infants,[84–86] and some studies show an increase in binding with increasing gestational[86,87] and postnatal[87,88] age, but others have not found a significant effect of gestational age on binding.[89] Furthermore, the risk of bilirubin encephalopathy is unlikely to be a simple function of the TSB level or the concentration of UB but is more likely a combination of both (ie, the total amount of bilirubin available [the miscible pool of bilirubin] as well as the tendency of bilirubin to enter the tissues [the UB concentration]).[83] An additional factor is the possible susceptibility of the cells of the central nervous system to damage by bilirubin.[90] It is therefore a clinical option to use the B/A ratio together with, but not in lieu of, the TSB level as an additional factor in determining the need for exchange transfusion[83] (Fig 4).

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APPENDIX 2: Phototherapy

There is no standardized method for delivering phototherapy. Phototherapy units vary widely, as do the types of lamps used in the units. The efficacy of phototherapy depends on the dose of phototherapy administered as well as a number of clinical factors (Table 5).[1]

Measuring the Dose of Phototherapy

Table 5 shows the radiometric quantities used in measuring the phototherapy dose. The quantity most commonly reported in the literature is the spectral irradiance. In the nursery, spectral irradiance can be measured by using commercially available radiometers. These instruments take a single measurement across a band of wavelengths, typically 425 to 475 or 400 to 480 nm. Unfortunately, there is no standardized method for reporting phototherapy dosages in the clinical literature, so it is difficult to compare published studies on the efficacy of phototherapy and manufacturers' data for the irradiance produced by different systems.[2] Measurements of irradiance from the same system, using different radiometers,

TABLE 5. Factors That Affect the Dose and Efficacy of Phototherapy

Factor	Mechanism/Clinical Relevance	Implementation and Rationale	Clinical Application
Spectrum of light emitted	Blue-green spectrum is most effective. At these wavelengths, light penetrates skin well and is absorbed maximally by bilirubin.	Special blue fluorescent tubes or other light sources that have most output in the blue-green spectrum and are most effective in lowering TSB.	Use special blue tubes or LED light source with output in blue-green spectrum for intensive PT.
Spectral irradiance (irradiance in certain wavelength band) delivered to surface of infant	↑ irradiance → ↑ rate of decline in TSB	Irradiance is measured with a radiometer as $\mu W/cm^2$ per nm. Standard PT units deliver 8–10 $\mu W/cm^2$ per nm (Fig 6). Intensive PT requires >30 $\mu W/cm^2$ per nm.	If special blue fluorescent tubes are used, bring tubes as close to infant as possible to increase irradiance (Fig 6). Note: This cannot be done with halogen lamps because of the danger of burn. Special blue tubes 10–15 cm above the infant will produce an irradiance of at least 35 $\mu W/cm^2$ per nm.
Spectral power (average spectral irradiance across surface area)	↑ surface area exposed → ↑ rate of decline in TSB	For intensive PT, expose maximum surface area of infant to PT.	Place lights above and fiber-optic pad or special blue fluorescent tubes* below the infant. For maximum exposure, line sides of bassinet, warmer bed, or incubator with aluminum foil.
Cause of jaundice	PT is likely to be less effective if jaundice is due to hemolysis or if cholestasis is present. (↑ direct bilirubin)		When hemolysis is present, start PT at lower TSB levels. Use intensive PT. Failure of PT suggests that hemolysis is the cause of jaundice. If ↑ direct bilirubin, watch for bronze baby syndrome or blistering.
TSB level at start of PT	The higher the TSB, the more rapid the decline in TSB with PT.		Use intensive PT for higher TSB levels. Anticipate a more rapid decrease in TSB when TSB >20 mg/dL (342 μmol/L).

PT indicates phototherapy; LED, light-emitting diode.
* Available in the Olympic BiliBassinet (Olympic Medical, Seattle, WA).

can also produce significantly different results. The width of the phototherapy lamp's emissions spectrum (narrow versus broad) will affect the measured irradiance. Measurements under lights with a very focused emission spectrum (eg, blue light-emitting diode) will vary significantly from one radiometer to another, because the response spectra of the radiometers vary from manufacturer to manufacturer. Broader-spectrum lights (fluorescent and halogen) have fewer variations among radiometers. Manufacturers of phototherapy systems generally recommend the specific radiometer to be used in measuring the dose of phototherapy when their system is used.

It is important also to recognize that the measured irradiance will vary widely depending on where the measurement is taken. Irradiance measured below the center of the light source can be more than double that measured at the periphery, and this dropoff at the periphery will vary with different phototherapy units. Ideally, irradiance should be measured at multiple sites under the area illuminated by the unit and the measurements averaged. The International Electrotechnical Commission[3] defines the "effective surface area" as the intended treatment surface that is illuminated by the phototherapy light. The commission uses 60 × 30 cm as the standard-sized surface.

Is It Necessary to Measure Phototherapy Doses Routinely?

Although it is not necessary to measure spectral irradiance before each use of phototherapy, it is important to perform periodic checks of phototherapy units to make sure that an adequate irradiance is being delivered.

The Dose-Response Relationship of Phototherapy

Figure 5 shows that there is a direct relationship between the irradiance used and the rate at which the serum bilirubin declines under phototherapy.[4] The data in Fig 5 suggest that there is a saturation point beyond which an increase in the irradiance produces no added efficacy. We do not know, however, that a saturation point exists. Because the conversion of bilirubin to excretable photoproducts is partly irreversible and follows first-order kinetics, there may not be a saturation point, so we do not know the maximum effective dose of phototherapy.

Effect on Irradiance of the Light Spectrum and the Distance Between the Infant and the Light Source

Figure 6 shows that as the distance between the light source and the infant decreases, there is a corresponding increase in the spectral irradiance.[5] Fig 6 also demonstrates the dramatic difference in irradi-

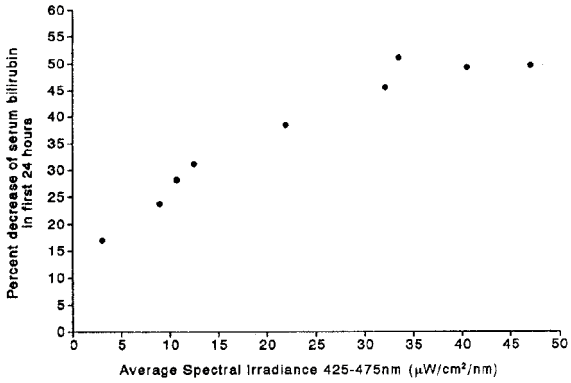

Fig 5. Relationship between average spectral irradiance and decrease in serum bilirubin concentration. Term infants with nonhemolytic hyperbilirubinemia were exposed to special blue lights (Phillips TL 52/20W) of different intensities. Spectral irradiance was measured as the average of readings at the head, trunk, and knees. Drawn from the data of Tan.[4] Source: *Pediatrics*. 1996;98: 283-287.

ance produced within the important 425- to 475-nm band by different types of fluorescent tubes.

What is Intensive Phototherapy?

Intensive phototherapy implies the use of high levels of irradiance in the 430- to 490-nm band (usually 30 $\mu W/cm^2$ per nm or higher) delivered to as much of the infant's surface area as possible. How this can be achieved is described below.

Using Phototherapy Effectively

Light Source

The spectrum of light delivered by a phototherapy unit is determined by the type of light source and any filters used. Commonly used phototherapy units contain daylight, cool white, blue, or "special blue" fluorescent tubes. Other units use tungsten-halogen lamps in different configurations, either free-standing or as part of a radiant warming device. Recently, a system using high-intensity gallium nitride light-emitting diodes has been introduced.[6] Fiber-optic systems deliver light from a high-intensity lamp to a fiber-optic blanket. Most of these devices deliver enough output in the blue-green region of the visible spectrum to be effective for standard phototherapy use. However, when bilirubin levels approach the range at which intensive phototherapy is recommended, maximal efficiency must be sought. The most effective light sources currently commercially available for phototherapy are those that use special blue fluorescent tubes[7] or a specially designed light-emitting diode light (Natus Inc, San Carlos, CA).[6] The special blue fluorescent tubes are labeled F20T12/BB (General Electric, Westinghouse, Sylvania) or TL52/20W (Phillips, Eindhoven, The Netherlands). It is important to note that special blue tubes provide much greater irradiance than regular blue tubes (labeled F20T12/B) (Fig 6). Special blue tubes are most effective because they provide light predominantly in the blue-green spectrum. At these wavelengths, light penetrates skin well and is absorbed maximally by bilirubin.[7]

There is a common misconception that ultraviolet light is used for phototherapy. The light systems used do not emit significant ultraviolet radiation, and the small amount of ultraviolet light that is emitted by fluorescent tubes and halogen bulbs is in longer wavelengths than those that cause erythema. In addition, almost all ultraviolet light is absorbed by the glass wall of the fluorescent tube and the Plexiglas cover of the phototherapy unit.

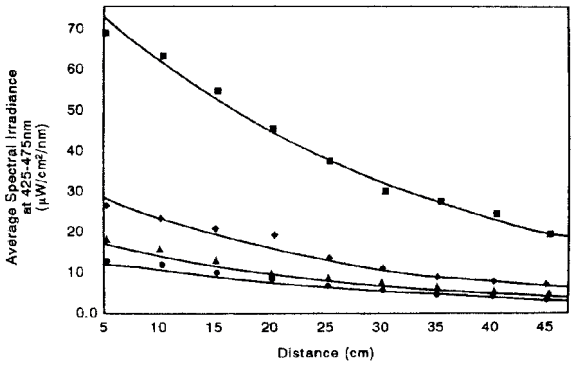

Fig 6. Effect of light source and distance from the light source to the infant on average spectral irradiance. Measurements were made across the 425- to 475-nm band by using a commercial radiometer (Olympic Bilimeter Mark II) and are the average of measurements taken at different locations at each distance (irradiance at the center of the light is much higher than at the periphery). The phototherapy unit was fitted with eight 24-in fluorescent tubes. ■ indicates special blue, General Electric 20-W F20T12/BB tube; ◆, blue, General Electric 20-W F20T12/B tube; ▲, daylight blue, 4 General Electric 20-W F20T12/B blue tubes and 4 Sylvania 20-W F20T12/D daylight tubes; •, daylight, Sylvania 20-W F20T12/D daylight tube. Curves were plotted by using linear curve fitting (True Epistat, Epistat Services, Richardson, TX). The best fit is described by the equation $y = Ae^{Bx}$. Source: *Pediatrics*. 1996;98:283-287.

Distance From the Light

As can be seen in Fig 6, the distance of the light source from the infant has a dramatic effect on the spectral irradiance, and this effect is most significant when special blue tubes are used. To take advantage of this effect, the fluorescent tubes should be placed as close to the infant as possible. To do this, the infant should be in a bassinet, not an incubator, because the top of the incubator prevents the light from being brought sufficiently close to the infant. In a bassinet, it is possible to bring the fluorescent tubes within approximately 10 cm of the infant. Naked term infants do not become overheated under these lights. It is important to note, however, that the halogen spot phototherapy lamps cannot be positioned closer to the infant than recommended by the manufacturers without incurring the risk of a burn. When halogen lamps are used, manufacturers recommendations should be followed. The reflectors, light source, and transparent light filters (if any) should be kept clean.

Surface Area

A number of systems have been developed to provide phototherapy above and below the infant.[8,9] One commercially available system that does this is the BiliBassinet (Olympic Medical, Seattle, WA). This

unit provides special blue fluorescent tubes above and below the infant. An alternative is to place fiber-optic pads below an infant with phototherapy lamps above. One disadvantage of fiber-optic pads is that they cover a relatively small surface area so that 2 or 3 pads may be needed.[5] When bilirubin levels are extremely high and must be lowered as rapidly as possible, it is essential to expose as much of the infant's surface area to phototherapy as possible. In these situations, additional surface-area exposure can be achieved by lining the sides of the bassinet with aluminum foil or a white cloth.[10]

In most circumstances, it is not necessary to remove the infant's diaper, but when bilirubin levels approach the exchange transfusion range, the diaper should be removed until there is clear evidence of a significant decline in the bilirubin level.

What Decline in the Serum Bilirubin Can You Expect?

The rate at which the bilirubin declines depends on the factors listed in Table 5, and different responses can be expected depending on the clinical circumstances. When bilirubin levels are extremely high (more than 30 mg/dL [513 μmol/L]), and intensive phototherapy is used, a decline of as much as 10 mg/dL (171 μmol/L) can occur within a few hours,[11] and a decrease of at least 0.5 to 1 mg/dL per hour can be expected in the first 4 to 8 hours.[12] On average, for infants of more than 35 weeks' gestation readmitted for phototherapy, intensive phototherapy can produce a decrement of 30% to 40% in the initial bilirubin level by 24 hours after initiation of phototherapy.[13] The most significant decline will occur in the first 4 to 6 hours. With standard phototherapy systems, a decrease of 6% to 20% of the initial bilirubin level can be expected in the first 24 hours.[8,14]

Intermittent Versus Continuous Phototherapy

Clinical studies comparing intermittent with continuous phototherapy have produced conflicting results.[15–17] Because all light exposure increases bilirubin excretion (compared with darkness), no plausible scientific rationale exists for using intermittent phototherapy. In most circumstances, however, phototherapy does not need to be continuous. Phototherapy may be interrupted during feeding or brief parental visits. Individual judgment should be exercised. If the infant's bilirubin level is approaching the exchange transfusion zone (Fig 4), phototherapy should be administered continuously until a satisfactory decline in the serum bilirubin level occurs or exchange transfusion is initiated.

Hydration

There is no evidence that excessive fluid administration affects the serum bilirubin concentration. Some infants who are admitted with high bilirubin levels are also mildly dehydrated and may need supplemental fluid intake to correct their dehydration. Because these infants are almost always breastfed, the best fluid to use in these circumstances is a milk-based formula, because it inhibits the enterohepatic circulation of bilirubin and should help to lower the serum bilirubin level. Because the photoproducts responsible for the decline in serum bilirubin are excreted in urine and bile,[18] maintaining adequate hydration and good urine output should help to improve the efficacy of phototherapy. Unless there is evidence of dehydration, however, routine intravenous fluid or other supplementation (eg, with dextrose water) of term and near-term infants receiving phototherapy is not necessary.

When Should Phototherapy Be Stopped?

There is no standard for discontinuing phototherapy. The TSB level for discontinuing phototherapy depends on the age at which phototherapy is initiated and the cause of the hyperbilirubinemia.[13] For infants who are readmitted after their birth hospitalization (usually for TSB levels of 18 mg/dL [308 μmol/L] or higher), phototherapy may be discontinued when the serum bilirubin level falls below 13 to 14 mg/dL (239-239 μmol/L). Discharge from the hospital need not be delayed to observe the infant for rebound.[13,19,20] If phototherapy is used for infants with hemolytic diseases or is initiated early and discontinued before the infant is 3 to 4 days old, a follow-up bilirubin measurement within 24 hours after discharge is recommended.[13] For infants who are readmitted with hyperbilirubinemia and then discharged, significant rebound is rare, but a repeat TSB measurement or clinical follow-up 24 hours after discharge is a clinical option.[13]

Home Phototherapy

Because the devices available for home phototherapy may not provide the same degree of irradiance or surface-area exposure as those available in the hospital, home phototherapy should be used only in infants whose bilirubin levels are in the "optional phototherapy" range (Fig 3); it is not appropriate for infants with higher bilirubin concentrations. As with hospitalized infants, it is essential that serum bilirubin levels be monitored regularly.

Sunlight Exposure

In their original description of phototherapy, Cremer et al[21] demonstrated that exposure of newborns to sunlight would lower the serum bilirubin level. Although sunlight provides sufficient irradiance in the 425- to 475-nm band to provide phototherapy, the practical difficulties involved in safely exposing a naked newborn to the sun either inside or outside (and avoiding sunburn) preclude the use of sunlight as a reliable therapeutic tool, and it therefore is not recommended.

Complications

Phototherapy has been used in millions of infants for more than 30 years, and reports of significant toxicity are exceptionally rare. Nevertheless, phototherapy in hospital separates mother and infant, and eye patching is disturbing to parents. The most important, but uncommon, clinical complication occurs in infants with cholestatic jaundice. When these infants are exposed to phototherapy, they may develop a dark, grayish-brown discoloration of the skin, serum, and urine (the bronze infant syndrome).[22] The

pathogenesis of this syndrome is unknown, but it may be related to an accumulation of porphyrins and other metabolites in the plasma of infants who develop cholestasis.[22,23] Although it occurs exclusively in infants with cholestasis, not all infants with cholestatic jaundice develop the syndrome.

This syndrome generally has had few deleterious consequences, and if there is a need for phototherapy, the presence of direct hyperbilirubinemia should not be considered a contraindication to its use. This is particularly important in sick neonates. Because the products of phototherapy are excreted in the bile, the presence of cholestasis will decrease the efficacy of phototherapy. Nevertheless, infants with direct hyperbilirubinemia often show some response to phototherapy. In infants receiving phototherapy who develop the bronze infant syndrome, exchange transfusion should be considered if the TSB is in the intensive phototherapy range and phototherapy does not promptly lower the TSB. Because of the paucity of data, firm recommendations cannot be made. Note, however, that the direct serum bilirubin should not be subtracted from the TSB concentration in making decisions about exchange transfusions (see Fig 4).

Rarely, purpura and bullous eruptions have been described in infants with severe cholestatic jaundice receiving phototherapy,[24,25] and severe blistering and photosensitivity during phototherapy have occurred in infants with congenital erythropoietic porphyria.[26,27] Congenital porphyria or a family history of porphyria is an absolute contraindication to the use of phototherapy, as is the concomitant use of drugs or agents that are photosensitizers.[28]

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All clinical practice guidelines from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.