PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Effect of Maternity-Care Practices on Breastfeeding

Ann M. DiGirolamo, Laurence M. Grummer-Strawn and Sara B. Fein

Pediatrics 2008;122;S43-S49
DOI: 10.1542/peds.2008-1315e

SUPPLEMENT ARTICLE

Effect of Maternity-Care Practices on Breastfeeding

Ann M. DiGirolamo, PhD, MPH[a], Laurence M. Grummer-Strawn, PhD[b], Sara B. Fein, PhD[c]

[a]Hubert Department of Global Health, Emory University, Atlanta, Georgia; [b]National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia; [c]Center for Food Safety and Applied Nutrition, Food and Drug Administration, US Department of Health and Human Services, College Park, Maryland

The authors have indicated they have no financial relationships relevant to this article to disclose.

ABSTRACT

OBJECTIVE. Our goal was to assess the impact of "Baby-Friendly" hospital practices and other maternity-care practices experienced by mothers on breastfeeding duration.

METHODS. This analysis of the Infant Feeding Practices Study II focused on mothers who initiated breastfeeding and intended prenatally to breastfeed for >2 months, with complete data on all variables (n = 1907). Predictor variables included indicators of 6 "Baby-Friendly" practices (breastfeeding initiation within 1 hour of birth, giving only breast milk, rooming in, breastfeeding on demand, no pacifiers, fostering breastfeeding support groups) along with several other maternity-care practices. The main outcome measure was breastfeeding termination before 6 weeks.

RESULTS. Only 8.1% of the mothers experienced all 6 "Baby-Friendly" practices. The practices most consistently associated with breastfeeding beyond 6 weeks were initiation within 1 hour of birth, giving only breast milk, and not using pacifiers. Bringing the infant to the room for feeding at night if not rooming in and not giving pain medications to the mother during delivery were also protective against early breastfeeding termination. Compared with the mothers who experienced all 6 "Baby-Friendly" practices, mothers who experienced none were ~13 times more likely to stop breastfeeding early. Additional practices decreased the risk for early termination.

CONCLUSIONS. Increased "Baby-Friendly" hospital practices, along with several other maternity-care practices, improve the chances of breastfeeding beyond 6 weeks. The need to work with hospitals to implement these practices continues to exist, as illustrated by the small proportion of mothers who reported experiencing all 6 of the "Baby-Friendly" hospital practices measured in this study. *Pediatrics* 2008;122:S43–S49

www.pediatrics.org/cgi/doi/10.1542/peds.2008-1315e

doi:10.1542/peds.2008-1315e

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Food and Drug Administration.

Key Words
breast feeding, maternity, hospital

Abbreviation
IFPS—Infant Feeding Practices Study

Accepted for publication Jun 4, 2008

Address correspondence to Ann M. DiGirolamo, PhD, MPH, Emory University, Hubert Department of Global Health, 1518 Clifton Rd, NE, Atlanta, GA 30307. E-mail: adigiro@sph.emory.edu

BREASTFEEDING PROVIDES MANY benefits to both infants and mothers, including optimal nutrients for infant growth and development, enhancing infants' immunologic defenses, and facilitating mother-infant attachment and mothers' recovery from childbirth.[1,2] However, despite the known benefits of breastfeeding, a substantial proportion of mothers do not breastfeed their infants or breastfeed for <6 months postpartum. In 2004, 73.8% of US mothers breastfed during the early postpartum period, and 41.5% continued to breastfeed at 6 months postpartum.[3] Although these findings represent a steady increase over the years in the percentage of women breastfeeding, the data still fall short of the national Healthy People 2010 goals of 75% women breastfeeding during the early postpartum period and 50% breastfeeding 6 months postpartum.[4]

Certain maternity-care practices in hospital settings have been shown to promote breastfeeding. In particular, the Baby-Friendly Hospital Initiative, a global movement launched in 1991 by the World Health Organization and the United Nations Children's Fund (UNICEF), has been associated with positive breastfeeding outcomes both nationally and internationally.[5–9] This initiative includes 10 steps to successful breastfeeding, including specific recommendations for maternity-care practices (Table 1). A 2001 national study that used data from the original Infant Feeding Practices Study (IFPS I) evaluated the influence of 5 of the 10 "Baby-Friendly" practices on breastfeeding. The study demonstrated significant associations between 2 of the 5 practices measured (initiating breastfeeding within 1 hour of birth and giving no food or drink other than breast milk) and breastfeeding and illustrated the cumulative effects of these 5 steps on positive breastfeeding outcomes.[10] The study also revealed that only a small percentage (7%) of women reported experiencing all 5 of the "Baby-Friendly" practices measured.

The purpose of the current study is to examine the current prevalence and the individual and cumulative influences of a greater number of "Baby-Friendly" hospital practices on breastfeeding duration among mothers who intended to breastfeed for at least 2 months postpartum. Specifically, using data from the IFPS II, the study provides an opportunity to assess changes in the prevalence of reported "Baby-Friendly" hospital practices since the admin-

TABLE 1 **The Baby-Friendly Hospital Initiative's 10 Steps to Successful Breastfeeding[4,5] and Prevalence of Reported Practices Among Women Who Initiated Breastfeeding in the IFPS II ($N = 1907$)**

"Baby-Friendly" Practice	Prevalence, %
1. Have a written breastfeeding policy that is routinely communicated to all health care staff	NM
2. Train all health care staff in skills necessary to implement this policy	NM
3. Inform all pregnant women about the benefits and management of breastfeeding	NM
4. Help mothers initiate breastfeeding within 1 h of birth[a]	59.6
5. Show mothers how to breastfeed and how to maintain lactation, even if they should be separated from their infants	NM
6. Give newborn infants no food or drink other than breast milk unless medically indicated[a,b]	51.5
7. Practice "rooming in" by allowing mothers and infants to remain together 24 h/d[a]	56.8
8. Encourage breastfeeding on demand[a,c]	66.3
9. Give no artificial teats, pacifiers, dummies, or soothers to breastfeeding infants[a,d]	44.2
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic[a,e]	72.0

NM indicates not measured.

[a] Practices that were measured in the current study. The sample is limited to women who initiated breastfeeding and intended to breastfeed for >2 months, with complete data on all variables.

[b] Question asks whether infant was fed water, formula, or sugar water at any time while in the hospital; practice coded as "yes" if the answer was "no" to all. Medical indication was not assessed.

[c] Practice coded as "yes" if infant was fed whenever he or she cried or seemed hungry and staff encouraged this.

[d] Question asks whether infant was given a pacifier while in the hospital or birth center; practice coded as "yes" if answer was "no."

[e] Practice coded as "yes" if mother reported being given information about breastfeeding support groups or services before she went home from the hospital or birth center.

istration of the original IFPS 11 years ago and to confirm the cumulative effects of a more complete measurement of these practices on breastfeeding. In addition, the new survey allowed us to assess the impact of additional maternity-care practices not currently designated as being "Baby-Friendly" on breastfeeding duration.

METHODS

Study Population

The IFPS II is a longitudinal survey of pregnant women and new mothers conducted by the US Food and Drug Administration. The sample is from a nationally distributed consumer opinion panel of 500 000 households. All questionnaires were administered by mail except a short birth screener telephone interview. Questionnaires were sent prenatally and 10 times postnatally. Qualifying criteria were used to achieve the sample goals of healthy term or near-term singleton infants (see ref 11 for additional study details). The current study focused on mothers from the IFPS II who initiated breastfeeding and intended prenatally to breastfeed for >2 months. Analyses were performed on data from the prenatal and 1-month postnatal questionnaires, along with the data on actual breastfeeding duration, and were limited to the sample of women with complete data on all variables ($n = 1907$).

Definition of Variables

The outcome variable was breastfeeding for <6 weeks postpartum. Breastfeeding duration was defined as the total length of time in weeks that infants were fed breast milk. This variable was based on age of the infant in weeks when the mother completely stopped breastfeeding or pumping milk. The outcome of breastfeeding for <6 weeks was chosen because it is a time period less than, but close to, the mother's stated intention to breastfeed for at least 2 months. The main independent variables were indicators of 6 of the 10 "Baby-Friendly" hospital practices, those most easily measured through mothers' reports; the steps measured in the study included breastfeeding initiation within 1 hour of birth, only breast milk given, rooming in, breastfeeding on demand, no pacifiers given, and providing information on breastfeeding support. We attempted to measure a seventh "Baby-Friendly" practice (show mothers how to breastfeed and maintain lactation); however, after examination of the data, the indicator seemed to be more reflective of providing help to those women experiencing initial problems with breastfeeding rather than a general practice of education and demonstration to all women. Therefore, this variable was dropped from additional analysis. We also examined certain other maternity-care practices that might impact breastfeeding, including not providing a formula sample or coupon in a hospital gift pack, bringing infants to the room at night for feeding if not rooming in, type of delivery (ie, vaginal versus cesarean), not giving pain medications during delivery, and the presence of labor support such as a doula. Mothers were asked about their hospital experience on the first questionnaire sent after the delivery at ~1 month postpartum.

Control variables included demographic characteristics, prenatal maternal smoking, number of friends and relatives who breastfed, mother's prenatal intentions to work after birth, and prenatal attitudes toward breastfeeding (ie, strength of agreement or disagreement with the following statements: "Infant formula is as good as breast milk" and "If a child was breastfed, he or she will be less likely to become obese").

Statistical Analyses

SAS 9.1 (SAS Institute, Inc, Cary, NC) was used for all analyses. Procedures used included frequencies, χ^2 tests, and logistic regression. For multivariate models with "Baby-Friendly" practices, we used the following procedures. In model 1, analyses controlled for all "Baby-Friendly" practices experienced. Model 1 allowed us to examine the individual impact of each of the "Baby-Friendly" practices while controlling for the other practices. In model 2, analyses included variables in model 1 plus various demographic variables shown to be associated with breastfeeding duration. Model 3 included variables in

model 2 plus additional behavioral and attitudinal variables also shown to be associated with breastfeeding duration to assess the full impact of "Baby-Friendly" practices while controlling for relevant demographic, behavioral, and attitudinal variables. Analyses that examined additional maternity-care practices used crude associations followed by associations adjusted for demographic, behavioral, and attitudinal variables.

We also counted how many of the 6 "Baby-Friendly" practices were experienced. We modeled the effect of each number of "Baby-Friendly" practices experienced compared with the referent group of experiencing all 6 practices. We used a similar model-building strategy to examine effects while controlling for relevant demographic, behavioral, and attitudinal variables.

RESULTS

At least half of the mothers reported experiencing each of the "Baby-Friendly" hospital practices measured in the survey (Table 1). Very few women reported experiencing all 6 (8.1%) or none (1.6%) of the hospital practices, with approximately half of the women experiencing either 3 or 4 of the "Baby-Friendly" practices.

The overall prevalence of women who terminated breastfeeding by 6 weeks postpartum was 14.4%. As shown in Table 2, early breastfeeding termination was associated with younger age, lower education and income, being unmarried, primiparity, smoking prenatally, having fewer friends and relatives who breastfed, intending to work after birth, and having less-favorable attitudes toward breastfeeding.

Of the 6 "Baby-Friendly" practices, 4 (breastfeeding initiation within 1 hour, only breast milk given, breastfeeding on demand, and no pacifiers given) showed a significant protective effect against early termination of breastfeeding (ie, <6 weeks) in crude analyses (Table 3). Results remained significant for 3 of the practices (breastfeeding initiation within 1 hour, only breast milk, and no pacifiers) after controlling for the other "Baby-Friendly" practices (Table 4, model 1). Controlling for various demographic factors associated with breastfeeding duration (Table 4, model 2) and certain relevant behavioral and attitudinal variables (Table 4, model 3) only slightly diminished the effect sizes for these practices.

Additional hospital practices showing a protective relationship with breastfeeding duration included bringing the infant to the mother's room at night for feeding among mothers not rooming in and not giving any pain medications to the mother during childbirth (Table 5). Other practices, such as not providing a formula sample or coupon in a hospital gift pack, support during labor, or type of delivery, were not significantly associated with breastfeeding outcome (Table 5). These results remained stable even after controlling for various demographic, behavioral, and attitudinal variables.

Our analyses of the association between the number of "Baby-Friendly" hospital practices experienced (0–6) and early breastfeeding termination suggested that women experiencing fewer practices were more likely to terminate breastfeeding before 6 weeks. Among women who intended to breastfeed for at least 2 months, one third of them had stopped breastfeeding before 6 weeks if they had experienced none of the "Baby-Friendly"

TABLE 2 **Sample Characteristics for Maternity-Care Practices According to Timing of Breastfeeding Termination: IFPS II (*N* = 1907)**

Variable	Breastfed for <6 wk (*n* = 274)	Breastfed for ≥6 wk (*n* = 1633)
Gender of child, %		
Male	50.0	49.7
Female	50.0	50.3
Age of mother, mean (SD), y[a]	27.0 (5.8)	29.5 (5.1)
Race/ethnicity of the mother, %		
White	85.8	84.9
Black	4.7	3.8
Hispanic	6.9	6.3
Asian/Pacific Islander/other	2.6	5.0
Education of mother, %[a]		
≤4 y of high school	29.2	14.5
1–3 y of college	48.5	39.3
≥4 y of college	22.3	46.2
Household income, %[a]		
Less than $20 000	22.6	10.0
$20 000–$39 999	31.0	28.8
$40 000–$74 999	29.6	40.3
$75 000 or more	16.8	20.9
Marital status, %[a]		
Married	65.7	85.0
Widowed	0.4	0.2
Divorced or separated	4.7	3.0
Never married	29.2	11.8
Previous births, %[a]		
0	46.7	26.5
≥1	53.3	73.5
No. of cigarettes smoked per day prenatally, %[a]		
0	87.6	94.8
1–5	4.7	1.8
6–10	4.7	1.7
≥11	2.9	1.7
No. of friends and relatives who breastfed, %[a]		
None or don't know	18.6	9.1
1–2	27.4	17.0
3–5	31.0	28.1
≥5	23.0	45.9
Mother's prenatal intention to work after birth, %[a]		
Yes	63.9	56.9
No	36.1	43.1
Prenatal attitudes toward breastfeeding, %		
Infant formula as good as breast milk[a]		
Agree or unsure	44.5	25.8
Disagree	55.5	74.2
If breastfed, child less likely to become obese[a]		
Agree	31.0	48.0
Disagree or unsure	69.0	52.0

The sample was limited to women who initiated breastfeeding and intended to breastfeed for >2 months, with complete data on all variables.

[a] Significant differences between 2 groups of breastfeeding duration: $P < .05$.

TABLE 3 **Prevalence of Stopping Breastfeeding Before 6 Weeks According to Reported "Baby-Friendly" Hospital Practice ($N = 1907$)**

"Baby-Friendly" Practice	*n*	Breastfed for <6 wk, %	OR (95% CI)[a]
Step 4: breastfeeding initiation within 1 h			
Yes	1137	10.9	0.51 (0.39–0.65)[b]
No	770	19.5	1.00
Step 6: only breast milk given			
Yes	982	8.5	0.35 (0.27–0.47)[b]
No	925	20.7	1.00
Step 7: rooming in			
Yes	1082	13.4	0.83 (0.65–1.08)
No	825	15.6	1.00
Step 8: breastfeeding on demand			
Yes	1265	12.5	0.65 (0.50–0.84)[b]
No	642	18.1	1.00
Step 9: no pacifiers given			
Yes	843	10.2	0.53 (0.40–0.70)[b]
No	1064	17.7	1.00
Step 10: provide information on breastfeeding support			
Yes	1373	13.6	0.79 (0.60–1.05)
No	534	16.5	1.00

[a] OR indicates odds ratio (odds of stopping breastfeeding before 6 weeks according to hospital practice); CI, confidence interval; no (did not experience practice; 1.00), referent group.
[b] The odds ratio was significant at $P < .05$.

practices, compared with 3% of those who experienced all 6 "Baby-Friendly" practices (Fig 1). Compared with mothers experiencing all 6 "Baby-Friendly" practices, mothers experiencing none were ~13 times more likely to stop breastfeeding early (Table 6). Adjusted analyses confirmed a clear dose-response relation even after controlling for a variety of demographic, behavioral, and attitudinal variables (Table 6). Compared with the reference group of mothers who experienced all 6 of the "Baby-Friendly" practices, mothers who experienced fewer practices were more at risk for early breastfeeding termination.

DISCUSSION

The current study provides additional support for the importance of certain "Baby-Friendly" maternity-care hospital practices in influencing breastfeeding outcome. Among women who intended to breastfeed for at least 2 months, 14.4% breastfed for <6 weeks. "Baby-Friendly" hospital practices that were consistently associated with longer breastfeeding duration included breastfeeding initiation within 1 hour of birth, giving only breast milk, and not giving any pacifiers, even after controlling for several relevant demographic, behavioral, and attitudinal variables. These results are similar to those found in other studies[12] and in the IFPS I, in which breastfeeding initiation within 1 hour of birth and giving only breast milk were both significantly associated with longer breastfeeding duration.[10] The earlier survey only measured 5 of the 10 "Baby-Friendly" steps; in contrast, the current survey measured 6 of the 10 steps (those most likely to be able to be reported on by the mother).

TABLE 4 **Multivariate Models Predicting Breastfeeding for <6 Weeks According to Type of "Baby-Friendly" Hospital Practice Experienced ($N = 1907$)**

"Baby-Friendly" Practice	Model 1, aOR (95% CI)[a]	Model 2, aOR (95% CI)[b]	Model 3, aOR (95% CI)[c]
Breastfeeding initiation within 1 h	0.63 (0.48–0.83)[d]	0.69 (0.52–0.91)[d]	0.71 (0.53–0.95)[d]
Only breast milk given	0.43 (0.32–0.58)[d]	0.44 (0.32–0.59)[d]	0.47 (0.34–0.64)[d]
Rooming in	1.08 (0.82–1.43)	0.90 (0.67–1.21)	0.93 (0.69–1.26)
Breastfeeding on demand	0.76 (0.58–1.00)	0.85 (0.64–1.14)	0.82 (0.61–1.10)
No pacifiers given	0.63 (0.48–0.84)[d]	0.68 (0.51–0.91)[d]	0.73 (0.54–0.99)[d]
Provide information on breastfeeding support	0.87 (0.65–1.15)	0.90 (0.66–1.21)	0.97 (0.71–1.32)

[a] Adjusted odds ratio (aOR) and 95% Wald confidence interval (CI) based on logistic regression; analysis controlling for other "Baby-Friendly" hospital practices.
[b] Adjusted odds ratio (aOR) and 95% Wald confidence interval (CI) based on logistic regression; analysis includes those variables in model 1 plus child gender, maternal age, maternal race, maternal education, household income, marital status, number of previous children, and number of cigarettes smoked.
[c] Adjusted odds ratio (aOR) and 95% Wald confidence interval (CI) based on logistic regression; analysis includes those variables in model 2 plus number of friends and relatives who breastfed, mother's prenatal intentions to work after birth, and prenatal attitudes toward breastfeeding (ie, formula as good as breast milk; if child breastfed, less likely to be obese).
[d] The odds ratio was significant at $P < .05$.

TABLE 5 **Prevalence of Stopping Breastfeeding Before 6 Weeks According to Additional Hospital Practices Reported ($N = 1907$)**

Hospital Practice	*n*	Breastfed for <6 wk, %	OR (95% CI)[a]	aOR (95% CI)[b]
No formula sample or coupon given in hospital gift pack				
Yes	309	12.3	0.81 (0.56–1.17)	0.89 (0.60–1.31)
No	1598	14.8	1.00	1.00
Infant brought to room at night for feeding if not rooming in[c]				
Yes	687	13.8	0.48 (0.31–0.75)[d]	0.48 (0.29–0.78)[d]
No	136	25.0	1.00	1.00
Type of delivery				
Cesarean	518	14.3	0.99 (0.74–1.32)	0.97 (0.71–1.33)
Vaginal	1389	14.4	1.00	1.00
No pain medications given				
Yes	317	7.6	0.44 (0.28–0.68)[d]	0.56 (0.35–0.89)[d]
No	1590	15.7	1.00	1.00
Labor support (doula)				
Yes	57	10.5	0.69 (0.30–1.63)	0.97 (0.39–2.41)
No	1850	14.5	1.00	

[a] OR indicates odds ratio (odds of stopping breastfeeding before 6 weeks by hospital practice); CI, confidence interval; no (did not experience practice) or vaginal delivery, referent group.

[b] Adjusted odds ratio and 95% Wald confidence interval based on logistic regression; analysis controlling for child gender, maternal age, maternal race, maternal education, household income, marital status, number of previous children, number of cigarettes smoked, number of friends and relatives who breastfed, mother's prenatal intentions to work after birth, and prenatal attitudes toward breastfeeding (ie, formula as good as breast milk; if child breastfed, less likely to be obese).

[c] Total $n = 823$ because only asked of those mothers not rooming in with their children.

[d] The odds ratio was significant at $P < .05$.

Comparison of the current data with that collected in the IFPS I administered 11 years ago[10] shows that women who intend to breastfeed are currently receiving more "Baby-Friendly" practices within hospitals than they were in the past. A higher prevalence was found in the most recent survey for each of the 5 practices measured in both studies, with the largest increases occurring for rooming in (from 44.9% to 56.8%) and not giving pacifiers (from 31.4% to 44.2%). A large percentage of mothers in the current study reported receiving information on breastfeeding support (72%), a practice not measured in the IFPS I. This practice, however, did not seem to influence breastfeeding duration.

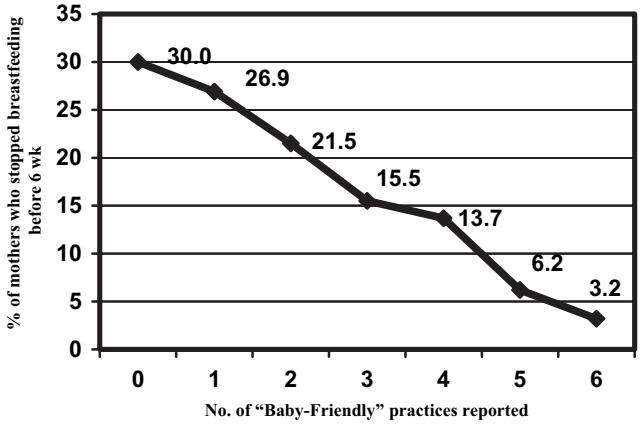

FIGURE 1
Among women who initiated breastfeeding and intended to breastfeed for >2 months, percentage who stopped breastfeeding before 6 weeks according to the number of Baby-Friendly Hospital Initiative practices they experienced.

The current study also provides information on additional practices, not included in the original 10 steps, which were important in increasing breastfeeding duration. Mothers who did not receive any pain medication during labor or delivery were more likely to continue breastfeeding beyond 6 weeks, an association that remained stable even after controlling for relevant demographic, behavioral, and attitudinal variables. However, type of delivery (ie, vaginal versus cesarean) did not seem to influence breastfeeding duration. Others have suggested that pain medication during delivery, specifically epidural analgesia, may be a barrier to breastfeeding success.[13,14] There is some evidence that pain medication may cross the placenta, making the infant drowsy and decreasing the sucking reflexes.[15] Infants of mothers who were not medicated, therefore, were also not medicated and perhaps were better able to suck effectively on the breast. In addition, mothers may have been better able to focus on and have positive experiences with breastfeeding if they were not medicated during delivery. Those who perform future studies may want to further explore some of the reasons behind the relation between pain medication and decreased breastfeeding duration.

If the mother and child were not rooming in, mothers were more likely to continue feeding after 6 weeks if the child was brought to the mother's room for feeding at night. The "Baby-Friendly" practice of rooming in was not significantly associated with breastfeeding duration

TABLE 6 **Multivariate Models for Breastfeeding for <6 Weeks According to Number of "Baby-Friendly" Hospital Practices ($N = 1907$)**

No. of Practices Experienced	Prevalence: No. of Practices Experienced, % (*n*)	Model 1, aOR (CI)[a]	Model 2, aOR (CI)[b]	Model 3, aOR (CI)[c]
0	1.6 (30)	12.86 (3.93–42.04)[d]	9.13 (2.65–31.48)[d]	7.60 (2.13–27.14)[d]
1	6.8 (130)	11.05 (4.18–29.20)[d]	8.95 (3.32–24.13)[d]	7.51 (2.75–20.51)[d]
2	15.9 (303)	8.19 (3.23–20.81)[d]	6.93 (2.69–17.85)[d]	6.41 (2.47–16.67)[d]
3	25.1 (478)	5.49 (2.18–13.85)[d]	4.68 (1.83–11.96)[d]	4.12 (1.60–10.62)[d]
4	24.8 (473)	4.78 (1.89–12.10)[d]	3.80 (1.48–9.75)[d]	3.81 (1.47–9.85)[d]
5	17.7 (338)	1.99 (0.74–5.37)	1.81 (0.66–4.96)	1.91 (0.69–5.30)
6	8.1 (155)	1.00	1.00	1.00

[a] Adjusted odds ratio (aOR) and 95% Wald confidence interval (CI) based on logistic regression; referent group, experienced all 6 "Baby-Friendly" hospital practices.

[b] Adjusted odds ratio (aOR) and 95% Wald confidence interval (CI) based on logistic regression; analysis controlling for child gender, maternal age, maternal race, maternal education, household income, marital status, number of previous children, and number of cigarettes smoked.

[c] Adjusted odds ratio (aOR) and 95% Wald confidence interval (CI) based on logistic regression; analysis includes those variables in model 2 plus number of friends and relatives who breastfed, mother's prenatal intentions to work after birth, and prenatal attitudes toward breastfeeding (ie, formula as good as breast milk; if child breastfed, less likely to be obese).

[d] The odds ratio was significant at $P < .05$.

(Table 3); however, most of those mothers not rooming in had their child brought to them at night for feeding (Table 5), which may have affected these results. It seems that the critical practice here may be ensuring that the infant breastfeeds at night rather than rooming in, per se. Given that rooming in (step 7) may not be possible in all situations, and that what seems important is having the infant with the mother at night for feedings, this may be an important addition to step 7 for hospitals to keep in mind.

We did not find an association between not providing a formula sample or coupon in a hospital gift pack and increased breastfeeding duration. These results are consistent with a Cochrane review in 2000,[16] which suggested that there was no evidence to support a significant effect of commercial hospital discharge packs (with formula or promotional materials) on early termination of nonexclusive breastfeeding. However, evidence from this review did suggest that hospital discharge packs seem to reduce the number of women exclusively breastfeeding at 6 and 13 weeks postpartum when compared with no intervention or a noncommercial pack in which samples of infant formula had been removed. Researchers who perform future analyses may want to examine the effects of this and other hospital practices on duration of exclusive breastfeeding to determine if different results are found.

Several studies have reported positive breastfeeding outcomes among women who give birth in hospitals that endorse the 10 steps.[17,18] Although support was not statistically significant for all of the individual practices measured in this study, evidence was found for the cumulative effects of experiencing these practices on breastfeeding duration. As found in the IFPS I,[10] women who experienced fewer "Baby-Friendly" practices were more likely to cease breastfeeding by 6 weeks with a dose-related response relationship, which suggests that the cumulative effect of the practices, rather than each individual practice, is important. Even among mothers who intended to breastfeed for at least 2 months, one third had stopped breastfeeding before 6 weeks if they had experienced none of the "Baby-Friendly" practices, compared with only 3% of those who experienced all 6 "Baby-Friendly" practices. Replicating a dose-response relationship a second time further confirms the importance of encouraging hospitals to adopt as many of these practices as possible. This notion was emphasized by Radford and Southall in their *Pediatrics* commentary,[19] in which they acknowledged that adopting "Baby-Friendly" practices within the hospital takes time and cited additional evidence for a dose-response effect observed during different stages of adoption of the 10 steps. Given that in the current study a very small percentage (8.1%) of women reported experiencing all 6 "Baby-Friendly" practices measured, the need still exists to increase efforts aimed at implementing these strategies within the hospital environment. As of August 2007, there were only 59 "Baby-Friendly" designated hospitals and birth centers in the United States,[20] further suggesting the need to facilitate adoption of these practices within the United States.

This study has several limitations. First, results are based on mothers' reports of their experiences within the hospital, which addressed only 1 aspect of "Baby-Friendly" practices: the mother's perception. Mothers' perceptions of their experiences in the hospital may prove to be somewhat different from the hospitals' perceptions of the practices they support. Second, we did not have data on the first 3 steps related to policies established within the hospital or the degree to which the hospital staff adhered to these practices and recommendations. A survey aimed at obtaining hospital and birth center reports of maternity-care practices is currently being implemented, which may provide additional information on the prevalence of these practices within US hospitals.[21] Researchers who perform studies in the future may want to obtain information from both mothers and hospital staff to obtain a full sense of what may be happening within the hospital setting. Third, the way in which the practices were measured may not fully

capture what is intended in the 10 Steps to Successful Breastfeeding, and wording of the actual items and measurement of the steps may affect the nature of the results. However, the fact that our results are fairly consistent with those found in the literature and with the IFPS I lends additional support to the validity of the findings. Fourth, the associations between hospital practices and early breastfeeding termination may have been affected by other factors about the women that were not controlled for in this study. This also may have affected the magnitude of the effects shown. Finally, the sample may not be nationally representative, because the results are based on information from a consumer mail survey, with the sample likely underrepresenting mothers from a lower socioeconomic status.

CONCLUSIONS

Our study provides a strong case for the importance of promoting certain maternity-care practices to move closer to the goals for breastfeeding duration. In addition, the results illustrate the need to work with hospitals to increase their implementation of "Baby-Friendly" practices, with the goal of including as many of these practices as possible. The results reinforce recommendations made by us in a previous article[10] to help hospitals implement these practices, even if gradually, and to reinforce their use rather than approaching these goals as an all-or-none endeavor. These recommendations are further supported by the commentary by Radford and Southall[19] on lessons learned for successful application of the Baby-Friendly Hospital Initiative. More attention should also be given to other practices shown to influence breastfeeding duration that may not currently be represented in the original 10 steps (eg, bring the infant to the room at night for feeding if not rooming in; avoid giving pain medications during delivery if possible). Future studies should assess whether a similar pattern of results is found with mothers more at risk for early breastfeeding termination (eg, less-educated mothers, mothers of lower socioeconomic status) and should attempt to obtain in-depth information on all 10 of the "Baby-Friendly" steps.

ACKNOWLEDGMENTS

This study was funded by the Food and Drug Administration, Centers for Disease Control and Prevention, Office of Women's Health, National Institutes of Health, and Maternal and Child Health Bureau in the US Department of Health and Human Services.

REFERENCES

1. American Academy of Pediatrics, Work Group on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics.* 1997; 100(6):1035–1039
2. Andraca I, Peirano P, Uauy R. Nutrition and care in the preterm and neonatal periods and later development: human milk is best for optimal mental development. In: Grantham-McGregor SM. *Nutrition, Health, and Child Development: Research Advances and Policy Recommendations* [joint publication of Pan American Health Organization, World Bank, and Tropical Metabolism Research Unit (University of the West Indies)]. Washington, DC: PAHO; 1998:43–68
3. Centers for Disease Control and Prevention. National Immunization Survey 2004. Available at: www.cdc.gov/breastfeeding/data/NIS_data/data_2004.htm. Accessed February 19, 2008
4. US Department of Health and Human Services. *Healthy People 2010: Understanding and Improving Health*. 2nd ed. Washington, DC: US Government Printing Office; 2000
5. World Health Organization/United Nations Children's Fund. *Protecting, Promoting and Supporting Breastfeeding: The Special Role of Maternity Services*. Geneva, Switzerland: World Health Organization; 1989
6. World Health Organization. *Evidence for the Ten Steps to Successful Breastfeeding*. Geneva, Switzerland: World Health Organization; 1998
7. Lazarov M, Feldman A. *WHO-UNICEF Ten Steps to Successful Breastfeeding*. Washington, DC: US Committee for the United Nations Children's Fund: 1995
8. Powers NG, Naylor AJ, Wester RA. Hospital policies: crucial to breastfeeding success. *Semin Perinatol.* 1994;18(6):517–524
9. Saadeh R, Akre J. Ten steps to successful breastfeeding: a summary of the rationale and scientific evidence. *Birth.* 1996; 23(3):154–160
10. DiGirolamo A, Grummer-Strawn L, Fein S. Maternity care practices: implications for breastfeeding. *Birth.* 2001;28(2): 94–100
11. Fein SB, Labiner-Wolfe J, Shealy KR, Li R, Chen J, Grummer-Strawn LM. Infant Feeding Practices Study II: study methods. *Pediatrics.* 2008;122(suppl 2):S28–S35
12. World Health Organization. *Evidence for the Ten Steps to Successful Breastfeeding*. Geneva, Switzerland: World Health Organization; 1998
13. Crowell M, Hill P, Humenich S. Relationship between obstetric analgesia and time of effective breast feeding. *J Nurse Midwifery.* 1994;39(3):150–156
14. Righard L, Alade M. Sucking technique and its success in breastfeeding. *Birth.* 1992;19(4):185–189
15. Radzyminski S. The effect of ultra low dose epidural analgesia on newborn breastfeeding behaviors. *J Obstet Gynecol Neonatal Nurs.* 2003;32(3):322–331
16. Donnelly A, Snowden HM, Renfrew MJ, Woolridge MW. Commercial hospital discharge packs for breastfeeding women. *Cochrane Database Syst Rev.* 2000;(2):CD002075
17. Broadfoot M, Britten J, Tappin D, MacKenzie J. The Baby Friendly Hospital Initiative and breastfeeding rates in Scotland. *Arch Dis Child Fetal Neonatal Ed.* 2005;90(2):F114–F116
18. Merten S, Dravta J, Ackerman-Liebrich U. Do Baby-Friendly hospitals influence breastfeeding duration on a national level? *Pediatrics.* 2005;116(5). Available at: www.pediatrics.org/cgi/content/full/116/5/e702
19. Radford A, Southall DP. Successful application of the Baby-Friendly Hospital Initiative contains lessons that must be applied to the control of formula feeding in hospitals in industrialized countries. *Pediatrics.* 2001;108(3):766–768
20. Baby-Friendly USA. Available at: www.babyfriendlyusa.org/eng. Accessed February 19, 2008
21. Centers for Disease Control and Prevention. CDC National Survey of Maternity Care Practices in Infant Nutrition and Care (mPINC). Available at: www.mpincsurvey.com:80. Accessed March 3, 2008

Effect of Maternity-Care Practices on Breastfeeding

Ann M. DiGirolamo, Laurence M. Grummer-Strawn and Sara B. Fein

Pediatrics 2008;122;S43-S49
DOI: 10.1542/peds.2008-1315e