

Economic Advantages of Breast-Feeding in an HMO Setting: A Pilot Study

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Abstract

We performed a pilot study on newborns randomly chosen from term singleton deliveries born to mothers in an HMO group between September 1992 and August 1993. Breast-fed infants were breast-feeding at 6 months ($n = 41$), whereas bottle-fed infants were bottle-fed from birth ($n = 107$). Medical care and costs for the first 12 months were retrospectively analyzed, including office visits, drug prescriptions, and hospitalizations. Both groups had similar numbers of office visits and pharmacy costs. Breast-fed infants had fewer inpatient admissions (0.13 vs. 0.20 discharges per 1,000 babies), and their average total medical costs were \$200 less than those of bottle-fed infants. Extrapolating to the total number of deliveries during this period, an increase in breast-feeding from the current rate (17%) to the Healthy People 2000 goal (50%) could save up to \$140,000 annually. (*Am J Man Care* 1997;3:861-865)

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Breast-feeding is advantageous to both mothers and infants for a multitude of reasons.¹ Perhaps the most obvious benefits are nutritional, as breast milk has a biochemical composition that is ideal for growing newborn babies.^{2,3} There is also considerable evidence that breast-fed infants have a stronger immune system, which translates into fewer infections^{4,8} and perhaps less allergic disease.⁹⁻¹¹ Breast-feeding may also reduce the incidence of chronic diseases such as diabetes mellitus,¹² Crohn's disease,¹³ and lymphoma.¹⁴ Psychosocial benefits of breast-feeding are apparent for both the mother and infant, and

improved neuropsychological development of the infant has been reported.¹⁵ Maternal benefits also include a decreased risk of developing premenopausal breast cancer,^{16,17} ovarian cancer,¹⁸ and endometrial cancer.¹⁹

In addition to these medical benefits of breast-feeding, there also are potential economic advantages of breast-feeding to the families and the healthcare system. Cost savings are evident to the family that does not have to buy formula.^{20,21} In addition, a decreased number of infections could lead to fewer office visits, pharmacy costs, and hospitalizations and even less time away from the workplace. To date, however, few studies have formally analyzed the economic advantages of breast-feeding. Therefore, we designed a pilot study in the setting of a health maintenance organization (HMO), where medical utilization and costs are routinely monitored. We performed a retrospective analysis on term singleton newborn infants according to their feeding method and analyzed medical care during the first year of life. Our pilot study demonstrates that such an economic analysis is possible in this setting, although certain limitations were recognized. Our preliminary results suggest that the average cost of medical services for breast-fed infants during the first year of life was \$200 less than that for bottle-fed infants. As the HMO derives a substantial cost savings from breast-feeding, as well as improved health outcomes in their members, lactation services should be supported in this setting.

... METHODS ...

Patient Selection

All live births that occurred during the 12-month period between September 1, 1992 and August 31, 1993 ($n = 2,140$) were initially considered for analysis. Based on the medical record number, a random sample of 269 infants (12.6%) was selected. A total of 27 infants were excluded from further analysis because of prematurity, multiple gestation, or prolonged length of stay in the newborn period. The remaining 242 infants were selected for subsequent analysis.

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Determination of Feeding Method

Chart review was performed for the 242 infants to determine the type of feeding method used. Infants were categorized as breast-fed if they received breast milk (but no formula) for the first 6 months of life or longer. On the basis of standardized criteria,^{22,23} these infants were fully breast-fed, either exclusively or almost exclusively, defined as complements of vitamins, water,

and/or juices. Infants were categorized as bottle-fed if they received only formula from birth. Infants who were initially breast-fed but were switched to formula before age 6 months were not analyzed further.

Calculation of Costs

Computer records for each infant were used to determine the medical costs for the first year of life. The following data were abstracted: (1) number of sick and well office visits, (2) number of pharmacy prescriptions, and (3) number and type of hospitalizations. The cost of an office visit was based on a fee-for-service scale. Actual costs were determined for prescriptions and hospitalizations.

Statistical Analysis

The Statistical Analytical Software package (SAS Institute Inc., Cary, NC) was used for all statistical analysis. Means were compared by using the *t* test and chi-square test to determine statistical significance.

... RESULTS ...

Patient Population

Of the 242 infants selected for analysis, 41 were categorized as breast-fed and 107 were categorized as bottle-fed, for a total of 148 infants. The remaining 94 infants switched feeding methods during the first 6 months of life and were not analyzed further. The 148 infants included 62 males (42%) and 86 females (58%). There were a total of 104 white infants (70%), 43 black infants (29%), and 1 Asian infant (1%). The average gestational age (mean \pm 1 SD) was 39.8 \pm 1.0 weeks. Maternal parity was primarily P1 (38%) or P2 (45%), with fewer mothers at P3 (14%) or higher (4%). A description of the patient population according to feeding method is shown in Table 1.

Medical Utilization

The medical care provided for these infants during the first year of life is summarized in Table 2. The average number of office visits (including both well and sick visits) was not significantly different between the groups. The average number of prescriptions also was similar for both groups. The total number of hospitalizations was 3 for the breast-fed group and 12 for the bottle-fed group, which was calculated to be a rate of 0.13 vs. 0.20 discharges per 1,000 babies. The average length of stay was similar for both groups: 6.0 \pm 2.8 days for breast-fed infants and 4.8 \pm 5.8 days for the bottle-fed group.

The reasons for hospital admission were analyzed next. Five hospitalizations were related to complications from congenital anomalies: one breast-fed infant was

Table 1. Patient Population by Feeding Method

	Breast	Bottle	Total
Maternal Age			
<18	0	1	1
18-25	8	31	39
26-30	16	35	51
31-35	13	27	40
36-40	4	13	17
Race			
White	37	67	104
Black	3	40	43
Asian	1	0	1
Parity			
P1	17	39	56
P2	18	48	66
P3 or >	6	20	26
Infant Sex			
Male	14	48	62
Female	27	59	86

Table 2. Comparison of Medical Utilization During the First Year of Life for Breast-Fed Infants vs. Bottle-Fed Infants*

Variable	No. (mean \pm 1 SD)	
	Breast-Fed Infants (n = 41)	Bottle-Fed Infants (n = 107)
Well office visits	4.2 \pm 1.4	4.1 \pm 1.2
Sick office visits	7.1 \pm 5.7	7.9 \pm 5.7
Prescriptions filled	9.0 \pm 7.2	7.9 \pm 6.6
Hospitalizations (total)	3	12
Discharges/1,000 babies	0.13	0.20
Length of stay	6.0 \pm 2.8	4.8 \pm 5.8

*There were no statistically significant differences between the two groups of infants for the average number of office visits, number of prescriptions, or hospital length of stay.

hospitalized for craniosynostosis repair, and two bottle-fed infants had a total of four admissions for congenital heart disease. These hospitalizations were excluded from analysis as there was no possible relationship to feeding type. The remaining 10 hospitalizations are summarized in Table 3. The cohort of breast-fed infants had only two admissions: one with a diagnosis of bronchiolitis and another with a urinary tract infection. In contrast, the bottle-fed infants had eight admissions, including three with a diagnosis of bronchiolitis, three with possible sepsis, one with a urinary tract infection, and one with empyema due to *Staphylococcus aureus* infection. The proportion of hospitalized babies was not significantly different between feeding groups.

Cost Analysis

The costs of the medical care provided to these infants during the first year of life are summarized in Table 4. The average costs of well office visits and pharmacy prescriptions were roughly equivalent for each group. The average cost of sick office visits was approximately \$60 more for the bottle-fed infants compared with the breast-fed infants. When hospitalization costs were analyzed, bottle-fed infants had an average cost of almost \$150 more than breast-fed infants. Although none of these differences was statistically significant between the two groups, breast-fed infants had an average total savings of more than \$200 during the first year of life.

... DISCUSSION ...

This pilot study was designed to analyze the medical utilization and costs for infants during the first year of life according to their feeding method. The purpose was to determine the potential economic advantages of breast-feeding. Several previous studies addressed this topic at least indirectly,^{20,21,24-27} although few were designed primarily with this goal in mind. For example, the hospitalization rate, which accounts for a large portion of medical costs, has been reported to be lower in breast-fed infants.^{24,25} Similarly, breast-fed infants in nonindustrialized nations have lower mortality rates,²⁶ which clearly translate into reduced healthcare costs. A recent analysis of the costs to corporations for maternal absenteeism provided convincing evidence of the cost-effectiveness of breast-feeding.²⁷ Another study identified financial benefits associated with breast-feeding in the Women, Infants, and Children (WIC) population.²⁸

The most striking finding of our study was that breast-fed infants had an average cost savings of more than \$200 for medical care during the first year of life. This figure was a weighted average, based on

the total costs of well and sick office visits, pharmacy prescriptions, and hospitalizations. Although the number of sick office visits was not statistically different between the group of breast-fed infants and the group of bottle-fed infants, there was an average cost savings of approximately \$60 per breast-fed infant. Similarly, the hospitalization costs were about \$150 lower per breast-fed infant. The total number of hospitalizations was small in each group, however, and we excluded several admissions for

Table 3. Reason for Hospital Admission During the First Year of Life for Breast-Fed Infants vs. Bottle-Fed Infants*

Type of Hospitalization	Breast-Fed Infants (n = 41)	Bottle-Fed Infants (n = 107)
Bronchiolitis/pneumonia	1	3
Rule out sepsis	0	3
Urinary tract infection	1	1
<i>Staphylococcus aureus</i> empyema	0	1
Total	2	8

*Five hospitalizations that were related to complications from congenital anomalies are not shown because they were excluded from further analysis (see text for details).

Table 4. Comparison of Medical Costs During the First Year of Life for Breast-Fed Infants vs. Bottle-Fed Infants*

Variable	Average Dollar Cost (mean ± 1 SD)	
	Breast-Fed Infants (n = 41)	Bottle-Fed Infants (n = 107)
Well office visits	209.76 ± 68.21	202.34 ± 58.83
Pharmacy costs	39.35 ± 48.60	38.68 ± 43.61
Sick office visits	521.61 ± 424.44	583.70 ± 423.00
Hospitalizations	133.27 ± 688.03	281.64 ± 1858.34
Total	900.62	1,105.35

*Although none of the dollar amounts are significantly different between the two groups, breast-fed infants had an average cost savings of more than \$200 in the first year of life compared with bottle-fed infants

management of congenital anomalies (eg, heart disease, craniosynostosis). It will be necessary to repeat this analysis on a larger sample to ensure that these results are reproducible. Our cost analysis represents an example of clinical significance despite a lack of statistical significance.

The current study was designed to analyze the economic advantages of breast-feeding. It was a pilot study, however, as we had not previously attempted to abstract data regarding medical utilization and costs according to feeding method. We also had few preliminary data regarding the potential cost savings for a breast-fed infant and therefore could not predict the sample size necessary to achieve statistical significance. Data generated from this study will therefore be valuable in designing future studies on this topic. In considering the design and results of the current study, we believe that there are three primary limitations: (1) the size of each group of infants was small, (2) the demographic factors for the groups were not controlled, and (3) the clinical severity of each office visit was not determined.

The small sample size of our infant groups, 41 breast-fed infants and 107 bottle-fed infants, was partly because of our rigorous requirements for study entry, as well as our definitions of breast-fed and bottle-fed infants. Of the original 269 newborn infants, 27 babies (10%) did not meet eligibility criteria of a term singleton infant with a normal length of stay; 94 babies (35%) switched feeding methods and therefore were not considered in the analysis of medical utilization and costs. Almost half of the randomly selected babies were not analyzed fully, and our results may not generalize to these infants.

The second limitation of our study was the lack of control of demographic factors. We reasoned initially that infants would simply be divided into two groups according to feeding method, and medical utilization and costs would be compared between groups. Once the cost savings associated with breast-feeding was noted, however, it became important to determine what contribution might have been made by additional factors (eg, race, socioeconomic status, parental education, household smoking, maternal age). In future studies, these data will also be available for analysis. Table 1 illustrates that there were differences between the groups of infants that might contribute to the observed cost savings.

Finally, we did not try to determine the clinical severity of each medical encounter. We assigned the same cost to each office visit that was coded as a "sick visit," although there clearly is a range of severity associated with sick office visits. Once a cost savings associated with breast-feeding was found within the category of sick visits (\$60 per baby), it became important to ensure the accuracy of our cost estimates. In subsequent stud-

ies, it may be necessary to review every office visit for each infant and assign a level of severity for which an appropriate cost can be determined.

The average cost savings of \$200 per breast-fed infant that was found in our study has important implications. Our patient population was randomly selected from all newborn infants born during a 12-month period. If the results are extrapolated to the entire cohort of newborns for that year ($n = 2,140$), then substantial savings can be predicted. For example, increasing the rate of breast-feeding at 6 months from the current rate of 17% to the Healthy People 2000 goal of 50% could mean an additional 700 breast-feeding infants and a projected savings of up to \$140,000 in medical costs in the first year of life. It is possible that medical care cost savings can be identified beyond the first year of life, which would provide even more compelling evidence for the economic advantages of breast-feeding. It should be noted, however, that the costs of lactation support would offset some of these financial savings.

Our pilot study has demonstrated that an analysis of medical utilization and costs is feasible. The HMO setting was conducive to such a financial analysis and allowed calculation of all medical costs during the first year of life. Armed with our preliminary data and recognizing the limitations inherent in such a pilot study, we plan to perform a larger study, perhaps a prospective one, that will address many of the limitations and provide additional insight into the economic advantages of breast-feeding.

The U.S. government has issued clear statements about the benefits of breast-feeding and the need to promote lactation. The Healthy People 2000 goal is for 50% of infants to breast-feed at least until age 6 months.²⁹ In our patient population, approximately 55% of the babies were breast-fed at the time of newborn discharge, but only 17% were still breast-feeding at 6 months. It is clear that much support is needed to achieve this laudable goal. The healthcare system must act in a unified manner to promote breast-feeding and effect social and political change regarding the benefits of lactation.²⁷

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