Effect of Breast Pumps on the Duration of Breastfeeding

Summary

Statement of the Problem

The purpose of this study targeting women and their newborn infants was to determine the effect of the content of the hospital discharge package on the duration of breastfeeding. Also evaluated was the effect of maternal attitudes toward infant feeding on the duration of breastfeeding. The project is consistent with maternal and child health goals to decrease infant morbidity and mortality, optimize conditions for survival, and improve cognitive and physical development. Underscoring the health benefits derived from breastfeeding, Healthy People 2000, published by the U.S. Department of Health and Human Services, includes objectives to increase the rate and duration of breastfeeding. At the time these objectives were established, the rate of breastfeeding had declined from a high of 62 percent in 1982 to 52 percent in 1989. Additionally, most women who initiated breastfeeding exclusively breastfed for a considerably shorter period of time than the 5-6 months recommended by the American Academy of Pediatrics and public health officials. The distribution of infant formula samples free of charge at the time mothers are discharged from the postpartum unit has frequently been cited as a contributing factor in decreased breastfeeding duration. Despite these assertions, studies of the effect of these samples on the duration of breastfeeding have been inconclusive. However, there are very few controlled studies of breastfeeding duration among women who received samples of infant formula compared
with those who received items of potential breastfeeding benefit (such as a breast pump).

**Research Questions or Hypotheses**

This project addresses two research hypotheses:
1. Women who receive a manual breast pump in their hospital discharge package will breastfeed for a longer period of time than will women who receive a commercial discharge package containing infant formula; and
2. Women’s attitudes concerning infant feeding can be used to predict those women most likely to be influenced by the inclusion of a breast pump in the hospital discharge package.

**Study Design and Methods**

The study included two components: The first was a hospital-based interview, and the second involved a series of telephone interviews. The hospital component was a randomized trial of women who elected to breastfeed their newborn infants. Women were interviewed within 48 hours postpartum. Hospital interviews addressed three content areas: Maternal infant feeding preferences, sociodemographic characteristics, and maternal attitudes concerning infant feeding. The 763 participants were randomly assigned to 1 of 3 groups. Group 1 received a specially prepared package containing a manual breast pump and breast pads. Group 2 received a commercially prepared package containing infant formula. Group 3, which served as the control, received both the breast pump package and the infant formula package. A multivariate analysis of variance (MANOVA) of the sociodemographic and attitudinal variables assessed during the hospital interview was used to test for overall differences between respondents who agreed to participate and those who decided not to participate.

The initial analyses evaluated possible biases in the sample created by loss of subjects to followup.

The second component of the study consisted of computer-assisted telephone interviews conducted at 2-week intervals until the infant was 16 weeks of age. At each 2-week telephone interview, the mothers were asked about their current method of infant feeding. The women were also asked to respond to questions addressing attitudes about infant feeding. All interviews (in the hospital setting and via computer-assisted telephone) were conducted by female interviewers specially selected and trained for this study. The dropout rates between the three groups were compared with a chi-square test of independence to determine any differences.

A one-way analysis of variance (ANOVA) was used to determine whether the inclusion of a manual breast pump in the hospital discharge package influenced the duration of exclusive breastfeeding or the duration of mixed breastfeeding and formula-feeding. Analyses concerning the effect of manual breast pumps on breastfeeding behavior involved survival analyses of changes in feeding over time. Survival analyses were conducted on the relationship between the experimental condition and changes in breastfeeding status over time. Product limit estimates of the survival curves for each dependent measure were used to graphically depict the role of the experimental condition in distinguishing time to change in breastfeeding behavior.

Survival analyses were also conducted for demographic or attitudinal variables found to predict breastfeeding duration. For the categorical predictor variables, survival curves were developed for the different groups, and comparisons were conducted with log-rank tests. For the continuous predictor variables, survival analyses were conducted with the continuous form to maximize the statistical power of the analyses. These survival curves indicated the point in time during the
16-week period when differences in breastfeeding behavior between the groups began to emerge.

Study Sample and/or Population

All women who gave birth at a private community hospital in Cedar Rapids, IA, and who during their hospital stay elected to breastfeed were eligible to participate. Each year, approximately 2,400 infants are born at this hospital, which numbers 456 beds and 25 bassinets. Cedar Rapids, a city of 120,000, is a predominantly Caucasian community whose minority population is less than 10 percent of the total population. It is not possible to find an Iowa community with a percentage of underrepresented minority groups that reflects the demographics of the country as a whole. Therefore, African-American, Asian-American, Hispanic-American, and Native American women were underrepresented in the study. Secondary analysis of racial and ethnic considerations were unproductive because of the small numbers of subjects involved.

Findings

The first specific aim concerned the impact of the discharge package on (1) the duration of exclusive breastfeeding and (2) the duration of mixed breastfeeding and formula-feeding. Over the entire 16-week period, 17 percent of the women reported exclusive breastfeeding and 35 percent reported at least partial breastfeeding. Results of the analyses for women who reported exclusive breastfeeding did not support the hypothesis. Giving women a manual breast pump in their discharge package did not lead to a significant increase in the rate or duration of breastfeeding. The one statistically significant difference that emerged among the three treatment groups indicated that giving women infant formula samples only served to increase the duration of exclusive breastfeeding, compared with giving a manual breast pump or both a breast pump and formula. However, after sociodemographic and attitudinal variables predictive of the duration of exclusive breastfeeding were controlled for, the differences among the treatment groups disappeared.

The second specific aim of the study pertained to the effect of maternal attitudes about infant feeding on the rate and duration of breastfeeding over the 16-week followup period. Specifically, the study sought to answer the following question: After the effects of sociodemographic characteristics of the mother are accounted for, are maternal attitudes predictive of infant feeding behavior? After controlling for the influence of demographic variables, maternal attitudes assessed in the hospital were related to duration of both exclusive and partial breastfeeding. Women with more positive attitudes toward breastfeeding were more likely to breastfeed over the 16-week followup period. In addition, women who maintained positive attitudes toward breastfeeding over the followup period were less likely to change their feeding methods from breastfeeding to either partial breastfeeding or to formula-feeding.

The results of this study differ from the common perception that infant formula discharge packages have a negative effect on the duration of breastfeeding. However, it must be emphasized that significant changes have occurred in hospital discharge practices and marketing of infant formulas in the last 10 years. Most published studies on the effect of discharge packages on duration of breastfeeding were conducted at a time when mothers remained in the hospital for 3 to 4 days after the birth of the baby. Similarly, marketing of infant formulas was restricted to health professionals. In the current climate, mothers and healthy newborn infants rarely remain in the hospital longer than 36 hours. Today, most infant for-
Formula companies conduct direct consumer marketing. In addition to distributing infant formula literature and samples to obstetricians and family practitioners, many infant formula manufacturers also use direct mailing strategies to target pregnant women. Because of these changes in hospital practices and marketing strategies, it is possible that the contents of the hospital discharge packages have less influence on breastfeeding duration now than 10 years ago.

Efforts to increase the duration of breastfeeding should target those factors that influence a woman’s breastfeeding attitudes both before conception and during the prenatal period. This strategy has merit because the study data confirm other published reports indicating that the vast majority of women have decided upon the initial method of infant feeding before the birth of the baby. The study also supports previous research reports that a woman’s attitudes toward infant feeding are the strongest predictor of breastfeeding intent and duration. The study also showed that the stronger a woman’s attitudes toward breastfeeding, the longer the duration of breastfeeding. Because of the critical role of maternal attitudes in the initiation and duration of breastfeeding, it is important that all maternal–fetal units in health settings maintain an environment that is supportive of breastfeeding. However, simply withholding infant formula discharge packages may not be sufficient to increase the duration of breastfeeding. To achieve the Healthy People 2000 breastfeeding objectives, efforts to influence positive attitudes toward breastfeeding must be introduced as early as possible.

Publications

Articles, Books, and Chapters

Dungy CI, Losch ME, Russell D, Romitti P, Dusdieker LB. Iowa Infant Feeding Attitude Scale. [Copyright pending].


Abstracts


Presentations


Iron Absorption in Infants

Summary

Statement of the Problem

Iron deficiency is the leading nutritional deficiency disorder of infants and preschool children in the United States and in most other countries. This problem is particularly important because individuals with iron deficiency are at risk for developing iron deficiency anemia, a condition associated with at least temporary (and perhaps permanent) interference with cognitive development. Iron deficiency is most prevalent among low-income individuals, and its prevention is therefore directly relevant to the goals of the Title V MCH Program.

Research Questions or Hypotheses

This research was designed to address three questions that are important to the development of strategies for prevention of iron deficiency:

Question 1: Is there a significant difference in the absorption of iron (mg/day) from infant formulas fortified at levels of 12 mg per liter (mg/L) compared to those fortified at 8 mg/L? The single most reliable way of preventing iron deficiency in infancy is the feeding of iron-fortified formulas. Currently, such formulas are fortified at a level of 12 mg/L (standard formula concentration of 667 kcal/L) in the United States and at 6 to 8 mg/L in western Europe. Adverse effects of iron on other minerals are most likely to occur at high levels of iron intake. The upper limit for iron in infant formulas as currently stipulated by the U.S. Food and Drug Administration is 3 mg/100 kcal
(19 mg/L at standard dilution), a value set to accommodate some “overage” by the manufacturers, especially in formulas based on soy protein. If the extent of iron absorption is not significantly greater from a formula with iron content of 12 mg/L than from a similar formula with iron content of 8 mg/L, it would seem desirable to decrease the level of iron fortification of infant formulas in the United States to 8 mg/L, and the allowable upper limit might be decreased appreciably.

Question 2: What is the extent of non-heme iron absorption from selected iron-fortified items: (a) Rice cereal fortified with ferrous fumarate, (b) iron-fortified strained beef and vegetables, and (c) iron-fortified strained beef? For breastfed infants and for formula-fed infants receiving formulas with low iron content (preferred by some physicians), iron can be supplied as a medicinal iron supplement or as an iron-rich food. With the exception of iron-fortified infant cereals, nearly all foods commonly fed to infants are low in iron content. Infant cereals have traditionally been fortified with iron, and such fortification has great appeal. However, the electrolytic iron of intermediate particle size that is the most common source of added iron in infant cereals is probably of low bioavailability, and a field study using a cereal fortified with this iron source did not demonstrate that regular feeding of the cereal was a reliable means of preventing iron deficiency in infants.

Thus, it would be desirable to find another source of iron that does not produce oxidative rancidity in the cereal (an important attribute of the currently used electrolytic iron powder) but that is of higher bioavailability. Ferrous fumarate, a product that is insoluble in water (and therefore unlikely to produce oxidative rancidity) but soluble in dilute acid (as in the stomach) seemed an attractive choice for study. Because meat, fish, and poultry are known to contain a factor (“meat factor”) that enhances absorption of non-heme iron, iron fortification of meat-containing products seemed logical.

Question 3: What is the extent of iron absorption from an iron-fortified vegetable product with a greater concentration of meat protein than any commercially available meat and vegetable combination? Although a high level of erythrocyte incorporation of iron from iron-fortified strained beef was demonstrated, strained meats have never been popular as infant foods. Meat and vegetable combinations have much higher levels of acceptance. Iron absorption was studied from two vegetable-beef mixtures in which the beef was provided as a beef protein concentrate. The beef protein content of these products was greater than that of commercially available products.

**Study Design and Methods**

Erythrocyte incorporation of the stable isotope $^{58}\text{Fe}$ was used as a surrogate for iron absorption. On 3 consecutive days, the iron-fortified food to be investigated was fed to normal infants under tightly standardized conditions. Each test feeding included a small amount of added $^{58}\text{Fe}$ as a label. It was assumed that the percentage of erythrocyte incorporation of the $^{58}\text{Fe}$ label was the same as that of the non-heme iron of the feeding (as is traditional in studies using isotopes, whether radioisotopes or stable isotopes). Three samples of capillary blood were obtained from each infant: The first sample was obtained before the feeding of the $^{58}\text{Fe}$-labeled test meals; the second, 14 days after consumption of the first of the test meals; and the third, 28 days after consumption of the first of the test meals. Hemoglobin, serum ferritin, and the $^{58}\text{Fe}/^{57}\text{Fe}$ ratio were determined. To decrease variability, data were not included in the case of an infant whose serum ferritin concentration in the first two blood samples averaged less than 20 µg/L.

Question 1: From 112 to 196 days of age, one group
was fed a formula whose iron content (actual analysis) was approximately 12 mg/L and the other group was fed a similar formula whose iron content was 8 mg/L. At age 154 days, a precisely weighed amount (about 1 mg) of a solution of $^{58}$Fe-enriched ferrous sulfate (providing approximately 0.4 mg of iron and 0.3 mg of $^{58}$Fe) was added to 0.8 liters of formula and consumed by the infant during the first two or three feedings of the day. The quantity of additional formula consumed during the day was determined by weighing the containers. This regimen was repeated at 155 and 156 days of age, thus providing a total of 0.9 mg of $^{58}$Fe during the 3 test days. Multiplying the percentage of absorption of the $^{58}$Fe label for each infant by the total quantity of iron consumed during the 3 days on which the test feedings were given, the quantity of iron incorporated into erythrocytes was calculated. Successive cohorts of 10 infants were enrolled; the first cohort was fed formula whose iron content was approximately 12 mg/L (formula 12), the second was fed formula whose iron content was approximately 8 mg/L (formula 8), and the iron content of the feeding was alternated in subsequent cohorts.

Question 2: Three iron-fortified foods were studied: (a) Rice cereal fortified with ferrous fumarate, (b) iron-fortified strained beef with vegetables, and (c) iron-fortified strained beef. From age 112 days until 4 days after the day on which the first test meal was fed, the infants were fed a milk-based formula whose iron content was approximately 2 mg/L. At 140 days of age, a food similar to that of the test meal was introduced and fed at least once daily. At ages 154, 155, and 156 days, each infant was admitted to the Lora N. Thomas Metabolic Unit and was fed the test meal enriched with $^{58}$Fe under direct supervision. The quantity of iron incorporated into erythrocytes from the three test meals was calculated by multiplying the percentage of incorporation of administered $^{58}$Fe from the test meals by the total iron content of the three test meals. Results were expressed as mean erythrocyte incorporation per test meal.

Rice cereal fortified with ferrous fumarate was prepared by an infant food manufacturer and was fed to the infants daily for 2 weeks before feeding the test meals. To each test meal was added a small amount of $^{58}$Fe-enriched ferrous fumarate. A strained beef and vegetable product fortified with ferrous sulfate was prepared by an infant food manufacturer and was fed to the infants daily for 2 weeks before feeding the test meals. To each test meal was added a small amount of $^{58}$Fe-enriched ferrous sulfate. A commercially available product containing strained beef not fortified with iron was fed for 2 weeks before feeding the test meals. To each test meal was added approximately 2.7 mg of iron from ferrous sulfate, including approximately 0.8 mg of $^{58}$Fe.

Question 3: To determine the extent of iron absorption from an iron-fortified vegetable product with a greater concentration of meat protein than any commercially available meat and vegetable combination, the research team mixed strained vegetables with AMP 1200, a beef muscle protein concentrate (90 percent protein). Two levels of beef protein concentrate were studied. A commercially available vegetable mixture (the same mixture included in the strained beef and vegetable mixture used in the study designed to answer question 2) was fed for 2 weeks before feeding the test meals. In the first study, the test meals consisted of 5 grams of AMP 1200, 35 grams of strained vegetables, and approximately 3 mg of $^{58}$Fe-enriched ferrous sulfate in the 40-gram test meal (meat protein concentration of more than 11 grams per 100-gram product). In the second study, the test meals consisted of 7 grams of AMP 1200, 33 grams of strained vegetables and approximately 3 mg of $^{58}$Fe-enriched ferrous sulfate (meat protein concentration of nearly 16 grams per 100-gram product).
For the first 20 infants studied in question 1 and for all of the infants studied in questions 2 and 3, the \(^{58}\text{Fe}/^{57}\text{Fe}\) ratio was determined by inductively coupled mass spectrometry (ICP/MS) that used the Elan 250 ICP/MS system. These results were calculated as mass isotope ratios (MIR\(^{58}\text{Fe}/^{57}\text{Fe}\)). The \(^{58}\text{Fe}/^{57}\text{Fe}\) ratio in blood samples from the remaining infants studied in question 1 were also determined by ICP/MS but with the use of different instrumentation and some refinements in sample processing. The results of these determinations are reported as atom isotope ratios (IR) rather than as mass isotope ratios.

**Study Sample and/or Population**

Normal term infants were recruited at 112 days of age; all infants had been fed an iron-fortified formula (label claim for iron: 12 mg/L) from 8 to 112 days of age. Equal numbers of male and female infants were included.

**Findings**

In interpreting the results of the first study component (question 1), it is important to emphasize that erythrocyte incorporation of iron from test meals is a surrogate for but not a direct measure of iron absorption. The quantity of iron incorporated into erythrocytes 14 and 42 days after consumption of the test meals is equal to or less than (never more than) the quantity absorbed. Is there a significant difference in the absorption of iron (mg/day) from infant formulas providing 12 mg of iron per liter and formulas providing 8 mg of iron per liter was nonexistent or minimal, and that fortification of infant formulas with iron to a level of 8 mg/L is adequate.

The research team concluded that the difference in absorption of iron (as reflected by erythrocyte incorporation of iron) from formulas providing 12 mg of iron per liter and formulas providing 8 mg of iron per liter was nonexistent or minimal, and that fortification of infant formulas with iron to a level of 8 mg/L is adequate.

The second study component (question 2) examined the extent of non-heme iron absorption from three selected iron-fortified items: (a) Rice cereal fortified with ferrous fumarate, (b) iron-fortified strained beef and vegetables, and (c) iron-fortified strained beef. Twelve infants completed the study ingesting rice cereal fortified with ferrous fumarate. The mean iron intake from a test feeding was 3.36 mg. (A baseline serum value for MIR\(^{58}\text{Fe}/^{57}\text{Fe}\) was not obtained for two infants, and results for these infants were calculated with the assumed baseline value of 0.1469, the mean baseline value for the other infants). The arithmetic mean incorporation of iron at 168 days (N = 10) was 3.2 percent of intake (geometric mean, 2.7 percent of intake), and the arithmetic mean incorporation of iron at 196 days (N = 11) was 2.8 percent (geometric mean, 2.4 percent of intake). At the current level of fortification of dry infant cereals (47.5 mg/100 g), a 70-gram feeding would provide slightly more than 3 mg of iron, and absorption of 3 percent would
be less than 0.1 mg/feeding. The research team concluded that this is too small a proportion of the estimated requirement for absorbed iron (0.55 to 0.77 mg/d) to merit promotion of ferrous fumarate as a fortifier for dry infant cereal.

In the third study component (question 3), 11 infants were fed with the iron-fortified strained beef and vegetables, but data from two were excluded because of low serum concentrations of ferritin. (A baseline value for MIR58/57 was not obtained for one subject, and results for this infant were calculated with the mean baseline for the other infants.) Arithmetic mean incorporation of iron at 168 days of age (N = 7) was 3.8 percent of intake, and at 196 days of age (N = 7) was 5.4 percent of intake. If a similar strained beef and vegetable product were fortified with ferrous sulfate at the level of 6 mg of iron per 100 grams of product (i.e., the level currently used in fortification of wet-pack cereal and fruit products), erythrocyte incorporation of 4 percent of a 70-gram serving would amount to 0.17 mg of iron (approximately 25 to 30 percent of the estimated requirement for absorbed iron) and erythrocyte incorporation of 5 percent would amount to 0.21 mg (approximately 0.28 to 0.38 percent of the estimated requirement for absorbed iron). The research team concluded that iron fortification of a commercially produced beef and vegetable product is worth considering.

Nine infants were studied by using the iron-fortified strained beef. The protein concentration of the product was 14.4 grams per 100 grams of product. Arithmetic mean erythrocyte incorporation of non-heme iron at 168 days of age (N = 8) was 10.0 percent of intake, and at 196 days of age (N = 8) was 14.6 percent of intake. Although commercially available strained meats have never been popular, it is evident that consumption of even 50 grams per day of a product fortified at a level of 6 mg of iron per 100 grams would result in erythrocyte incorporation of about 0.3 mg/day (approximately 40 to 55 percent of the estimated requirement for absorbed iron). The research team concluded that iron fortification of a strained beef product should be considered.

The extent of iron absorption from two iron-fortified vegetable products with a relatively high concentration of meat protein was tested in 10 infants. Test meals that included 5 grams of AMP 1200 with 35 grams of strained vegetables were fed to the infants. Data were excluded for one infant because of low serum ferritin concentration. Arithmetic mean erythrocyte incorporation of iron at 168 days of age (N = 8) was 3.1 percent of intake, and at 196 days of age (N = 8) was 3.1 percent of intake. Eleven infants were fed test meals that included 7 grams of AMP 1200 with 33 grams of strained vegetables. Arithmetic mean erythrocyte incorporation of iron at 168 days of age (N = 11) was 4.2 percent of intake, and at 196 days of age (N = 11) was 4.1 percent of intake.

The results of these two studies are surprising. Although the concentration of meat protein in the test meal with 5 grams of AMP 1200 and 33 grams of strained vegetables was greater than that of the strained beef and vegetable product, erythrocyte incorporation of iron was not greater from the product containing AMP 1200. The concentration of meat protein in the test meal with 7 grams of AMP 1200 was greater than that of the strained beef product, but erythrocyte incorporation of iron from the product containing AMP 1200 was much less than from the strained beef product. Because the beef protein concentrate failed to enhance iron absorption to the same extent as the beef protein, it seems possible that the “meat factor” either was inactivated during the course of processing the beef protein concentrate or does not reside in the protein fraction.
Publications

Articles, Books, and Chapters


Abstracts

None to date.

Presentations

None to date.
Breastfeeding Promotion Strategies for Urban WIC Women

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Year 5  n/a  n/a
Year 6

Year 2000 Objectives 2.11*, 8.11, 14.9*

Study Design  Experimental
Time Design  Longitudinal
Care Emphasis  Interventional
Population Focus  Pregnant women, Adolescents (pregnancy related)
Racial/ Ethnic Focus  African Americans

Summary

Statement of the Problem

Breastfeeding promotion programs have emphasized the delivery of a consistent educational message and effective peer counseling. Although studies of populations receiving services through the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) have evaluated the effects of prenatal and postnatal breastfeeding programs on the decision to breastfeed, few have evaluated the effects of these programs on intention, initiation, and duration or variation in breastfeeding practice. Little was known about the effects of promotional programs among the WIC population and WIC’s influence on breastfeeding decisions or compliance with recommended practices. Moreover, studies about the effects of breastfeeding promotion on actual practice rarely controlled for demographic characteristics. Testing these factors would (1) lead to more precise estimates of the effects of breastfeeding promotion on practice, and (2) improve understanding of the effect of these interventions in populations of interest.

At the beginning of this study, the breastfeeding rate among Baltimore City WIC enrollees was 4.1 percent. The breastfeeding rate in the remainder of the State averaged 14.9 percent. The estimated national rate at hospital discharge was approximately 39 percent. A variety of efforts had been initiated to improve the low rates of breastfeeding initiation, with limited or no success. The use of peer counselors and/or the use of videotapes emphasizing the impor-
tance of breastfeeding within a clinic setting were considered potentially useful in influencing a woman’s intention to initiate and continue breastfeeding.

**Research Questions or Hypotheses**

The objective of this study was to test the effectiveness of peer counseling and promotional videotapes singly or in combination in increasing breastfeeding rates among inner-city, African-American women enrolled in the Baltimore City WIC program. The research team hypothesized that the effects of the interventions would be additive so that the largest difference in breastfeeding rates would occur in the WIC clinic population receiving both interventions, when compared with the control group.

Specifically, the research team hypothesized the following:

1. A 10-percent difference would be seen in the rate of breastfeeding initiation between WIC participants exposed to the prenatal videotape and similar WIC controls;
2. A 10-percent difference would be seen in the rates of breastfeeding initiation between WIC participants receiving peer counseling (PC) and similar WIC controls;
3. For a combined effect of videotape and peer counseling interventions, a 20-percent difference would be seen in rates of breastfeeding initiation between WIC women receiving both interventions and similar WIC controls; and
4. A 10-percent difference in breastfeeding continuation would be seen between WIC women receiving peer counseling and those receiving either videotape or routine WIC health education (controls) at 16 weeks’ postpartum.

**Study Design and Methods**

This study examined whether differences in attitudes toward the behavior of breastfeeding, subjective norms, and attitude toward breastfeeding resulted in differences in breastfeeding rates between the WIC participants receiving the prenatal videotape and WIC counseling and the WIC controls. Differences in breastfeeding initiation rates between WIC participants receiving the peer counseling and similar WIC controls were examined to see whether identified differences, if any, were associated with social learning and behavioral control, and, to a lesser extent, with attitudes and behaviors toward breastfeeding. Also tested were differences in rates of breastfeeding continuation between WIC women receiving the peer counseling and similar WIC controls, and the differences (if any) in social learning and behavioral control.

The model assumed that behavioral intention is the immediate determinant of behavior and that all other factors that influence behavior are mediated through intention. The strength of a person’s intention to perform a specific behavior is a function of two factors: Attitude toward the behavior, and the influence of the social environment or general objective norms on the behavior. Social norms are determined by a person’s normative belief about what salient others think they should do and by the individual’s motivation to comply with those persons’ wishes.

The study took place within the Baltimore City WIC clinics administered by The Johns Hopkins University. The four WIC clinic study sites were matched for ethnicity and previous rates of breastfeeding, based on data from WIC certification records. The implementation of the intervention by clinic minimized
crossover and contamination between groups that would be likely to occur if interventions were randomized by individual.

Following is a brief description of the four WIC clinic sites selected:

1. Videotape intervention: A breastfeeding motivational videotape consisting of a series of eight trigger vignettes, 2–5 minutes in length, addressed the benefits and major barriers to breastfeeding. The tape was formatted to play so that it could be used in a waiting area without staff supervision. Posters corresponding with the video were displayed in the clinic areas and at other relevant sites. A discussion with the service provider following the videotape was encouraged, and printed information reinforcing the video message was distributed.

2. Peer counseling intervention: The peer counselor met with every client, assessed each woman’s attitudes toward breastfeeding and formula feeding, corrected any misconceptions about breastfeeding or formula feeding, distributed/reviewed handouts and pamphlets, and informed each woman about discussion sessions with other pregnant mothers who were thinking about breastfeeding. The counselor was also available at contact sites and for home visiting. Study personnel visited the assigned delivery suites, reviewed delivery logs, and documented infant feeding selection. Personnel visited breastfeeding women and delivered a breastfeeding promotional gift package, confirmed followup plans, and gave the mother a contact number to call if the mother had any problems or questions.

3. Combined peer counseling and videotape intervention: This intervention combined all of the components of each of the two interventions described above. The WIC provider and peer counselor coordinated their efforts through the use of the breastfeeding promotion record so that one could reinforce and extend areas not covered by the other.

4. Control: The control clinic provided all ongoing WIC services, all nutrition education, and breastfeeding promotion activities as required by Federal and State regulations. Services provided in the control clinic were indistinguishable from any other WIC clinic, but did not include any peer counseling or breastfeeding videotapes.

The formative component of the project investigated the knowledge, beliefs, and reported practices of WIC providers and clients in Baltimore on issues of breastfeeding and infant feeding. During individual interviews that used a photo projection technique, the respondents discussed advantages and disadvantages of various infant feeding choices. Topics raised and discussed by the respondents included the mother’s age; the mother’s nutrition; the influence of tobacco, alcohol, and drugs on her choice; career or work issues; time elements; self-concept; myths about breastfeeding in public; male influences; and others’ influences on the woman’s decision. In addition, focus group discussions were held with clients and providers after they had viewed the Best Start breastfeeding promotion videotape. Issues that emerged from these discussions included conversations about which segments were appealing and why; which segments the viewers did not like or felt skeptical about; and suggestions for improving the video and its use with WIC clients in promoting breastfeeding. The formative component not only provided information on knowledge, attitudes, beliefs, and behavior but also provided data to develop and modify the study instruments to more closely parallel perceptions within the community.

This study employed a two-by-two factorial design to assess the single and combined effects of the two different clinic-based breastfeeding promotion programs designed for use in the WIC population. The
research team prospectively followed a cohort of 548 mother-infant pairs from their entry into prenatal care before the 24th week of pregnancy until their 16th week postpartum. If the woman was eligible and consented to participate, the demographics questionnaire and the Knowledge, Attitudes, and Beliefs Questionnaire were administered. Study exclusions were (1) contraindications to breastfeeding (e.g., women with tuberculosis, HIV infection, or dependent use of illicit drugs); (2) delivery of a preterm or low birthweight singleton infant, twins, or an infant with major congenital disabilities.

Each woman received a modest payment of $5.00 for participating in the study and was instructed about future interviews. Follow-up telephone interviews were carried out. The telephone interviewer was an experienced individual who has worked on similar research projects in this community for almost 20 years. She was empathetic, nonjudgmental, and very supportive. She maintained a rapport with each client by being available at any hour of any day to answer questions, provide additional information, and refer the client if appropriate. Recruitment of study subjects was monitored by the research team very closely on a weekly basis. Adjustments were made with respect to deployment of personnel, interviewers, and study clinic staff to assure scheduled enrollment.

Women were followed from the time they entered prenatal care and enrolled in WIC (at or before 24 weeks’ gestation) through 16 weeks postpartum. At enrollment and at 34 weeks’ gestation, women were interviewed concerning their infant feeding intentions; at 7–10 days postpartum, they were reinterviewed to determine whether they had ever put the baby to the breast (initiation), whether they continued to breastfeed at 7–10 days (adoption), and whether they were still breastfeeding at 8–16 weeks (duration).

**Study Sample and/or Population**

Women were recruited into the study from the four WIC clinic sites in Baltimore City that were matched on breastfeeding rates and ethnicity. The clinics were administered through The Johns Hopkins University WIC Program. At the inception of the study, the clinics had rates of breastfeeding comparable to those of Baltimore City (4.1 percent). Although the WIC clinic populations in Baltimore City do vary, the clinics sites selected were similar in ethnicity, with the African-American population ranging from 90.4 to 96.1 percent, and the breastfeeding rates ranging from 2.0 to 5.9 percent.

Both primiparous and multiparous women ages 15–45 were included in the study. Verbal informed consent was obtained prior to each interview, eligibility determined, and signed consent obtained consistent with the approved materials from The Johns Hopkins University Committee on Human Volunteers.

**Findings**

Maternal intention to breastfeed at the time of enrollment in WIC had a powerful influence on breastfeeding initiation and adoption. Enrollment in the study did not influence the decision to breastfeed during the prenatal period as measured at 34 weeks prenatally and upon hospital admission. Peer counseling in the WIC clinic positively influenced the initiation rate. Video intervention alone and in combination with peer counseling had a weak effect, and after adjustment for intention to breastfeed, showed no significant effect. Thus, peer counseling activities in WIC may have limited ability to influence breastfeeding; motivational videotapes showed no significant influence primarily because decisions on how to feed an infant in this study population were formed prior to
enrollment in WIC and were strongly held throughout the prenatal period.

Specific hospital practices such as providing formula to the mother and increased length of separation of mother and baby appear to negatively influence decisions to initiate and adopt breastfeeding, whereas providing instruction on infant feeding appears to positively influence such decisions on breastfeeding, regardless of maternal infant feeding intention. These findings highlight the crucial role played by hospital policy and personnel in efforts to promote and sustain breastfeeding.

Almost 80 percent of the women who intended to breastfeed their infants at prenatal enrollment did so. Breastfeeding was initiated by 49 percent, 60 percent, and 55 percent of the women in the videotape, peer counseling, and combined intervention study clinics, respectively, compared with 27 percent of women in the control clinic. However, these crude differences were not significant when intention to breastfeed was entered into the analytical model.

The data indicate that the number of breastfeeding mothers dropped by almost one-half in each of the study and control clinics by 7–10 days postpartum. The mean duration of breastfeeding in weeks in the control, video, peer counseling, and combined clinic was 1.1 (+ 2.8), 4.2 (+ 6.4), 5.0 (+ 6.9), and 4.5 (+ 6.3), respectively. A significant effect on duration of breastfeeding (p < .001) was identified for each of the three intervention clinics.

Data indicated that women in this population experienced a number of impediments and problems as they attempted to establish breastfeeding, and often abandoned breastfeeding during the first week of an infant’s life, even when they reported an intention to breastfeed. When a number of factors in a multivariate model of women who ever initiated breastfeeding were controlled for, the factors that predicted breastfeeding at 1 week included (1) breastfeeding intention before 24 weeks’ gestation, (2) receipt of free infant formula in hospital, and (3) maternal leave policy. Qualitative data indicated that decisions about infant feeding in this study population were based on a complex array of perceived advantages and barriers. The barriers to breastfeeding in the population were most often cited as “time” (due to work/career or other demands on time), uneasiness with breastfeeding in public, lack of knowledge of alternatives to breastfeeding in public, and pain.

Clients cited the importance of significant support persons in influencing their infant feeding decision. The significant person was infrequently the partner, more often a female relative, female friend, or health provider. Given the short amount of time available to the WIC providers to counsel clients about infant feeding choices, the WIC provider could assist clients interested in breastfeeding in identifying a support person. Data indicated that the infant feeding decision could best be made by each woman through discussions with a person who has time, interest in the client, and knowledge about breastfeeding. WIC can promote breastfeeding among clients by raising the issue, giving clients an opportunity to openly consider their choice, and helping each client identify a resource person for the information and support she needs.

In this population, many more women intended to breastfeed, initiated breastfeeding, and in fact, adopted breastfeeding than expected based on statistics gathered by WIC, indicating that WIC-based statistics may underestimate breastfeeding practices. Overall WIC-based statistics do indicate an increase in breastfeeding among African-American women, suggesting that in addition to any program effect, a secular trend may be occurring as a result of factors within and outside of WIC that are influencing breastfeeding rates in this urban African-American community. The results suggest that public health
interventions should capitalize on the high level of interest in breastfeeding and the relatively high initiation rates by retargeting programs and policies to support women who indicate an intention to breastfeed.

Publications

Articles, Books, and Chapters


Abstracts


Presentations


Bronner Y. 1994. Breastfeeding peer counselors: Their role in breastfeeding promotion. Presented at the International Lactation Consultant Association meeting, Atlanta, GA.

Bronner Y. 1993. Breastfeeding promotion from the peer counselor’s and mother’s perspective. Presented at the Maryland Breastfeeding Promotion Project, Baltimore, MD.


initiation. Presented at the American Public Health Association Annual Meeting, Washington, DC.


Paige DM. 1994. Breastfeeding patterns and the determinants of initiation and duration of breastfeeding. Presented at Advances in Pediatric Nutrition, Division of Gastroenterology and Nutrition, Department of Pediatrics, The Johns Hopkins University School of Medicine, Baltimore, MD.


Russ J. 1993. Lessons learned from ethnography regarding desired qualities of a peer counselor: Use of this information in selection and training of peer counselors in the WIC breastfeeding promotion project. Presented at the Maryland Breastfeeding Promotion Project, Baltimore, MD.


Evaluation of the Guidelines for Maternal Transport

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Project Number 240586
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Project Period 10/01/88-09/30/92

Costs

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Year 2000 Objectives

Study Design
Quasi-experimental

Time Design
Longitudinal

Care Emphasis
Noninterventional

Population Focus
Pregnant women, Neonates, Infants

Racial/ Ethnic Focus
None

Summary

Statement of the Problem

As maternal transport has become widespread, the need to establish guidelines within specific areas, apart from the transport of the woman in premature labor, has become increasingly important. Yet little is known about the full impact that could be achieved through maternal transport, particularly with regard to the postpartum health status of mothers with complications or the health status of their newborns who were not transported to a facility with the necessary capabilities.

The importance of this research stems from its use in a sizable geographic area of a large population-based sample of all pregnant women who had complications that might lead to maternal transport. The importance of this research stems from the use of a large population-based sample of all pregnant women in a large geographic area who had complications that might lead to maternal transport. Previous population-based studies have been constrained by sample size and limited to transported mothers who delivered very-low-birthweight infants. The results of those studies are mixed, partly because of potential selection bias in the regions where the studies were conducted. The evaluation of the guidelines for maternal transport represents a significant contribution of this research.
Research Questions or Hypotheses

The purpose of this study was to evaluate the guidelines for the transfer of high-risk mothers from community hospitals to perinatal centers. The study used data from a sample of women admitted for labor and delivery in 1984 and 1985 in the 15 hospitals that were part of the Southern New Jersey Perinatal Cooperative (SNJPC).

Two major hypotheses were evaluated:
1. The transfer of pregnant women to a tertiary center conforms to the recommended guidelines for maternal transport; and
2. The transfer of pregnant women to a tertiary center is optimal when their newborns are expected to develop complications requiring intensive care, because the technology needed to manage high-risk infants is available immediately after birth.

Study Design and Methods

The project was designed as a nonconcurrent prospective epidemiologic study. Using medical records data, the study followed participating women from the prenatal period to delivery, and their newborns from birth to hospital discharge or death. By design, the study sample was restricted to women at greatest risk for needing transport. The sample included all women (1) who were admitted for labor and delivery at one of the 15 hospitals providing perinatal care in the 7 southernmost counties in New Jersey at the time of the study, and (2) who had complications of pregnancy that were likely to lead to transport. The sample included all women (1) who were admitted for labor and delivery at one of the 15 hospitals providing perinatal care in the 7 southernmost counties in New Jersey at the time of the study, and (2) who had complications of pregnancy that were likely to lead to transport. These hospitals, which were part of SNJPC, included a mix of Level I, Level II, and Level III hospitals in rural and urban communities that served a diverse group of mothers and newborns at various socioeconomic levels. SNJPC, a nonprofit network of these hospitals, was the primary organizational structure coordinat-
the eligible sample of known maternal transports). Of these, 82 of the women (84 percent) were transported from Level I hospitals, 130 women (90 percent) from Level II hospitals, and 27 women (93 percent) from Level III/IIA hospitals. A total of 1,554 nontransported women were identified as eligible for the study sample. Of these, 307 delivered at Level I hospitals, 658 at Level II hospitals, and 589 at Level III/IIA hospitals (413 at Level III and 176 at Level IIA). Data from medical records were available for 1,445 of these women (93 percent).

The sample for the analysis of the likelihood of maternal transport and for the evaluation of the effect of transport on postpartum morbidity in the mother was restricted to women who delivered a potentially viable fetus. Excluded from the sample analysis were women whose pregnancy resulted in stillbirth (N = 162), whose fetus was born before 20 weeks (N = 1), or whose infant weighed less than 500 grams at birth (N = 9). For women with multiple gestations, the research team selected at random one of the multiple births to yield only one record for the mother. The resulting sample for analysis included 1,512 women, of whom 228 (15.1 percent) were maternal transports. The analysis of the data on newborns included 1,422 mothers for whom newborn data were obtained (94 percent of the 1,512 mothers with maternal data).

The primary data source for the study consisted of the medical records from the 15 SNJPC hospitals to which the pregnant women were initially admitted and the Pennsylvania or Delaware hospitals to which they were transported. Data were abstracted from the records of mothers and their babies for all study hospitals to which they were admitted during the intrapartum, postpartum, and neonatal periods. The abstracted data included demographic information about the mother, diagnoses and signs and symptoms of the most commonly occurring complications in the mother and newborn, and major procedures or therapeutic treatment given to the mother or newborn.

The study focused on both the process and outcome of transport. The dependent variable included in the study of the process of transport was the likelihood of transport. The transport variable became an independent variable in the study of the appropriateness of transport. The dependent variables in the study of the appropriateness of maternal transport included both maternal and newborn outcomes. Maternal outcomes were the length of maternal postpartum hospital stay and the presence or absence of significant postpartum morbidity and postpartum infection. Newborn outcomes included 5-minute Apgar scores, resuscitation at birth, length of nursery stay, presence and severity of respiratory distress syndrome, confirmed neonatal sepsis, seizures, intraventricular hemorrhage, necrotizing enterocolitis, and early neonatal mortality.

Among the independent variables, maternal obstetric and medical complications included premature rupture of membranes, preterm labor, maternal hypertension, multiple gestation, third trimester bleeding, diabetes, heart disease, other chronic disease, isoimmunization, and maternal infection. The research team defined (when feasible) varying levels of severity of these complications. Other independent variables included in the analysis were cesarean delivery and demographic and prenatal care variables.

The first step in the analysis involved investigation of the variables associated with maternal transport. In this step, the sample for analysis included all maternal transports from Level I, Level II, and Level III/IIA hospitals and all nontransported women who delivered at these hospitals. The analysis was performed separately for each level of hospital. A bivariate association between the likelihood of transport and maternal obstetric complications, medical complications, maternal demographic variables, and the hospital and
prenatal care variables was performed first, followed by a multiple logistic regression. The variables defining maternal complications and their severity, gestational age, maternal demographic variables, and prenatal care use were included in the regression analysis. This analysis was performed separately for Level I and Level II hospitals, and the results of the regressions were compared to evaluate possible interactions of the effect of the variables on transport rates by level of hospital.

The first step in the analysis of the impact of transport was a bivariate analysis in which maternal and newborn outcomes were compared for transported and nontransported women, followed by a multivariate analysis. Logistic regression was used for the dichotomous dependent variables and multiple linear regression for the continuous dependent variables (the same approach as in the likelihood of transport). The regression coefficients were compared for the Level I and Level II hospitals, with primary focus on the coefficient for maternal transport.

The final step in the analysis was to evaluate each case, using a Maternal Transport Index (MTI). In this analysis, women were assigned a value of the MTI based on the complications they experienced, and the MTI was related to the odds of mortality in the newborn.

**Findings**

In general, the study findings support the hypothesis that the predictors of transport conform to the ACOG guidelines for transport and that differences in transport rates between Level I and Level II hospitals are greatest for women with severe complications. The findings also suggest that improvements in maternal outcomes may be gained with transport of mothers at risk for major complications. For the most part, however, any improvements in newborn outcomes occurred only with regard to 5-minute Apgar scores. Transport did not appear to increase the occurrence of problems in the newborn.

Women who presented at the hospital with early gestation, who had preeclampsia, acute bleeding, incompetent cervix (premature dilation of the cervix), chorioamnionitis, and multiple pregnancies were more likely to be transported from Level I or Level II hospitals than women without these complications. All of these conditions were included in the guidelines. On the other hand, intrauterine growth retardation, diabetes, and other chronic illnesses were not related to maternal transport. The most interesting findings with regard to the predictors of maternal transport involved the effects of the source of prenatal care. Women who received prenatal care from private doctors were less likely to be transported from Level I or Level II hospitals than women who had other sources of prenatal care, independent of their complications. This effect was stronger at Level I than at Level II hospitals.

None of the measures of maternal outcomes were related to transport status with the exception of the mother’s length of hospital stay in Level II hospitals. Here, the shorter stays of transported women remained significant even with adjustment for maternal complications, length of pregnancy, and cesarean delivery.

Maternal transport had a positive effect on 5-minute Apgar scores. Resuscitation scores were significantly higher among transported babies, independent of gestational age, suggesting that the technology needed for the newborns of high-risk mothers was made available to them following maternal transport. However, the positive effect of maternal transport did not extend past the time of birth, in that mortality and morbidity rates were no better for the infants of transported mothers and were worse only for infants with respiratory distress syndrome whose mothers had been transported from Level I hospitals.

The findings that may have the most important
policy implications address the selective retention of private patients at Level I and Level II hospitals. In order for a regionalized system of care to work effectively, there must be cooperation and communication among providers. It is surprising that in an area with a formal cooperative of hospitals working together for the health of the mother and the newborn, such selective behavior was noted.

A second implication of the findings involves the positive effect of transport on maternal length of hospital stay and 5-minute Apgar scores. These findings suggest that the availability of immediate intensive postpartum care can improve both the mother’s and the newborn’s outcomes. The fact that the higher-risk mothers were transported and that they had similar outcomes to nontransported mothers also supports the continued need to utilize the resources of tertiary centers in an area.

This population-based study needs to be repeated in a more contemporary population. The issues of managed care and selective retention of patients may be even more pressing today than in 1984 and 1985. It is difficult to tell from the results whether this retention may have a negative effect on the mother or newborn.

Publications

Articles, Books, and Chapters


Abstracts

None to date.

Presentations

None to date.
Young Adult Users of Services for Children with Special Health Care Needs: Service Utilization, Psychological Status, and Developmental Tasks

Summary

Statement of the Problem

Older adolescents and young adults with serious physical health conditions may encounter difficulties in making the transition from pediatric programs to adult services. Anecdotal reports have identified various problems, including decreased access to care, problems in finding appropriate services, and lack of assistance in coordinating care. However, few empirical studies have documented the nature and extent of these problems. Moreover, this group of youth may be at risk for poor mental health and developmental outcomes. Research on mental health status for this population has yielded contradictory findings because most studies use clinic-based samples, which tend to be small and seriously biased. Few studies analyze mental health and developmental data from community-based samples. In view of the paucity of previous empirical research, this study addressed issues related to (1) health services, (2) mental health status, and (3) developmental outcomes for the population of young adults with chronic illnesses and disabilities.

Research Questions or Hypotheses

This study addressed critical gaps in the literature by describing access to care and service use for a sample of young adults with chronic illnesses and disabilities and by identifying risk, protective, and mediating factors that influence mental health and developmental outcomes. Analyses tested the fol-
Following hypotheses related to three primary domains of interest: Health services (hypotheses 1–3), mental health (hypotheses 4–5), and developmental outcomes (hypothesis 6).

Following are the study hypotheses:
1. Both age and impairments will affect use of both primary care and subspecialty care;
2. Age influences access to care after other key variables are taken into account, such as functional status, educational attainment, employment status, and family composition;
3. Greater access to condition-related or general health care services is associated with having help in service coordination;
4. Mental health status is worse in respondents with selected condition characteristics (e.g., those who have some or many functional limitations, compared with those who have no functional limitations);
5. Perceived impact of the condition mediates the influence of condition characteristics on mental health; and
6. Disabilities, age, and parental education have significant effects on rates of education, employment, and idleness.

Study Design and Methods

This study used a cross-sectional cohort survey design with 45-minute telephone interviews of youth who were randomly selected from lists of users of Children with Special Health Care Needs (CSHCN) programs in two States, Illinois and Ohio.

Study Sample and/or Population

In total, 424 youth ages 20–24 or their parents constituted the sample for this study. Of the 424 persons interviewed, 286 were young adults and 138 were parents. Parents responded when youth themselves were unable to communicate over the telephone as a result of their disabilities.

More than one diagnosis was reported by 38.2 percent of the sample and more than 70 distinct diagnoses were reported by respondents overall. As a whole, the sample was predominately white and all but 10 percent of the subjects had received a high school diploma or had pursued further education. Most respondents had never been married and were living with parents or relatives. Approximately half were not employed (either part-time or full-time). About 20 percent said they were receiving Supplemental Security Income (SSI) benefits and slightly more said they were receiving welfare assistance. Compared with many previous studies of youth with a chronic illness or disabling condition, this sample was a relatively advantaged group of young adults. However, compared with youth of similar ages without an ongoing physical health condition, they were more likely to be unemployed and unmarried.

Findings

Access to Health Services: Of the total sample, 13.8 percent said that they did not have a regular source of care for their condition, and 18.6 percent said they had no regular source of general health care. Less than 5 percent of the sample had neither source of care. Other key findings included the following:
1. Respondents ages 22–24 were more than twice as likely to lack a regular source of care than respondents ages 20–21.
2. SSI recipients were less likely to lack a regular source of care for both condition-related services and general health services, whereas respondents not receiving SSI were almost four times as likely to lack a regular source of care for their condition.
3. Youth who had functional impairments were less likely to lack a regular source of care for both chronic conditions and general health, compared with those who had no functional impairments.

4. Of the total sample, 75.8 percent said they had no one to help them with service coordination. Service coordination was available to 32.8 percent of those with SSI; in contrast, only 19.9 percent of those without SSI reported having someone to help them work with other agencies.

5. Having a regular source of care doubled the likelihood of having service coordination and informational support.

Mental Health Status: The mean Psychiatric Symptom Index (PSI) score for the total sample was quite high (21.25), compared with normative samples (10.5); 45 percent of the sample fell above the score of 20, the point indicating “high” symptoms. Other key findings included the following:

1. Respondents who had some or many functional limitations had more symptoms, compared with those who had no such limitations.

2. Respondents reporting a need to watch for sudden changes in their physical condition had more psychological symptoms in comparison with those who had no such need.

3. Respondents whose condition was likely to deteriorate reported more psychological symptoms, in comparison with those whose condition was likely to improve.

4. Respondents with more than one condition reported more psychological symptoms than those with only one condition, and respondents with hearing and speech problems reported more symptoms than those without such sensory impairments.

5. Respondents’ perceptions of the negative impact of their condition mediated the relationship between selected condition characteristics and psychological symptoms.

Developmental Tasks: Overall, 37 percent of the subjects were enrolled in some kind of educational program, and 48 percent were employed on either a part-time or full-time basis at the time of the survey. Considering these variables together, 17 percent were both in school and employed, 20 percent were in school and not employed, 30 percent were employed and not in school, 33 percent were neither in school nor employed, and 23 percent were “idle” according to our definition. Other key findings related to developmental tasks included the following:

1. Compared with a random sample of healthy youth in the same States, proportionately more youth in this study were in school, fewer were employed, and more were idle; differences were larger in the older age group.

2. Youth whose parents had more than a high school education were more than three times as likely to be in school, compared with youth whose parents had less than a high school education.

3. Parental education was associated with employment in a somewhat curvilinear fashion: Proportionately more youth with parents who had a high school education (56.2 percent) were employed, compared with the other two groups (38.8 percent and 41.3 percent); youth with parents who had a high school education were more than twice as likely to be employed, compared with youth whose parents had less than a high school education.

4. Youth who had a chronic condition in addition to mental retardation were more than twice as likely to be in school and significantly less likely to be employed, compared with youth who had a chronic condition and no additional disability.

5. Respondents who had a chronic condition and mental retardation were more than four times as likely to be idle as those who had a chronic condition alone; respondents who had a chronic con-
dition and a physical disability were more than three times as likely to be idle, compared with those who had a chronic condition alone.

6. Overall, when the effects of age, parental education, and disability status were considered simultaneously, rates of school enrollment were independently influenced by age, parental education, and disability status; rates of employment were independently influenced by parental education and disability status; and rates of idleness were independently influenced only by disability status.

The results of this study led to several recommendations for State CSHCN programs. First, the results suggest that State CSHCN programs will need to enhance access to someone who can help older adolescent participants with coordination of services and ensure that these youth receive both primary care and specialty services. Second, to help improve developmental outcomes for these youth, State programs will need to develop methods for identifying individuals with mental retardation and multiple disabilities; special efforts are needed to assure that these youth are given opportunities for employment as they move into adulthood. Finally, difficulties in recruiting a sample for this study underscore the lack of adequate tracking procedures in many State CSHCN programs. Better information systems are needed urgently. If such systems can be put in place, they may yield a data base that can be used for more comprehensive outcome studies.

The results also indicated that it may be possible to identify young adults at high risk for mental health problems, and support the importance of a careful exploration of the perceptions of limitations that youth believe have ensued from their disability. Such perceptions may result from “real” limitations (e.g., physical impediments or intransigent social attitudes) as well as from “imagined” limitations (such as the belief that a goal is not possible to obtain when it actually could be accomplished). Intervention with these young adults may require overlapping efforts to minimize real limitations in education, employment, and social opportunities as well as to change the meaning of the condition to the individual. Pediatricians, nurses, social workers, and psychologists working with adolescents who have chronic health conditions and disabilities can play key roles in ensuring that these obstacles do not prevent these youth from seizing educational and employment opportunities.

Publications

**Articles, Books, and Chapters**


Abstracts

None to date.

Presentations


Ireys H. 1993. Access to health services for graduates of State CSHCN programs. Presented at the Continuing Education Institute for Leadership in State CSHCN Programs, Columbus, OH.


Behavioral Intervention with IUGR Infants

Summary

Statement of the Problem

Intrauterine growth retardation (IUGR), or the failure to grow adequately in utero, affects the infant’s postnatal growth and development. Followup studies have shown physical growth (primarily height and weight) to be affected up to 15 years of age. Developmental problems include sensorimotor delays and language and cognitive deficits up to 13 years of age. However, a wide range of individual differences in both physical growth and development have been observed within this population. No mechanism has been postulated to explain these individual differences in developmental outcome among infants with IUGR.

The research team’s work and the work of others suggest that IUGR infants have behavioral characteristics that can affect their feeding capacities during the neonatal period. Some infants with IUGR are predominantly drowsy and lethargic and frequently display poor sucking, spitting up, choking, or gagging during feeding. These individual differences observed within the IUGR population might explain the slow postnatal growth displayed by some infants with IUGR.

Research Questions or Hypotheses

The present research was designed to study the impact and generalization of a parent/infant-based behavioral intervention during the neonatal period to prevent and/or ameliorate the negative conse-
quences of IUGR on the infant. The study was based on a theoretical model of development in which the impact of an early insult (IUGR) on the developing infant was partly a function of the characteristics of the caregiving environment (maternal behaviors). Moreover, interventions geared to the caregiving environment rather than to the infant alone are proven to have more long-lasting effects, especially if they are based on the individual behavioral characteristics of the infant. Therefore, the research team postulated that an intervention geared to the mother that was based on her infant’s behavior during feeding might alter her immediate responses to her infant’s behavior, increase her sensitivity and responsiveness to her infant, and ultimately enhance the infant’s developmental outcome.

The research team hypothesized that mothers and infants assigned to intervention would show more positive mother-infant interaction patterns than mothers of IUGR infants who received no intervention or mothers of infants without IUGR.

**Study Design and Methods**

The present study involved two sites (Providence, Rhode Island, and San Juan, Puerto Rico), with three groups at each site: (1) Infants with IUGR randomly assigned to an intervention group, (2) infants with IUGR randomly assigned to a control group, and (3) a comparison group of infants without IUGR. The intervention took place twice at birth (at the hospital prior to discharge) and at 2 and 4 weeks of age. The basis for the behavioral intervention with infants with IUGR was a body of research showing the effects of IUGR on neonatal behavior. In general, these characteristics can be summarized in the following dimensions: (1) State control and regulation, (2) motoric process, and (3) behaviors during feeding. The intervention consisted of two main components: (1) general information given to the mother about the importance of feeding and behavioral characteristics of neonates, especially related to newborns with IUGR, and (2) a review of videotape segments depicting both problems and positive aspects of the interaction. The impact of the intervention was assessed longitudinally from birth to 18 months of age with repeated measures of physical growth at birth, at 4 weeks, and at 4, 8, 12, and 18 months; repeated measures of caloric intake and mother-infant interaction at birth, and at 2, 4, and 16 weeks; maternal sensitivity at 8 months; and developmental outcomes at 12 and 18 months.

**Study Sample and/or Population**

The population studied consisted of full-term infants (37–42 weeks’ gestation) recruited at each site (Women & Infants’ Hospital in Providence and Hospital Universitario in San Juan) and stratified according to two factors: IUGR and intervention. Infants with congenital syndromes or infections were excluded, as were those whose mothers had a documented history of substance abuse. Approximately half of the infants at each site had IUGR, and approximately half were randomly assigned to intervention.

**Findings**

At the Providence site, mothers of infants with IUGR who received the intervention tended to stimulate their infants more often at 2 weeks and to insert the bottle, wipe the infant, and check the bottle more often at 4 weeks. No effects of the intervention were observed on the infants’ behavior. At the San Juan site, positive effects of the intervention were observed at 2 and 4 weeks on maternal vocalizations and on total positive maternal behavior. No effects of the intervention were observed on the infants’ behavior.

In the Providence sample, positive effects of the
intervention were observed in proportional change between birth and 1 month for most parameters of growth. Specifically, infants with IUGR who received the intervention had a higher proportional change in weight, skinfold thickness, and length than infants with IUGR who did not receive the intervention or infants without IUGR. In the San Juan sample, infants who received the intervention had greater proportional change in length between birth and 4 weeks than the other two groups. No other intervention effects were observed until 18 months: Infants who had received the intervention showed greater proportional change in weight between 12 and 18 months than infants with IUGR who did not receive intervention. No intervention effects were observed in any of the dimensions of the Home Observation for Measurement of the Environment (HOME) assessment, inclusive of verbal and emotional sensitivity at either site.

The final sets of analyses evaluated the impact of the intervention on the infants' developmental outcomes. No systematic effects of the intervention were observed at either site.

The study was designed to test the efficacy and generalizability of a perinatal behavioral intervention on the growth and developmental outcome of infants with IUGR. The impact of the intervention was significant, although limited to the areas of feeding interactions and physical growth. Specifically, the effects of the intervention were observed during feeding interactions on quantitative (but not qualitative) aspects of mother-infant interactions during feeding at both sites.

In terms of the effects of the intervention on subsequent physical growth, more general and consistent positive effects of the intervention were obtained (although short-lived) in Providence but not in San Juan. Thus, the findings obtained in the Providence site suggest that an individualized behavioral feeding intervention can accelerate early growth in full-term infants with IUGR.

However, several caveats need to be stated. First, this initial acceleration did not result in ultimate catchup growth over the 18-month duration of the study. One interpretation of these findings is that the intervention’s positive effects on growth are seen as long as the intervention was carried out (between birth and 1 month), but not after it was discontinued.

The second limitation of these findings is that the positive effects of the intervention were observed most consistently in one site but could not be replicated in the second. Differences in maternal characteristics might explain this differential because the mothers in Providence were older, more educated, and of higher socioeconomic backgrounds and might have incorporated the learning aspects of the intervention more readily. However, cultural differences might also play a role in the impact of the intervention. The malleability of developmental outcome (including growth) differs among different ethnic groups. Specifically, the issue of how much and through what mechanisms a caregiver can alter an infant’s behavior and, ultimately, the infant’s developmental outcome differs among cultures. Thus, the impact of any intervention has to consider the cultural constructions of development as a fundamental part of implementing any intervention that is geared to changing maternal behavior. The present study has only started to address these issues by trying to replicate the impact of an intervention across two cultural settings. But more in-depth assessments have to be conducted to fully comprehend the interactions between the implementation of an intervention and the day-to-day cultural context of mothers and their infants.

This study was proposed as a demonstration project of the utility of this kind of intervention with the IUGR population. If positive findings had been obtained, this study was expected to ultimately impact
anticipatory guidance and discharge planning for infants with IUGR, through which parents could be given guidelines on how to promote their infant's feeding behaviors, postnatal catchup growth, and sensorimotor and language development. Although the present findings do not support the formulation of such guidelines, they suggest that the impact of a long-term preventive intervention is a very important area of investigation. It is recommended that future studies evaluate the impact of interventions that go beyond the neonatal period or perhaps are more comprehensive.

Publications

Articles, Books, and Chapters


Abstracts

None to date.

Presentations


Summary

Statement of the Problem

Improved organization, delivery, and quality of prenatal nutrition services are needed within a framework of cost containment. Low-cost improvements in prenatal health services require a system in which professional and nonprofessional personnel can use a standardized procedure to classify pregnant women according to nutritional status and to refer those at nutritional risk for special nutritional services. Also required are efficient and effective mechanisms for providing essential nutrition services for pregnant women. Widespread use of an efficacious system has been impaired by the lack of a practical, tested method for classifying pregnant women according to nutrient intake. Scores from nutrition assessments can be combined with data from other indicators of nutritional risk to provide a sound basis for screening and referral.

While the long-range implementation of the Food Frequency Questionnaire (FFQ) in prenatal health services is to improve the scope and quality of nutrition services while containing costs, we anticipate that the FFQ will also be used to collect dietary data in wide-scale epidemiologic studies of associations between nutrition and outcomes of pregnancy.

Research Questions or Hypotheses

This research involved (1) developing and evaluating the FFQ for use in classifying low-income pregnant women according to nutritional risk; (2) test-
ing the practicality of administering the questionnaire by direct computer entry or by paper copy with computerized scoring; and (3) considering the methodological issues pertaining to the evaluation of the instrument.

In related studies, the research team evaluated the FFQ for stability and selected aspects of validity by determining how reproducibility and validity measures are associated with the method of administering the questionnaire and the characteristics of the women. In this report, the research team focused on comparing the paper copy and the computerized version of the FFQ.

Study Design and Methods

This project used a convenience sample in a non-experimental study design in three sites that provided prenatal care services to low-income women. The sites were selected by the relatively large numbers of pregnant women served and by ethnic diversity. Three sites participated in the study, two hospital-based prenatal clinics and one community health center. All three sites received Title V support for prenatal services. All pregnant women were eligible to participate unless they spoke neither English or Spanish.

The instruments used for the study were a semi-quantitative food frequency questionnaire designed specifically for use with low-income pregnant women. The validation study of the paper copy has been previously reported. The computerized version has the same food list in an easy-to-use format. Three keys (spacebar, enter, and backspace) allow the user to select responses, enter responses, and make corrections, respectively. In addition to using the spacebar to select the desired response, participants may use the up and down arrows. Color coding greatly facilitates the use of a standard keyboard. Participants contributed to the selection of the colors. The enter key was coded green, designating “go” or “OK,” the spacebar pink, and the backspace key yellow. An instructional sequence at the beginning of the program was designed to be understood by people with limited reading ability without supplementary oral instructions. The instructions focused on food intake, incorporated practice in the use of the three color-coded keys, and gave positive reinforcement by using the participant’s first name. Periodically, the user was given positive reinforcement with statements such as “You are doing well, Mary.” At the completion of the questionnaire, there was a message thanking the participant for using the program.

Study Sample and/or Population

The director of nutrition services at each site was the primary contact for the study. Each site volunteered to use the computerized version of the FFQ for as many subjects as they could recruit over a 3-month period. The computerized version (N = 306) was compared with the scores on the paper version (N = 265) collected on a similar sample in a prior study of tool validation.

In both samples, 60 percent of the women received medicaid assistance. Both samples were comparable in education and marital status. A higher proportion of the sample using the computerized version designated race as “other” because one site had a high proportion of Hispanic women. The two samples were comparable in the time during pregnancy at which they completed the FFQ.

Findings

Although the amount of time needed to complete the paper version was impossible to measure precisely in a clinic setting, it was estimated to be less than 16 minutes for most women. The time to com-
The computerized version was measured electronically; the median time was 13 minutes. For one site, the research team compared the amount of time needed to complete the English version (N = 83) and the Spanish version (N = 66) of the FFQ. The median time needed to complete the English version was 14 minutes, and the median time for the Spanish version was 17 minutes. The means were 14 ± 6 minutes and 18 ± 6 minutes, respectively, with a p value of 0.0001 based on Wilcoxon Rank Sums.

As reported in the validation study, a substantial percentage (18 percent) of the women completing the paper copy had estimated caloric intakes in excess of 4,500 Kcal per day. The research team found much less overestimation (less than 5 percent) when subjects used the computerized version. The overestimation was across many foods and therefore contributed to all of the nutrients. The women using the computerized version were less likely to select all the foods, suggesting that women may tend to respond to each food item separately when only that item is before them. Nineteen percent of the women using the computerized version responded that they had used alcohol in the last month, compared with 8 percent of women respondents who had used the paper version.

The estimated caloric intake mean for the total sample using the computerized version was 1,893 Kcal, compared to 2,386 Kcal for the total sample using the paper version (after removing the responses of those with a caloric intake > 4500 Kcal). The paper copy showed higher estimates of calories compared with either diet recalls or the computerized version. The computerized version approximated the series of diet recalls in the validation study. Of particular note is the overestimation of vitamin A on both versions of the FFQ. However, the computerized version was again closer to the estimates by diet recalls.

Further investigation of the feasibility of using self-administered, computerized questionnaires as a dietary data collection method in health care settings should be considered. The principal advantages of such an approach would be (1) the ability to collect and analyze rather detailed information and produce useful reports in a manner requiring minimal time and effort by the health care provider, and (2) the simplification of the data collection process for the client. Without an inordinate amount of time, no manual method can produce information comparable to that prepared automatically by the computer. A computer program can tabulate and summarize data on both food and nutrient intake and can make comparisons with whatever standards are selected. Once the programming is completed and staff have received the minimal training required to run the program, the potential for an efficient operation is great.

If the software is designed to be easy to read and use, it appears that low-income women who have basic reading skills can respond to the FFQ quickly and easily. Those who do not have adequate reading skills can be identified through the brief self-training portion of the program. In contrast, people who cannot read can easily mask this problem when asked to complete most paper FFQs.

In summary, there are serious limitations regarding the extent to which the paper version of the FFQ can be simplified and still provide useful information. Computerized versions of the questionnaire can circumvent this problem.

Publications

**Articles, Books, and Chapters**


**Abstracts**

None to date.

**Presentations**

None to date.