

Effect of an Educational Intervention About Breastfeeding on the Knowledge, Confidence, and Behaviors of Pediatric Resident Physicians

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ABSTRACT. *Objective.* Breastfeeding is the preferred nutrition for infants, but many pediatricians report inadequate training to advise mothers who breastfeed. This study was designed to examine the effect of an educational intervention on pediatric residents' knowledge about breastfeeding, their confidence in addressing lactation issues, and their management skills during clinical encounters with breastfeeding mothers.

Design. An interactive multimedia curricular intervention was designed for pediatric residents to increase their knowledge about common lactation issues. The residents completed questionnaires before and after the intervention to measure knowledge and confidence. Resident behaviors in the clinical setting were measured before and after the intervention using telephone surveys of breastfeeding mothers after a clinic visit with a pediatric resident.

Results. Forty-nine pediatric residents participated in the study. Mean knowledge scores increased from 69% before the intervention to 80% after the intervention. Significant increases in knowledge included advising mothers about low milk supply, mastitis, abscess, or using medication, and in recognizing the benefit of the decreased risk of maternal cancer. Management skills with breastfeeding mothers and infants in the clinical setting improved significantly. Before the intervention residents performed an acceptable number of behaviors 22% of the time, while after the intervention their performance was acceptable 65% of the time. Particular behaviors that showed significant improvement after the intervention included discussing signs of breastfeeding adequacy with the mother and correct management of lactation problems.

Conclusions. These results indicate that not only breastfeeding knowledge and confidence, but most importantly clinical behaviors of pediatric residents can be enhanced through innovative educational opportunities. Appropriate counseling for breastfeeding mothers by pediatricians might contribute to an increase in the duration of breastfeeding. *Pediatrics* 2002;110(5). URL: <http://www.pediatrics.org/cgi/content/full/110/5/e59>; breastfeeding, education, medical, internship and residency, lactation.

Breastfeeding is preferred for all infants, and exclusive breastfeeding of infants is recommended for the first 6 months after birth.¹ The benefits of breastfeeding to both infant and mother are well known and include superior nutritional content of human breast milk, enhanced immunologic status of the newborn, strengthening of the infant-mother dyad, delayed return of ovulation, and economic savings.² The Healthy People 2010 Objectives include goals of having 75% of mothers breastfeed their infants in the early postpartum period, and 50% continuing to breastfeed at least 6 months.³ Large-scale national surveys indicate increasing rates of initiation and continuation of breastfeeding, but current rates still fall significantly short of year 2010 goals, with lower rates seen in mothers who are black, young, less educated, in the lowest income group, and living in the Southern Atlantic states.⁴

A number of factors that influence a mother's choice to initiate and continue breastfeeding have been identified. Studies evaluating the physician's role in this decision-making process have found that although women place a high value on the advice of the health care provider, they typically receive minimal advice about breastfeeding from a physician, and view this advice as unhelpful or confusing.⁵⁻⁷ Freed et al^{8,9} surveyed pediatric residents and practitioners about breastfeeding practices. He found that residents recognize the importance of their role in promoting and supporting breastfeeding, but they have considerable knowledge deficits and report difficulty in advising mothers with lactation problems. The residents cited inadequate training, especially in preparing them for clinical encounters with breastfeeding women.⁸ Residents also indicated that most education about breastfeeding was presented via passive instruction, such as lecture, rather than by interactive techniques such as role play, demonstration, and videotape.⁹

This study examines the effect of an educational intervention on pediatric residents' knowledge and confidence about breastfeeding, and on their counseling behaviors during clinical encounters with breastfeeding mothers. We hypothesized that a series of interactive educational interventions about breastfeeding for pediatric residents would result in an increase in knowledge about breastfeeding and lactation problems and increased confidence when counseling breastfeeding women. More importantly, we postulated that breastfeeding mothers would report an increase in appropriate management and

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support for breastfeeding in their clinical encounters with pediatric residents.

METHODS

A 4-session educational intervention was designed to have an effect on the knowledge, confidence, and behaviors of pediatric residents about breastfeeding. Measurements were obtained before and after the educational intervention in 2 ways. Knowledge and confidence were assessed using a questionnaire administered to residents. Behaviors were evaluated by interviewing breastfeeding mothers after a clinic visit with a pediatric resident.

Subjects and Setting

Pediatric and Medicine-Pediatric Residents (hereafter referred to as "residents") in training with the University Health Systems of Eastern Carolina were eligible to participate. The residency programs are located in a small southern university city and provide primary care for residents of the city and the surrounding rural area. The majority of the population served is insured by Medicaid, or is underinsured or uninsured. Fifty residents were enrolled in the 2 residencies during the study period.

All residents who participated in outpatient clinics during the study period were eligible. In addition, residents who were present for both the preintervention and postintervention questionnaire, even if they participated in no clinics, were included for analysis of changes in knowledge and confidence. Residents were excluded from analysis if they neither took the preintervention knowledge test nor saw any breastfeeding infants in the outpatient clinics during the study period.

All residents participated in the surveys voluntarily; informed consent was waived because it was expected that the process of obtaining consent might modify behavior of the subjects independent of the study intervention. Data were analyzed collectively without individual identification of subjects. Approval for the study was granted by the University and Medical Center Institutional Review Board.

Educational Intervention

The intervention consisted of a 4-part educational series about breastfeeding, presented over 4 consecutive days. Attendance was recorded at each session. The educational sessions were internally developed by the authors using standard texts and review articles, with additional input from local lactation consultants and pediatrician colleagues.^{1,2,10-14} Residents were assigned standard review articles and other readings before and during the intervention to facilitate their participation in the activities.^{1,10-14} The series was structured as follows:

DAY 1 Lecture/group discussion: current statistics, recommendations about breastfeeding, benefits of breastfeeding, perceived barriers, physiology, and resources.

DAY 2 Role-playing exercise, group practice, and video: initiating breastfeeding, assessing position and latch-on, evaluating the adequacy of breastfeeding, and maternal medication use while breastfeeding.

DAY 3 Role playing exercise and demonstration: management of common lactation problems including cracked, bleeding, or sore nipples, maternal nutrition, maintenance of breastfeeding after return to school or work, and use of a breast pump.

DAY 4 Panel discussion: with breastfeeding mothers, focusing on lactation problems, sources of support, and identified needs.

Measures

Residents' knowledge and confidence about breastfeeding were assessed using a questionnaire, and their behaviors for counseling and support of breastfeeding mothers were assessed with telephone interviews of the mothers. The questionnaire was administered to all participating pediatric residents before the educational intervention, and a similar questionnaire was administered 4 weeks later. The questionnaire was a modification of a previously validated and reliable survey instrument used by Freed et al⁸ to assess knowledge and attitudes of pediatric residents about breastfeeding. The modified instrument contained 11 questions evaluating resident attitudes about their role in counseling breastfeeding mothers and feelings of competence in providing those services. Twenty-one knowledge questions evaluated

awareness of the benefits of breastfeeding and management of common lactation issues. Correct answers to knowledge questions were determined based on information provided in a standard breastfeeding text.² The questionnaire also solicited demographic information including resident gender, age, race, year of training, months of newborn nursery experience, and personal breastfeeding experience. The questionnaire administered after the intervention was identical to the one administered before the intervention, except that demographic information was omitted on the postintervention questionnaire, and questions about changes in confidence were added. To ensure clarity of interpretation, the questionnaire was piloted with a sample of practicing pediatricians.

To assess the impact of the intervention on resident behaviors when counseling breastfeeding mothers, post-visit telephone interviews of mothers were conducted before and after the intervention. Subjects for the interviews were breastfeeding mothers whose infants were evaluated by a pediatric resident at a well-child visit from birth to 1 month of age in the pediatric outpatient center. Excluded were breastfeeding mothers whose infants presented for acute care, mothers who did not accompany their infants during the visit, and mothers without phones. Breastfeeding mothers who brought their infants to the clinic more than once during the study period were contacted only once. Mothers were contacted within 5 working days of the clinic visit. Two investigators performed the telephone interviews using a script; Spanish language interpreters interviewed Hispanic mothers who did not speak or understand English well. Consent was obtained from the mother for the telephone interview and for review of the infant's medical record.

The telephone interview contained questions to determine whether the resident had performed each of 9 behaviors identified as important (Table 1). Interviews were scored from 0 to 9 based on the number of behaviors addressed. A minimum acceptable performance was defined as demonstrating at least 6 of the 9 behaviors. The phone interview also contained questions to determine whether the mother was confused by anything the resident said about breastfeeding, whether the discussion was helpful, and her degree of satisfaction on a 5-point Likert scale.

Analysis

Data were analyzed using SPSS (Chicago, IL). Knowledge questions from the questionnaires were assessed as being answered correctly or incorrectly. The frequency of correct responses to individual questions on the preintervention and postintervention questionnaire was compared using χ^2 (or Fisher exact test when expected frequencies were small). A composite knowledge score, representing the percent correct of 21 knowledge questions, was calculated; preintervention and postintervention composite knowledge scores for each individual were compared using the paired *t* test. Each of the 9 desired behaviors was assessed as being present or absent on the preintervention and postintervention telephone surveys. The frequency of each behavior performed by the preintervention group was compared with that of the postintervention group using χ^2 (or Fisher exact test when expected frequencies were small). All statistical tests were 2-tailed. Statistical significance was defined as $P < .05$.

Sample size calculations were performed before study initiation. Calculation to determine the necessary number of resident participants used estimations of knowledge from previous studies of pediatric residents, which suggested a baseline knowledge about breastfeeding of 60 percentage points.^{8,9,15} To detect an improvement in knowledge score of 20 percentage points with an estimated standard deviation of 20 points, a 2-tailed α error of 0.05 and a power of 0.80, sample size was calculated at a minimum of 16 resident participants. The number of phone interviews needed was based on a "best guess" estimation from previous observation and chart review looking for desired behaviors performed by residents. Estimating that 10% of residents preintervention would perform an acceptable number of desired behaviors and 50% of residents postintervention would perform an acceptable number of desired behaviors, and using a 2-tailed α of 0.05 and power of 0.80, a minimum of 19 phone interviews was needed before and after the intervention.

RESULTS

Fifty residents participated in clinics and were present at the study institution during at least part of

TABLE 1. Behaviors Assessed by Telephone Interview, and Sample Questions Used to Identify Each

Behavior	Sample Questions
1. Assess amount, adequacy of feeding*	Did the doctor ask how many times a day your baby feeds? . . . ask about wet diapers? . . . check your baby's weight?
2. Reassure the mother about adequacy of feeding*†	Have you been worried that your baby isn't getting enough milk? Did the doctor tell you signs that your baby is getting enough? What did (s)he tell you?
3. Identify problems, if they exist	Did the doctor ask if you were having problems? Do you have sore nipples? trouble with latch-on? a jaundiced baby? Did the doctor talk to you about it?
4. Manage problems appropriately, if they exist and are identified†	What did the doctor tell you to do about jaundice? . . . sore nipples? . . . trouble with latch-on?
5. Give advice about maternal nutrition†	Did the doctor talk to you about what you should eat or drink while breastfeeding? What did (s)he tell you?
6. Discuss maternal use of medication†	Did the doctor talk to you about taking medicines while you are breastfeeding? What did (s)he tell you?
7. Discuss feasibility of breastfeeding after return to work/school	Are you planning to go back to work or school? Did the doctor talk to you about continuing breastfeeding when you do?
8. Encourage exclusive breastfeeding	Did the doctor tell you not to give your baby other food or drink besides breast milk?
9. Encourage continued breastfeeding	Did the doctor tell you to continue breastfeeding? Did the doctor tell you breastfeeding is good for your baby?

* For behaviors that could be performed in >1 way, residents were given credit for performing the behavior if they addressed it in at least 1 accepted way.

† For questions involving delivery of advice, residents were given credit if the advice they gave was correct, based on standard breastfeeding texts and resources.

the study. One resident was excluded because she was absent for the preintervention test, and saw no breastfeeding infants in the clinics during the study period. Forty-nine residents were included for evaluation. Characteristics of the participating residents are included in Table 2. Forty-eight residents completed both the preintervention and postintervention questionnaires. One additional resident, who did not complete the preintervention and postintervention questionnaires but who saw breastfeeding infants in

the clinic, was included in the behaviors analysis only. For the behaviors analysis, 27 residents had clinical visits with 40 different breastfeeding mother/infant pairs; 8 residents were evaluated on >1 occasion. Thirty-six residents attended 1 or more of the 4 sessions of the educational intervention.

The mean composite knowledge score was 69% preintervention, and 80% postintervention; the mean % difference was 11% with a standard deviation of 8.95 ($t = 8.7$; $df: 47$; $P < .001$). Pediatric residents demonstrated increased knowledge both about the benefits of breastfeeding and about the management of common lactation problems (Table 3). Residents were already aware of many of the benefits of breastfeeding before the intervention; however, they demonstrated increased awareness of the relative protection breastfeeding may offer against otitis media ($P = .045$) and against some forms of cancer in mothers ($P < .001$). Residents showed significant knowledge increases in advising mothers concerned about low milk supply ($P = .049$), mothers with infections including mastitis ($P = .002$) or abscess ($P = .044$), and mothers taking medications ($P < .001$).

Ninety-two percent of residents agreed that breastfeeding promotion is an important use of their time, and 84% agreed that breastfeeding is the most beneficial form of infant nutrition. Before the intervention, only 48% believed they had adequate training about breastfeeding, and 53% reported low levels of confidence in meeting the needs of breastfeeding mothers. Residents reported increased confidence as a result of attending breastfeeding education sessions. Of 36 residents who attended at least 1 session

TABLE 2. Characteristics of Pediatric Resident Study Participants ($N = 49$)

Characteristic	<i>n</i>
Gender	
Male	20
Female	29
Age	
<30 y	32
30–35 y	17
Race	
African American	7
Asian	4
Caucasian	38
Residency	
Pediatrics	30
Medicine/Pediatrics	19
Year in training	
1st	13
2nd	15
3rd	17
4th	4
Newborn nursery rotation(s) completed	
0 mo	5
1 mo	35
2 mo	9
Has breastfed, or spouse has breastfed	8

TABLE 3 Pediatric Residents' Knowledge of Breastfeeding Benefits and Treatment for Common Problems (Percentage Providing Correct Information)

	Before Intervention (N = 48) n (%)	After Intervention (N = 48) n (%)	P
Benefit			
Overall superior to formula	40 (83)	41 (85)	NS
Decreased otitis media	40 (83)	46 (96)	.045
Decreased early allergic disease	44 (92)	44 (92)	NS
Decreased gastroenteritis	32 (67)	40 (83)	NS
Increased immune function	47 (98)	47 (98)	NS
Decreased infant obesity	17 (35)	24 (50)	NS
Decreased maternal cancer	20 (42)	39 (81)	<.001
Problem			
Maternal concern of low milk supply	28 (58)	37 (77)	.049
Breastfeeding jaundice	35 (73)	38 (79)	NS
Sore nipples	43 (90)	46 (96)	NS
Mastitis	25 (52)	39 (81)	.002
Breast abscess	6 (13)	14 (29)	.044
Mother with HIV	45 (94)	46 (96)	NS
Mother with chronic hepatitis B	2 (4)	6 (13)	NS
Infant teething	44 (92)	44 (92)	NS
Infant with loose stools	46 (96)	48 (100)	NS
Mother taking over-the-counter medicine	27 (56)	43 (90)	<.001
Mother using cocaine	41 (85)	46 (96)	NS
Use of early supplements	18 (38)	24 (50)	NS

NS indicates not significant.

and completed the postintervention questionnaire, 14 reported "a little increase" in overall confidence in talking to breastfeeding mothers, and 20 reported that their "confidence increased a lot." Residents reported increased confidence in their abilities to manage common clinical lactation situations after the intervention sessions. In some cases, increase in confidence was related to session participation. For example, 32 residents reported they were "not at all confident" in discussing use of a breast pump before the intervention. Fourteen reported the same lack of confidence after the intervention, but 13 of the 14 did not attend the session, which included demonstration and hands-on practice with pumps.

Interviews of breastfeeding mothers after clinical encounters with residents showed substantial increases in active counseling behaviors after the inter-

vention compared with preintervention interviews of mothers. Although improvement was noted for each measured behavior, statistical significance was achieved only for discussing signs of breastfeeding adequacy with mothers ($P = .012$) and for managing lactation problems correctly ($P = .004$; Fig 1). Before the intervention residents performed at or above the acceptable threshold (demonstrating 6 of 9 behaviors) in 22% of encounters. After the intervention residents performed at or above the threshold for 65% of encounters ($P = .006$; Fig 2). Performance of acceptable behaviors was higher postintervention even if no educational sessions were attended (22% before and 40% after), with incremental performance improvement noted with increasing attendance (Fig 3). No change was noted in reported satisfaction of breastfeeding mothers being seen by residents: 91%

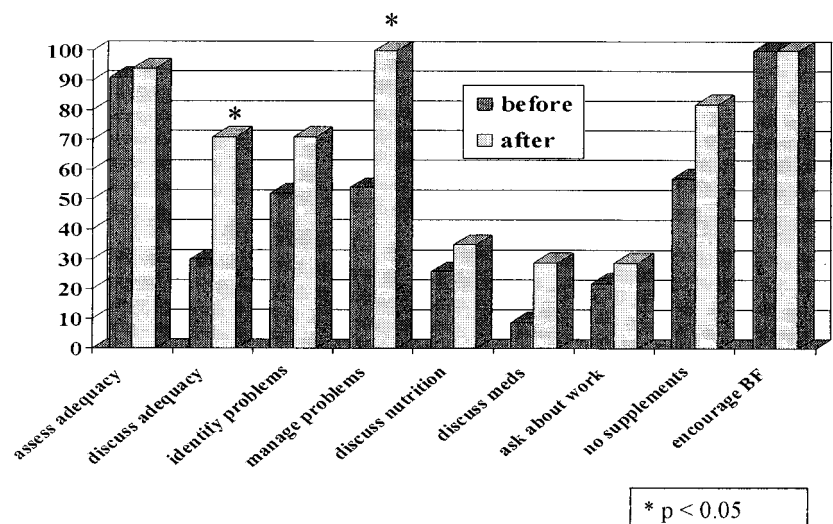


Fig 1. Change in resident behaviors: percentage of residents demonstrating each behavior before and after the educational intervention.

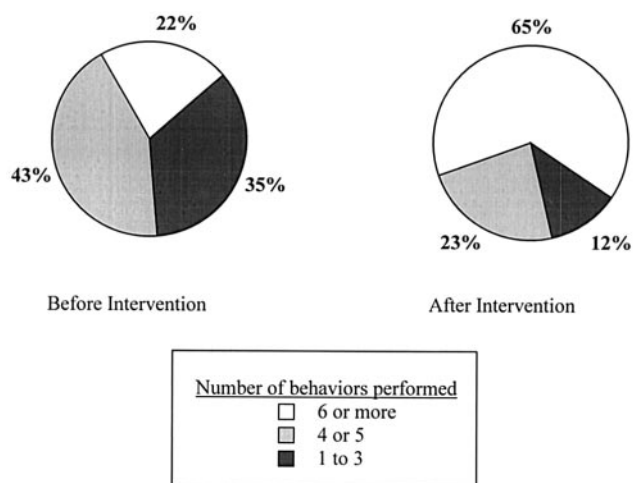


Fig 2. Performance of desirable behaviors, before and after educational intervention.

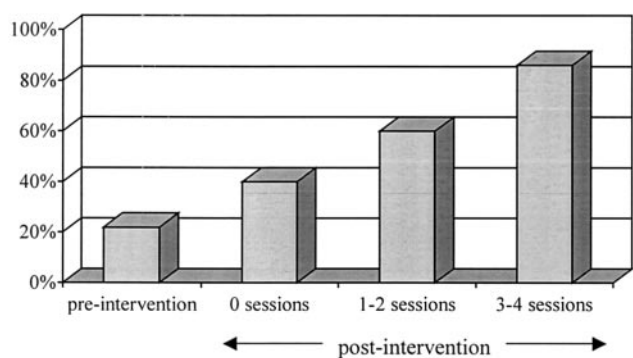


Fig 3. Percentage of residents with "acceptable performance" of desired behaviors (at least 6 of 9) compared with number of sessions attended.

reported being "satisfied" or "very satisfied" in both the preintervention and postintervention groups.

DISCUSSION

In this study, we confirmed that an interactive educational intervention about breastfeeding results in improved knowledge and confidence of pediatric residents. In addition, and of more obvious benefit to patients, we demonstrated that appropriate counseling behaviors with breastfeeding mothers in the clinical setting increase after the intervention.

Most health care practitioners have positive views about breastfeeding but report inadequate knowledge and desire additional training about lactation management.¹⁵⁻¹⁸ Studies have suggested that small, interactive workshops can increase the knowledge of general practitioners about breastfeeding.¹⁹⁻²¹ In this study, resident knowledge about the benefits of breastfeeding showed a modest increase following the intervention. In many cases, residents were already aware of the well-established benefits, particularly those associated with overall immune function, protection against otitis media, and early allergic disease (Table 3). Fewer residents were familiar with the protective effects of breastfeeding against infant obesity or maternal cancer. After the intervention residents demonstrated an increased

recognition of protection against some forms of maternal cancer, but few recognized the relative protection against obesity. One explanation for this is that breastfed infants typically grow more rapidly in weight during the first several months but less rapidly during months 3 to 12, ultimately becoming leaner than their bottle-fed counterparts.² In the population served by the study residents, breastfeeding beyond 2 months of age is rare, and residents are likely to observe the early rapid weight gain associated with breastfeeding without the subsequent slowing of weight gain, leading to a misperception that breastfed infants may be at more risk for obesity than bottle-fed infants.

Physicians surveyed in other studies have often responded to concerns about inadequate milk supply by recommending interruption of breastfeeding or early supplementation.²² In addressing clinical management questions before the intervention, residents in this study often incorrectly chose to interrupt breastfeeding. Of concern, many residents both before and after the intervention disagreed with the statement that early supplementation is a cause of breastfeeding failure, although previous studies have clearly demonstrated this relationship.^{22,23} This misconception will need to be corrected to maximize success and prolong duration of breastfeeding.

The measured increase in confidence among residents after the intervention is of uncertain meaning. Although it might be inferred that confidence in addressing the needs of breastfeeding mothers translates into better clinical management of breastfeeding issues, the number of residents in this study was too small to correlate the performance of individual residents in the clinical setting with their reported confidence level. Other studies have reported a lack of correlation between confidence and knowledge or between confidence and clinical practices regarding breastfeeding.^{15,18}

With respect to changes in the performance of behaviors when counseling breastfeeding mothers, the most significant improvements were noted in discussing signs of breastfeeding adequacy with the mother and in managing lactation problems (Fig 1). The increased number of residents providing reassurance of adequacy is particularly important, because many mothers express concerns about low milk supply and consider early supplementation. Inability to reassure a breastfeeding mother about the adequacy of her milk supply may lead to supplementation and failure of breastfeeding. It is reasonable to expect that reassurance from a physician about the adequacy of breastfeeding early in lactation and a discussion of signs of adequacy observable by the mother might result in longer duration of breastfeeding for some infants.

Although resident performance improved for each of the 9 behaviors assessed, 3 behaviors were performed by less than half the residents even after the intervention (Fig 1). These 3—discussion of appropriate nutrition while breastfeeding, advice about use of medications while breastfeeding, and questions about plans to return to work—may indicate areas for additional emphasis and education. In par-

ticular, many mothers quit breastfeeding on return to work, so addressing this issue early may be an important step toward prolonging breastfeeding.

A surprising finding was an observed increase in the performance of desired behaviors from 22% to 40% among residents who attended none of the educational sessions. The improved performance may have stemmed from assigned readings given to all residents, or from heightened awareness and discussions about breastfeeding among resident colleagues who had attended sessions. Residents may also have responded to a perception that with a week of lecture sessions devoted to breastfeeding education, it must be an issue of importance for their training, or at least was important to the faculty. The finding might also represent regression to the mean. A larger study, with randomization to intervention and control groups might help define whether changes were attributable to the intervention, to differences at baseline, or to other influences.

When questioned about their degree of satisfaction with the resident's counseling about breastfeeding, mothers reported satisfaction before and after the intervention at equal rates. In most cases mothers reported being "satisfied" or "very satisfied" even if the interview revealed that the resident had addressed few important behaviors, been unable to answer their questions, or provided incorrect advice. Mothers' reports of satisfaction may have been influenced by the perception of the increased attention they were receiving, created by a follow-up telephone call. Reported satisfaction level—clearly a multifactorial issue—is not likely to be helpful in determining which interventions are useful to promote and support breastfeeding.

The strength of the study was limited by the small number of breastfeeding mothers available to be seen by residents. The number of visits was not adequate to allow for paired preintervention and postintervention comparisons of individual residents when seeing breastfed infants and their mothers. Some residents were evaluated on >1 occasion during each phase of the study period; each resident/mother encounter was considered independently for purposes of analysis. Future studies with larger numbers of breastfeeding mothers could allow for paired comparisons before and after an intervention, as well as analysis of the impact of independent variables like gender, year of training, age, or previous breastfeeding experience.

Additional limitations relate to the use of telephone surveys. Study investigators, who were aware of the status of the educational intervention collected information about resident behaviors by performing telephone interviews with breastfeeding mothers. Bias was minimized by the use of a scripted interview, which was closely followed by both investigators. In addition, many of the interviews were conducted directly from the script by Spanish language interpreters who were unaware of the nature or status of the study; their results were not different from those of the investigators. Post-visit surveys rely on maternal recall of what was said or done by the resident during the clinic visit; even within a few

days of the visit, this may not have accurately reflected the actual performance of the resident. This recall bias should be similar for mothers interviewed before and after the intervention. Assessment of what the mother remembered or perceived to have happened may be more likely to affect her behavior than what actually happened but was not recalled. Alternative techniques to gather similar information without reliance on recall might include videotaped visits, in-room observers, or simulated patient encounters.²¹

In this study we demonstrated that interactive educational opportunities increased knowledge and confidence and improved behaviors. A more important question is whether these changes will have an impact on the health of mothers and infants. Will mothers whose physicians are knowledgeable, confident, and capable in managing breastfeeding issues have fewer problems, breastfeed longer, or have healthier infants? Additional studies should evaluate whether increased competence in caring for breastfeeding mothers and infants correlates with longer duration of breastfeeding or fewer reported problems. Studies should also be done to measure the durability of these changes as the time from an educational intervention increases.

CONCLUSION

The value of breastfeeding has been clearly documented. Pediatricians, in their traditional role as advocate for the child and family, are ideally situated to positively influence the breastfeeding experiences of the mother and young infant. In this role, it is essential that they have adequate knowledge and ability to counsel the breastfeeding mother. At least in the short term, innovative and interactive educational experiences can enhance resident knowledge, confidence, and behaviors, with the possibility for a positive change in the duration of breastfeeding among their patients.

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