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breastfeeding, educational intervention, resident education/training

ABBREVIATIONS
AAP—American Academy of Pediatrics
PP—practice pattern
OR—odds ratio

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WHAT'S KNOWN ON THIS SUBJECT: Despite a rise in overall breastfeeding, lack of physician support has continued to undermine the practice of exclusive breastfeeding. Inadequacies exist in breastfeeding education during residency, and study results have suggested that support of breastfeeding is decreasing among practicing pediatricians.

WHAT THIS STUDY ADDS: The authors used an AAP curriculum to train a multispecialty group of primary care residents. This training on breastfeeding improved knowledge, confidence, and practice patterns related to breastfeeding care among residents and resulted in increased breastfeeding rates in their patients.

abstract

OBJECTIVES: Multiple studies have revealed inadequacies in breastfeeding education during residency, and results of recent studies have confirmed that attitudes of practicing pediatricians toward breastfeeding are deteriorating. In this we study evaluated whether a residency curriculum improved physician knowledge, practice patterns, and confidence in providing breastfeeding care and whether implementation of this curriculum was associated with increased breastfeeding rates in patients.

SUBJECTS AND METHODS: A prospective cohort of 417 residents was enrolled in a controlled trial of a novel curriculum developed by the American Academy of Pediatrics in conjunction with experts from the American College of Obstetricians and Gynecologists, American Academy of Family Physicians, and Association of Pediatric Program Directors. Six intervention residency programs implemented the curriculum, whereas 7 control programs did not. Residents completed pretests and posttests before and after implementation. Breastfeeding rates were derived from randomly selected medical charts in hospitals and clinics at which residents trained.

RESULTS: Trained residents were more likely to show improvements in knowledge (odds ratio [OR]: 2.8 [95% confidence interval (CI): 1.5–5.0]), practice patterns related to breastfeeding (OR: 2.2 [95% CI: 1.3–3.7]), and confidence (OR: 2.4 [95% CI: 1.4–4.1]) than residents at control sites. Infants at the institutions in which the curriculum was implemented were more likely to breastfeed exclusively 6 months after intervention (OR: 4.1 [95% CI: 1.8–9.7]).

CONCLUSIONS: A targeted breastfeeding curriculum for residents in pediatrics, family medicine, and obstetrics and gynecology improves knowledge, practice patterns, and confidence in breastfeeding management in residents and increases exclusive breastfeeding in their patients. Implementation of this curriculum may similarly benefit other institutions. *Pediatrics* 2010;126:289–297

Increasing the rate of breastfeeding has been a public health priority in the United States for more than a century.[1] Multiple strategies have been studied, including prenatal promotion, improvement of hospital policies, public health awareness campaigns, peer support, and work-site improvements.[2] Physician promotion and support of breastfeeding is less well studied. In 1974, when breastfeeding rates were recovering from an all-time low, only 30% of physicians routinely encouraged breastfeeding, and only 52% said that they would encourage breastfeeding if the mother was already interested.[3] Attitudes about breastfeeding had improved 20 years later, with 90% of physicians indicating that they encouraged breastfeeding but only 50% saying that they felt confident in their ability to counsel breastfeeding patients.[4] Practicing physicians and residents have reported inadequacies in the training and preparation they received to help them advise breastfeeding mothers.[4,5] In 1999, results of the American Academy of Pediatrics (AAP) Periodic Survey indicated a lack of knowledge, confidence, and positive attitudes toward breastfeeding counseling in a random sample of pediatricians that included US pediatric residents and fellows.[6] Most respondents in that survey reported that breastfeeding and formula feeding were equally acceptable. In a follow-up 2004 survey, more pediatricians recommended exclusive breastfeeding but were up to 5 times more likely than pediatricians in 1995 to recommend termination of breastfeeding for inappropriate reasons.[7] The results of these studies demonstrated a need to improve breastfeeding knowledge and attitudes among practicing physicians and to develop more effective faculty, mentors, and role models for physicians in training. However, many primary care physicians, who have an influential role in mothers' decisions to breastfeed, lack the necessary clinical skills to provide lactation management.[4,5,8–10] Furthermore, if physicians have poor attitudes and absent skills, they are more likely to discourage continued breastfeeding.[10]

In October 2000, the US Department of Health and Human Services Office on Women's Health released the *HHS Blueprint for Action on Breastfeeding*,[1] which documented a comprehensive national policy in which breastfeeding was identified as the ideal method of feeding and nurturing infants and declared a national health priority. The authors advocated changes in the health care system that included providing professional maternal and child health care providers with culturally appropriate clinical and in-service training and continuing education on the basics of lactation, breastfeeding counseling, and lactation management.

To address this issue, the AAP, with funding from the Health Resources and Services Administration's Maternal and Child Health Bureau, partnered with organizations such as the American College of Obstetricians and Gynecologists, American Academy of Family Physicians, and Association of Pediatric Program Directors to develop a model residency breastfeeding curriculum. In this we study evaluated the impact of that curriculum on breastfeeding knowledge, practice patterns (PPs), and confidence among participating residents, as well as the impact of implementing the curriculum on the institution's breastfeeding rates.

Our primary hypothesis was that residents would improve their breastfeeding knowledge, skills, and PPs as a result of curriculum implementation. Our secondary hypothesis was that breastfeeding rates at the institutions implementing the curriculum would increase.

METHODS

Development of Curriculum

The AAP Breastfeeding Residency Curriculum was developed by a project advisory committee that included expert representation from the AAP, American College of Obstetricians and Gynecologists, American Academy of Family Physicians, Association of Pediatric Program Directors, and other professional organizations. Two previously studied models, a field-trip design and the second edition of the Wellstart Lactation Management Self-study Modules[11,12] were incorporated into the new curriculum that also included a comprehensive resource and reference list. The curriculum contained 7 major sections: advocacy, community outreach and coordination of care, anatomy and physiology, basic skills, peripartum support, ambulatory management, and cultural competency. For each category, goals, learner objectives, suggested activities, clinical correlations, and evaluation strategies were specified. The authors structured the curriculum according to the Accreditation Council of Graduate Medical Education Core Competencies (www.acgme.org/outcome/comp/compMin.asp) to allow for flexibility during implementation. The full curriculum and related materials are available online (www.aap.org/breastfeeding/curriculum) for general use.

Selection of Pilot Intervention Sites and Control Sites

In 2006, the AAP sent a request for applications to directors of residency programs in pediatrics, obstetrics, and family medicine, and 69 of those directors responded. The AAP selection committee chose applications from programs reported to have low or unknown breastfeeding rates, and enrollment included at least 20 ethnically diverse pediatrics, family medicine, obstetrics and gynecology resi-

dency programs. Additional site-selection criteria included sites that serve a diverse patient population, represent different geographical regions, lack a local Baby-Friendly Hospital Initiative certification, and have the ability to administer pretests and posttests and to collect breastfeeding data. Seven sites were selected for curriculum intervention, and 7 matched sites were selected as controls.

At each intervention site, personnel were expected to (1) implement the curriculum within 1 year with a participation level of at least 20 residents representing all 3 disciplines, (2) attend a preimplementation training meeting and a follow-up evaluation meeting, (3) host a site visit with a day of activities and lectures with a visiting professor for residents and other hospital staff, (4) administer an online pretest and posttest to all participating residents, and (5) collect data on breastfeeding rates at the initiation of the program and 6 months later. Each control site was expected to perform the data collection in items 4 and 5 and, at the completion of the study, was granted full access to the curriculum, which included site visits with visiting professors.

Resident Subjects and Procedures

The project was approved by the institutional review boards of the AAP, the institution of the overall project director, and at each intervention and control site. Residents who agreed to participate provided signed consent and were assigned an identifier that maintained subject blinding to investigators. Enrolled residents completed secure online pretests before implementation, which began in July 2006, and posttests after completion of the curriculum.

Curriculum Implementation

Two faculty members from each implementation site participated in a 2-day curriculum-training program at the AAP, during which each developed a site-specific curriculum-implementation plan. Implementation of the curriculum took place after completion of resident pretests and collection of baseline breastfeeding data.

In all programs, resident training began with self-study materials on anatomy and physiology and basic skills. Residents then met with faculty who led discussion questions, didactic lectures, and skills workshops. Residents learned peripartum breastfeeding support during the newborn-nursery rotation. During this time, the residents were required to assist 3 new mothers with breastfeeding, with at least 1 encounter (live or role-play) being observed and scored by faculty. Sites generally fulfilled the requirement for community outreach and coordination of care by arranging a field trip to or presentation from local breastfeeding support groups. The faculty taught advocacy of breastfeeding to residents by reviewing the World Health Organization/United Nations Children's Fund *Ten Steps to Successful Breastfeeding*[13] and comparing this information with their hospital's current policy. Residents learned about ambulatory management through discussion of clinical case scenarios in a small-group setting and with hands-on practice during continuity clinic. Cultural competency cases were also discussed.

Collection and Analysis of Resident Knowledge, Confidence, and PPs

The AAP assisted sites in collecting data regarding resident knowledge, confidence, and PPs by posting the pretests and posttests on Survey Monkey (www.surveymonkey.com). The pretests and posttests can be viewed at http://aap.org/breastfeeding/curriculum. The tests were adapted from the Academy of Breastfeeding Medicine "What Every Physician Needs to Know About Breastfeeding" course and the American Academy of Pediatrics Periodic Survey.[7,14]

Three scales were used to measure the impact of curriculum completion. Knowledge was measured by 25 items in the pretest and 26 items in the posttest with "right-or-wrong" answers. Perceived confidence was measured by using questions from 2 domains: adequately addressing parental questions and competently managing common breastfeeding problems. An ordinal scale was used to determine residents' confidence. PPs were summarized as a composite on the basis of 3 specific practices: (1) assessment of a mother breastfeeding; (2) counseling a mother about infant feeding choices; and (3) teaching a mother breastfeeding techniques. Residents reported each PP by using a scale from never to 5 times or more. Composite scores were calculated as the mean response overall for the 3 PP items. There were additional PP items that addressed cultural competency: (1) asking about cultural beliefs and practices before counseling about breastfeeding; (2) asking about cultural beliefs and practices regarding colostrum; (3) asking for assistance by another staff member (chaperone) when observing breastfeeding; and (4) using the assistance of a bilingual staff member or certified interpreter for a mother who had low English proficiency. PP scores were analyzed with and without the inclusion of items that assessed cultural competency.

Median group differences in demographic variables were tested for significance by using the Mann-Whitney *U* test. Mean scaled scores within groups were tested for significance by using a paired *t* test. Mean differences between groups were tested by an independent-samples *t* test with homogeneity of variance correction as indicated by Levene-test results. Improve-

ments (binary) in scale scores between groups were summarized as odds ratios (ORs) and tested for significance by using 2-tailed log-likelihood χ^2.

Sample-Size Determination

On the basis of available resources, we determined that the study could include up to 14 sites. A minimum of 20 residents were chosen at each site to provide 80% power to detect an OR of 2.0 between groups on any increase in any of the 3 scales analyzed by using a 2-tailed log-likelihood χ^2 test at $\alpha = .05$ and allowing for an increase in up to 33% among control-group residents.

Breastfeeding Rates

Each site collected rates of breastfeeding at study initiation and 6 months later by randomly selecting 100 medical records at specific intervals. Each site determined its baseline breastfeeding rates by selecting newborn and residency continuity-clinic medical records for a 3-month interval (July through September 2006). Sites derived their postintervention rates from charts that were dated after completion of the curriculum and after residents completed their posttests. Breastfeeding-initiation data were collected May through July 2007, and 6-month breastfeeding data were collected December 2007 through January 2008. Site coordinators were instructed to record feeding in 1 of 3 categories: exclusive breastfeeding, nonexclusive breastfeeding (breastfeeding plus feeding of formula or other foods and/or fluids), and exclusive formula feeding. Sites were asked to define "exclusive breastfeeding" as an infant's consumption of human milk with no supplementation of any type (water, juice, nonhuman milk, or foods) except for vitamins, minerals, and medications. "Overall breastfeeding" was defined for the purpose of analysis as the sum of nonexclusive breastfeeding and exclusive breastfeeding. Breastfeeding rates between intervention and control groups were compared in the preintervention and postintervention periods by using Pearson's χ^2 or Fischer's exact test depending on expected values. The odds of increased breastfeeding rates at birth and 6 months (overall and exclusive) were calculated by using the percentage of exclusive or overall breastfeeding at each point in time and tested for significance as a ratio. A sample of 450 charts in all sites combined provided 82% power to detect an OR of 1.5 between the exclusive breastfeeding rates before and after the intervention by using a 2-tailed log-likelihood χ^2 test at $\alpha = .05$, allowing for baseline preintervention rates up to 25%.

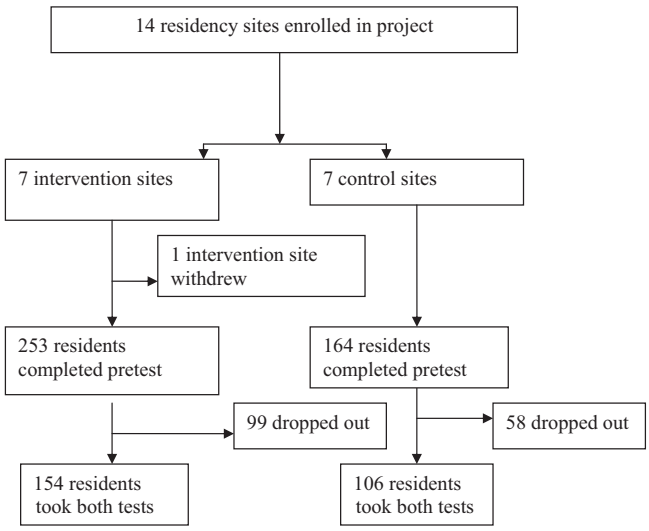

FIGURE 1
Study algorithm.

RESULTS

A total of 417 residents were enrolled from 13 sites (6 interventions and 7 controls) (Fig 1). One intervention site was unable to obtain institutional review board approval. Resident characteristics are listed in Table 1. There were 157 residents who completed pretests but did not complete posttests (noncompleters), which resulted in 260 residents who completed both pretests and posttests (completers). Completers and noncompleters were similar except for a higher rate of exclusive breastfeeding among completers. This difference was not observed in comparisons between intervention and control residents in the completers group.

Resident Knowledge, Confidence, and PPs

Residents at the intervention sites improved significantly in knowledge, PPs, and confidence (Table 2). Residents who completed the curriculum were more than twice as likely to improve their knowledge, PP (adjusted), and confidence compared with residents at control sites (Table 3).

Baseline scores were analyzed for residents according to completion status. Baseline confidence and PP between completers and noncompleters were similar. Residents who completed the study (intervention and control groups) had more knowledge on their pretest than noncompleters ($P < .01$). Completers in the intervention group scored 64.8%, and completers in the control group scored 68.3%; noncompleters in the intervention group scored 60.1%, and noncompleters in the control group scored 61.3%.

TABLE 1 Resident Demographics: Completers Versus Noncompleters and Intervention Versus Control Sites

	Completer	Noncompleter	*P*	Completers Only		
				Intervention	Control	*P*
Age, *n* (median, y)	254 (30)	150 (30)	.24	148 (30)	106 (30)	.590
Race	256	153		150	106	
Asian, %	29.6	22.2	.11	30.7	28.3	.78
Black, %	6.3	7.8	.69	8.0	3.8	.20
Hispanic, %	8.6	7.9	.85	5.3	13.2	.04
Native Hawaiian, %	0.8	0.6	.99	0.7	0.9	.99
American Indian, %	0.4	0.0	.99	0.0	0.9	
White, %	54.3	61.4	.31	52.8	55.3	.70
Gender	256	154		150	106	
Female, %	70.3	77.3		70.7	69.8	
Male, %	29.7	22.7	.13	29.3	30.2	.88
Other demographics						
Speaks other language, *n* (%)	256 (66.4)	153 (61.4)	.31	150 (73.3)	106 (56.6)	.01
Have children, *n* (%)	257 (25.3)	154 (26.6)	.77	150 (27.3)	107 (22.4)	.39
Any breastfeeding, exclusive and combined, *n* (%)	65 (92.3)	41 (80.5)	.07	41 (92.7)	24 (91.7)	.99
Exclusive breastfeeding, all, *n* (%)[a]	65 (86.2)	41 (65.9)	.01	41 (82.9)	24 (91.7)	.47
Exclusive breastfeeding, 6 mo, *n* (%)[b]	65 (46.2)	41 (39)	.47	41 (43.9)	24 (50.0)	.80
Exclusive formula feeding, *n* (%)	65 (7.6)	41 (14)	.33	41 (7.3)	24 (8.3)	.99

[a] Exclusive breastfeeding (human milk without other food or fluids) for any amount of time by resident or spouse.

[b] Exclusive breastfeeding of all children for at least 6 months by resident or spouse.

TABLE 2 Changes in Resident Knowledge, Confidence, and PPs

	Intervention					Control					*P*[c]
	n	Mean Pretest Score	Mean Posttest Score	Mean Score Difference	*P*[a]	*n*	Mean Pretest Score	Mean Posttest Score	Mean Score Difference	*P*[b]	
Knowledge[d]	154	64.8	80.7	15.9	<.001	106	68.2	76.3	8.1	<.001	.022
Confidence[e]	154	2.770	3.895	1.125	<.001	103	3.146	3.665	.519	<.001	.013
PPs[f]	154	1.796	2.239	.443	<.001	103	1.822	2.148	.326	<.001	NS
PPs, excluding cultural questions[g]	152	1.992	2.432	.440	<.001	101	2.034	2.254	.220	.005	.034

NS indicates not significant.

[a] *P* value of the mean difference between pretest and posttest scores for the intervention group only.

[b] *P* value of the mean difference between the pretest and posttest scores for the control group only.

[c] *P* value of the difference between the mean score differences for the intervention versus control group.

[d] Knowledge scores indicate percent correct responses for test (perfect score = 100).

[e] Confidence levels were measured on the scale: 1 = not at all confident; 2 = not confident; 3 = neutral; 4 = confident; and 5 = very confident.

[f] PP values are mean differences for which point values were defined as 1 = never, 2 = once or twice, 3 = 3 or 4 times, and 4 = ≥5 times.

[g] Adjusted to exclude PPs related to cultural competency (see "Methods").

TABLE 3 Improvements in Knowledge, Confidence, and PPs among Residents Exposed Versus Not Exposed to Curriculum

	Intervention			Control			OR	95% CI
	N	*n* Improved	*n* Not Improved	*N*	*n* Improved	*n* Not Improved		
Knowledge	154	129	25	106	69	37	2.767	1.541–4.970
Confidence	152	115	37	103	58	45	2.411	1.409–4.127
PPs	152	111	41	103	72	31	1.166	0.671–2.026
PPs, excluding cultural questions	152	106	46	101	52	49	2.171	1.289–3.658

CI indicates confidence interval.

Improvements in knowledge, confidence, and PP were analyzed according to the size of the residency program, to determine if effects were shared equally, by using the weighted number of residents who completed the study at each site (Table 4). After adjustments were made for size, mean improvements remained significant.

Knowledge, PP, and confidence were examined according to gender among residents in the intervention group who completed the study (Table 5). Despite baseline and posttest differences in PP, mean improvements did not differ between genders.

When compared among the 3 medical specialties, pediatric residents improved most in their confidence, whereas residents in obstetrics/gynecology and family medicine improved most in knowledge (Table 6).

TABLE 4 Weighted Averages of Mean Differences in Scores Based on Size of Residency Program

	N	Mean Score (SD) Difference Intervention (Unweighted/Weighted)	Mean Score (SD) Difference Control (Unweighted/Weighted)	*P*, Unweighted	*P*, Weighted
Knowledge	154	15.9 (15.6)	8.1 (9.1)	<.001	.003
Confidence	154	1.125 (1.07)	0.519 (.550)	<.001	<.001
PPs	154	0.443 (.431)	0.326 (.322)	.173	.198
PPs, excluding cultural questions[a]	152	0.440 (.435)	0.226 (.220)	.023	.022

[a] Adjusted for PPs related to cultural competency (see "Methods").

Impact of Curriculum on Breastfeeding Initiation and Continuation at 6 Months

Twelve sites (5 intervention and 7 control programs) provided data at baseline (initiation and 6-month rates) and breastfeeding initiation after intervention, and 8 sites (3 intervention and 5 control programs) provided 6-month data. Breastfeeding of infants was more likely to be initiated and continued at intervention sites after curriculum implementation (Table 7). The curriculum had the most significant effect on increasing exclusive breastfeeding at intervention sites (OR: 4.1 [95% confidence interval: 1.8–9.7]), whereas among control sites, 6-month-old infants were half as likely (OR: 0.53 [95% confidence interval: 0.32–0.78]) to be exclusively breastfeeding after the intervention period.

DISCUSSION

Previous studies have revealed that neither residents nor practicing physicians believe that they received adequate training in clinical breastfeeding management.[4] Our study results demonstrate that a targeted breastfeeding curriculum can improve breastfeeding knowledge, PPs, and resident confidence in managing breastfeeding. Because general knowledge about breastfeeding is increasing among health care professionals, more institutions are improving their breastfeeding practices.[6,7,15] In addition, breastfeeding rates have increased in most populations and geographic areas over the past decade and driven needed improvements in professional care.[16] It was important, therefore, to include control sites to reduce back-

TABLE 5 Knowledge, PPs, and Confidence Scores According to Gender-Intervention Group

	Baseline			After Intervention			Mean Score Differences		
	Male ($n = 79$)	Female ($n = 175$)	*P*	Male ($n = 79$)	Female ($n = 175$)	*P*	Male ($n = 79$)	Female ($n = 175$)	*P*
Knowledge	65 (14)	68 (13)	.079	77 (14)	80 (16)	.116	12	12	.665
Confidence	3.1 (.99)	2.91 (.96)	.230	3.9 (.68)	3.75 (.69)	.158	0.8	0.84	.590
PPs	1.69 (.65)	1.9 (.53)	.028	2.15 (.68)	2.2 (.59)	.444	0.46	0.3	.167
PPs, excluding cultural questions[a]	1.76 (.64)	2.13 (.64)	.000	2.2 (.68)	2.4 (.64)	.015	0.44	0.27	.060

Scores are mean (SD).

[a] Adjusted for PPs related to cultural competency (see "Methods").

TABLE 6 Improvements According to Specialty

	Intervention			Control			*P*[a]
	Before Intervention	After Intervention	Difference	Before Intervention	After Intervention	Difference	
Pediatrics ($N = 166$), *n*		84			82		
Knowledge	68 (12)	82 (17)	14	71 (13)	80 (14)	9	.057
PPs	1.74 (0.51)	2.21 (0.64)	0.47	1.81 (0.63)	2.15 (0.62)	0.34	.208
PPs, excluding cultural questions[b]	1.87 (0.54)	2.35 (0.64)	0.48	1.95 (0.66)	2.30 (0.62)	0.35	.277
Confidence	2.76 (0.89)	3.76 (0.87)	1.00	3.27 (1.02)	3.85 (0.63)	0.58	.015
Obstetrics and gynecology ($N = 48$), *n*		35			13		
Knowledge	63 (14)	81 (10)	18	62 (14)	67 (13)	5	.007
PPs	2.07 (0.56)	2.42 (0.59)	0.34	2.08 (0.52)	2.13 (0.50)	0.05	.062
PPs, excluding cultural questions[b]	2.34 (0.58)	2.7 (0.59)	0.36	2.49 (0.63)	2.44 (0.52)	−0.05	.063
Confidence	2.71 (1.03)	3.65 (0.71)	0.94	2.62 (1.17)	2.75 (0.89)	0.13	.052
Family medicine ($N = 46$), *n*		35			11		
Knowledge	59 (14)	77 (13)	18	56 (14)	58 (17)	2	.009
PPs	1.64 (0.52)	2.18 (0.58)	0.54	1.58 (0.67)	1.86 (0.81)	0.28	.279
PPs, excluding cultural questions[b]	1.83 (0.60)	2.42 (0.60)	0.59	1.72 (0.77)	2.02 (0.84)	0.30	.302
Confidence	2.95 (0.88)	3.97 (0.59)	1.22	2.95 (0.88)	3.45 (0.96)	0.5	.072

Scores are mean (SD).

[a] *P* value of the difference between mean score differences intervention versus control.

[b] Adjusted for PPs related to cultural competency (see "Methods").

TABLE 7 Impact of Curriculum on Breastfeeding Rates in Infants at Study Initiation and 6 Months Later

Type of Feeding	Before, *n* (%)	After, *n* (%)	Change, %	*P*
Breastfeeding rates in infants at study initiation before and after implementation				
Intervention sites				
Total	504	493	—	—
Exclusive breastfeeding	78 (15.5)	114 (23.1)	7.5	.002
Overall breastfeeding	383 (76.0)	398 (80.7)	4.7	.071
Control sites				
Total	701	701	—	—
Exclusive breastfeeding	193 (27.5)	214 (30.5)	3.0	.239
Overall breastfeeding	454 (64.8)	467 (66.6)	1.8	.500
Breastfeeding rates 6 mo before and after implementation				
Intervention sites				
Total	300	300	—	—
Exclusive breastfeeding	7 (2.3)	27 (9.0)	6.7	.001
Overall breastfeeding	76 (25.3)	86 (28.7)	3.4	.291
Control sites				
Total	499	550	—	—
Exclusive breastfeeding	58 (11.6)	34 (6.2)	−5.4	.002
Overall breastfeeding	134 (26.9)	139 (25.3)	−1.6	.574

ground improvements in breastfeeding training and care from changes that were measured as a result of the targeted intervention with the AAP breastfeeding curriculum.

Intervention-group residents showed significant improvements in knowledge over control-group residents, and these differences were most striking in the obstetrics/gynecology and family medicine residents. Improvements in knowledge were also independent of the size of the residency program, suggesting that programs of all sizes can benefit from the use of these materials. Residents at the intervention sites indicated a change in their PPs (ie, they were more likely to perform bedside assessment of breastfeeding, counsel mothers about breastfeeding issues, or teach breastfeeding techniques than they were before implementing the curriculum). When comparing PPs of residents who received the intervention to those who did not, however, there was no significant difference before adjusting for items relating to cultural competency. One explanation for the lack of difference may have been an emphasis on cultural competency training at the control sites coincidental to the implementation of the breastfeeding curriculum at the intervention sites.

For residents who received the intervention, perceived confidence significantly improved. This result may reflect both increased knowledge and more frequent opportunities to assist mother-infant breastfeeding dyads. Improvement of physician knowledge and practice skills is critical, because lack of physician support has contributed to dwindling rates of exclusive breastfeeding, and attitudes of practicing pediatricians toward breastfeeding are currently deteriorating.[7]

Results of previous studies have demonstrated that those residents and practicing physicians who have personal experience with breastfeeding have the greatest confidence in providing support. In this study, 70% of the completing residents were female, and 92% of women who completed the study had personal breastfeeding experience. Female residents were more likely than male residents to provide breastfeeding care for their patients. However, both female and male participants demonstrated similar improvements in breastfeeding care after implementation. It is important to target breastfeeding support and management to both male and female physicians as part of their residency training.

The AAP breastfeeding curriculum resulted in improved rates of breastfeeding. The health education theory, diffusion of innovation, provides a rationale for why training residents may have improved the institution's overall breastfeeding care.[17] Faculty who championed the new curriculum and their trained residents became the innovators by changing their own knowledge, confidence, and PPs. Fellow residents and other health care practitioners in each health system then became the early adopters to new practices. Trained residents served as catalysts for change by disseminating new information to their colleagues, which resulted in improved policies and practices that supported increased breastfeeding. Although there may have been other influences of change during the study period, the degree of change for control sites is consistent with national trends. It is not clear why this intervention was most influential for exclusive breastfeeding at 6 months. One explanation is that physicians' support for exclusive breastfeeding was a stronger component of the curriculum than prenatal breastfeeding promotion.

Although this study is one of the first to evaluate the effectiveness of a standardized breastfeeding curriculum, there were limitations. The number of completing residents and participating residency programs was small. The programs were not randomized, and the participating faculty and residents could not be blinded to whether they were an intervention or control

site. In addition, because each residency program constantly revised and improved its own curriculum, the control sites might have received some exposure to breastfeeding through faculty, Web-based, or print materials or through exposure to knowledgeable lactation consultants or nursing personnel, which would serve to minimize any significant differences in improvements seen between sites. Finally, the measurement of breastfeeding rates at the hospitals and resident continuity clinics were imprecise and may not represent a statistical sample population of breastfeeding infants. Tracking breastfeeding rates was a reflection of institutional rather than individual change.

CONCLUSIONS

Our results demonstrate that a targeted breastfeeding curriculum for residents in pediatrics, family medicine, and obstetrics and gynecology improves knowledge, PPs, and confidence in breastfeeding management in the residents and leads to increases in exclusive breastfeeding in their patients. Training residents to improve care of breastfeeding patients influences practices throughout the medical institution, which leads to increased rates of breastfeeding. Opportunities for additional research depend on a wider dissemination of the curriculum to residency programs through the Web site and measurement of the ultimate goal of increased rates of breastfeeding initiation, exclusivity, and duration.

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What Will Be the Second Disease Eliminated Worldwide after Smallpox and Not Require a Vaccine? Guinea Worms!: *It is hard to believe that a quarter century ago, there were 3.5 million cases of guinea worm reported in 20 countries and now there are fewer than 3200 cases in four countries. According to an article in* The New York Times *(Kristof ND, April 28, 2010), thanks to efforts spear-headed by former President Jimmy Carter, the cases of Guinea worms now remain only in Sudan (primarily) and in Ethiopia, Ghana and Mali. This parasite, which grows up to a yard long inside the body and eventually pokes out of the skin with burning pain, is propagated when larva from the open skin where the worm has burrowed are deposited in unclean water that others then drink. Treatment involves keeping those with a guinea worm out of water—a campaign that has been successful, not because of a vaccine or a medicine, but due to behavioral change—because villagers themselves volunteer to inspect other villagers for signs of a blister suggestive of the worm and then keep an infected person out of the water while the worm is pulled out slowly an inch or two a day. Former President Carter, age 85, has stated that he is determined to outlive the Guinea worm and recently stated, "If I can survive two more years, I'll meet my goal." He is certainly close!*

Noted by JFL, MD