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The Effectiveness of Baby Books for Providing Pediatric Anticipatory Guidance to New Mothers

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Abstract

Objective—To assess whether embedding pediatric anticipatory guidance into books read to babies is an effective way to educate low-income, first-time mothers about injury prevention and health promotion practices.

Patients and Methods—Primiparous women (n = 168) were randomly assigned to one of three groups; an educational book group, a non-educational book group, or a no book group. Knowledge of anticipatory guidance topics from birth to 12 months of age (e.g., injury prevention, parenting, nutrition) was assessed during the third trimester of pregnancy and again when infants were approximately 2, 4, 6, 9, 12, and 18 months of age.

Results—The educational book group scored consistently higher on knowledge than the other two groups. The educational book group was found to have significantly higher knowledge scores than both the non-educational book group (ES = .3, p-value < 0.001) and the no book group (ES = .3, p-value < 0.001) in the longitudinal model.

Discussion—Books read by mothers to babies appear to be an effective way to provide anticipatory guidance to new mothers. However, future work is needed to determine if increased knowledge translates into safer and more developmentally appropriate parenting practices.

Keywords

Anticipatory Guidance; Patient Education; Injury Prevention; Health Promotion

A major effort by the pediatric community to reduce preventable injuries and promote healthy development has been to use medical visits, especially well-child visits, as an opportunity to provide anticipatory guidance to parents¹. Research on the success of anticipatory guidance provision has been promising, especially in the area of injury prevention¹⁻⁴. While the extant research is encouraging, studies of the implementation of anticipatory guidance suggest many gaps and problems exist. Although parents who report discussing anticipatory guidance with their child's pediatrician typically report feeling more confident in applying such information⁵, many topics are not addressed during routine visits. In fact, research has found that pediatricians devote less than 10% of the time of a well child visit on parent education^{6, 7}, with only 10-60 seconds provided per topic covered^{8,9}. Moreover, when anticipatory

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guidance is given during a well child visit, there is evidence that parents do not retain the information¹⁰, especially as the number of topics increases¹¹.

In response to inconsistent dissemination and retention of anticipatory guidance information, the NICHD-funded Baby Books Project explored whether baby books, that is books read by mothers to babies, could be another vehicle for providing injury prevention and health promotion information to parents. Taking content from the *Bright Futures Guidelines for Health Supervision*¹², the project embeds age-appropriate educational material into professionally illustrated board books anticipating that mothers will learn while reading to their child. Six books were developed for this project corresponding to the six recommended well-child visits for the first year (i.e., newborn, 2, 4, 6, 9, and 12 months). Because baby books are written at a low reading level, have pictures to supplement content and tend to be read over and over again, we hypothesized that this medium would be an effective way to educate parents about injury prevention and health promoting parenting.

Method

One hundred and ninety-eight women were recruited from obstetric clinics and enrolled in the study while in their third trimester of pregnancy. From this pool, 168 participated in post-random assignment data collection. (See table 1 for details.) These 168 low-income, primiparous women were randomly assigned to one of three groups. One group received an educational intervention book during the third trimester of pregnancy and again when their baby was 2, 4, 6, 9, and 12 months old. Another group was given books with the same illustrations but different, non-educational text on the same schedule, and the third group was not given any books. Four of the 168 women did not have complete data for analyses. A University Institutional Review Board approved the consenting, intervention, and data collection procedures.

The educational intervention baby books contained information from the *Bright Futures Guidelines for Health Supervision*¹² about infant physical, cognitive, and emotional development, safety practices in the home, car, and outside, maternal self-care, benefits of breast feeding, discipline strategies, and nutrition recommendations. Each book addressed each of these topics as they pertain to that specific age (e.g., home safety recommendations are the same for all books while feeding recommendations change with each book).

Measurement

Participants were interviewed in their homes during their third trimester of pregnancy (baseline) and when their baby was 2, 4, 6, 9, 12 and 18 months of age, with phone calls two weeks after the 2, 4, 6, 9, and 12 month visits. At each visit and phone call, participants completed the *Opinions about Babies Questionnaire*, a criterion-referenced knowledge assessment. A baseline knowledge assessment was given during the third trimester of pregnancy (before randomization), and contained 31 questions in multiple-choice format offering four response options per question. The post-randomization knowledge assessments offer a statement in which participants can *agree*, *disagree*, or have *no opinion*. The opinion structure, rather than typical test format, was used to reduce the perception of “test-taking” and the likelihood of test anxiety. Each item was scored as correct or incorrect and all no opinion responses were scored as incorrect (i.e. lacking knowledge). From this, a percentage correct was calculated from the number of correct responses divided by the number of items completed for each wave. This avoided falsely concluding a lack of knowledge for items that were unintentionally skipped. The *Opinions about Babies Questionnaire* has been used in other research to assess maternal knowledge in similar settings (see Reich, 2005¹³ for details). Data

collection time intervals, payment, and the amount of researcher contact were equivalent among all groups.

Analysis

A linear mixed model for longitudinal data¹⁴ was implemented to model the percentage correct of knowledge questions across the waves of data collection. The model incorporated the following predictors: book group (i.e., educational book, non-educational book, and no-book groups), infant age at each interview, maternal education (some high school, completed high school, some college, college degree), race (White/Non-Hispanic vs. other), maternal age at baseline, marital status at baseline (married/living as married vs. other), total number of public assistance programs mother received at baseline, baseline knowledge (i.e., percent correct pretest items), and general intelligence as measured by the Wonderlic¹⁵ at baseline. All continuous variables, with the exception of public assistance, were centered by the overall mean, and the model and predictors were pre-specified. A book group by infant age interaction term was initially included to determine if the treatment effect varied over time, with the plan of removing the interaction term from the model if non-significant at the $\alpha = 0.05$ significance level. A random intercept was used to account for the correlation between observations within an individual and restricted maximum likelihood methods were used to fit the model.

Results

Raw means by group and wave are given in Table 2. The educational book group consistently answered a greater percentage of the questions correctly than the other two groups. Fitting the pre-specified full model, the interaction between group and infant age was not statistically significant ($p = 0.44$), meaning there is no evidence that the group effect varied over time. Thus, the interaction term was removed from the model for easier interpretation of the group effect. The parameter estimates and p-values are given in Table 3. Statistically significant associations were observed for group, infant age, knowledge at baseline, general intelligence, and maternal age. Other maternal characteristics (e.g., age, race, marital status, and public assistance) were not significant predictors of maternal knowledge. The pairwise differences in groups are given in Table 4, and show that on average mothers in the educational book group scored 7 (CI: 4,10.1) percentage points higher than the no book group ($p\text{-value} < 0.001$), and 7.2 (CI: 4.2,10.3) percentage points higher than the non-educational book group ($p\text{-value} < 0.001$). As expected, the difference in means between the non-educational and no book groups was non-significant ($p\text{-value} = 0.90$).

Given that the average number of questions asked per individual per wave is 11.5 questions, a 7 percentage point increase for the educational book versus no book is essentially equivalent to an increase of 0.81 additional questions correct. In other words, based on an average of 11.5 questions per wave, the educational book participants averaged nearly 1 more correct question per wave than either of the other two groups. This is a standardized effect size of 0.3 between the educational book group and the two comparison groups.

Discussion

This study tested whether providing anticipatory guidance material through the use of books read to babies is an effective method for increasing maternal retention of anticipatory guidance topics. This method of presentation made the content more visually interesting, offered a lower reading level than typical pediatric brochures¹⁶, and increased the likelihood that mothers would read the material more than once, which has been shown by learning theorists to be an important contribution to retention¹⁷. From the post-test knowledge assessments at five time points, mothers did learn the anticipatory guidance materials presented in the books. However,

these knowledge gains were modest with mean scores not exceeding 74% correct for any one wave.

Research has shown that pediatricians have many competing demands for their time, and as such, providers use clinical judgment to decide which topics are appropriate for a particular child and family¹⁸. Through this process, many topics are omitted. For instance, in an analysis of audiotaped pediatric visits, Gielen et al. found that less than half of visits discussed accident prevention⁹ and of those that did, an average of two types of prevention activities were discussed for a total of one minute of the appointment. Other studies of pediatric well-child visits have found that only 8.4-12.4% of pediatricians allocated time to anticipatory guidance discussions^{6,10,19} with some evidence that pediatricians typically cover three topics over an average of 86 seconds⁸. Along these lines, a national survey of parents of children under three years found that 37% reported never discussing any anticipatory guidance topics with their pediatrician. When asked about specific topics, over half of the parents reported never discussing each issue, with the exception of newborn care, which was discussed with 2/3 of the parents²⁰. Clearly, not many anticipatory topics are typically covered during well child visits. One possible solution is to provide this information in the form of baby books, which enable more topics to be covered than are typically discussed in a well child appointment.

In addition to gaps in parent/caregiver education during pediatric appointments, there is evidence that this information is not retained once it is given. For instance, a recent study found that while a practice-based educational intervention increased the amount of anticipatory guidance topics pediatricians discussed with families, this increase did not result in greater knowledge gains/retention for parents²¹. Similarly, in looking at the recall of information, Barkin et al. found that the more topics that were discussed during a well child visit, the less likely parents were to remember the information one month later¹¹. Thus, it is plausible that providing more than a few topics at a time could hinder learning. Embedding this information into baby books may help overcome this issue since parents are able to revisit the material by rereading the books to their child and/or looking up desired topic in the book.

Given the problems with the dissemination and retention of pediatric anticipatory guidance material, some primary care practices and community centers provide these topics in the form of parenting classes. Although parenting classes have been shown to be highly effective in changing parent behavior^{22,23}, they are often time consuming, expensive and/or difficult for many parents to attend (due to transportation, scheduling, and childcare problems). Some pediatric practices have relied on brochures and hand-outs for parents, but there is little support for the efficacy of these materials. For instance, in a study of printed hand-outs (TIPPS sheet) and pictorial hand-outs (PAG) for injury prevention, Powell and colleagues found that while parents did remember getting injury prevention material during their child's pediatric visit, they could not recall the topics they addressed. On the whole, the researchers found that the hand-outs were not effective, regardless of the visual appeal²⁴. Another difficulty with hand-outs and brochures is the complexity of the text. A recent review of 75 AAP patient education brochures found that at least half were written at higher than acceptable readability levels for the general population¹⁶. Similarly, studies of brochures for other medical issues, such as stroke symptoms and exercise programs have found these forms of medical information to be too complex to be useful^{25, 26}. Instead, there is a need for easier, more accessible and less expensive ways to educate parents. One option is to create an educational format that is easy to use, enjoyable, inexpensive, and not too time consuming, such as baby books.

Limitations and Future Directions

While this study found the educational baby books to be effective for increasing maternal knowledge of anticipatory guidance topics for low-income primiparous women, these findings

may not be generalizable to other types of parents such as fathers, multiparous women, and higher income mothers. Future research should test the efficacy of the educational baby books for other types of parents and caregivers.

These baby books appear to be an easy, cost-effective way to provide anticipatory guidance to new mothers. The next step is to assess whether increased knowledge translates into improved parenting practices such as implementation of safety devices (e.g., car seats, window guards), appropriate feeding practices (e.g., prolonged breast feeding, appropriate serving sizes), and higher quality infant-mother interactions (e.g., playing, talking).

Conclusion

Using a three-group randomized design, this study found that embedding anticipatory guidance material into baby books is an effective way to increase new mothers' knowledge of injury prevention and healthy development in the first year. These findings are promising as educational baby books could easily be disseminated during pediatric visits, added to programs such as Reach Out and Read, mailed to families, and offered through public assistance and community programs, thus providing educational opportunities to families that do not visit their health care provider regularly or whose pediatricians do not cover anticipatory guidance topics.

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Table 1

Participant Characteristics by Group and Test for Differences

	N	No Book N = 59	Non-Educational Book N = 56	Educational Book N = 53	Test Statistic
Education	168				$\chi^2_2 = 2.26$, $P = 0.32^f$
Some high school		19%	32%	25%	
Completed high school		37%	27%	26%	
Some college		22%	32%	36%	
College degree		22%	9%	13%	
Race	168				$\chi^2_2 = 2.69$, $P = 0.26^2$
Other		64%	75%	77%	
White non-Hispanic		36%	25%	23%	
Maternal Age	168	20.3 22.3 24.8	19.4 20.9 23.8	19.5 21.7 25.2	$F_{2,165} = 1.19$, $P = 0.31^3$
Marital Status	167				$\chi^2_2 = 2.45$, $P = 0.29^2$
Other		74%	86%	81%	
Married or living as married		26%	14%	19%	
# of kinds of pub. assist. M recvd at W1 (max=7)	167	0 1 2	1 1 2	1 1 2	$F_{2,164} = 0.64$, $P = 0.53^3$
Income	105				$\chi^2_2 = 4.39$, $P = 0.11^f$
1 Less than \$8,000		17%	23%	31%	
2 \$8,000 - \$12,000		20%	16%	21%	
3 \$12,001 - \$16,000		3%	19%	10%	
4 \$16,001 - \$21,000		11%	16%	5%	
5 \$21,001 - \$26,000		11%	6%	13%	
6 \$26,001 - \$30,000		3%	3%	5%	
7 \$30,001 - \$40,000		9%	10%	5%	
8 \$40,001 - \$50,000		6%	0%	5%	

a b c represent the lower quartile a, the median b, and the upper quartile c for continuous variables. N is the number of non-missing values.

Tests used:

¹ Proportional odds likelihood ratio test
² Pearson test
³ Kruskal-Wallis test

Table 2

Percentage Correct, by book group and wave

Wave (baby age)	No Book (comparison)			Educational Book (1x)			Non-educational Book (comparison)			Total		
	N	Mean	(SD)	N	Mean	(SD)	N	Mean	(SD)	N	Mean	(SD)
1 (prenatal)	59	42	(10.7)	56	39.7	(9.9)	53	39.1	(10.5)	168	40.5	(10.5)
2 (2-month)	54	61.8	(12.8)	47	63.3	(14.2)	50	56.9	(13.2)	151	60.6	(13.6)
3 (4-month)	53	61.9	(15.7)	45	74.2	(10.8)	53	60	(15.3)	151	64.6	(15.4)
4 (6-month)	54	57.9	(15.4)	49	74.4	(13.6)	48	56.7	(15.1)	151	62.2	(16.3)
5 (9-month)	51	42.6	(23.1)	46	51.1	(20.4)	46	39.1	(19.5)	143	44.2	(21.5)
6 (12-month)	55	67.2	(21.9)	47	72.6	(15.1)	50	62.4	(16.8)	152	67.3	(18.7)
7 (18-month)	54	57.4	(16.3)	44	69.3	(21.4)	47	56	(20.2)	145	60.6	(20)
Total	380	55.9	(19.1)	350	62.8	(19.7)	331	52.8	(18.2)	1061	57	(19.4)

Table 3

Parameter estimates for linear mixed model

	Estimate	Std Error	LL	UL	P-value	Interpretation
Intercept	56.68	2.02	52.72	60.65	<0.001	Average taught score for No Book Group at reference levels
Educational Book	7.04	1.55	4.01	10.07	<0.001	Average change for Treatment Book versus No Book
Non-educational Book	-0.18	1.51	-3.15	2.78	0.904	Average change for Control Book versus No Book
Infant Age	-0.89	0.13	-1.14	-0.64	<0.001	Average change per 1 month increase in baby age
Percentage Correct Baseline	0.23	0.07	0.09	0.37	0.001	Average change per unit increase in baseline knowledge
Wonderlic	0.50	0.11	0.29	0.71	<0.001	Average change per unit increase in Wonderlic score
Maternal Age (linear)	-0.05	0.25	-0.54	0.43	0.827	Linear effect of mother's Age
Maternal Age (quadratic)	0.05	0.02	0.00	0.10	0.038	Quadratic effect of mother's age
Education (Completed HS)	2.69	1.84	-0.91	6.29	0.145	Average change for High School Completion versus No High School
Education (Some College)	4.07	1.93	0.29	7.84	0.036	Average change for Some College versus No High School
Education (College Degree)	3.11	2.77	-2.32	8.54	0.263	Average change for College Degree compared to No High School
Race (white)	0.25	1.58	-2.85	3.35	0.873	Average change for Non-Hispanic Whites versus Other
Public Assistance	0.66	0.67	-0.64	1.97	0.321	Average change for each additional public assistance program
Marital Status (married)	1.81	1.79	-1.70	5.32	0.314	Average change for Married/Living as Married versus Other

Table 4

Model-Based Pairwise Differences in Percent Correct Taught

	Effect Estimate	Lower	Upper	p-value	Standardized Effect Size
Educational – No Book	7.0	4.0	10.1	<0.001	0.31
Educational – Non-Educational	7.2	4.2	10.3	<0.001	0.32
Non-Educational – No Book	–0.2	–3.2	2.8	0.904	–0.01