

Randomized Trial of a Children's Book Versus Brochures for Safe Sleep Knowledge and Adherence in a High-Risk Population

John S. Hutton, MD; Resmi Gupta, MS, MA; Rachel Gruber, MS; Jennifer Berndsen, LSW; Thomas DeWitt, MD; Nicholas J. Ollberding, PhD; Judith B. Van Ginkel, PhD; Robert T. Ammerman, PhD

From the Division of General and Community Pediatrics (Dr Hutton, Dr DeWitt, and Ms Gruber), Reading and Literacy Discovery Center (Dr Hutton, Dr DeWitt), Every Child Succeeds (Ms Berndsen, Dr Van Ginkel, Dr Ammerman), Division of Biostatistics and Epidemiology (Ms Gupta, Dr Ollberding), and Division of Behavioral Medicine and Clinical Psychology (Dr Ammerman), Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio

Conflict of Interest: Dr Hutton wrote and edited the children's book utilized in this study, with distribution rights and all royalties donated to the nonprofit Charlie's Kids Foundation. Dr Hutton owns and directs Blue Manatee Press, the publisher of the book, which distributes the book in retail and library markets. Dr Hutton receives no salary or other compensation for this role. The other authors declare that they have no conflict of interest.

Address correspondence to John S. Hutton, MD, Division of General and Community Pediatrics, Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave, MLC 7035, Cincinnati, OH 45229 (e-mail: John1.Hutton@cchmc.org).

Received for publication March 5, 2017; accepted April 15, 2017.

ABSTRACT

OBJECTIVE: Sleep-related infant deaths have plateaued in the past decade, disproportionately affecting low socioeconomic status (SES) families. Printed materials are widely used for anticipatory guidance, yet none for safe sleep has been studied. We tested the efficacy of a specially designed children's book compared to brochures for safe sleep knowledge and adherence, which we hypothesized would be greater due to superior readability and engagement.

METHODS: This randomized controlled trial involved low-SES mothers (n = 282) enrolled in a home visiting program. Home visitors (n = 56) were randomly assigned to perform safe sleep teaching and assessments during 3 visits: third trimester, 1 week old, and 2 months old, exclusively utilizing a specially designed children's book or brochures, and surveys incorporating the American Academy of Pediatrics' safe sleep recommendations. Outcomes were safe sleep knowledge, adherence, and usefulness of materials, controlling for maternal health literacy.

RESULTS: Safe sleep knowledge increased across all time points with no overall group difference, though gains for sleep-evocative and general health items varied. Odds of bed

sharing were higher and exclusive crib use lower for the brochure group ($P < .05$). Mothers and home visitors reported similar usefulness, though home visitors reported greater dialogue via the book and mothers in the book group reported more book sharing with their baby.

CONCLUSIONS: While a specially designed children's book and brochures were equally effective conveying aggregate safe sleep knowledge in low-SES mothers, adherence to exclusive crib use and avoiding bed sharing were greater in the book group, attributable to enhanced dialogue, readability and emotional engagement. Children's books are a promising mode of anticipatory guidance, warranting further investigation.

KEYWORDS: anticipatory guidance; brochures; children's books; pediatric health literacy; printed educational materials; safe sleep; SIDS; sudden infant death syndrome; sudden unexplained infant death; SUID

ACADEMIC PEDIATRICS 2017; ■:1–8

WHAT'S NEW

Compared to standard brochures, high-risk mothers presented with safe sleep information by home visitors using a specially designed children's book showed greater adherence to exclusive crib use and avoiding bed sharing, attributable to enhanced dialogue, readability, and emotional engagement.

SUDDEN UNEXPECTED INFANT death (SUID) is "death of an infant less than 1 year of age that occurs suddenly and unexpectedly, and whose cause is not immediately obvious before investigation."¹ Major etiologies of SUID

are accidental suffocation and strangulation in bed (25%), attributed to an identifiable factor such as entrapment; sudden infant death syndrome (SIDS; 42%), where the cause cannot be explained after thorough investigation; and unknown cause (31%).² While decreased since the Back to Sleep campaign, the incidence of SUID and SIDS have plateaued over the past decade,² and continue to disproportionately affect low socioeconomic status (SES) and minority populations.^{1,3} The American Academy of Pediatrics' (AAP) safe sleep recommendations include exclusive crib use,² exclusion of bulky items from cribs, exclusive breastfeeding, supine positioning, and avoiding bed sharing with other children or adults,³ with bed sharing the predominant risk factor

for younger infants.^{4,5} Printed educational materials are a common means of safe sleep anticipatory guidance due to low cost and ease of distribution, though their efficacy has not been previously studied.

Health literacy is defined as “an individual’s capacity to understand and use health information to meet individual and family health needs.”⁶ An estimated 30% of US parents manifest inadequate health literacy, costing billions of dollars annually.⁷ Parents with low health literacy are 1.2 to 4 times more likely to exhibit negative parenting and inadequate preventive care behaviors,⁸ and poor adherence to anticipatory guidance, with consequently increased infant morbidity and mortality.⁸ As the reading level of US parents is estimated at 7th to 8th grade,⁹ health-related brochures and Web-based information¹⁰ often prove exceedingly difficult.^{9,10} Lack of culturally and emotionally engaging content can also impair engagement with messaging and efficacy.¹¹ Thus, the AAP and National Institutes of Health have advocated the development of alternate, family-centered platforms addressing these concerns.^{8,12,13}

Children’s books are an established element in pediatric primary care, notably through the Reach Out and Read program, where they are used as developmental screening tools and catalysts for parent-child engagement.^{14,15} Children’s books addressing health topics have shown promise, including infant safety,¹⁶ common behavioral issues,¹⁷ and developmental milestones.¹⁸ Parents receiving children’s books from providers tend to value them,¹⁵ describe superior access of information,¹⁹ and improved retention through repeated reading.¹⁸ The aim of this randomized controlled trial was to compare a specially designed children’s book incorporating AAP safe sleep recommendations to brochures during the perinatal period. A home visiting model was selected given the potential to simultaneously and efficiently assess safe sleep knowledge and adherence in a population at high risk for SIDS, utilizing trusted home visitors. Our hypothesis was that safe sleep knowledge and adherence would be higher in mothers presented the book as a result of superior readability and emotional engagement, as well as repeated reading at home.

METHODS

STUDY SETTING, PARTICIPANTS, AND RANDOMIZATION

Every Child Succeeds (ECS) is a home visiting program serving first-time low-SES mothers at risk for negative parenting and child health outcomes, followed prenatally until their child’s third birthday.²⁰ All mothers in this study were enrolled in the Healthy Families America model of home visiting. Major objectives of ECS include support for parents in providing children with a safe and nurturing home environment to optimize health and development.²⁰ To achieve these, home visitors use a Home Visit Planning Guide, which identifies applicable tools, handouts and content based on the child’s age, developmental period, and needs of the family. ECS home visitors are trained professionals holding at least a bachelor’s or master’s degree in social work, early childhood education, or a

related field of study. This study was registered with [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT02376673) (NCT02376673).

Fifty-six home visitors from 8 community sites were randomly assigned by a biostatistician to the intervention (book; $n = 27$) or control (brochures; $n = 29$) group. Randomization was stratified by agency and experience (<2 , 2 to 7 , ≥ 8 years), and then assigned (1:1) using computer-generated random numbers. Home visitors and supervisors were trained via presentation of study materials in role-play sessions led by the principal investigator, videos dramatizing this process for each visit, scripts on all data collection forms, and a checklist of required items at each visit. Given that randomization was within agencies, it was not possible to blind home visitors to the purpose of the intervention, though mothers were blinded. Biostatisticians and the principal investigator were also blinded, groups identified as A or B, and decoded only after analysis was complete.

This study was approved by the Cincinnati Children’s Hospital institutional review board. Participating mothers were enrolled prenatally in the home visiting program, and written informed consent for this study was obtained separately. Additional inclusion criteria were fluency in English (the book was not then available in Spanish), and mothers were at least 15 years old. Mothers received no financial compensation for participation but were given a new children’s book at the conclusion of the study. A total of 708 mothers were eligible over the 18-month span of our study. Of these, 394 were not approached for reasons including missed or canceled third trimester visits, prohibitive agency workloads, or competing issues in the home such as illness. Of the 314 mothers approached, 4 were excluded per criteria, 6 declined, 22 were lost to follow up before assignment or data collection, and 282 (90%) were successfully enrolled. A CONSORT diagram is provided in [Online Appendix Figure](#).

SAFE SLEEP EDUCATIONAL MATERIALS

Home visitors in the brochure group performed safe sleep education at each study visit in accordance with the ECS Home Visit Planning Guide exclusively using at least one of the following brochures: “What does a safe sleep environment look like?” (Eunice Kennedy Shriver National Institute of Child Health and Human Development), “Home Safe Home—Sleep” (ECS), “Bright Futures—Newborn Visit” (AAP), “Helping Baby Back to Sleep” (Maternal and Child Health Bureau), and “Sleep and your 1–3 month-old,” (Nemours KidsHealth). These vary in terms of length, complexity, and pictures versus text, with estimated Flesch-Kincaid reading level ranging from 5th to 10th grade. Choice of brochures at each visit was at home visitor discretion per standard ECS practice, depending on perceived needs of the family. Typically all are used across the perinatal period, with favorites often reviewed multiple times. Mothers were also encouraged to review materials on their own and post helpful graphics—for example, taped to the refrigerator.

Home visitors in the intervention group performed safe sleep education at each study visit by exclusively reading

or reviewing a specially designed children's book, *Sleep Baby, Safe and Snug* (Blue Manatee Press). The book is board-format typical of infant books, professionally illustrated featuring ethnic diversity, and incorporates AAP safe sleep guidelines³ into rhyming verse. Estimated Flesch-Kincaid reading level for interior text is 1st grade, and 4th grade for safe sleep "Do's and Don'ts" listed on the back cover. Suggested retail price for the book is \$7.99, the discounted price for agencies and nongovernmental organizations provided by the publisher and nonprofit Charlie's Kids Foundation ranging between \$1.00 and \$2.25.

SAFE SLEEP/SIDS KNOWLEDGE, ADHERENCE, AND IMPRESSION OF MATERIALS

All assessment instruments utilized in this study were developed or adapted by the principal investigator and were reviewed by experts in safe sleep and measure design. They were pilot tested for clarity via colleagues and a convenience sample of low-SES mothers at a hospital-based primary care clinic. Flesch-Kincaid reading level was estimated at approximately 6th grade.

Assessments were performed by home visitors during 3 home visits: prenatally (baseline, typically third trimester), approximately 1 week old (1–3 weeks), when sleep routines are typically established,⁴ and approximately 2 months old (7–10 weeks), the onset of peak SIDS risk.²¹ Follow-up data collection was occasionally not possible, for reasons including canceled/missed appointments, attrition from the home visiting program, competing concerns such as illness or household chaos, or refusal.

Safe sleep/SIDS knowledge was assessed by the home visitor at all 3 time points. Three questions were adapted from a published survey,²² gauging the mother's familiarity with SIDS, whether she personally knows anyone who has lost a child to SIDS, and level of worry about SIDS for her baby. The primary safe sleep knowledge question utilized an open-ended format: "Name as many things as you can think of to help keep your baby safe from SIDS." Maternal responses were compared to an 11-item checklist of AAP safe sleep recommendations,²³ which are each referenced at least once in the book and brochures, with 1 point awarded for each correct response. Home visitors submitted unclear responses to the research team for resolution. An open-ended format was used to minimize priming during repeat assessment and model teachback,^{6,24} and because no validated, aggregate safe sleep knowledge instrument was available.

Adherence with safe sleep recommendations was assessed by the home visitor at the 1-week and 2-month study visits, utilizing maternal report and direct observation of the infant sleep environment. The mother was asked where the infant usually sleeps, and the home visitor noted the existence and location of the crib, state of the mattress (ie, firm, fitted sheet), and presence of bulky items such as pillows. The mother was asked if she practiced bed sharing, and clear evidence of bed sharing (eg, infant asleep in adult environment) was noted. The mother was prompted to

show the home visitor how she put her baby down to sleep and was then asked if she ever placed her child on his or her stomach or side, and why this position was used. The mother was then asked about pacifier use, smoking in the home (the visitor also noted any evidence of smoking), and whether she was breastfeeding, bottle feeding, or both.

Maternal impression of safe sleep educational materials was assessed by the home visitor at the 1-week and 2-month visits. Items included the extent the materials helped the mother understand safe sleep recommendations, the amount of information conveyed, and perceived importance for her baby as opposed to general medical information. Mothers were also asked how often they reviewed the educational materials on their own and with their baby.

Home visitor impression of educational materials was assessed via self-report at all 3 visits, including helpfulness for conveying safe sleep information, most useful features (choose one), and time required for presentation. To control for preexposure, at the 2-month visit mothers were asked if they had been presented with the book in another context (eg, nursery), and if so, how often they had read it.

HEALTH LITERACY SCREEN

Maternal health literacy was assessed during the prenatal study visit via the Rapid Estimate of Adult Literacy in Medicine (REALM-R),²⁵ a psychometrically strong, 8-item health-related word recognition screen. Scoring is from 0 to 8, with a score under 7 corresponding to a 6th-grade reading level, considered at risk for inadequate health literacy.²⁵

SAMPLE SIZE DETERMINATION

The enrollment goal for this study was 270 mother–infant dyads, to account for 15% estimated attrition, for a resulting 230 dyads with at least one follow-up visit. This sample size was determined to detect a 0.37 standard deviation (SD) change in mean safe sleep knowledge scores between intervention and control groups with 80% power, feasible for our timetable and budget. Assuming a common SD of 2.5 (range divided by 4) for maternal knowledge of safe sleep practices, this corresponded to a detectable difference of 0.9 points (2-sided $\alpha = 0.05$).

STATISTICAL ANALYSES

Descriptive statistics were calculated to summarize participant characteristics, including frequencies and percentages for categorical measures, and means and SDs for continuous variables. A quantile–quantile plot was used to determine whether safe sleep knowledge score was normally distributed and amenable to analysis with traditional parametric techniques. A linear mixed effects model with home visitor, mother, and agency as random effects was used to assess the efficacy of the children's book intervention in conveying safe sleep knowledge compared to the brochure group. Initially, the mixed-effects models included random intercepts and random slopes, but slope was removed from the final models as it did not improve model fit. Group by time interaction

effects also did not improve model fit, and hence were dropped from the final model. A number of covariance structures were tested, and on the basis of model fit statistics (Akaike information criteria, Bayesian information criteria), an unstructured covariance was selected for the final model. Generalized linear mixed effects models with a logit link function, with home visitor and mother as random effects were used to compare adherence to safe sleep practices (supine positioning, not bed sharing, exclusive crib use, no unsafe items in the crib, pacifier use, nonsmoking, and breastfeeding) between the intervention and control groups. We initially included level of worry about SIDS and health literacy score as covariates but these were dropped due to lack of statistical significance. Statistical significance level was set at $\alpha = 0.05$, with Bonferroni-Holm adjustment for all post hoc comparisons. All analyses were conducted with SAS 9.4 software (SAS Institute, Cary, NC).

RESULTS

Demographic characteristics of study mothers (including health literacy score) and home visitors are shown in the [Table](#). More mothers were enrolled in the book group ($n = 160$) than the brochure group ($n = 122$). Home visitors in the book group had more years of experience overall, though the mean for each group was in the “middle” randomization category (2–7 years). Mothers were low SES in terms of education and income, and predominantly black or white. Eight percent of mothers reported exposure to the book outside of the study, typically via the newborn nursery. Sensitivity analyses did not find a significant effect of maternal demographic factors or extramural book exposure on our results.

Mean REALM-R score was 6 (SD 2.3; range 0–8), 36% of mothers were considered at risk for inadequate health literacy (score under 7). There was no significant difference in REALM-R score between groups.

SAFE SLEEP/SIDS KNOWLEDGE

The majority of mothers reported familiarity with SIDS (81%); 29% reported that they knew someone personally who had lost a child to SIDS, with no significant group difference. The majority of mothers reported at baseline that they worry about SIDS for their baby most of the time (23%) or sometimes (41%), versus 15% not very often and 21% not at all ([Table](#)). Level of worry was equivalent between groups, with a nonsignificant decrease at 1 week and a significant decrease at 2 months (21% most of the time, 31% sometimes, 20% not very often, 28% not at all; $P < .05$). Level of worry did not moderate safe sleep knowledge or adherence in our analyses.

Total safe sleep knowledge scores increased significantly for both groups between prenatally and 1 week (36% for brochures, 50% for book, each $P < .01$), prenatally and 2 months (45% for brochures, 65% for book, each $P < .01$), and marginally between 1 week and 2 months (7% for brochures, 9% for book, each $P = .11$). There was no significant difference in total knowledge

Table. Demographics of Study Mothers and Home Visitors by Group

Characteristic	Brochure (n = 122)	Book (n = 160)	P
Maternal age	21.89 (4.89)	22.14 (4.69)	.58
Race			.05*
American Indian	1 (0.91%)	0	
Asian	1 (0.91%)	0	
Biracial	5 (5%)	4 (3%)	
Black	52 (47%)	91 (63%)	
White	51 (47%)	51 (35%)	
Education			.39
Less than high school	27 (25%)	48 (33%)	
High school/GED graduate	41 (37%)	41 (28%)	
Some college	36 (34%)	50 (34%)	
College graduate	2 (1%)	6 (4%)	
Household income			.58
≤\$20,000	63 (57%)	69 (47%)	
\$21,000–40,000	6 (5%)	21 (14%)	
>40,000	1 (0.09%)	3 (2%)	
Unknown	34 (31%)	48 (33%)	
Baseline SIDS worry			.17
Not at all	19 (17%)	32 (22%)	
Not very often	13 (12%)	26 (18%)	
Sometimes	49 (46%)	53 (37%)	
Most of the time	27 (25%)	32 (22%)	
REALM (health literacy) score	5.74 (0.22)	6.21 (0.18)	.11
Baseline knowledge score	3.11 (1.84)	2.70 (1.91)	.10
Assigned home visitor experience			.01*
<2 y	46 (41.8%)	57 (39%)	
2–7 y	40 (36.36%)	35 (24%)	
≥8 y	24 (22%)	55 (37%)	

SIDS indicates sudden infant death syndrome; REALM, Rapid Estimate of Adult Literacy in Medicine.

Data are presented as n (%) or mean (SD).

*Statistically significant difference between 2 groups.

score between groups at any time point. Baseline knowledge for supine positioning and avoiding bulky items in cribs was high (73–75% and 63–77%, respectively), moderate for avoiding bed sharing (40–49%), and low for other recommendations (1–27%), with no significant group differences. Individual knowledge items showing largest serial increases for the brochure group were pacifier use and not smoking (4% to 23% and 20% to 33%, respectively; $P < .01$). Items showing the largest increase for the book group were exclusive crib use (12–29%), pacifier use (7–24%) and avoiding bed sharing (40–54%; all $P < .01$). Safe sleep knowledge scores are summarized in [Online Appendix Table](#) and [Figure 1](#).

There was significant positive correlation between health literacy scores and total safe sleep knowledge scores at all 3 time points ($r = 0.29, 0.16, 0.21$, respectively; $P < .05$). There was no significant group–literacy interaction effect on knowledge scores.

ADHERENCE WITH SAFE SLEEP RECOMMENDATIONS

A summary of safe sleep adherence is provided in [Figure 2](#). The odds of reported bed sharing (sometimes or often) were significantly higher in the brochure (1.81; 95% confidence interval [CI] 1.15–2.86; $P < .01$) relative to the book group. Odds of observed bed sharing were

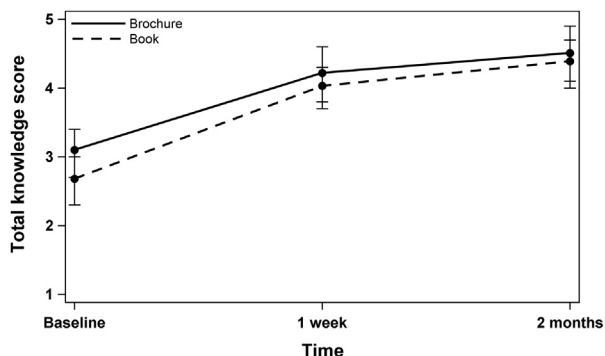


Figure 1. Total safe sleep knowledge score at baseline/prenatal, 1 week, and 2 months old for mothers in book and brochure groups. Scoring was on scale of 0 to 10 in response to open-ended question: “Name as many things as you can think of to help keep your baby safe from SIDS.”

also higher for the brochure group (2.17; 95% CI 1.24–3.80; $P < .01$). Odds of observed exclusive crib use were lower in the brochure group (0.48; 95% CI 0.29–0.80; $P < .01$). There were no significant group differences in other reported or observed safe sleep behaviors.

IMPRESSION OF SAFE SLEEP EDUCATIONAL MATERIALS

A majority of mothers and home visitors reported educational materials utilized as “helpful” or “very helpful,” with no significant group differences. Most mothers reported the level of information as “just right” and relating to “my baby,” rather than general medical information. Forty-one percent of mothers in the book group reported reading the book with their baby sometimes or often at 1 week, and 81% at 2 months. The odds of sharing safe sleep materials with the baby were significantly lower in the brochure

group (0.44; 95% CI 0.41–0.48; $P < .01$). Features of printed materials reported by home visitors as most helpful for conveying safe sleep information differed by group, the brochure group strongly preferring pictures/graphics at all 3 time points, followed by written contents. Those in the book group preferring a balance of written contents, pictures/graphics, and interactive mode of presentation. Time required for presentation was significantly less for the book (mean 8.81 minutes vs 10.13 minutes, $P < .05$). Home visitor preferences are summarized in Figure 3.

DISCUSSION

This randomized controlled trial leveraged insights afforded by home visitation to compare a customary mode of safe sleep anticipatory guidance (brochures) to a specially designed children’s book in a population at high-risk for SUID/SIDS.¹ To our knowledge the efficacy of printed materials for safe sleep education has not been previously studied. Access to the home environment provided an ecological view of how safe sleep knowledge may be assimilated and translated into adherence, suggesting social–emotional catalysts favoring the children’s book platform. Importantly, these benefits manifest in behaviors with outsized influence on SUID/SIDS risk,^{3,4} with mothers presented with the book approximately half as likely to practice bed sharing and twice as likely to exclusively use a crib compared to those receiving brochures. As the incidence of sleep-related infant deaths has plateaued over the past decade,³ especially in low-SES and minority households,¹ we believe that these findings are valuable to help develop alternative approaches addressing cultural and literacy barriers, and improve child health outcomes.^{21,26}

Maternal Adherence with Safe Sleep Recommendations – Book Versus Brochures

Odds Ratio and 95% Confidence Interval

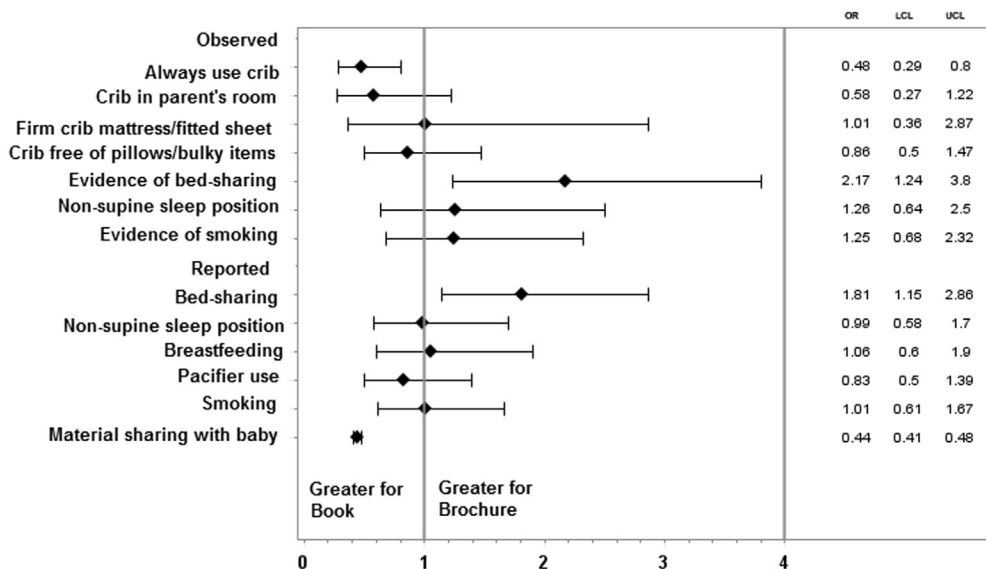


Figure 2. Forest plot showing odds ratios and 95% confidence intervals of observed and reported maternal adherence with safe sleep recommendations, with brochure group as reference group. Odds less than 1 (left side of line) suggest greater incidence for children’s book group; greater than 1 (right side of line), greater incidence for brochure group.

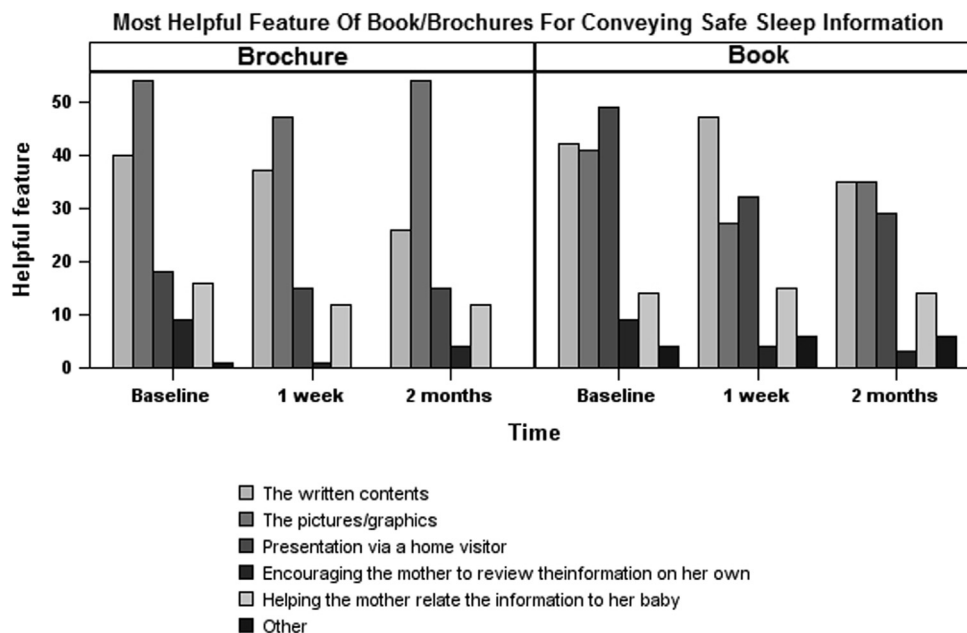


Figure 3. Features reported by home visitors in book and brochure groups as being most helpful for conveying safe sleep information at prenatal/baseline, 1-week, and 2-month home visits.

Familiarity with SIDS was high (81%) in our study population, as was personal knowledge of someone who had lost a child to SIDS (29%), consistent with disproportionately high rates of SIDS in low-SES, minority households.¹ Level of worry about SIDS was moderate and decreased significantly for both groups between the baseline assessment and 2 months old. This finding is concerning, given the cited peak in SIDS risk between 2 and 4 months, when parents tend to let their guard down and relax safe sleep behaviors.²¹ Increasing rates of bed sharing and nonsupine positioning found between the 1-week and 2-month assessments affirm this concern, underscoring the importance of sustained anticipatory guidance during infancy. As expected, a high proportion of mothers screened at risk for inadequate health literacy (36%, vs 30% previously cited⁷). While literacy scores were positively correlated with safe sleep knowledge at all time points, surprisingly, these did not moderate our results. While counterintuitive, we speculate that this may be attributable to relative independence of health literacy (and health knowledge) and emotional engagement, which we propose is the primary driver of our results. This disconnect between knowing what to do and visceral sense that doing it is important is consistent with prevalent nonadherence with health recommendations in general,^{7,27} though this complex relationship is beyond the scope of the present study.

Contrary to our hypothesis, there was no significant difference in total safe sleep knowledge scores between the book and brochure groups, which increased across all time points. Overall equivalence was fueled by parallel gains in certain constituent items (eg, pacifier use), nonsignificant change in items with high baseline knowledge (eg, supine positioning), and nonsignificant change in items with low baseline knowledge (eg, immunizations, breastfeeding).

The latter finding regarding breastfeeding (9–14% baseline, nonsignificant change) is concerning, given its emphasis in public health campaigns,^{28,29} and suggests potential for improved synchronization of anticipatory guidance. In terms of the knowledge aim of this trial, the most intriguing finding involved offsetting gains in knowledge of infant sleep-evocative behaviors favoring the book group (exclusive crib use and avoiding bed sharing) and of more general behavior favoring the brochure group (nonsmoking). We propose that the driver of these differential gains is emotional engagement, with the narrative in the book reinforcing internal rehearsal of items involving the baby who is “telling the story,” while more explicit messaging in brochures (eg, “do not smoke”) may more clearly convey specific health recommendations. It may also be true that greater readability of the book, the result of its lower reading level and rhyming cadence, may exert an effect, with simpler text providing just enough—but not too much—information to enhance imagery and emotional connection for these items. Home visitors in the book group cited interactive mode of presentation as “most helpful,” while those in the brochure group largely did not, suggesting this is an additional factor, consistent with our hypothesis and the well-described power of children’s books to facilitate dialogue.³⁰ Book sharing with a home visitor may have also effectively modeled this practice for the mother, encouraging her to review the book at home and with her baby, reinforcing infant sleep-evocative knowledge, consistent with our results.

While knowledge is clearly necessary to provide direction, our findings suggest that it is not sufficient to invoke healthy behavioral change. Greater emotional engagement and dialogue favoring the book seem likely catalysts influencing how safe sleep knowledge was assimilated and translated into adherence. Our finding of significantly lower odds of

both reported and observed bed sharing in the book group in the context of differential sleep-evocative knowledge gains described above is highly consistent with this construct. This finding is noteworthy, given that bed sharing is the predominant risk factor for SIDS in younger infants.^{4,5} On a less positive level, this proposed mechanism is further evidenced by our finding of greater evidence of smoking in the brochure group, albeit marginally significant, despite greater knowledge of smoking as a contributor to SIDS risk in this group. Children's books have a long history of effectively addressing difficult topics such as death, fears, and differences, exemplified by fairy tales³¹ and Dr Seuss.³² The power of narrative is increasingly recognized in contemporary learning theory,³³ given its long-standing, likely hard-wired,³⁴ role in human communication, facilitating access to emotion, memory, and social connection. It is possible that while information was adequately conveyed via brochures to "pass the knowledge test," the children's book approach more effectively inspired and empowered actual change in behavior by helping mothers make such connections between safe sleep recommendations and the baby to which they lovingly apply. Our results highlight the potential of well-crafted children's books to help bridge the adherence gap for a range of anticipatory guidance and bibliotherapy topics, ideally conveyed via providers during home visiting or clinic visits. Combined approaches where families are presented with a well-crafted children's book and brochure that complement one another also seem appealing.

This study had several strengths. The home visiting program provided access to a high-risk population (urban and rural), and an established research infrastructure affording efficient intervention and data collection with minimal intrusion, including objective assessment of the sleep environment. Maternal health literacy screening affirmed the prevalence of mothers at risk and was controlled for in our analyses. Using open-ended format in our safe sleep knowledge measure reduced priming via repeated assessment, modeled teach-back for educational purposes,²⁴ and revealed relatively high recall of select items and deficits in others. That overall knowledge gains were equivalent between 84 rhyming words and an assortment of 5 vetted brochures containing far more explicit information taking longer to present affirms the merits of simplicity and family-centeredness stressed in recent health materials recommendations,¹³ and potential of narrative to foster learning and behavioral change.³³ The children's book studied is feasible for clinical use, is user friendly for parents and providers, and is scalable (deeply discounted for agency and nongovernmental organization use), with its modest cost outweighed by potentially large savings in morbidity and mortality through improved adherence. Specifically, our findings have the potential to complement established cognitive and social-emotional benefits in programs such as Reach Out and Read,¹⁴ by incorporating carefully designed children's books conveying health information during well-child visits. Additional studies are needed comparing efficacy when printed materials are presented passively (eg, mailed, handed out), as is often the case given limited time and resources, where we speculate

that appealing features of children's books may exhibit even greater advantages.

This study also had limitations. It was not possible to accurately assess or control for exposure to safe sleep information outside of the study, such as via public service campaigns, though such exposure would be expected to affect both groups equally, as evidenced by equivalently high baseline knowledge of supine positioning. Home visitors performed both intervention and data collection, a potential source of bias, though this dual role is customary in the ECS program and all surveys and procedures were scripted and rehearsed. It was not possible to blind home visitors to the purpose of the study, though it was stressed that neither material had been previously studied, bias could reasonably manifest for or against either type, and the effect of home visitor was included in our model. Similarly, home visitors in the book group had greater overall experience, which could bias them for or against novel approaches, though there was no significant home visitor effect on our results. Choice of brochures in the control group was at home visitor discretion, a potential source of variability, though all can be considered reference standards, and it is expected that home visitors actively select those viewed as best at each visit, favoring this group. It was not feasible to randomize by mother, given potential errors and confounding if home visitors were to perform education via both materials. Less than half of eligible mothers were enrolled, potentially reflecting selection bias, although enrollment drivers were agency and home visitor caseloads, reasonably expected to affect our groups equally, and few mothers declined to participate. Outcomes were not assessed beyond 2 months of age and may not reflect longer-term knowledge or adherence, though they do reflect a formative stage of parenting and sleep behavior,³ culminating at the onset of peak SIDS risk.^{3,4} Findings represent low-SES first-time mothers enrolled in home visiting and may not be generalizable, though this population is critical, given its outsized SIDS risk^{1,3} and documented resistance to anticipatory guidance.^{8,22,26,35} Future studies involving a diverse population, additional settings, and active versus passive mode of presentation would be worthwhile to optimize safe sleep and other anticipatory guidance, and improve child health outcomes.

CONCLUSIONS

While a specially designed children's book and brochures were equally effective in conveying aggregate safe sleep knowledge in this randomized trial involving low-SES mothers in a home visiting program, the book was superior in terms of translating knowledge into adherence. Mothers in the book group exhibited significantly greater exclusive crib use and less reported and observed bed sharing, the latter a predominant SIDS risk factor. Potential catalysts favoring the book include enhanced mother-provider dialogue, readability, emotional engagement, and book sharing with the baby, and greater item-level knowledge gains for sleep-related behaviors evoked

by the narrative. These findings highlight the potential of well-crafted children's books for safe sleep and other pediatric anticipatory guidance, especially when presented by health care providers.

ACKNOWLEDGMENTS

All phases of this study were supported by a grant from the DeCavel Family SIDS Foundation, a Ruth L. Kirschstein National Research Service Award, and in-kind support from the ECS program. The authors would like to thank the ECS program and its partner agencies for their hard work and dedication to this study, particularly ECS program director Margaret Clark, MPA, and Alonzo T. Folger, PhD, for their invaluable support and guidance. The authors acknowledge the participation and support of the United Way of Greater Cincinnati, Kentucky HANDS, and Ohio Help Me Grow. The authors also thank Charlie's Kids Foundation for their steadfast advocacy for safe sleep education and donation of copies of the book for this study, and Rachel Y. Moon, MD, for encouragement and advice on development of the safe sleep/SIDS measures utilized.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.acap.2017.04.018>.

REFERENCES

- Centers for Disease Control and Prevention. *Sudden Unexpected Infant Death and Sudden Infant Death Syndrome: About SUID and SIDS*. Atlanta, Ga: Centers for Disease Control and Prevention; 2016. Available at: <http://www.cdc.gov/sids/aboutsuidandsids.htm>. Accessed December 2016.
- Moon RY, Fu L. Sudden infant death syndrome: an update. *Pediatr Rev*. 2012;33:314–320.
- American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome. SIDS and other sleep-related infant deaths: updated 2016 recommendations for a safe infant sleeping environment. *Pediatrics*. 2016;138:e20162938.
- Colvin JD, Collie-Akers V, Schunn C, et al. Sleep environment risks for younger and older infants. *Pediatrics*. 2014;134:e406–e412.
- Mollborg P, Wennergren G, Almqvist P, et al. Bed sharing is more common in sudden infant death syndrome than in explained sudden unexpected deaths in infancy. *Acta Paediatr*. 2015;104:777–783.
- Sanders LM, Shaw JS, Guez G, et al. Health literacy and child health promotion: implications for research, clinical care, and public policy. *Pediatrics*. 2009;124(suppl 3):S306–S314.
- Yin HS, Johnson M, Mendelsohn AL, et al. The health literacy of parents in the United States: a nationally representative study. *Pediatrics*. 2009;124(suppl 3):S289–S298.
- Sanders LM, Federico S, Klass P, et al. Literacy and child health: a systematic review. *Arch Pediatr Adolesc Med*. 2009;163:131–140.
- Freda MC. The readability of American Academy of Pediatrics patient education brochures. *J Pediatr Health Care*. 2005;19:151–156.
- D'Alessandro DM, Kingsley P, Johnson-West J. The readability of pediatric patient education materials on the World Wide Web. *Arch Pediatr Adolesc Med*. 2001;155:807–812.
- Swartz EN. The readability of paediatric patient information materials: are families satisfied with our handouts and brochures? *Paediatr Child Health*. 2010;15:509–513.
- National Institutes of Health. *Clear Communication: A NIH Health Literacy Initiative*. Washington, DC: National Institutes of Health; 2013. Available at: <https://www.nih.gov/institutes-nih/nih-office-director/office-communications-public-liaison/clear-communication/health-literacy>. Accessed May 2017.
- Centers for Disease Control and Prevention; Strategic and Proactive Communication Branch. *Simply Put: A Guide for Creating Easy-to-Understand Materials*. Atlanta, Ga: Centers for Disease Control and Prevention, Division of Communication Services; 2009.
- Zuckerman B, Khandekar A. Reach Out and Read: evidence based approach to promoting early child development. *Curr Opin Pediatr*. 2010;22:539–544.
- Zuckerman B, Augustyn M. Books and reading: evidence-based standard of care whose time has come. *Acad Pediatr*. 2011;11:11–17.
- Reich SM, Penner EK, Duncan GJ. Using baby books to increase new mothers' safety practices. *Acad Pediatr*. 2011;11:34–43.
- Bauer NS, Hus AM, Sullivan PD, et al. A pilot study using children's books to understand caregiver perceptions of parenting practices. *J Dev Behav Pediatr*. 2012;33:423–430.
- Reich SM, Bickman L, Saville BR, et al. The effectiveness of baby books for providing pediatric anticipatory guidance to new mothers. *Pediatrics*. 2010;125:997–1002.
- Hartling L, Scott S, Pandya R, et al. Storytelling as a communication tool for health consumers: development of an intervention for parents of children with croup. Stories to communicate health information. *BMC Pediatr*. 2010;10:64.
- Ammerman RT, Putnam FW, Kopke JE, et al. Development and implementation of a quality assurance infrastructure in a multisite home visitation program in Ohio and Kentucky. *J Prev Interv Community*. 2007;34:89–107.
- Fu LY, Colson ER, Corwin MJ, et al. Infant sleep location: associated maternal and infant characteristics with sudden infant death syndrome prevention recommendations. *J Pediatr*. 2008;153:503–598.
- Robida D, Moon RY. Factors influencing infant sleep position: decisions do not differ by SES in African-American families. *Arch Dis Child*. 2012;97:900–905.
- Moon RY. SIDS and other sleep-related infant deaths: expansion of recommendations for a safe infant sleeping environment. *Pediatrics*. 2011;128:1030–1039.
- Turner T, Cull WL, Baylton B, et al. Pediatricians and health literacy: descriptive results from a national survey. *Pediatrics*. 2009;124(suppl 3):S299–S305.
- Bass PF 3rd, Wilson JF, Griffith CH. A shortened instrument for literacy screening. *J Gen Intern Med*. 2003;18:1036–1038.
- Ajao TI, Oden RP, Joyner BL, et al. Decisions of black parents about infant bedding and sleep surfaces: a qualitative study. *Pediatrics*. 2011;128:494–502.
- Grudniewicz A, Kealy R, Rodseth RN, et al. What is the effectiveness of printed educational materials on primary care physician knowledge, behaviour, and patient outcomes: a systematic review and meta-analyses. *Implement Sci*. 2015;10:164.
- Young J, Watson K, Ellis L, et al. Responding to evidence: breastfeed baby if you can—the sixth public health recommendation to reduce the risk of sudden and unexpected death in infancy. *Breastfeed Rev*. 2012;20:7–15.
- Hauck FR, Thompson JM, Tanabe KO, et al. Breastfeeding and reduced risk of sudden infant death syndrome: a meta-analysis. *Pediatrics*. 2011;128:103–110.
- US Department of Education. *Dialogic Reading*. Washington, DC: Institute of Education Sciences; 2007.
- Pagel M. Anthropology: the long lives of fairy tales. *Curr Biol*. 2016;26:R279–R281.
- Walsh JA. Dr Seuss meets Dr Freud: primary prevention in the community library. *Am J Public Health*. 1977;67:561–562.
- Clark MC, Rossiter M. *Narrative Learning in Adulthood. New Directions for Adult and Continuing Education*. New York, NY: Wiley-InterScience; 2008.
- Hasson U, Ghazanfar AA, Galantucci B, et al. Brain-to-brain coupling: a mechanism for creating and sharing a social world. *Trends Cogn Sci*. 2012;16:114–121.
- Brown CM, Girio-Herrera EL, Sherman SN, et al. Low-income parents' perceptions of pediatrician advice on early childhood education. *J Community Health*. 2013;38:195–204.