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ORIGINAL RESEARCH

A Hospital-Based Infant Safe Sleep Intervention and Safe Sleep Practices Among Young Women: A Prospective Longitudinal Study

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Abstract

Introduction The rates of sudden unexpected infant death (SUID) are still high in the U.S. The longitudinal effects of SUID preventive education on infant safe sleep practices are less known. The current study evaluated the effects of a comprehensive hospital-based, SUID preventive intervention on safe infant sleep practices in the first six months of life and to identify factors associated with infant sleep practices.

Methods Using a one-group pretest and multiple posttest design, the current quantitative study examined the impacts of the infant safe sleep intervention among 411 women recruited at a large, urban, university medical center. Participants were prospectively followed and completed four surveys from childbirth. Linear mixed models were used to evaluate the effects of the SUID prevention program on four sleep practice outcomes, including removing unsafe items from the sleeping environment, bed sharing, room sharing without bed sharing, and placing the infant in a supine sleep position.

Results Compared to the baseline, participants were less likely to use unsafe items (e.g., soft bedding) in infants' sleeping areas over time. However, we found that participants reported more frequent bed sharing at 3-month and 6-month follow-ups, compared to the baseline.

Conclusions Overall, maternal education and family income were positively related to healthy infant safe sleep practices. A hospital-based preventive intervention pairing an educational initiative with home-visiting services might improve safe sleep practices to remove accidental suffocation risks from the infant sleep environment.

Significance Statement

What is already known on this subject? Despite large public health efforts, rates of sudden unexpected infant death have stagnated across the U.S. in recent years. The majority of caregivers implement some of the American Academy of Pediatrics (AAP) safe sleep guidelines, such as safe sleep position. Few caregivers, however, follow other AAP recommendations such as not using any soft and loose bedding that present a potential suffocation hazard.

What this study adds? A hospital-based preventive intervention was effective in removing unsafe items from infants' sleeping area. The development of policy and practice initiatives to prevent the use of unsafe items in an infant sleeping environment should be further encouraged.

Keywords Safe Sleep Practices · Sudden Unexpected Infant Death (SUID) · Sudden Infant Death Syndrome (SIDS) · Prevention · Infant Mortality

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Sudden unexpected infant death (SUID) refers to the unexpected death of a child less than one year old without a known cause of death prior to investigation, including sudden infant death syndrome (SIDS), accidental suffocation and strangulation in bed, and unknown causes of death. Although SUID rates declined during the 1990s, rates have recently stagnated across the U.S. (Bass et al., 2018; Lambert et al., 2018). In 2019, about 3,500 infants died of SUID in the U.S. (Centers for Disease Control and Prevention, 2021).

Although there are inconsistencies in defining and classifying SUID types, a majority of SUID cases involve unhealthy infant sleep practices such as bed-sharing and unsafe items in infants' sleeping areas (e.g., blankets, pillows, stuffed animals). For example, using the Centers for Disease Control and Prevention (CDC) SUID Case Registry of 4,929 infants, Parks and colleagues found that about 72% of SUID and 75% of suffocation deaths were attributable to unsafe sleeping areas (Parks et al., 2021).

There have been many efforts to reduce sleep-related infant deaths. According to a review by Ward and Balfour (2016), most studies used multifaceted interventions including one-on-one or group education, printed materials, videos, and providing resources (e.g., cribs and wearable blankets). However, little is known regarding the effectiveness of combinations of educational videos, providing appropriate sleeping materials, and using home-visiting services to reinforce the initial educational intervention. Comprehensive prevention and education strategies focusing on removal of hazardous items from infants' sleeping area, avoidance of bed-sharing, and infant sleep position might be particularly effective in preventing SUID. In addition, few longitudinal studies have investigated whether parents/caregivers maintain infant safe-sleep practices after the initial intervention (Moon et al., 2016).

Previous studies have shown that women with low socioeconomic status were less likely to adopt infant safe-sleep practices, therefore, preventive interventions focusing on this high-risk populations are particularly important. Longitudinal and cross-sectional studies have reported that maternal education and family income are strong predictors of compromised infant safe-sleep practices (Colson et al., 2013; Hauck et al., 20,008; Hirai et al., 2019). For instance, using national trend data from 1993 to 2010, Colson and colleagues (2013) found that women with household income below $20,000) and less than high school education were 1.7 and 1.4 times more likely to bed-share with an infant, respectively. The present study examined the effects of a hospital-based safe-sleep intervention on safe-sleep practices during the first six months of infants' lives. Using a prospective longitudinal sample of women, our study also identified factors associated with infant sleep practices.

Methods

Study Design

Our study utilized the data collected from the Longitudinal Infant and Family Environment (LIFE) study, which employed a one-group pretest and multiple posttest design to decrease unsafe sleep practices and to prevent SUID. The LIFE intervention program consisted of three components: a 15-minute educational video on infant safe-sleep practices, a baby box with a firm foam mattress and a cotton fitted sheet, and a postpartum home visit. The video recommended four safe-sleep practices from the American Academy of Pediatrics (AAP), which included placing the baby on their back to sleep, room-sharing without bed-sharing, removing unsafe items, and reducing exposure to smoke and other chemicals (AAP Task Force on Sudden Infant Death Syndrome, 2016). The baby box was provided to reduce the financial burden associated with purchasing safe sleeping materials. Trained nurses conducted home visits 7 days after hospital discharge assessing both the infant and mother and providing a brief refresher course on infant safe-sleep practices. Additional details about the study design are described elsewhere (Shin et al., 2019).

Procedures

Participants were recruited from a large, urban, university medical center in the Mid-Atlantic region. The exclusion criteria included women who were under 18 years old and non-English speakers. Those who were not excluded were provided with detailed information regarding the intervention study by our team members. Informed consent procedures were conducted with all participants prior to their participation. The LIFE study collected data four times to track how safe sleep practices changed over time using self-administered surveys. Baseline data were collected prior to intervention (i.e., prior to watching the educational video) in the hospital (Time 1). This data reflects participants' awareness of or planned behaviors regarding safe infant sleep practices at home. Follow-up data were collected during the 7-day home visit (Time 2) as well as through online surveys at 3 months (Time 3) and 6months (Time 4). Participants were asked to report on their actual practices related to infant sleep during the Time 2–4 surveys, which took about 5 to 10 min to complete. Participants received a gift card after each completed survey. All study procedures were approved by the Virginia Commonwealth University institutional review board.

Participants

A total of 895 eligible participants provided consent and completed the baseline survey. The attrition rate were 28.8% from baseline to Time 2, 39.2% from Time 2 to Time 3, and 7.8% from Time 3 to Time 4. In this study, we included participants who completed at least three surveys (45.9%; $n = 411$). We compared the characteristics of the analytic sample and those excluded from analysis. The results showed that our study sample had a higher likelihood of having higher income and postsecondary education, being married, and being primiparous compared to those who were excluded from analysis due to attrition (all $p < .05$).

Measures

We assessed four infant sleep practice outcomes, including the use of unsafe items, bed-sharing, room-sharing without bed-sharing, and sleep position. Participants reported their use of various types of soft bedding (e.g., blankets, pillows) in the past 7 days and 3 months during the follow-up surveys (Time 2–4). According to the American Academy of Pediatrics (REF), bedsharing is defined as "parent(s) and infant sleeping together on any surface (bed, couch, chair).

Participants who reported any use of these soft bedding items in the past 7 days or past 3 months, were defined as using unsafe sleep items. The question regarding bedsharingasked participants how often their infant slept in the same bed with them or anyone else in the past 7 days. Similarly, the question about room-sharing without bedsharing asked whether their baby box/crib/bed was in the same room where they slept in the past 7 days when infant slept alone. Responses to both questions were coded from 0 (*never*) to 4 (*always*). Participants also answered questions about their infant's sleep position, with response options of "on side," "on stomach," or "on back." In our analysis, we classified these responses into either supine and non-supine sleep positions. The questions for the baseline survey were different, using the phrasing "how often will you/in which ways will you" instead of "in the past 7 days."

We also collected information regarding infant characteristics such as sex, birth order, preterm birth (defined as being born more than three weeks before the due date) and low birth weight (defined as birth weight < 2500 g). Maternal sociodemographic background was also obtained, including race/ethnicity, age, education, marital status, and gross annual household income.

Statistical Analysis

Descriptive statistics were used to summarize the characteristics of the study sample and parents' infant safe-sleep practices during the first 6 months of life. We used linear mixed models (LMMs) to evaluate changes in sleep practices over time and to investigate the associations between maternal/child characteristics and infant safe-sleep practices. LMMs allowed us to analyze within-subject and between-subject effects in a model simultaneously and provided relatively robust results for longitudinal data with unequal time spaces and missing observations (Puspone-goro et al., 2017). For binary outcome variables such as sleep position, we used a generalized linear mixed model (GLMM) assuming a binomial logistic distribution. The time effect was included in the mean structure of the mixed model along with covariates, while a first-order autoregressive variance-covariance matrix was assumed for the error terms. Statistical significance of factors was evaluated using beta coefficients for LMMs and odds ratio for GLMMs. All analyses were conducted using IBM SPSS.

Results

On average, participants were 27.6 years old at baseline (see Table 1). The majority of sample participants (57.9%) was non-Hispanic Black, 28.2% non-Hispanic white, and about 9% were Hispanic. About 65.7% of the sample had a high school/GED or less, and over half (56.9%) of participants reported gross annual household income less than $25,000. Furthermore, about 60.6% of the sample were married or cohabiting while the rest were never married, separated, divorced, or widowed. In terms of infants' characteristics, nearly half were female (48.2%) and firstborns (45.8%). About 17% of infants were born preterm, and 10.2% had low birth weight.

Table 2 presented the prevalence of infant sleep practices during the first six months of life. Before watching the educational video and hospital discharge, the majority of women (75.6%) reported their intention to use one or more unsafe items in their baby's sleeping areas. However, the actual use of unsafe items in sleeping areas decreased over time, with 65.2% reporting it at Time 2, 52.2% at Time 3, and 52.1% at Time 4. In contrast, while only 3.6% of women reported their intention to share a bed with their infants "often" or "always" at baseline, this percentage increased over time to6.7% at Time 2, 18.7% at Time 3, and 22.1% at Time 4. Furthermore, the frequency of reporting "often" or "always" room-sharing without bed-sharing, decreased at Time 4 (76.2%) from 92.8% at Time 2 and 90.7% at Time 3. All participants at baseline and 97.5% of the sample at Time 2 reported they planned to use or actually used the supine position with their infants. However, the percentage of women who put their babies to sleep on their back decreased from (83.4%) at Time 3 to 78.7% at Time 4. Due

Table 1 Sociodemographic characteristics and birth outcomes of the sample

Variable	*n*	%
Maternal age		
< 20	29	7.1
≥ 20	382	92.9
Maternal race/ethnicity		
African American	238	57.9
Non-Hispanic White	116	28.2
Hispanic	35	8.5
Others	22	5.4
Maternal education		
≤ high school or GED	270	65.7
> high school or GED	141	34.3
Marital status		
Married or cohabiting	248	60.6
Never married, separated, divorced, or widowed	161	39.4
Gross annual income ($US)		
≤ $25,000	231	56.9
$25,000 – $39,999	67	16.5
$40,000 – $49,999	33	8.2
$50,000 – $74,999	31	7.6
$75,000 – $99,999	15	3.7
> $100,000	29	7.1
Infant sex		
Male	205	51.8
Female	191	48.2
Birth order		
First offspring	187	45.8
Second or higher offspring	221	53.8
Preterm birth		
Yes	67	16.9
No	329	83.1
Birth weight (g)		
< 2500	42	10.2
≥ 2500	369	89.8

Table 2 Prevalence of infant sleep practices in the first six months of life

Variable	T1	T2	T3	T4
Unsafe items in infant sleeping areas	75.6%	65.2%	52.2%	52.1%
Sleep position (Supine)	100.0%	97.5%	83.4%	78.7%
Bed sharing				
Always	0.5%	1.1%	11.0%	11.6%
Often	3.2%	5.6%	7.7%	10.5%
Sometimes	22.9%	17.0%	12.2%	11.3%
Rarely	17.5%	19.0%	25.4%	20.7%
Never	56.0%	57.3%	43.6%	45.9%
Room sharing without bed sharing*				
Always	-	90.5%	85.1%	74.1%
Often	-	2.2%	5.5%	2.1%
Sometimes	-	2.5%	2.6%	7.5%
Rarely	-	1.4%	1.5%	2.4%
Never	-	3.3%	5.2%	13.9%

Note. T1 (Time 1) = Baseline assessment; T2 = 7-day follow-up; T3 = 3-month follow-up; T4 = 6-month follow-up

* Not measured at T1

to the highly skewed nature of the sleep position variable, it created convergence issues in conducting LMM, therefore sleep position outcomes were excluded from the multivariable LMM analyses.

To investigate factors associated with infant safe-sleep practices, we used a logistic GLMM for the unsafe items outcome and LMMs for bed-sharing and room-sharing without bed-sharing outcomes. We controlled for maternal age, race/ethnicity, educational attainment, marital status, family income, birth order, duration of pregnancy, birth weight, and infant sex (see Table 3). Women with a high school diploma/GED or less ($OR = 1.89$, $p < .001$) and first-time mothers ($OR = 1.53$, $p < .05$) were more likely to use at least one unsafe item in their infants' sleeping areas than those with higher education level and who had previously given birth, respectively. Women with higher gross annual household income were less likely to place unsafe items in their babies' sleeping areas ($OR = 0.70$, $p < .001$) compared to their counterparts. Our results also showed that women were less likely to use unsafe items in infants' sleeping areas over time, compared to their planned behavior before the intervention (ORs = 0.50 at Time 2, 0.30 at Time 3, 0.33 at Time 4, all $p < .001$).

With respect to bed-sharing, our study found that non-Hispanic African American ($b = 0.37$, $p < .01$), Hispanic ($b = 0.81$, $p < .001$), and other race women ($b = 0.46$, $p < .01$) tended to share a bed with their infants more frequently non-Hispanic white women. After adjusting for covariates, our results showed that bed-sharing became more frequent at Time 3 ($b = 0.44$, $p < .001$), and Time 4 ($b = 0.49$, $p < .001$). In terms of room-sharing without bed-sharing, our analysis showed that Hispanic women ($b = 0.36$, $p < .05$) were more likely to room-share without bed-sharing with their babies compared to non-Hispanic White women. Moreover, women with higher gross annual household income shared rooms with their babies less frequently (b=-0.18, $p < .001$) compared to those with lower income. Finally, our results indicated that less frequent room-sharing with infants was reported at Time 4 compared to Time 2 (b=-0.49, $p < .001$).

Discussion

The present study examined the effect of a comprehensive, hospital-based, infant safe-sleep intervention on changes in safe-sleep practices among a sample of women primarily from socio-economically disadvantaged and minoritized racial/ethnic backgrounds. The intervention demonstrated

Table 3 Factors associated with infant sleep practice from multivariable linear mixed models

	Unsafe items		Bed sharing		Room sharing without bed sharing	
	OR	95% CI	b	95% CI	b	95% CI
Intercept	2.65	0.60–11.65	-0.21	-0.76–0.76	3.96***	3.25–4.67
Maternal race/ethnicity						
Non-Hispanic White	Ref.		Ref.		Ref.	
African American	1.38	0.91–2.10	0.37**	0.15–0.59	0.16	-0.07–0.38
Hispanic	1.61	0.83–3.12	0.81***	0.46–1.15	0.36*	0.01–0.71
Other	1.65	0.84–3.23	0.46**	0.10–0.82	0.24	-0.12–0.61
Maternal educational attainment						
> high school/GED	Ref.		Ref.		Ref.	
≤ high school/GED	1.89**	1.29–2.91	0.18	-0.06–0.42	0.08	-0.17–0.32
Maternal marital status						
Single	Ref.		Ref.		Ref.	
Married/cohabiting	1.01	0.72–1.43	-0.01	-0.19–0.17	-0.07	-0.25–0.12
Maternal age	0.99	0.96–1.03	0.01	-0.01–0.26	0.01	-0.01–0.03
Family income	0.70***	0.61–0.81	-0.04	-0.12–0.03	-0.18***	-0.25 - -0.10
Birth order						
Second or higher offspring	Ref.		Ref.		Ref.	
First offspring	1.53*	1.10–2.10	-0.01	-0.17–0.15	-0.01	-0.18–0.16
Duration of pregnancy						
Full-term birth	Ref.		Ref.		Ref.	
Preterm birth	0.92	0.59–1.41	0.01	-0.21–0.24	-0.09	-0.32–0.13
Birth weight (kgs)	1.13	0.84–1.52	0.05	-0.10–0.20	-0.08	-0.20–0.05
Infant sex						
Male	Ref.		Ref.		Ref.	
Female	0.93	0.69–1.24	-0.03	-0.18–0.13	0.04	-0.11–0.20
Time (T)						
T1	Ref.		Ref.		-	-
T2	0.50***	0.37–0.68	-0.00	-0.14–0.13	Ref.	Ref.
T3	0.30***	0.22–0.42	0.44***	0.28–0.60	-0.08	-0.23–0.06
T4	0.33***	0.23–0.46	0.49***	0.33–0.65	-0.49***	-0.65 - -0.33

Note. GED = General Educational Development; CI = Confidence interval; Ref. = Reference group of a categorical variable; T1 = Baseline; T2 = 7-day follow-up; T3 = 3-month follow-up; T4 = 6-month follow-up. Room sharing was not measured at T1

*$p < .05$. **$p < .01$. ***$p < .001$

positive effects on reducing unsafe items in infant sleeping areas over time. Our results also indicated that maternal education and family income were negatively associated with using unsafe items in infant sleeping areas. With regard to bed-sharing, our findings suggest that there were racial/ethnic differences, with women from minoritized racial/ethnic backgrounds being more likely to bed-share with their infants compared to non-Hispanic White women. Infant characteristics were not significantly associated with safe-sleep practices except for low birth order being positively related to the use of unsafe items in the sleeping area.

Our results provide evidence that our intervention was effective in reducing the use of unsafe items in the infant sleep environment over time. According to the baseline survey, most women were aware of safe-sleep practices for sleep position and location (i.e., room-sharing without bed-sharing), which was consistent with previous research (Ahlers-Schmidt et al., 2014; Mathews et al., 2016; Thach et al., 2007). However, over 75% of women were not aware of the risks of soft bedding materials in the sleeping environment before the intervention. This highlights the importance of educational programs like our intervention, to reduce the risk of SUID. Prevention strategies could be improved by educating caregivers on the danger of soft bedding and encouraging them to remove unsafe items from infant sleeping areas to promote safe sleep practices.

Our intervention program was designed based on the 2016 AAP recommendations, therefore, it is possible that our results may have been influenced by concurrent evidence-based infant safe-sleep practices recommended by pediatricians. Although we were unable to account for how much information women received through other channels

such as pediatricians, this may help to explain why our findings differ from other studies. For example, Mathews et al. (2016) conducted a randomized controlled trial among African American women and did not observe significant effects on messaging emphasizing safe-sleep practices according to the AAP for the reduction of SIDS and use of unsafe bedding items. However, messaging emphasizing safe-sleep practices to reduce the risk of SIDS and suffocation significantly reduced the use of soft bedding in their study. Given that the use of soft bedding remains one of the leading causes of suffocation deaths (Parks et al., 2021), future research should focus on identifying the most effective strategies to modify caregivers' behaviors and reduce the use of unsafe items in the sleeping area. One possible direction is to explore whether consistency of information shared with women by both an intervention program and their pediatricians may further decrease this practice.

In contrast to the observed reduction of unsafe items, our study found a decline in adherence to other infant safe-sleep practices decreased over time. Specifically, although most women reported avoiding bed-sharing with their infant throughout the study period, the percentage of women who bed-shared always or often increased after the third postpartum month. These findings are consistent with previous research indicating an increase in prone sleeping and bed-sharing during the first six months of life (Jenni et al., 2005; Lesko et al., 1998; Stremler et al., 2013). One possible explanation for the observed increase in bed-sharing over time is related to infant development. As infants grow and gain motor skills, parents may perceive that prone sleep position or bed-sharing are less risky. Additionally, our findings suggest that women reported room-sharing with their infant without bed-sharing frequently (i.e., often or always) throughout the study period (92.7% at Time 2, 90.6% at Time 3, 76.2% at Time 4). This high frequency of room-sharing may contribute to the increase in bed-sharing over time. For example, Paul et al. (2017) found that room-sharing is associated with greater odds of later bed-sharing during the night among parents of 4- and 9-month-old infants compared to parents whose infants sleep in a separate room. Although the majority of SUID occur during the first four months of life, it is still critical to adhere to safe-sleep guidelines to reduce the risk of SUID until the infant's first birthday (Trachtenberg et al., 2012).

Although our intervention included education on safe-sleep practices during the 7-day home visit, our study found a decline in safe-sleep practices related to sleep position, bed-sharing, and room-sharing without bed-sharing over time. These results suggest that more intensive strategies for follow-up interventions may be beneficial to maintain safe-sleep practices. As discussed previously, pediatricians may play a critical role in providing education and reinforcing safe-sleep practices. Therefore, future research should explore the effects of consistent messaging from a hospital-based intervention program and pediatricians on promoting and sustaining safe-sleep practices.

It is important to contextualize our findings within the sociocultural background of our study sample, which predominantly consisted of minoritized racial/ethnic women with low income and educational attainment. Our study found that women from marginalized groups were more likely to use unsafe sleep practices over time. This finding is consistent with prior research, that reported that women with low socioeconomic status and minoritized racial/ethnic backgrounds engaged in unsafe infant sleep practices due to limited resources to create safe-sleep environments or having cultural differences in sleep practices (Colson et al., 2013; Hauck et al., 2008; Herman et al., 2015; Oden et al., 2010). It is important to acknowledge that social and cultural factors may play a significant role in shaping safe-sleep practices and to develop interventions that are culturally sensitive and tailored to the specific needs of these populations.

Although we used the AAP recommendation to create the educational video, the messages were not tailored to families with low income and educational background, or to be culturally-relevant to minoritized racial/ethnic groups. As these groups seemed to benefit the least from the intervention, it is important to consider whether the intervention is effective within these populations and explore culturally-relevant intervention strategies to improve safe-sleep practices. In addition, it is necessary to identify alternative safe-sleep practices that would honor cultural traditions while reducing risk of SUID (Tipene-Leach et al., 2014). Several studies have found that parents' knowledge and beliefs about comfort, safety, and convenience of certain sleep practices can influence caregiver's decisions regarding infant sleep location, position, and environments (Carlin & Moon, 2017; Gaydos et al., 2015). Thus, qualitative studies that obtain caregiver perceptions and knowledge of safe-sleep practices can reveal cultural barriers to infant safe-sleep practices and potential strategies to better engage at-risk populations to promote safe-sleep practices and health equity among minoritized racial/ethnic groups.

It is also important to consider the intersection of low income, lack of health insurance and/or healthcare access. Women who cannot receive regular healthcare or infant well-child visits may miss out on education regarding safe-sleep practices; therefore, it is essential to proactively provide educational interventions prior to hospital discharge after birth and through other avenues. For example, public awareness campaigns and education strategies can focus on innovative message delivery systems to reach a

broader audience, particularly women from marginalized backgrounds.

Strengths and Limitations

Our study has strengths in terms of using a comprehensive approach to prevent SUID, a relatively large sample of at-risk women, and a prospective longitudinal design. However, the findings must be considered within its limitations. First, baseline measures reflect women's intentions rather than actual behaviors. Therefore, our findings from baseline to Time 2 might reflect the intention-to-action transition rather than changes in actual behaviors. Second, the lack of a control group in this non-RCT study limits the ability to draw, causal inferences about the effectiveness of the intervention. Although an RCT is the gold standard for determining effectiveness of an intervention, it is not feasible for many safe-sleep interventions (Moon et al., 2016). Third, our study excluded women who were younger than 18 years and non-English speaking which may limit the generalizability of the findings. Minors, in particular, may benefit from comprehensive safe-sleep initiatives and home-visiting services due to limited child development knowledge and resources. Moreover, cultural differences in infant sleep practices were not examined although cultural influences may play a role in safe sleep. Next, the current study was not able to include all risk and protective factors for infant safe sleep such as breastfeeding or birth experiences. For example, while the birthing person's birth experience, particularly a traumatic birth, may have contributed to their awareness and engagement with our intervention, the current study did not examine such variables. Further research would be needed to fully explore the roles of birth experiences in the development and maintenance of infant safe sleep practices. Finally, the study sample was limited to women from the Mid-Atlantic region of the U.S. and those included in the analysis differed from those excluded from analysis in terms of, income, education levels, marital status, and parity. Therefore, the interpretation of findings may be specific to the characteristics of the study sample.

In conclusion, our results suggest that a hospital-based preventive intervention incorporating education and home-visiting services can effectively improve safe-sleep practices by reducing accidental suffocation risks in the first six months of life through removing unsafe items from the sleeping areas. However, the intervention did not demonstrate the effectiveness in a reduction in bed-sharing. Furthermore, we still continue to see that underlying sociocultural factors influencing parents' decisions to continue to bed-share. Therefore, it is imperative that future research focuses on specific target groups and develop culturally appropriate intervention strategies that effectively reduce the use of unsafe sleep practices to reduce the rate of SUIDs and promote health equity across populations.

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Author contributions All authors whose names appear on the submission: (a) made substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data; or the creation of new software used in the work; (b) drafted the work or revised it critically for important intellectual content; (c) approved the version to be published; and (d) agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Data Availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Code Availability Not applicable.

Declarations

Conflicts of interest The authors have no conflicts of interest and/or competing interests to declare.

Ethics Approval This study was approved by the Virginia Commonwealth University IRB.

Consent to Participate Informed consent procedures were established and approved by the University IRB. All participants provided written consent prior to data collection.

Consent for publication The consent procedures/form participants signed gave the study investigators permission to analyze and publish results in their aggregate form.

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