Journal of Pediatric Nursing 50 (2020) 20–24

Contents lists available at ScienceDirect

Journal of Pediatric Nursing

journal homepage: www.pediatricnursing.org

Modeling Safe Infant Sleep in the Hospital

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ARTICLE INFO

Article history:
Received 14 April 2019
Revised 6 October 2019
Accepted 10 October 2019

Keywords:
Safe sleep
SIDS
Infant
Hospitalization

ABSTRACT

Purpose: Despite reductions in the rate of sudden infant death syndrome (SIDS) over the last 25 years, over 3000 infant deaths annually in the US are attributable to sleep-related causes. We aimed to improve safe sleep practice (SSP) adherence by healthcare providers working with infants admitted to an inpatient pediatric unit in an urban academic center specifically increasing compliance on five core SSP (supine, alone in the crib, no objects in crib, appropriate bundling, and flat crib).
Design and methods: This Quality Improvement project evaluated a staff education intervention using a pre- and post-design. Surveys of providers determined baseline SSP knowledge. Adherence to SSP in the hospital was audited before and after education. One hundred pre-intervention infant sleep placement observations were recorded and 123 were collected post-intervention.
Results: Surveyed providers had appropriate knowledge of SSP; however, baseline audits indicated that no patients met all SSP practices in the hospital. Post-intervention adherence to SSP showed significant ($p < .05$) improvements in keeping the crib flat, removing objects from the crib, and avoiding over-bundling. Overall, SSP adherence increased by 12.5% post-intervention.
Conclusions: This quality improvement project suggests that the inpatient setting provides opportunities for providers to demonstrate SSP but that healthcare providers often do not follow SSP in practice. Continued education can lead to improvements in SSP adherence ensuring that hospitals are modeling SSP for the families of infants.
Practice implications: Limited improvements to SSP adherence illustrate the complexities of modifying provider behaviors in the absence of formal policy.

Introduction

Problem description

The Back to Sleep campaign was launched in 1994 in an effort to reduce the rates of sudden infant death syndrome (SIDS) in the United States. The initial campaign, encouraging parents to put their infants to sleep in a non-prone position after research demonstrated an association between the prone sleep position and an increased risk of SIDS, reached a wide audience and was incredibly successful (AAP Task Force, 2016; Moon, 2016; Shadman, Walk, Smith, & Coller, 2016). Between 1994 and 2001, rates of SIDS declined dramatically (Moon, 2016; Shadman et al., 2016). Ongoing research over the last thirty years has expanded our understanding of SIDS risk factors and, in response, the American Academy of Pediatrics (AAP) continually updates the recommended safe sleep practices (SSP) for infants (Moon, 2016). However, the most recent data from the US Centers for Disease Control (CDC) indicates that SIDS rates have remained relatively steady since 2001, and in 2015 roughly 2500 infant deaths could be specifically be attributed to SIDS or accidental strangulation/suffocation in bed and an additional 1200 were attributed to unknown causes (CDC, 2017). These statistics, despite known prevention practices, seem to suggest that there is still a great deal of work to be done to improve the communication of risk mitigation strategies from pediatric healthcare professionals to the families they serve.

Available knowledge

While many parents are aware of basic safe sleep recommendations, studies find that they are often uncertain about what recommendations mean and what they look like in practice (Moon, Oden, Joyner, & Ajao, 2010). Evidence suggests an association between healthcare provider behaviors when caring for infants and subsequent caregiver behavior in the home with studies showing that parents are likely to mimic the practices they see in the hospital or clinic (Ajao, Oden, Joyner, & Moon, 2011; Brenner et al., 1998; Colson et al., 2006; Eisenberg et al., 2015; Goodstein, Bell, & Krugman, 2015; Hauck et al., 2002; Hauck et al., 2003; Mason, Ahlers-Schmidt, & Schunn, 2013; Moon et al.,

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https://doi.org/10.1016/j.pedn.2019.10.002
0882-5963/

2010; Moon, Hauck, & Colson, 2016; Smith et al., 2010). Thus, in the most up to date safe infant sleep recommendations released in 2016, the AAP states that, "Health care professionals, staff in newborn nurseries and neonatal intensive care units, and child care providers should endorse and model recommendations to reduce SIDS risk," (AAP Task Force, 2016). Unfortunately, data indicates that healthcare providers often model unsafe practices or simply fail to discuss safe sleep (Ajao et al., 2011; Eisenberg et al., 2015; Goodstein et al., 2015; Hauck et al., 2002; Hauck et al., 2003; Mason et al., 2013; Shadman et al., 2016; Smith et al., 2010). These failures can both further confuse parents and implicitly suggest that unsafe practices are acceptable. One study found that over 90% of mothers who observed a healthcare provider place their infant in the prone position for sleep reported that they planned to use the prone position at home (Brenner et al., 1998).

Rationale

In an effort to further combat SIDS rates, many quality improvement studies have been conducted to increase SSP adherence in a variety of healthcare settings, with a particular focus on newborn nurseries and NICUs (Eisenberg et al., 2015; Goodstein et al., 2015; Mason et al., 2013; Moon et al., 2016; Shadman et al., 2016). In this study, we build on that foundation and turned our focus to a general pediatric inpatient service within a hospital that does not have a policy regarding SSP and where a pilot needs assessment showed that a majority of infants were not being put to sleep in a fashion consistent with the AAP recommendations. As recommended by the Institute of Healthcare Improvement, we developed our study structure and interventions using a key driver diagram (available on request).

Specific aims

Our aims were to determine the providers' baseline knowledge and perceptions of SSP, provide education to healthcare providers regarding recommended SSP, and to improve SSP adherence by healthcare providers working with infants admitted to the general pediatrics service. We hypothesized that following our initial education intervention with the pediatric hospitalists, residents and nurses working on the general pediatric inpatient service, we would show improved compliance with SSP as measured by audits of sleeping infants in the hospital.

Methods

This quality improvement study has been reported according to the Standards for Quality Improvement Research Excellence V.2.0 guidelines (Ogrinc et al., 2016).

Context

The University of Chicago Medicine Comer Children's Hospital (UCM), located in Chicago, Illinois, houses 172 acute care beds. The hospital provides care to children with a diverse set of needs in both inpatient and outpatient settings. In the general pediatrics inpatient setting, care is provided over two floors by a team of pediatric hospitalists, residents and nurses.

In this study, we aimed to modify healthcare provider practices using a brief and focused educational intervention and to assess its effectiveness by comparing baseline and post-intervention adherence to SSP in the inpatient setting. The pediatric hospitalists (attending physicians who exclusively work in the hospital setting), residents and nurses working on the general pediatric wards were identified as the primary targets for the intervention. In total, there were 184 providers subject to the interventions.

Ethical considerations

This quality improvement project took place on two floors in a single institution and does not require reviewing protected health information. Observations of sleeping infants and the healthcare provider team self-assessments were deemed exempt activities by the local institutional review board (IRB16–1492).

Intervention

In reviewing the AAP recommended SSP and assessing modifications that may be required in the hospital, we identified five core SSP that should be followed using the standard hospital-issued crib for all infants admitted to Pediatric Hospital Medicine (PHM) provided that the patient's medical condition does not require any placement/environmental modifications. The five core SSP identified were the following: (1) infant placed supine, (2) infant alone, (3) infant in a flat crib, (4) no objects in the crib, and (5) infant clothed and covered in a manner that limits the risk of overheating and suffocation (Fig. 1) (Moon, 2016; Shadman et al., 2016). When adhered to, these five SSP constitute a safe sleep environment for infants in the hospital and an environment that is compliant with the AAP recommendations.

Targeted healthcare providers were asked to complete a brief survey (26 questions) that investigated their beliefs about and knowledge of SSP (survey available on request). Responses were collated and analyzed using an online data management tool (i.e. Redcap). Survey responses were used to inform interventions by identifying gaps in SSP knowledge and motivation for behavior change, as well as to better interpret the results of the study.

Brief (10 min) educational interventions tailored to each provider group were presented in a variety of formats depending on venue and resource availability; however, all participants received the same basic information including: current rates of SIDS, associated disparities across racial, geographic, and socioeconomic groups, current hospital practices, AAP-endorsed SSP, and the impact of healthcare provider practices on caregivers.

In-person resident education was conducted on June 21 and June 28, 2017. Thirty-eight (45%) residents, including all interns, attended at least one lecture, and all residents received email communication with information covered in the lecture. A series of presentations for nurses were held between July 6 and July 14, 2017. Fifty-five nurses (60%) attended presentations and received handouts. In addition, informative posters were placed within all nursing stations located on the general pediatric floors. Four hospitalists (80%) attended a presentation and received handouts about SSP in the hospital on July 11, 2017. "Ask me about safe sleep" buttons were distributed to healthcare providers during the in-person presentations and afterwards on the floors to serve both as reminders to practice SSP and as a means to facilitate conversations between providers and caregivers.

Study of intervention

Efficacy of the intervention was assessed by comparing audits of sleeping infants in hospital rooms prior to (baseline) and following (post-intervention) the education sessions. During each audit period, a team member would go to the floors unannounced, identify all eligible infants (0 to ≤12 months) admitted to the general pediatrics service, and visit these infants' rooms. If the infant was found asleep, the team member would record compliance of sleep placement with the five aforementioned core SSP (Safe sleep audit form available on request). Efforts were made to observe infants throughout the day and night in order to obtain a representative and unbiased sample.

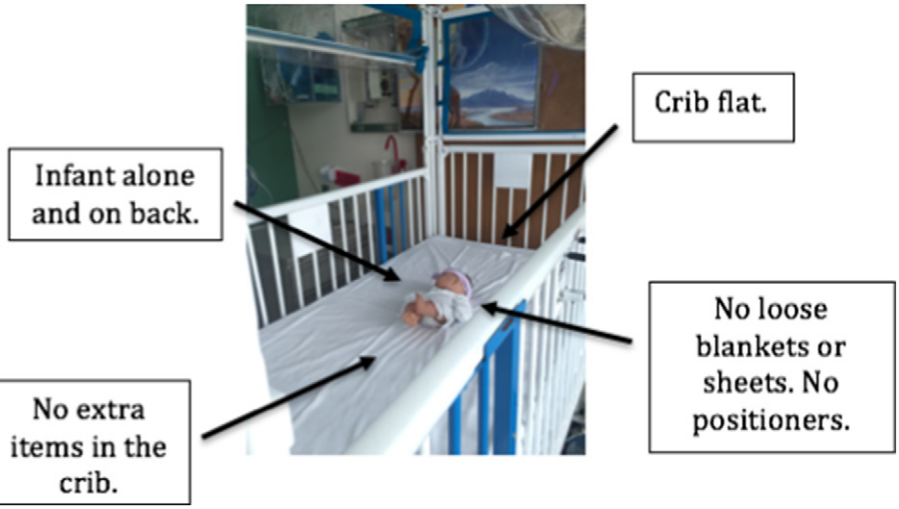

Fig. 1. Compliant infant sleep placement as defined by our 5 identified SSP: Supine, alone, no objects, no loose blankets/sheets or positioners, flat crib. An infant may be swaddled, if done correctly, until showing signs of rolling at which time swaddling must be discontinued.

Measures

One hundred infant sleep positions were collected between April 6 and May 10, 2017, serving as the baseline sample. One hundred twenty-three post-education observations were recorded between July 17 and August 11, 2017. Each patient observation from baseline and post-education audits was assessed for adherence to individual core SSP and was scored from 0 to 5 with a point awarded for each SSP observed.

Analysis

Comparisons between baseline and post-intervention data were conducted using STATA. Categorical variables were compared using chi-squared (χ^2) tests and continuous data was compared using Student's *t*-tests. A *p*-value of <.05 was considered significant for all analyses.

Results

Survey data

One hundred thirty-five of the targeted providers completed our survey – a response rate of 73.4%. When asked in a multiple-choice format to identify the 2016 AAP recommendations for SSP, the survey found that over 80% of providers were up-to-date on recommendations regarding sleep placement, co-sleeping, and swaddling. However, survey results suggested uncertainty about the use of bumper pads and positioners/wedges for sleeping infants with 78.5% of surveyed providers responding correctly that bumper pads should never be used and only 54.8% responding correctly that positioners should never be used for sleeping infants. In addition, the survey found that while many providers had not had institution-based education regarding the SSP, they both recognized a need for improvement (64.4%) and deemed improvement to be a priority (80%).

SSP audits

Observed infants ranged from <1 month old to twelve months of age. The mean age for the baseline sample was 5.3 months and the mean for the post-intervention sample was 4.3 months. Of note, the difference in mean age between the samples was statistically significant ($p = .0492$).

At baseline, adherence to individual SSP varied (Table 1). Most infants were placed to sleep on their backs (87%) and alone in their cribs (86%). A smaller proportion (39%) of infants were found to be appropriately covered. Only 6% of infants were found in cribs where the head of the bead was flat, and likewise, only 6% of infants were found in cribs with no additional objects. Most notably, 0% of infants were found in completely compliant environments meeting all 5 SSP recommendations.

Post-intervention SSP adherence was similarly varied (Table 1). Still, most infants were placed to sleep in the supine position (80.5%) and alone in their cribs (83.7%). Thus, we did not observe a statistically significant change for practices where there was a high baseline compliance. However, 15.4% of infants were observed in completely flat cribs, 18.7% of infants were placed in cribs with no objects, and 53.7% of sleeping infants were appropriately bundled, representing a statistically significant improvement for all three observations ($p < .05$). Again, no infants (0%) were observed in completely compliant (SSP score 5) sleep environments. Overall average SSP compliance scores increased 12.5% from baseline (2.24) to post-intervention (2.52).

Table 1
Individual SSP adherence rates for the 5 identified SSP at baseline and post intervention.

	Baseline ($n = 100$)		Post intervention ($n = 123$)		*p*-value
	n	%	n	%	
Sleep placement					
Supine	*87*	*87%*	*99*	*80.5*	0.194
Non-supine	13	13%	24	19.5	
Sleep location					
Alone in crib	*86*	*86%*	*103*	*83.7*	0.641
Other	14	14%	20	16.3	
Environment					
No objects	*6*	*6%*	*23*	*18.7*	**0.005**
Objects	94	94%	100	81.3	
Bundling					
Appropriate	*39*	*39%*	*66*	*53.7*	**0.029**
Over bundled	61	61%	57	46.3	
Crib					
Flat	*6*	*6%*	*19*	*15.4*	**0.026**
Elevated	94	94%	104	84.6	

Italicized SSP are adherent states and bolded *p* values showed statistically significant increases.

Discussion

Summary

Our initial efforts to improve SSP compliance in the general pediatrics inpatient setting at Comer Children's Hospital using brief, focused educational interventions and visual reminders for pediatric hospitalists, residents, and nurses had mixed success. While we were unable to obtain complete compliance for any single infant and our overall compliance improved by only 12.5%, the significant improvements in individual SSP over a relatively short time frame suggest potential for success with future iterations of this study. This work demonstrates the utility of longitudinal messaging regarding key safe sleep tenants, identifies persistent gaps in provider knowledge, and highlights the complexities of system change on a service-wide scale.

Interpretation

Surveys and room audits indicated that providers were both aware of AAP recommendations to place infants to sleep in the supine position and alone in cribs, and that they followed these SSP in the majority of observations. Given this consistent compliance, it was not surprising that we found no significant change in supine placement or infants sleeping alone in cribs following intervention. We suggest that the high compliance to these SSP, seen here and in previous studies, can be largely attributed to the pervasiveness and success of the Back to Sleep campaign as well as to recent media attention addressing the dangers of co-sleeping (Shadman et al., 2016). Of note, when infants were found in a non-supine position, they were most often in the prone position. In addition, when not asleep alone in their cribs, infants were found to be co-sleeping with parents on couches, in pullout beds or in chairs. There were also instances in which parents were found sleeping with infants in the hospital-issued cribs.

With few exceptions, the infants observed during the baseline audit were placed in cribs that incorrectly had the head of the bed elevated. The survey results indicated the majority of providers were unsure of the correct recommendation for wedges and positioners, devices that also serve to prop up infants while sleeping. We agree with previous authors that these results may be related to unfounded, but persistent fears of infant aspiration, issues of reflux, and respiratory distress (Shadman et al., 2016; Tablizo et al., 2007). Throughout our intervention period, nurses explicitly expressed uncertainty regarding the meaning of reflux precautions, further bolstering these hypotheses and suggesting the need for further education directed at demystifying the components of reflux precautions. Following education, we saw a small, but significant improvement in the number of cribs found in the compliant flat position.

Our data indicates another significant improvement in the number of unnecessary objects placed in cribs following intervention. Any required medical equipment or supplies found in the sleep area were permitted and did not affect the sleep placement assessment. Anecdotally, observers noted the greatest offender of excess objects in the crib to be diaper changing supplies – an oversight that seemed to improve following education. We also found a majority of infants were over-covered during our baseline observations, and auditors reported many of these infants had their heads covered with blankets. Brief conversations with healthcare providers indicated a persistent concern that infants will get too cold in the hospital where room temperatures can be hard to control. As a result, during the educational interventions, we discussed the AAP's recommendation that no loose bedding, including sheets or blankets, should be in the crib during infant sleep. Instead, the use of infant sleep clothes, including but not limited to sleep sacks, is recommended to help ensure adequate warmth. Additionally, guidelines permit the use of swaddling, if done correctly, until an infant begins demonstrating attempts at rolling, at which time swaddling must be discontinued as it presents a danger to the rolling infant. What is more, the AAP notes that caution should be used to avoid infant overheating recommending that infants should wear only one layer more than an adult would require to be adequately warm (Moon, 2016). Following education there was a small but significant improvement in adherence to recommended bedding practices.

We believe that our marginal improvement in SSP compliance of 12.5% reflects two issues: (1) the size of our intervention and (2) an inherent limitation to impactful change at a hospital-wide level without administrative action. First, given that our educational intervention was brief and only 53% of providers were able to attend the presentations, it seems that greater compliance may have been achieved if we had been able to expand our intervention to include longer more-interactive presentations, allowing us to reach more providers. Second, our survey data indicated that the majority of our providers knew the recommended SSP, were aware of the dangers of unsafe sleep, agreed SSP should be a priority in the hospital, and identified the need for improvement before any intervention had occurred, yet our rate of improvement did not reflect these opinions. This point highlights the difficulty in changing long-standing provider practice and hospital culture without administrative action. We believe that in order to achieve sustainable improvements in compliance at such a large scale, an institution must adopt and enforce formal policies regarding safe infant sleep practices. This requires a commitment to training of all providers, both as a part of the standard onboarding process and as a part of continued provider education when new recommendations are released. It also likely requires some formal documentation of SSP in the medical record and follow up with providers who are not routinely practicing recommended SSP so that misconceptions can be addressed (Shaefer, Herman, Frank, Adkins, & Terhaar, 2010). Considering this, future work is needed to better define best practices in regard to SSP in the hospital and will likely require further evaluation of interventions to modify provider behavior. Additional work could focus on methods of incorporating safe infant sleep documentation into the medical record as well as barriers to practicing SSP in the hospital environment (Shaefer et al., 2010).

Limitations

Limitations of this study include: single site study, short observation period, and minimal demographic data. Data was only collected between April and August 2017 and thus is unable to accurately reflect any seasonal variation in patient population or provider practice. We did not collect any protected health information and did not record patient diagnosis, race, gender, or socioeconomic status. Therefore, we were unable to complete any further analysis on our results to determine if there was any variation in SSP based on these factors. Additionally, in most cases, we had no formal method for identifying who was responsible for the infant sleep environment and thus could not definitively track changes in provider practice versus parent practice.

It is notable that the difference in the mean age of our baseline and post-intervention populations was statistically significant ($p < .05$). In the post-intervention population, 61% of observed infants were between the ages of 0 months and 5 months, but only 40% of infants observed baseline fell into this age group. We believe this may be a confounder given that anecdotally SSP seems to get more attention in younger infants, perhaps because most providers are aware of the evidence that suggests that the highest rates of SIDS occur between one and four months of age and that the risk begins to drop significantly after six months (AAP Task Force, 2016). Furthermore, infants over six months are likely to be rolling and so are more capable of influencing their own sleep environments. Thus, it seems possible that the statistically significant difference in the mean age of our two patient groups impacted our results increasing adherence to SSP in the post-intervention group.

Conclusions

Safe infant sleep practices are both well-studied and well-documented; however, rates of SIDS in the United States persist, indicating that despite being well-known, these practices are not consistently followed. Healthcare providers have an opportunity and duty to serve as the champions of safe infant sleep, both in the hospital and in the community since it has been proven that families mimic behaviors they see providers practice in the hospital setting (Brenner et al., 1998). This study adds to a small subset of studies looking at adherence to SSP in the general pediatric inpatient setting and demonstrates that the general pediatric inpatient setting provides ample opportunities for providers to serve as safe sleep role models, but that they often do not follow safe sleep practices. While modest short-term improvements were achieved using the brief focused educational interventions; sustainable change will require formal policies and procedures to encourage and remind providers of safe sleep which can play a role in decreasing the prevalence of sudden infant death syndrome.

All authors have seen and approved this manuscript; none have any relevant conflicts of interest.

Funding

This work was supported by the University of Chicago Pritzker School of Medicine Summer Research Program.

Acknowledgments

The authors thank the participating hospitalists, nurses, and residents, without whom this study would not have been possible. Additionally, we would like to thank the Pritzker School of Medicine for its generous support of this research.

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