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# Integrating Safe Sleep Practices into a Pediatric Hospital: Outcomes of a Quality Improvement Project

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Received 13 May 2015; revised 20 October 2015; accepted 21 October 2015

## Key words:

Safe sleep;  
Quality improvement;  
Knowledge;  
Beliefs;  
Infants;  
Crib;  
Infant mortality;  
SIDS

A quality improvement project for implementing safe sleep practices (SSP) was conducted at a large, U.S. children's hospital. The intervention involved education of staff and standardization of infant sleep practices utilizing a multifaceted approach. Staff surveys and environmental audits were conducted pre- and post-intervention. Safe Sleep Environment (SSE) audits showed an improvement from 23% to 34% ( $p < 0.001$ ) post-intervention. Staff confidence to provide education to caregivers on SSP showed a significant increase. Results from this project demonstrate a successful approach to implement SSP in the hospital setting. Infant safe sleep practices have the potential to reduce infant mortality.

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INFANT MORTALITY IN the United States (U.S.) continues to be higher than in other developed countries. In 2010, the rate for infant mortality in the U.S. was 6.1 per 1000 live births (MacDorman, Matthews, Mohangoo, & Zeitin, 2014). This rate has the U.S. ranked 26th among Organization for Economic Co-operation and Development countries. Because infant mortality is an important indicator of national health, it is concerning that the rate of infant mortality in the U.S. is continually higher than other developed countries (MacDorman et al., 2014).

Furthermore, Arkansas's infant mortality rate is 7.3 per 1000 live births. This equated to 290 infant deaths in the state in 2009 (Arkansas Department of Health (ADH), 2009).

This rate was higher than the U.S. infant mortality rate of 6.39 per 1000 live births for the same year. Infant mortality is a public health problem at the state and national levels that needs to be addressed (Arkansas Department of Health (ADH), 2009).

Infant mortality in the U.S. includes the approximately 4000 infants who die suddenly every year with half of these deaths secondary to Sudden Infant Death Syndrome (SIDS) (Centers for Disease Control and Prevention (CDC) (CDC), 2013). SIDS is defined as a sudden death of an infant who is less than 1 year of age and that is unable to be explained after a thorough investigation. Components of the investigation include autopsy, review of all clinical history, and examination of the death scene (Centers for Disease Control and Prevention (CDC), 2013). After a complete forensic investigation, the cause of death can be ruled as SIDS versus other causes such as a clinical cause, homicide, or Accidental Suffocation and Strangulation in Bed (ASSB). The leading cause of infant

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death secondary to injury is ASSB, which can include suffocation by bedding, a person rolling over on top of the infant, the infant becoming wedged or trapped between two objects, and accidental strangulation (Centers for Disease Control and Prevention (CDC), 2013). The rate of ASSB in 2013 was 20.8 per 100,000 live births (American Academy of Pediatrics, 2011b). Moreover, it is important to note that since the implementation of the “Back to Sleep” campaign by the American Academy of Pediatrics (AAP) in 1992, the overall rate of SIDS has declined by over 50%; yet the rate of deaths by ASSB has increased significantly. This increase in ASSB may be secondary to deaths that had previously been classified as SIDS now being properly identified as ASSB (Centers for Disease Control and Prevention (CDC), 2011; American Academy of Pediatrics, 2011a).

In 2011, the AAP expanded the safe sleep guidelines going beyond “Back to Sleep” and incorporating the infant sleep environment (American Academy of Pediatrics, 2011b). The guidelines express the importance of a firm sleep surface and recommend room sharing over bed-sharing secondary to the risk of SIDS and ASSB. For the same reason, keeping soft objects, such as stuffed animals, positions, and bumpers out of the crib is also recommended. Moreover, the significance of prenatal care; breastfeeding; and avoiding smoking, alcohol consumption, and illicit drug use during and after pregnancy are emphasized. The expanded guidelines include offering a pacifier, avoiding overheating, receiving immunizations on schedule, avoiding products that claim to reduce the risk of SIDS, utilizing cardiorespiratory monitors for SIDS reduction, and the importance of infants receiving supervised tummy time (American Academy of Pediatrics, 2011b).

In addition, it is important that health professionals educate and model safe sleep practices (SSP) because they influence caregiver sleep practices at home (Gelfer, Cameron, Masters, & Kennedy, 2013). However, integrating SSP into the in-patient hospital setting is challenging because there is a significant knowledge gap in infant safe sleep recommendations among healthcare providers (Gelfer et al., 2013; Grazel, Phalen, & Polomano, 2010). Hospital staff may not be aware of the current safe sleep recommendations, which is evidenced by the common hospital practices of elevating the head of bed, nesting the infant with blankets, and use of other positioning devices that conflict with AAP recommendations. Facing these challenges and a high state infant mortality rate, a multidisciplinary team at a large, mid-south U.S., tertiary care children’s hospital initiated a project to improve safe sleep practices at our facility.

## Local Problem

In Arkansas the infant mortality rate and rate of infant death from SIDS are consistently higher than the national rates. In 2010, the rate for SIDS related deaths in Arkansas was 133% higher than the U.S. rate of 0.5 per 1000 births (United States Department of Health et al. (DVS), 2015). With these rates, there is the potential to save 43 infants every year by dropping the state rate to that of the national

level. With this type of data and lifesaving potential, the hospital felt an obligation to act and work to improve the infant mortality and SIDS rates in the state by educating and modeling SSP for patients and families.

## Project Aims

The aims of this quality improvement project were to increase knowledge of and adherence to SSP on the inpatient units that provide care for infants. The primary question to be answered was what impact would education and policy implementation have on SSP adherence in the hospital setting. By developing a safe sleep educational program and standardizing infant sleep practices across all intensive care and medical–surgical units caring for infants 0–12 months of age, our organization was able to implement evidence-based SSP.

## Methods

### Setting and Ethics

In April 2013, the Safe Sleep Taskforce was established to examine SSP at the 370 bed, tertiary care, free-standing children’s hospital that includes 10 medical–surgical units, 3 intensive care units, multiple ambulatory clinics and an emergency department. The project received administrative review and was deemed not human subjects research by the university-affiliate institutional review board. Risks to participants were minimal. There were no conflicts of interest identified by the authors or taskforce members. Project activities were part of hospital education and quality improvement activities; identifiable information about patients, parents, and staff was not collected. The project was carried out over a 14-month period from April 2013 to June 2014.

### Planning and Implementation

A quality improvement model was adopted for the project to translate the evidence-based AAP’s SSP into practice at our facility. The interdisciplinary project team of 20 worked closely with all stakeholders including nurses, administration, physical therapists, child life, social work, interpreter services, and physicians. Initially the team met one or two times per month to review the literature, define the project, discuss implementation plans, and identify barriers to implementation. Additionally, a small sub-group of 5 nursing educators met more frequently to develop the specific detail for SSP education.

A data-driven quality improvement strategy known as the “Define, Measure, Analyze, Improve, Control” (DMAIC) methodology (Borror, 2009, p. 331-332) was utilized to outline and define the problem statement, project scope, goals, process and outcome measures and planning of the intervention. The goal was to increase the proportion of hospitalized infants in a safe sleep environment by January 2014 and to sustain the improvement throughout the calendar year. Process measures for the project included staff education development, staff education completion rate, and percentage of infant caregivers educated on SSPs. The overall outcome measure was the percentage of hospitalized infants in a safe sleep environment.

## Measurements

The Safe Sleep baseline data were collected in June 2013 regarding staff knowledge, understanding, and beliefs surrounding the 2011 AAP SSP Guidelines. Safe Sleep Taskforce developed electronic surveys that were sent to clinical staff throughout the organization. Recipients of the survey included registered nurses (RNs), licensed practical nurses, unlicensed assistive personnel, rehabilitation services, speech-language pathology, child life specialists, advanced practice registered nurses, physicians, social workers, and interpreters. The electronic survey was designed to assess the level of knowledge of AAP SSP, along with the perception of relevance to patient care. The survey questions also addressed staff demographic data along with familiarity of and perceived barriers to the AAP guidelines. Demographic data included age, area of employment, and role. See [Table 1](#) for a complete list of questions that were included in the survey. Survey responses included Likert scale descriptions, select all that apply, and open-ended comment. The survey was developed by the Safe Sleep Taskforce with questions specifically examining aspects of the safe sleep guidelines and barriers to practice. The survey has not been psychometrically tested and validated.

The sleep environment of all patients 0–12 months of age was audited weekly during the month of June. The audit tool was developed by the Safe Sleep Taskforce. Members of the team rounded on all infants admitted to their respective unit one day a week for the entire month and noted (yes or no) which components of safe sleep were in practice for all infants. See [Table 2](#) for audit tool questions.

**Table 1** Safe sleep staff knowledge/beliefs survey questions.

Q1	I am knowledgeable of current Safe Sleep guidelines recommended by the American Academy of Pediatrics (AAP).
Q2	Overall view of Safe Sleep practices recommended by the AAP in 2011.
Q3	Safe Sleep practices as recommended by the AAP are followed consistently by staff (RNs, PCTs, LIPs, Ancillary staff).
Q4	I routinely assess that my patients are in a Safe Sleep environment.
Q5	Implementation and providing education to caregivers/families on importance of Safe Sleep is a high priority.
Q6	I feel confident in providing education and role modeling for caregivers/families on Safe Sleep practices.
Q7	What barriers have you encountered in providing Safe Sleep practices with your patients and families?
Q8	Reflux precautions should include positioning devices (i.e. wedges, slings, nests).
Q9	Which interventions do you feel are effective for reflux in infants?
Q10	Swaddling techniques leaving the hips and legs loose is both effective and safe compared to tight papoose swaddling.
Q11	Area in which you work.
Q12	Role
Q13	Age Range

**Table 2** Safe sleep crib audit tool.

Q1	Head of bed flat. If no, degree of elevation?
Q2	Patient asleep supine?
Q3	Multiple blankets in crib?
Q4	Stuffed animals in crib?
Q5	Large or fluffy blankets around patient?
Q6	Patient in nest?
Q7	Patient bundled?
Q8	Patient able to move legs?
Q9	Medical or commercial positioning device used?
Q10	Additional Comments.

## Intervention

From July through September 2013 the taskforce worked to develop the education and implementation plan for SSP. A review of the literature identified limited articles discussing the utilization and implementation of a safe sleep environment in a hospital setting. However, two articles, [Gelfer et al. \(2013\)](#) and [Grazel et al. \(2010\)](#), were identified that found success utilizing staff surveys, education and crib audits to improve SSP in the neonatal intensive care unit; this project was modeled after this work. Importantly, the pre-data from staff surveys and crib audits assisted with identifying needs and what specific pieces of SSP needed to be emphasized.

Education training modules were developed by the Safe Sleep Taskforce sub-group for inpatient and outpatient staff, unlicensed/ancillary personnel, and LIPs. Each module contained core content and local and national SIDS statistics with role specific information, along with a video demonstrating a “good show, bad show” visual of SSP. To ensure adoption of SSP and standardization of practice throughout the facility, the interventions for the project included:

- Education for Staff: Online training modules discussing the components of the 2011 AAP Safe Sleep Guidelines were developed by the sub-group of nursing educators. Modules included national and state level data on SIDS, components of SSP, hospital policy on SSP, and documentation requirements and included video. Online module was assigned to all registered nurses (RNs) with required viewing and post-test completion within three months.
- Education for Licensed Independent Providers (LIP): LIP members of the taskforce provided face to face education entitled Safe Sleep for Infants, a commentary on Safe Sleep for Infants was published in the state’s medical society journal, and online training modules with video discussing the components of the 2011 AAP Safe Sleep Guidelines were required.
- Education for Families: Educational materials in the form of written handouts and videos, available in both English and Spanish, were provided to families.
- Sleep sacks: Provided to serve the infant population facility wide
- Policy Change: Updated Infant Sleep and Positioning policy to reflect AAP 2011 guidelines
- Documentation: Changes added to the electronic medical record to reflect care of infants 0–12 months of age followed SSP guidelines and family education on SSP.

In October 2013, the education was provided to the clinical team including inpatient and outpatient RNs, along with ancillary departments such as rehabilitation services, radiology, and respiratory therapy. In addition, the modules were also distributed to volunteer services and to LIPs via email. Implementation of SSP occurred in early January 2014 with the policy and documentation changes along with the sleep sacks and family educational materials available facility wide.

## Evaluation

To evaluate the implementation of SSP, post-intervention audits of the sleep environment and documentation began in January 2014 and occurred monthly from January through June 2014 utilizing the audit tool (Table 2). These audits were completed by Safe Sleep Taskforce members in the same way in which the pre-intervention audits were completed. In addition, staff were surveyed via emailed electronic survey (Table 1) in May 2014 regarding their knowledge, understanding, and beliefs of the 2011 AAP SSP guidelines following the implementation of the SSP interventions. Data from pre and post-intervention audits and surveys were stored securely in a locked file cabinet in a locked office. Electronic files were stored on a password protected computer in a password protected files.

## Statistical Analysis

All questions from the staff survey and audit tool survey were summarized pre- and post-intervention by biostatisticians. All continuous variables, including Likert scale outcomes, were summarized using means and standard deviations, while all categorical variables were summarized using frequencies and percentages. For the staff survey, all Likert scale outcomes were compared between pre- and post-interventions using a two-sample t-test owing to the large sample size and the interest in detecting a significant difference

in mean scores between the two groups. Matching of pre- and post-intervention responses was unable to be completed secondary to the electronic survey method and time period between pre- and post- survey. Effects from the two-sample t-test were reported in terms of difference in means and 95% confidence intervals (CI). All categorical outcomes were compared between both time points using a Chi-square test of association. Effects were presented as difference in proportions and 95% confidence intervals. Results from the staff survey were also compared from pre- to post-intervention among the registered nurses (RN) only.

Pre and post-intervention audit data were also compared using a Chi-square test for categorical variables and results were reported using difference in proportions and corresponding 95% CIs. Parents and staff were assumed to be following AAP guidelines if all of the following were true: no multiple blankets in crib, no stuffed animals in crib, no large or fluffy blankets, infant not in nest, and patient asleep supine. Audit data from June 2013 (pre-intervention) were compared with data from January 2014 to June 2014 (post-intervention) to test for the effect of intervention on parents and staff following AAP guidelines. Further, audit data from June 2013 were compared with data from June 2014 to remove bias due to the seasonal variation on the responses. Run charts were also used to graphically display percent conforming to safe sleep practices over time from June 2013 to June 2014. All analyses were conducted using the software R (R Core Team, 2013).

## Results

### Success of Implementation

Staff and leaders were receptive to adopting SSP throughout the facility. Education was completed by 1656 staff members. Moreover, the staff survey evaluating staff knowledge and beliefs of SSP was completed by 615 staff pre-intervention and 628 staff post-intervention. Among the nursing staff, 391 (19.5%) completed the survey before the

**Table 3** Comparison of pre (June 2013) and post (Jan 2014-Jun 2014) audit data.

Variable	N	Pre n (%)	N	Post n (%)	Diff (95% CI)	<i>p</i>
Head of bed flat?	426	103 (24%)	561	237 (42%)	18% (12%, 24%)	<0.001 *
Patient asleep supine?	398	286 (72%)	498	385 (77%)	5% (-1%, 11%)	0.07
Multiple blankets to crib?	427	250 (59%)	566	240 (42%)	-16% (-23%, -10%)	<0.001 *
Stuffed animals in Crib?	427	42 (10%)	566	45 (8%)	-2% (-6%, 2%)	0.35
Fluffy large blankets around Patient?	427	110 (26%)	566	113 (20%)	-6% (-11%, -0%)	0.04
Patient in nest?	425	88 (21%)	566	109 (19%)	-1% (-7%, 4%)	0.63
Patient bundled?	426	211 (50%)	554	302 (55%)	5% (-2%, 11%)	0.14
Patient able to move legs?	426	351 (82%)	565	547 (97%)	14% (10%, 19%)	<0.001 *
Medical or commercial positioning device used?	406	234 (58%)	566	187 (33%)	-25% (-31%, -18%)	<0.001 *
Follow AAP guidelines? All	396	91 (23%)	498	170 (34%)	11% (5%, 17%)	<0.001 *
NICU	281	73 (26%)	162	83 (51%)	25% (16%, 35%)	<0.001 *
ITU	34	9 (26%)	116	37 (32%)	5% (-14%, 24%)	0.70
CVICU	26	2 (8%)	94	17 (18%)	10% (-5%, 26%)	0.33
PICU	11	2 (18%)	77	11 (14%)	-4% (-32%, 24%)	1.00
Other	44	5 (11%)	34	13 (38%)	27% (5%, 48%)	0.01

\* Statistically significant ( $p < .05$ ).



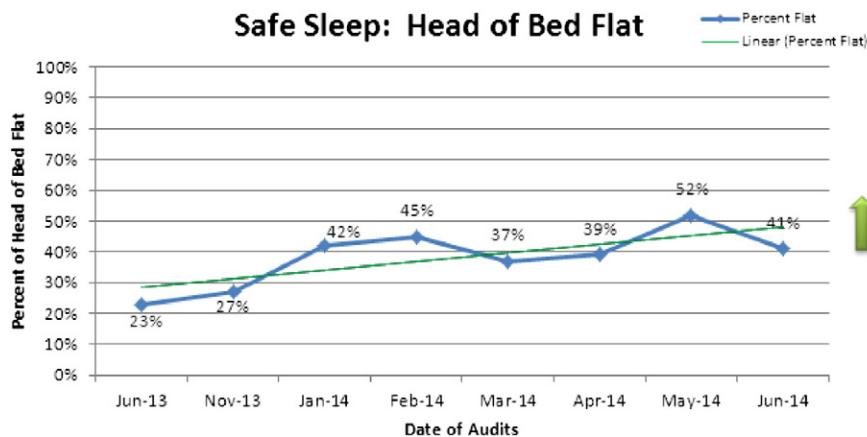


Figure 1 Overall increase in infants having head of bed flat as part of SSP.

intervention, while 462 (23.1%) completed the survey after the intervention. There was also support from the administration and the purchasing department to ensure availability of sleep sacks throughout the facility to assist with alleviating the usage of loose blankets in the crib.

### Safe Sleep Environment Audits

Audits of the safe sleep environment were completed pre- and post-intervention. Audits included evaluation of sleep position, head of bed elevation, soft objects in the crib, and use of positioning devices. A total of 991 environmental audits were completed during the project. All infants who were 0–12 months of age and asleep at the time of the audit were observed, including intubated patients in the ICU settings (Table 3). The mean (standard deviation) chronological age of patients in the NICU was 27.2 (15.8) weeks. The mean age of patients on other units was 4.2 (5.9) months. Prior to intervention (June 2013), 91/396 (23%) patients were in a safe sleep environment while post-intervention (January to June 2014) 170/498 (34.1%) were in a safe sleep environment, showing a statistically significant improvement (Difference = 11.2%; 95% CI 5.1% to 17.3%;  $p < 0.001$ ) (Table 3). Significant improvement was also noted in patients

having head of the bed flat (24.2% pre vs. 42.2% post; difference = 18.1%; 95% CI 12.1% to 24%;  $p < 0.001$ ) (Figure 1). Use of positional devices also decreased significantly from 57.6% pre-intervention to 33% post-intervention (Difference = 24.6%; 95% CI 18.2% to 31%;  $p < 0.001$ ). No significant changes were noted in patients asleep in a supine position or having soft objects in the bed (Figures 2 and 3).

### Staff Knowledge and Beliefs

Results from the survey showed significant increases from pre- to post-intervention in knowledge of the AAP SSP guidelines. Staff knowledge about reflux precautions and swaddling technique significantly improved from pre- to post-intervention ( $p < 0.001$  for both). Beliefs about safe sleep practices (Questions 4 to 7) also increased significantly from pre- to post-intervention ( $p < 0.001$  for all). Results for the RNs responses were also consistent with those of staff in that there was a significant increase in knowledge of safe sleep practices from pre- to post-intervention (Table 4). Additionally, there were statistically significant decreases in the barriers of implementation of SSP secondary to inconsistent information/practices ( $p < 0.001$ ) and lack of LIP/RN awareness/willingness to follow guidelines ( $p < 0.001$ ) along with parents wishing

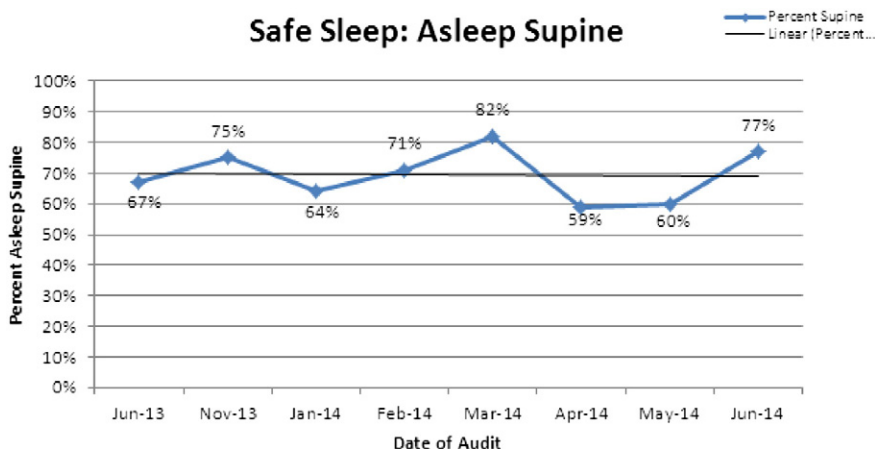
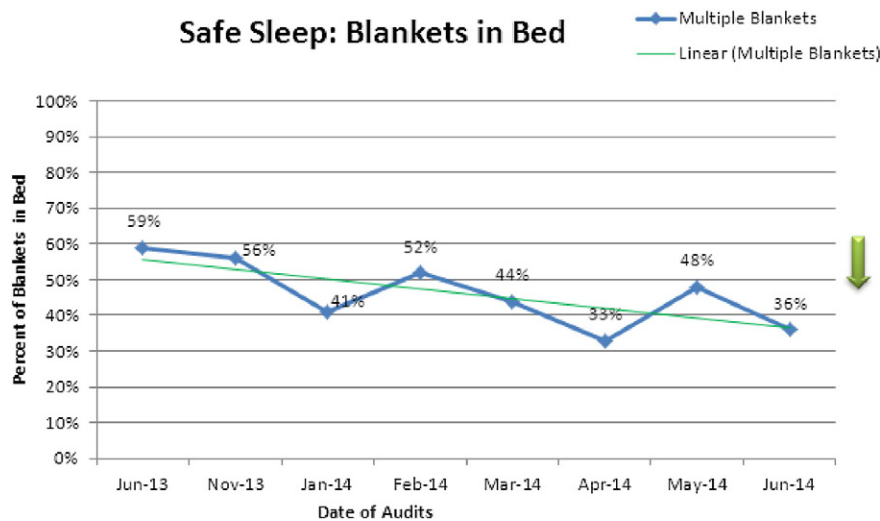


Figure 2 No consistent impact on infants asleep in a supine position.



**Figure 3** Overall decrease in patients having loose blankets in the sleep environment as part of SSP.

to sleep with their infant ( $p = 0.004$ ) post-intervention. Conversely, there was a statistically significant increase ( $p = 0.02$ ) in staff identification of parent wishes for soft objects in the crib as a barrier to implement SSP.

## Discussion

The implementation of SSP throughout an organization poses difficulties in that infants in the hospital setting present with different needs and conditions than those in the home setting. Despite this, it is of utmost importance for healthcare providers to model SSP and educate families on the importance of following these practices in the home setting. This project showed success in implementing SSP, not only in a nursery or NICU setting, but throughout a facility as a whole to ensure parents of infants at all points of care received information and modeling of SSP. By providing education to staff, educational materials to families, sleep sacks for infants, and policy to support SSP, knowledge of SSP increased as well as implementation of those practices supporting SSP in the hospital setting. This assisted with decreasing barriers to implementation of SSP related to healthcare personnel knowledge and willingness to implement SSP and parental wishes to sleep with the infant.

These findings were similar to the results of other quality improvement projects. Gelfer et al. (2013) showed that education of staff and policy implementation to support SSP can make substantial changes in practice by providing a knowledge base and organizational support to nurses. Moreover, similar to the Grazel et al. (2010) study, this project identified that nurses are at times conflicted about implementation of SSP secondary to patient condition, comfort needs, and parental request. With education and organizational support these barriers can be overcome to provide SSP and model the guidelines for parents and families.

## Implications for Practice

Nurses and other health care providers are in a distinct position to influence SSP in the home setting by modeling the behavior in the hospital setting and providing education to parents and caregivers. With the U.S. infant mortality rate being higher than other developed countries and the increasing rate of infant deaths secondary to ASSB, the importance of anticipatory guidance by nurses in all settings is of upmost importance. Moreover, partnership across all disciplines provides consistency in practice and message for parents and caregivers. Identification of patients ready for all aspects of

**Table 4** Comparison of pre and post responses from the staff RN-only survey.

	Pre (N = 391) Mean (SD)	Post (N = 462) Mean (SD)	Mean Difference (95% CI)	<i>p</i>
Priority of education to caregivers	4.4 (0.9)	4.4 (0.8)	-0.1 (-0.2, 0.1)	0.35
Use of reflux precautions	4.1 (1.0)	3.8 (1.1)	-0.3 (-0.4, -0.2)	<0.001 *
Loose swaddling	3.4 (1.1)	3.8 (1.1)	0.4 (0.2, 0.5)	<0.001 *
Assess safe sleep routinely	4.2 (1.0)	4.4 (0.8)	0.1 (0.0, 0.3)	0.018
Follow AAP safe sleep practices	3.4 (1.0)	3.7 (0.9)	0.2 (0.1, 0.4)	<0.001 *
Confidence in education & role modeling	3.9 (1.2)	4.3 (0.8)	0.4 (0.2, 0.5)	<0.001 *
Knowledge of AAP safe sleep guidelines	3.3 (1.3)	4.1 (0.9)	0.8 (0.7, 1.0)	<0.001 *
Overall view of AAP safe sleep practices	4.2 (0.9)	4.2 (0.9)	-0.0 (-0.2, 0.10)	0.66

\* Statistically significant ( $p < .05$ ).

SSP requires critical thinking and collaboration between all members of the care team. As the primary care provider in the hospital setting, nurses are key to ensure identification of SSP readiness, partnership and modeling of SSP by all members of the care team. Education regarding SSP and organizational support of nurses implementation of SSP through policy development are keys to success. Lastly, continued focus on SSP, recurrent education of staff, and leadership support are key components for sustainability of SSP in the hospital setting.

### Lessons Learned

Some lessons learned from the implementation of SSP in the hospital setting include ensuring all stakeholders are at the table and obtaining buy-in early in the process. To facilitate this in the future, engaging the support and participation of a neonatologist and certified nurse practitioners who practice in both the hospital and outpatient setting will assist with SSP adherence across the continuum for the largest population of infants in the organization. Moreover, to aid in proper evaluation, infants not ready for all components of SSP (i.e. head of bed flat, supine positioning) would be precluded from data collection both pre- and post-intervention. Lastly, adding a face-to-face component of education for staff would add opportunity for discussion, question and answer, and greater understanding of rationale and importance.

### Limitations

A limitation to this study includes lack of pairing of staff responses to the knowledge and beliefs survey, making it impossible to discern the impact the education had on individuals; thus the data can only be analyzed as a group. Additionally, towards the end of the post-intervention audit period, the number of audits completed began to decrease, thus limiting the size of the sample. Lastly, because this project encompassed infant patients in all units, including intubated infants in the ICU setting and low birth-weight infants in the NICU, discerning patients' readiness for SSP was difficult when examining the data. Future evaluation will include only patients clinically ready for all components of SSP.

### Conclusion

Successful implementation of SSP in a hospitalized setting, including modeling of the guidelines and educating staff, parents, and families about the practices, should expand from one institution to others across the U.S. in hopes of decreasing the SIDS and ASSB rates in the nation. This quality improvement model can be utilized at other organizations for successful implementation. This relatively simple project required no additional staff and only a minimal cost of obtaining sleep sacks for the organization. Additionally, since the staff training was completed in an online format over a three month time period, there was no added cost to the organization related to education as nurses were able to

complete during scheduled work hours. Moreover, the project can be expanded in the future to study the impact that modeling and education of SSP in the hospital setting have on practice by parents and families at home. Additional exploration and intervention aimed at parents' wishes and behaviors may eliminate another barrier to full SSP implementation. A reduction in infant mortality is the ultimate goal and SSP implementation in the hospital and home settings is one method for achieving this aim.

### Acknowledgments

The authors would like to acknowledge the Safe Sleep Taskforce at Arkansas Children's Hospital for all their contributions to the success of this project.

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