7-2019

Safe to sleep: Summary

Children's Mercy Kansas City

Office of Evidence Based Practice (EBP) – Critically Appraised Topic (CAT): Safe to Sleep

Specific Care Question

In Medical/Surgical hospital units and/or Intensive Care Nurseries are there countermeasures (interventions) that have been successfully employed to increase compliance to Safe to Sleep (S2S) recommendations?

Recommendation Based on Current Literature

Based on review of current literature by the Department of EBP. Five studies (De Luca & Hinde, 2016; Gaw, Chounthirath, Midgett, Quinlan, & Smith, 2017; Geyer, Smith, & Kair, 2016; McMullen, Fioravanti, Brown, & Carey, 2016; Randall, Thompson, & Wilson, 2019; Voos, Terreros, Larimore, Leick-Rude, & Park, 2015) were identified and included various countermeasures, such as nursing education projects/bundles/QI projects. The studies were not consistent in the outcomes measured, either change in nurses' knowledge of S2S or crib audits to assess compliance after the counter measure was employed. Standard work should be developed, implemented and monitored to increase what is known about this topic.

Literature Summary

Background. Sudden infant death syndrome (SIDS) rates have decreased from 130.3 deaths per 100,000 live births in 1990 to 36.4 deaths per 100,000 live births in 2017. Since 1994 when supine sleeping position was initiated as the preferred sleep position for infants less than one year, the number of SIDS deaths has decreased by 50%. Due to incomplete investigations of unexplained infant deaths, the CDC created the Sudden Unexpected Infant Death (SUID) Case Registry in 2009 (CDC, 2019b). As the SUID Case Registry is used, the quality of SUID data has improved as there are now less "unknown cause" deaths and more deaths are classified as SIDS or accidental suffocation and strangulation (ASSB). The trends in unexpected infant deaths are:

Cause and Definition	% of Total Deaths Reported in 2015	% of Total Deaths Reported in 2017
Total Unexpected Infant Deaths in the US	3700	3600
SIDS – sudden death of an infant less than one-year old that cannot be explained after a thorough investigation is conducted, including a complete autopsy, examination of the death scene, and a review of the clinical history.	43%	39%
Unknown Cause- sudden death of an infant less than one year old that remains undetermined because one or more parts of the investigation was not completed.	32%	25%
ASSB- sudden death of an infant less than one-year old that can happen because of (a) suffocation by soft bedding, (b) when another person rolls on top or against the infant while sleeping, (c) when the infant is wedged between two objects such as a mattress and wall, bed frame or furniture, and (d) when an infant's head and neck is caught between crib railings.	25%	36%

Note. CDC (2019a)

Safe sleep practices for infants less than one year of age have evolved from the recommendation to place infants in the supine position for sleep in 1994, to the current recommendations for the Safe to Sleep Campaign launched in 2013 (CDC, 2019). The Safe to Sleep Campaign expands the "back to sleep" message to include (a) provide a firm mattress; (b) remove pillows, blankets, sheepskins, and crib bumpers; (c) remove soft objects like soft toys and loose blankets out of infant's sleep area; (d) nothing should cover the infant's head; (e) avoid overheating the infant; and (f) do not bed-share (NICHD, 2015).

In 2016, the American Academy of Pediatrics (AAP) released an updated policy statement and technical report expanding their recommendations on safe sleep environments for infants (Moon, and AAP Task Force on Sudden Infant Death Syndrome, 2016). The AAP and S2S campaign reinforce each other's message (see Appendix). The policy is clear that infants should be placed "wholly on the back" for every sleep period, including when at

daycare, other family member's homes, and if major changes in caregivers occurs, such as entry to foster or adoptive care. The policy reiterates that sitting devices, such as car seats, swings, infant carriers etc. are "not recommended for routine sleep in the hospital or at home" (Moon et al., 2016). Educational materials for families and health care providers are plentiful. The public site for educational materials can be found at http://www.nichd.nih.gov/sts/Pages/default.aspx with health care provider materials available in English and Spanish at http://www.nichd.nih.gov/sts/materials/Pages/default.aspx#providers.. This review will summarize the countermeasures identified in the literature used to improve compliance to S2S recommendations in hospitals.

Study characteristics. The search for suitable studies was completed on March 20, 2019. Lory Harte, PharmD reviewed the 84 titles and/or abstracts found in the search and identified 17 articles believed to answer the question. After an in-depth review, three articles answered the question. The three articles were added to four articles included in the previous CAT, for a total of seven articles for this review (see Figure 1). There was one systematic review (de Luca & Hinde, 2016); two cohort studies (Gaw, Chounthirath, Midgett, Quinlan, & Smith, 2017; Geyer, Smith, & Kair, 2016) one quality improvement project (Voos, Terreros, Larimore, Leick-Rude, & Park, 2015); one longitudinal quasi-experimental study (Sleutel, True, Gustus, Baldwin, & Early, 2018); and one survey (McMullen, Fioravanti, Brown, & Carey, 2016). The overall certainty of the evidence is very low. De Luca and Hinde (2016) is a systematic review and includes 21 studies. Many of the included studies are reports of surveys. There was substantial heterogeneity in the purpose of the surveys and the data could not be pooled. De Luca and Hinde (2016) identified country of origin as a confounder and report that most of the early papers in their SR were from only the United States. More recent papers are from other countries. This dichotomy further weakens pooled results due to population inconsistencies. The other non-randomized studies included in this review varied in the interventions employed and the outcomes assessed.

Summary

Descriptive Studies. Gaw et al. (2017) reported locations of ASSB deaths and objects in the crib (n = 1757) as collected by the U.S. Consumer Product Safety Commission (CPSC) from 2000 to 2012. Mean age at death was 3.76 ($\pm$ 2.51) months. Sleep orientation, as a cause of death, was reported in 701 cases (40.4%). Of those with sleep orientation reported, 595 (85%) were in the prone position. Location of death was reported in 1253 cases. Three hundred eighty-three (31%) were in a crib or bassinet, 285 (23%) were in an adult bed, 238 (19%) were on a sofa or chair, 221 (18%) were on an unspecified mattress or bed, and 126 (10%) were in another location. Items in the sleep location were reported as pillows n = 425, a wedge on a mattress n = 364, blankets n = 228, and wedged against a wall n = 199. The evidence was of low certainty, it is a retrospective cohort, based on voluntary reporting standards (Consumer Product Safety Act, 1972). Only ASSB deaths are reported, deaths by SIDS or other causes are not included.

Infant sleep position and objects in the crib. Geyer et al. (2016) and Voos et al. (2015) reported on countermeasures before and after S2S education of nurses, parents, and the community. Geyer et al. (2016) also started using safe to sleep products such as Sleep Sacks® (n = 77), while Voos et al. (2015) developed a S2S checklist (n = 28). After the introduction of S2S products, infants in supine sleep position increased from 82% at the outset, to 95% after one year, and 83% after two years (Geyer et al., 2016). Voos et al. (2015) also reported an increase in safe sleep positioning from 6/28 (21%) to 23/26 (88%) after the interventions of nursing staff and parent education. Cribs with sleeping infants and soft objects decreased from 68% at the outset, to 35% after one year, and 28% after two years (Geyer et al., 2016). Voos et al. (2015) also reported a decrease in objects in the cribs of sleeping infants from 9/28 (32%) to 1/26 (4%) after the intervention. The evidence was of very low certainty. The trials were not randomized and there was very serious inconsistency, as methods and educational content varied, as did the timing of the surveys pre- and post-interventions

Nurse's knowledge and or beliefs. Three studies included changes in nurses' knowledge and/or beliefs (deLuca & Hinde, 2016; McMullen, Fioravanti, Brown, & Carey, 2016; Sleutel, True, Gustus, Baldwin, & Early, 2018). McMullen et al. (2016) reported on surveys pre- and post- education countermeasures, as did Sleutel et al. (2018), n = 196 and n = 62, respectively. de Luca and Hinde, (2016) is a systematic review that included 21 trials, all of which were surveys.

From de Luca and Hinde, (2016), neither the number of surveys sent, nor survey the return rates were reliably reported. However, there was an increase in awareness that the supine sleep position is best for reducing SIDS over the 20 years included in the literature search conducted by the SR

(de Luca & Hinde, 2016). Inconsistencies among the 21 trials were (a) "non-prone" was not defined in the included studies to mean supine and the methods of obtaining the surveys varied from face-to-face, to mail or email (de Luca & Hinde, 2016).

Sleutel et al. (2018) reported on 62 (47%) nurses who completed pre- and post- education and bundle initiation survey (N = 132). Countermeasures included an attractive/intriguing baby poster, education on the AAP S2S policy, parent education on the AAP S2S policy, and crib cards reinforcing the AAP S2S policy. Nurses' knowledge/beliefs were significantly improved on the post test for the following S2S factors:

- Supine positioning for sleep (p = .002)
- Bed-sharing (p = .022)
- Room temperature (p < .001)
- Amount of clothes (p < .001)
- Offering a pacifier at nap or bedtime (p < .001)
- Breastfeeding (p = .004)
- Room-sharing during sleep WITHOUT bed-sharing (p < .001)

Nurses knowledge/beliefs were not significantly different for the following: (a) firm sleep surface, (b) sleeping with soft or loose objects in their cribs, (c) smoke exposure, (d) nurses' role modeling safe infant sleep practices (Sleutel et al., 2018). Cronbach's alpha was reported for two of the three study locations. (see Characteristics of Studies section for results).

McMullen, Fioravanti, Brown, and Carey (2016) had 658 nurses from pediatric (Med/Surg and ICN) and mother-baby units complete a pre- and post - survey after a S2S educational intervention. There was improvement in agreement with the AAP S2S recommnedations pretest 47% and post-test 56% (p < .001). The pre-post observation of 125 cribs of infants sleeping on the units observed for S2S compliance showed prone sleeping positon changed from 15% to 5%, side sleeping position from 15% to 1.7% and supine sleeping position increased from 70% to 90% (p < .01). The mean number of items such as diapers, wipes, and other supplies decreased from 3 $\pm$2 to 2$\pm$1 (p < .001) (McMullen, Fioravanti, Brown, & Carey, 2016).

Identification of Studies

Search Strategy and Results (see Figure 1)

Pub Med: "Sudden Infant Death/statistics and numerical data"[Majr] "filtered for the last 5 years 100 results. 9 articles selected
Search repeated August 24, 2015, no new articles identified
Search repeated October 12, 2016- 2 articles identified
Search March 20, 2019 -"Sudden Infant Death/statistics and numerical data"[Majr] AND ("2016/07/01"[PDAT]: "2019/12/31"[PDAT]), 38 results

CINAHL: Boolean/Phrase**:** (MH "Sudden Infant Death") Limiters Published Date: 20110101-20150431 Peer Reviewed Human Geographic Subset: USA Age Groups: Infant, Newborn: birth-1-month, Infant: 1-23 months 33 results 4 articles selected.
Search repeated August 25, 2015. One article selected
Search repeated October 12, 2016 18 results,
Search repeated March 20, 2019, 48 results

Government Sources: CDC, Missouri Health Department for statistics

Studies Included in this Review

Citation	Study Type
De Luca and Hinde (2016)	Systematic Review
*Aris et al. (2006)	Survey
*Bullock, Mickey, Green, and Heine (2004)	Survey
*Delzell, Phillips, Schnitzer, and Ewigman (2001)	Telephone survey

*Eron et al. (2011)	Survey
*Grazel, Phalen, and Polomano (2010)	Survey
*Hein and Pettit (2001)	Survey
*Hudak, O'Donnell, and Mazyrka (1995)	Survey
*Moon, Gingras, and Erwin (2002)	Survey
*Moon, Kington, Oden, Iglesias, and Hauck (2007)	Survey
*Morgan and Johnson (2001)	Telephone survey
*Ottolini et al. (1999)	Cohort
*Peeke, Hershberger, Kuehn, and Levett (1999)	Survey
*Price, Hillman, Gardner, Schenk, and Warren (2008)	Questionnaire
*Scheidt, Willinger, H.J., Moss, and Lerner (1993)	Narrative review
*Shaefer, Herman, Frank, Adkins, and Terhaar (2010)	Quality Improvement
*Spieker and Brannen (1996)	Questionnaire
*Stastny, Ichinose, Thayer, Olson, and Keens (2004)	Survey
*Yikilkan et al. (2011)	Survey
*Young, Schluter, and Francis (2002)	Narrative review
*Young and Schluter (2002)	Survey
Gaw et al. (2017)	Descriptive cohort study
Geyer et al. (2016)	Cohort study
McMullen, Fioravanti, Brown, and Carey (2016)	Survey
Sleutel et al. (2018)	Longitudinal quasi-experimental
Voos, Terreros, Larimore, Leick-Rude, and Park (2015)	QI project

*References marked with an asterisk indicate studies included from previously published SR

Studies Not Included in this Review with Exclusion Rationale

Study	Reason for Exclusion
Abney-Roberts (2015)	Abstract
Ahlers-Schmidt, Kuhlmann, Kuhlmann, Schunn, and Rosell (2014)	Wrong location, clinics only
Colvin, Collie-Akers, Schunn, & Moon, 2014	Does not answer the question
Freyne et al. (2014)	Case report
Hauck, Thompson, Tanabe, Moon, & Vennemann, 2011	This meta-analysis is included in the AAP Guideline 2011
Kelly, Irigoyen, Pomerantz, Mondesir, and Isaza-Brando (2017)	Does not answer the question
Mathews et al. (2016)	Addresses parent practice at home
McDonnell and Moon (2014)	Updated by Gaw et al. (2016)
Moon, Hauck, et al. (2017)	Addresses parent practice at home
Moon, Mathews, et al. (2017)	Addresses parent practice at home
Shapiro-Mendoza et al. (2015)	Addresses parent practice at home

Methods Used for Appraisal and Synthesis

[a]Rayyan is a web-based software used for the initial screening of titles and / or abstracts for this analysis (Ouzzani, Hammady, Fedorowicz & Elmagarmid, 2017).

[b]Review Manager (Higgins & Green, 2011) is a Cochrane Collaborative computer program used to assess the study characteristics as well as the risk of bias and create the forest plots found in this analysis.

[c]The GRADEpro Guideline Development Tool (GDT) is the tool used assess quality of evidence

[d]The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram depicts the process in which literature is searched, screened, and eligibility criteria is applied (Moher, Liberati, Tetzlaff, & Altman, 2009).

[a]Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan-a web and mobile app for systematic reviews. *Systematic Reviews, 5*(1), 210. doi:10.1186/s13643-016-0384-4

[b]Higgins, J. P. T., & Green, S. e. (2011). *Cochrane Handbook for Systematic Reviews of Interventions [updated March 2011]* (Version 5.1.0 ed.): The Cochrane Collaboration, 2011.

[c]GRADEpro GDT: GRADEpro Guideline Development Tool (2015). McMaster University, (developed by Evidence Prime, Inc.). [Software]. Available from gradepro.org.

[d]Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA

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Acronyms Used in this Document

Acronym	Explanation
AAP	American Academy of Pediatrics
ASSB	Accidental suffocation and strangulation in bed
CAT	Critically Appraised Topic
CDC	Center of Disease Control
CMH	Children's Mercy Hospital
CPSC	Consumer Product Safety Commission
EBP	Evidence Based Practice
HCP	Health care professional
ICN	Intensive Care Nursery
ISS	Infant safe sleep
NICU	Neonatal intensive care unit
NISP	National Infant Sleep Position Study
PICU	Pediatric intensive care unit
RN	Registered Nurse
S2S	Safe to Sleep
SIDS	Sudden Infant Death Syndrome
SUID	Sudden Unexpected Infant Death
UK	United Kingdom

Date Developed/Updated
July 2019

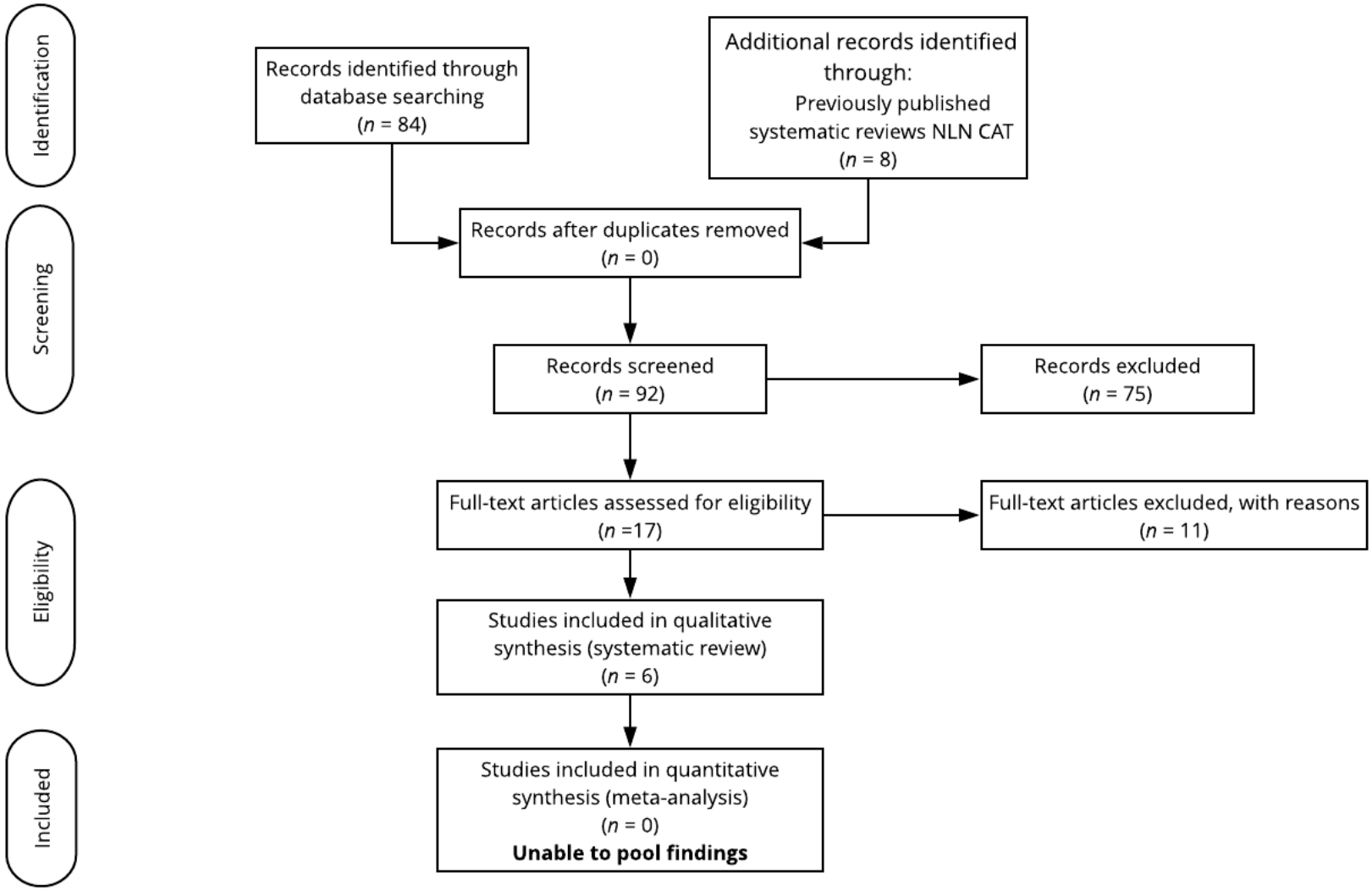

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIMSA)[d]

Characteristics of Studies

De Luca 2016

Design	Quantitative Synthesis
Objective	Assess the understanding of the Back to Sleep campaign among health care professionals.

Methods	**Protocol and registration.** Not reported
	Eligibility Criteria.
	• A study was included if it
	  ○ Investigated healthcare professional's knowledge and/or parent advice about infant sleeping positions
	  ○ Published within the 20-year period after the initiation of the Back-to-Sleep campaign to 2013 (20 years)
	  ○ Published in international peer-reviewed journals in English.
	Information sources. Search.
	• PubMed and MEDLINE
	Study Selection.
	• Two authors independently assessed studies for eligibility. There is no description of how conflicts in study selection were resolved.
	Data collection process.
	• Two authors extracted data independently, and results compared. No differences were found
	Risk of bias (RoB) across studies.
	• Method not reported
	Summary measures.
	Health care professional's
	• Awareness that supine sleep position is best
	• Recommend the supine sleep position
	• Awareness that the non-prone position lowers risk of SUID
	• Recommend the non-prone position
	Synthesis of results.
	• Summarized how percentages of the four summary measures changed over 20 years
	• If survey year(s) were not available, assumed a 2-year lag between pre and post surveys
	• If more than one study was performed in the same year an average was calculated and weighted according to sample size
	• If a study reported pre/post training course, only pre-training course data was used

Results	**Study Selection.** **Number of articles identified:** *N* = 386 **Full-text articles assessed for eligibility:** *n* = 54 ○ **Studies included in qualitative synthesis:** *n* = 21 **Synthesis of results.** • Percentage of Health Care Professionals (HCP) in the United States who are aware that the supine sleeping position is best for reducing SIDS has increased over the 20 years included in this analysis • Pediatricians' knowledge of risk of sleep position was greater than other HCPs

	• There is an increase in the recommendation of supine or non-prone sleeping position. Stated concern that non-prone does not always mean supine. Poorly described in studies. **Risk of bias across studies.** • Risk of bias across studies is high, as all are surveys**.** Survey return rates were not reported.
Discussion	**Summary of evidence.** • Infant deaths rates related to sleep have decreased since the inception of Back to Sleep campaigns • The percent HCPs aware that supine sleep position is best has increased since the inception of Back to Sleep campaigns • Back to Sleep message appears to have reached both parent and HCPs • Pediatricians' knowledge of risk of sleep position is greater than other HCPs • By 2004 almost all HCP were recommending a non-prone sleep position. **Limitations.** • Small number of studies • Searched only two databases • Year surveys completed for some included trials is unknown • Method of survey not captured, face-to-face data may be different than mailed surveys
Funding	**Funding.** • UK Economic and Social Research Council grant number ES/1026193/1

Gaw 2017

Methods	Descriptive cohort study

Participants	**Participants:**
	• Reported accidental suffocation and strangulation in bed (ASSB) incidents for children younger than 12 months of age from January 2000 through November 2012.
	Setting:
	• Reports were derived from the CPSC Consumer Product Safety Risk Management System from the following:
	  ○ Death Certificates database, *n* = 978 (56.3%)
	  ○ Injury and Potential Injury Incidents, *n* = 492 (28.3%)
	  ○ In-Depth Investigations database, *n* = 244 (14.1%)
	  ○ National Electronic Injury Surveillance System, *n* = 22 (1.3%)
	Number enrolled into study: *N* = 1736
	Number completed: *N* = 1736
	Gender, males: *N* = 1009 (58.3%)
	Age, month (%):
	• 0-2: 681 (39.2)
	• 3-4: 487 (28.1)
	• 5-6: 289 (16.6)
	• 7-11: 279 (16.1)
	Inclusion criteria:
	• Death in children younger than 12 months of age
	• Between the years of January 2000 through November 2012
	• Death related to bedding/soft bedding or specific object (including pillow, cushion, blanket, stuffed animal, plush, positioner, bumper, as well as wedge or wedging).
	Exclusion criteria:
	• Duplicate reported incidents among databases
	• Fire-related incidents
	• If the death did not occur during sleep per the narrative description in report
	Covariates identified:
	• Sleep location (crib/bassinet, adult bed, sofa/chair, unspecified bed/mattress, other)
	• Orientation (prone, side, supine, or other)
	• Position in which the infant was found upon death (wedged, on top of object, pressed against, entangled, overlay, other)
	• Outcome (suffocation, compressive asphyxia, other)
	• External factors (acute illness, chronic condition, prematurity)

Interventions	No interventions occurred
Outcomes	**Primary outcome:** Objects associated with ASSB **Secondary outcome:** Position in which the infant was found upon death

Results	**Results:**
	• ASSB cases (*n* = 1253) reported death by location:
	  ○ Crib/bassinet, *n* = 383
	  ○ Adult bed, *n* = 285

	○ Sofa/chair, *n* = 238 ○ Unspecified bed/mattress, *n* = 221 ○ Other, *n* = 126 • Mean death age: 3.76 months (SD = 2.51; median, 3.00) ○ 39.2% (681 of 1736) of recorded deaths were in infants 2 months of age or younger ○ 67.3% (1168 of 1736) of recorded deaths were infants 4 months of age or younger • Sleep orientation was documented for 40.4% (*n* = 701). Of these reported cases, 84.9% (*n* = 595) were found in the prone position. • Position reported (*n* = 1424): ○ Wedged 43.3% (*n* = 616) ○ On top of an object 25.9% (*n* = 369) ○ Covered by an object 8.3% (*n* = 118) • Most deaths were by suffocation (87.6%; *n* = 1521) or compressive asphyxia (8.4%; *n* = 145) • Identified co-morbid risk factors, such as prematurity, acute illness, or chronic conditions, accounted for 5.1% (*n* = 89) of all cases • Sleep location deaths (*n* = 1253) ○ Crib/bassinet, *n* = 383 ○ Adult bed, *n* = 285 ○ Sofa/chair, *n* = 238 ○ Unspecified bed/mattress, *n* = 221 ○ Other, *n* = 126 • Mean death age: 3.76 months (SD = 2.51; median, 3.00) ○ 39.2% (681 of 1736) of recorded deaths were in infants 2 months of age or younger ○ 67.3% (1168 of 1736) of recorded deaths were infants 4 months of age or younger • Sleep orientation was documented for 40.4% (*n* = 701). Of these reported cases, 84.9% (*n* = 595) were found in the prone position. • Most deaths were by suffocation (87.6%; *n* = 1521) or compressive asphyxia (8.4%; *n* = 145) • Identified co-morbid risk factors (such as prematurity, acute illness, or chronic conditions) accounted for 5.1% (*n* = 89) of all cases **Most common objects associated with ASSB and ways infants were found deceased with objects:** • Pillows: 24.5% (*n* = 425) with 46.6% of this sub-population found positioned on top of a pillow and in the face-down or prone orientation • Mattresses: 21.0% (*n* = 364) with 97.3% of this sub-population was found wedged • Blankets: 13.1% (*n* = 228) with 84.2% of this sub-population being found on top of, entangled in, or covered by • Walls: 11.5%; (*n* = 199) with 99% of this sub-population found wedged

Geyer 2016

Methods	Cohort
Participants	**Setting:** University of Iowa Hospital • Preintervention audit, August 2013 • 1-year postintervention audit, August 2014 • 2-year postintervention audit, August 2015 **Number enrolled into study:** *N* = 77 • **Group 1:** Preintervention group, *n* = 22 • **Group 2:** 1-year post intervention, *n* = 37 • **Group 3:** 2-year post intervention, *n* = 18 **Number completed:** *N* = 77 • **Group 1:** *n* = 22 • **Group 2:** *n* = 37 • **Group 3:** *n* = 18 **Gender, males:** Data not provided **Age**: Data not provided **Inclusion criteria**: • All patients less than 1-year of age in the University of Iowa Children's Hospital • Developmentally ready for a crib and asleep at the time of the audit. • Infants are considered developmentally ready to transition to a crib were if they weighed >1700 grams, are tolerating feeds, are hemodynamically stable, and have demonstrated 5 days of consistent weight gain. **Exclusion criteria:** • Greater than 1-year of age • Not developmentally ready for a crib • Not asleep at the time of the audit **Covariates identified:** Not identified

Interventions	• **Group 1:** No intervention
	• **Group 2:** Bundled intervention
	  ○ Staff educated on safe sleep
	  ○ Implemented safe sleep products (Sleep Sacks®, organizational caddies and fitted crib sheets)
	  ○ Parents educated on safe sleep
	  ○ Community education on safe sleep
	• **Group 3:** No intervention documented (interventions from Group 2 continued for another year)

Outcomes	**Primary outcome(s):** • To improve sleep environment safety for inpatient infants.

Results	**Results:**
	• **Preintervention**
	  ○ 82% had safe sleep position (supine in crib)
	  ○ 32% had no unsafe objects in crib
	• **1-year post intervention**
	  ○ 95% had safe sleep position (supine in crib) --increased from preintervention however not significant
	  ○ 65% had no unsafe objects in crib--significantly increased from preintervention (p = .017)
	• **2-year post intervention**

	○ 83% had safe sleep position (supine in crib) -- stable rates of safe positioning however not significant ○ 72% had no unsafe objects in crib--sustained and significantly improved compared to preintervention (p = .025)

McMullen2016

Methods	Cohort
Participants	**Participants:** • Nurses in the 10 units, 658 (500 pediatric and 158 obstetric) nurses in these units **Setting:** • Golisano Children's Hospital, Rochester, New York. • Ten units with 70 pediatric patient beds, 60 NICU beds and 41 mother–baby beds **%male subjects:** • No report **Number complete:** • All completed the educational intervention. • Participate pretest (n = 203) and post-tests (n = 196) **% male subjects:** • 3% **Inclusion criteria:** • Infants were considered hemodynamically stable **Exclusion Criteria:** • Infants with ○ Respiratory distress ○ Ventilator support ○ Congenital or surgical conditions that prevent them from being on their back, ○ No dopamine or dobutamine support, ○ No umbilical catheters in place **Power analysis:** Cohort, not needed
Interventions	• Questionnaire to assess nurses' knowledge, attitudes, and opinions • Observations of infants' sleep positions
Results	**Results:** • Number of observations: 125 inpatient infants ○ Bed sharing decreased from 7% to 2% ○ The mean number of items in crib was reduced from 3 (± 2) to 2 (± 1) ○ Sleep positions: ▪ Prone - 15 -> 5% ▪ Side - 15 -> 1.7% ▪ Supine - 70 -> 90% • Safe sleep compliance increased from 60 to 70%

Sleutel 2018

Methods	Cohort study - longitudinal quasi-experimental study
Participants	**Participants:** Nurses and parents of newborn(s) at three participating hospitals with a goal to improve infant safe sleep (ISS) practices. Variance was noted in hospital size, location, and nursing specialty, location, and specialty of the nurses. **Setting:** Three participating hospitals in the United States. • **Hospital 1** = medium sized, 2000 annual births • **Hospital 2** = medium sized, 3000 annual births • **Hospital 3** = small/rural sized, 300 annual births **Number enrolled in study:** *N* = 132 • **Group 1 (Hospital 1) + Group 2 (Hospital 2) + Group 3 (Hospital 3):** *N* = 132 **Number completed:** *N* = 62 • **Group 1 (Hospital 1):** *n* = 16, maternal-baby nurses • **Group 2 (Hospital 2):** *n* = 36, maternal-baby, labor and delivery, neonatal intensive care, and pediatric intensive care nurses • **Group 3 (Hospital 3):** *n* = 10, all maternity nurses (who are clustered to work in all of the above units) **Inclusion criteria:** • Nurses must complete a pre/post survey using the same anonymous survey code **Exclusion criteria:** • Failed to complete pre AND post survey • Failed to utilize the same survey code **Covariates identified:** • Hospital size, location, nursing specialty, and sampling distribution
Interventions	• **Pre-intervention survey** ○ Baseline data ▪ RN knowledge and/or beliefs regarding safe sleep practices (11 questions), ▪ RN self-reported practices and teaching of safe sleep actions (8 questions). • **Bundle:** ○ Attractive/intriguing baby posters were placed throughout the hospital in their respective units. ○ Nursing was sent out education about ISS practice changes per American Academy of Pediatrics (AAP) recommendations. ○ Systematic parental education for ISS practices (on admission, each shift, and during discharge). ○ Crib cards and educational pictures for ISS placed in the units. • **Post-intervention survey** ○ Sent two months later; it consisted of all the same questions as #1.
Outcomes	**Primary outcome(s):** • Changes in nursing knowledge/beliefs and practices • Parental recall of ISS teaching **Safety outcome(s):** • Inpatient infant sleep environments and safety
Results	• **Notes on the survey:** ○ Questionnaires were tested for internal consistency reliability for each administration of the questionnaire at the two larger hospitals. The third, smaller hospital was not tested, because of the small sample size. At

	Hospital 1, the pre-post coefficient alphas were 0.76 and 0.85. At hospital 2, the corresponding coefficient alphas were 0.72 and 0.83. The did not assess factor analysis. They based content validity on basing factors on well-established safe to sleep recommendations. ○ Questions were adaptive, for example, if nurses did not routinely work on the mother baby unit, only knowledge questions, not practice questions were included. **Results:** **Changes in nursing knowledge/beliefs- nurses' self-rating of importance of safe sleep factors** • The following were rated significantly ($p < .05$) after the interventions ○ Sleep position- supine positioning for sleep decreases risk ○ Bed-sharing increases risk ○ Room temp > 78 degrees F increases risk ○ Excess clothing increases risk ○ Offering a pacifier at nap or bedtime decreases risk ○ Breastfeeding decreases risk ○ Room sharing without bed sharing decreases risk • The following were not rated significantly after the interventions ○ Firm sleep surface increases risk ○ Sleeping with loose or soft objects (loose blankets, toys) increases risk ○ Smoke exposure increases risk ○ Nurses role in modeling safe infant sleep practices **Audit of crib environment safety conditions (time after interventions is not reported)** • Significant improvement in the following ($p < .001$ for each): ○ Baby on back or being held ○ No soft objects (loose blankets or toys) ○ Sleep sac or safe baby attire ○ Not bed sharing ○ Baby in crib or being held by an awake adult • No change in number of rooms after interventions ○ Room temperature not > 78 degrees F • Changes in parent recall of RN teaching ○ Pre-interventions 28.6 % of parents recalled RN teaching on Safe Sleep, after interventions 86.4% of parents recalled RN teaching on Safe Sleep ($p > .001$) ○ All factors noted above were generally recalled by parents after RN teaching ($p > .001$)

Voos 2014

Methods	Developed a safe sleep educational model
Participants	• Medically stable, infants in the NICU who were in an open crib • ICN and the ICN nurses
Interventions	Nursing education at unit Updates • Safe Sleep packets including video and written materials • Development of safe sleep competencies developed with unit educators Family education plan developed • Bedside nurse • Safe Sleep packet with video and written materials • Use of wearable blankets Developed a Safe Sleep Checklist • Was the head of bed elevated without a medical order? • Was the infant not positioned on their back • Was the infant asleep in a seat or swing • Were there toys in the bed • Were there pillow(s) in the bed • Was there a gel pillow(s) or positional device in the bed? • Was there a loose blanket? Ten separate observational rounds were made by study team members using the Safe Sleep Checklist Created a place to document safe sleep education in the EMR
Outcomes	Goal: increase the percentage of infants in a safe sleep environment Education results: Staff: • All 250 ICN nurses attended the education sessions • Presentation was given to NNPs, no attendance record • Presentation at a noon conference attended by neonatologists and NNPs • Presentation at a Division of Neonatology meeting • Nursing administration made Safe Sleep one of the yearly competencies Parent/Families • Safe sleep packets were distributed to parents when the child moved to an open crib • Safe sleep education was added to the discharge checklist • Parent viewing of the video and safe sleep packet
Results	At baseline 21% (6/28) patients were in a safe sleep environment. Three most common deviations from a safe sleep environment were • Elevated head of bed without a medical order 29% (8/28) • Infant not positioned on its back 21% (6/28) • Toys in the bed 32% (9/28) There were 260 patient observations with an average of 26 patients eligible for safe sleep (range 19-32) By the end of a 1.5-year period, there was an increase to 88% (23/26) patients in a safe sleep environment • Elevated head of bed without a medical order 0%

	• Infant not positioned on its back 12% (3/26) • Toys in the crib 4% (1/26)

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Appendix

Recommendations made by the AAP Taskforce (Moon & Task Force On Sudden Infant Death, 2016):

1) **Level A Recommendations**
   a) Back to sleep for every sleep
   b) Use a firm sleep surface
   c) Breastfeeding is recommended
   d) Room sharing with the infant on a separate sleep surface is recommended
   e) Keep soft objects and loose bedding away from the infant's sleep area
   f) Consider offering a pacifier at nap time and bed time
   g) Avoid smoke exposure during pregnancy and after birth
   h) Avoid alcohol and illicit drug use during pregnancy and after birth
   i) Avoid overheating
   j) Pregnant women should receive regular prenatal care
   k) Infants should be immunized in accordance with recommendations of the AAP and Centers for Disease Control and Prevention
   l) Do not use home cardio respiratory monitors as a strategy to reduce the risk of SIDS
   m) Health care providers, staff in newborn nurseries and NICUs, and child care providers should endorse and model the SIDS risk-reduction recommendations from birth
   n) Media and manufacturers should follow safe sleep guidelines in their messaging and advertising
   o) Continue the "Safe to Sleep" campaign, focusing on ways to reduce the risk of all sleep-related infant deaths, including SIDS, suffocation, and other unintentional deaths. Pediatricians and other primary care providers should actively participate in this campaign
2) **Level B Recommendations**
   a) Avoid commercial devices that are inconsistent with safe sleep recommendations
   b) Supervised, awake tummy time is recommended to facilitate development and to minimize development of positional plagiocephaly
3) **Level C Recommendations**
   a) Continue research and surveillance on the risk factors, causes, and pathophysiological mechanisms of SIDS and other sleep related infant deaths with the ultimate goal of eliminating these deaths entirely
4) **Other**
   a) There is no evidence to recommend swaddling as a strategy to reduce the risk of SIDS