Safe Sleep for Infants

Accessible version: https://www.youtube.com/watch?v=NdjihiES8FY
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Today’s Speakers and Contributors

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Acknowledgments

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- Shanna Cox
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- Paula Eriksen
- Stacy Fentress
- Sarah Foster
- Meredith Fulmer

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- Luis Luque
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- Alicia May
- Jane Mezoff

- Eve Colson, MD, MHPE

- Christine Olson
- Emily Osteen-Johnston
- Jackie Rosenthal
- Carrie Shapiro-Mendoza
- Michelle Walker

- SUID Case Registry Awardees

- National Center for Fatality Review and Prevention

- Eunice Kennedy Shriver National Institute of Child Health and Human Development

Samuel Hanke, MD, MS
Safe Sleep for Infants
Trends of U.S. Sleep-related Infant Deaths

CDR Sharyn Parks Brown, PhD, MPH, USPHS
Epidemiologist, Maternal and Infant Health Branch, Division of Reproductive Health
National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention
Sleep-related Infant Deaths

- 3,500 deaths occur each year in the U.S.
- Also known as Sudden Unexpected Infant Death (SUID)
  - Deaths of infants less than 1 year old
  - Occur during sleep or in a sleep environment
- Sudden Unexpected Infant Death (SUID) includes:
  - Sudden Infant Death Syndrome (SIDS)
  - Accidental suffocation and strangulation in bed
  - Undetermined causes
Almost 80% of Sleep-related Infant Deaths Occur Before Infants Are 4 Months Old

Age of Sleep-related Infant Deaths, U.S., 2014–2016; N=10,754

Rates of Sleep-related Infant Deaths


Released June 2017; wonder.cdc.gov/cmf-icd10.html
Rates of Sleep-related Infant Deaths Dropped in 1990s But Have Not Declined Since 2000


Deaths per 100,000 live births


155

AAP recommends infants sleep on their backs

Back to Sleep campaign launched

91

Released June 2017. wonder.cdc.gov/cmf-icd10.html
Sleep-related Infant Deaths Correspond to Numbers of Infants Placed on Their Back to Sleep

Rates for All Sleep-related Infant Deaths, U.S., 1990-2016

*Percent of Mothers Reporting Placing Infants on Their Back to Sleep


Released June 2017. wonder.cdc.gov/cmf-icd10.html
Rates Vary Widely among States

Rates of Sleep-related Infant Death by State, 2013–2015

SUID Rate per 100,000 live births
- 33–67
- 67–100
- 101–134
- 135–168
- 169–202

U.S. Rate: 89 per 100,000 live births

Erck Lambert AB, Parks SE, Shapiro-Mendoza CK. *Pediatrics* Feb 2018, e20173519
Racial and Ethnic Disparities Exist in Sleep-related Infant Deaths


Deaths per 100,000 Live Births

- American Indian/Alaska Native: 217
- Non-Hispanic Black: 190
- Non-Hispanic White: 87
- Hispanic: 53
- Asian/Pacific Islander: 38

### Known Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-supine position (e.g., on side or stomach)</td>
</tr>
<tr>
<td>Sleep surface sharing</td>
</tr>
<tr>
<td>Non-firm, non-flat sleep surface</td>
</tr>
<tr>
<td>Presence of soft bedding or other soft objects</td>
</tr>
<tr>
<td>Overheating during sleep</td>
</tr>
<tr>
<td>Tobacco exposure (prenatal &amp; environmental)</td>
</tr>
<tr>
<td>Alcohol exposure (prenatal &amp; environmental)</td>
</tr>
</tbody>
</table>
# How to Reduce Risk of Sleep-related Infant Death

<table>
<thead>
<tr>
<th>Known Risk Factors</th>
<th>This means infants should be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-supine position (e.g., on side or stomach)</td>
<td>Placed on their back to sleep every time they go to sleep</td>
</tr>
<tr>
<td>Sleep surface sharing</td>
<td>Placed on a separate space to sleep, in same room as caregiver</td>
</tr>
</tbody>
</table>

**What to avoid**

<table>
<thead>
<tr>
<th>Where the infant sleeps should be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-firm, non-flat sleep surface</td>
</tr>
<tr>
<td>Presence of soft bedding or other soft objects</td>
</tr>
<tr>
<td>Overheating during sleep</td>
</tr>
</tbody>
</table>

**What else to avoid**

<table>
<thead>
<tr>
<th>What else can you do?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco exposure (prenatal &amp; environmental)</td>
</tr>
<tr>
<td>Alcohol exposure (prenatal &amp; environmental)</td>
</tr>
</tbody>
</table>
Where Can We Reduce Risks and Increase Prevention?

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not sleeping in a crib, portable crib, or bassinet</td>
<td>76</td>
</tr>
<tr>
<td>Sleep surface-sharing</td>
<td>61</td>
</tr>
<tr>
<td>Use of soft bedding or soft objects</td>
<td>39</td>
</tr>
<tr>
<td>Non-supine sleep position</td>
<td>22</td>
</tr>
<tr>
<td>Prenatal tobacco exposure</td>
<td>10</td>
</tr>
<tr>
<td>Prenatal alcohol exposure</td>
<td>8</td>
</tr>
</tbody>
</table>

Kemp JS, et.al. *Pediatrics* Sep 2000, 106 (3) e41 (non-firm sleep surface)
CDC PRAMStat Data for 2011 (alcohol and tobacco exposure)
Protective Factors for Sleep-related Infant Death

- 60% are breastfeeding at least through the infants’ first 2 months
- 32% of infants placed to sleep with a pacifier

Sudden Unexpected Infant Death (SUID) Case Registry

- **CDC supports the SUID Case Registry to monitor sleep-related deaths and related circumstances**
  - Demographics, infant health history, sleep position, location and contents of the sleep environment

- **CDC SUID classification algorithm**
  - Provides a standardized grouping method
  - Accounts for unknown and incomplete investigation
  - Acknowledges uncertainty about suffocation or asphyxiation
  - Allows calculation of SUID category-specific death rates

www.cdc.gov/sids/CaseRegistry.htm
Since 2000, Decreases in SIDS Have Not Led to Decreases in Overall Sleep-related Infant Deaths

Deaths per 100,000 live births


All Sleep-related Infant Deaths

Sudden Infant Death Syndrome (SIDS)

Undetermined Cause

Accidental Suffocation and Strangulation in Bed

Released June 2017. wonder.cdc.gov/cmf-icd10.html
Changes in Cause of Death Determination for Sleep-related Infant Deaths

- Medical examiners and coroners (ME/Cs) certify cause of death
  - Include terms that describe cause and manner of death

- Cause-of-death codes (ICD-10) are used for national surveillance
  - Sudden Infant Death Syndrome (SIDS): R95
  - Undetermined: R99
  - Accidental suffocation and strangulation in bed: W75

- Moving away from SIDS as a diagnosis
- Reporting more deaths as undetermined or accidental suffocation
Variability in Cause of Death Determination Limits Our Understanding and Prevention Efforts

- **Shifts in cause-of-death reporting**
  - More thorough investigations lead to more deaths being classified as accidental suffocation or undetermined causes
  - Increased influence of multidisciplinary child death reviews
  - Changing death certifier diagnostic preference, away from SIDS

- **This variability influences surveillance and research**
- **Impacts true understanding of causes of sleep-related infant deaths**
- **Inhibits ability to prevent future deaths**
Other CDC Initiatives and Efforts

- **PRAMS infant safe sleep questions**
- **Promoting recommendations and educational campaigns**
  - American Academy of Pediatrics safe sleep recommendations
  - NIH’s Safe to Sleep public health education campaign
- **Supporting hospital-based quality improvement initiatives**
  - CDC-funded Perinatal Quality Collaborative (PQC)
  - National Network of PQCs

www.cdc.gov/prams/index.htm
pediatrics.aappublications.org/content/138/5/e20162938
www1.nichd.nih.gov/sts/Pages/default.aspx
www.cdc.gov/reproductivehealth/maternalinfanthealth/pqc-states.html
Death Investigations and Safe Sleep

Roger A. Mitchell, Jr., MD
Chief Medical Examiner
Office of the Chief Medical Examiner
Government of the District of Columbia
D.C. Office of the Chief Medical Examiner
CDC Recommended Sudden Unexplained Infant Death Investigation (SUIDI) Form

![CDC SUIDI Form](https://www.cdc.gov/sids/SUIDRF.htm)

<table>
<thead>
<tr>
<th>INVESTIGATION DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant's Last Name</td>
</tr>
<tr>
<td>Male/Female</td>
</tr>
<tr>
<td>Race</td>
</tr>
<tr>
<td>Infant's Primary Residence</td>
</tr>
<tr>
<td>Contact Information for Witness</td>
</tr>
<tr>
<td>Relationship to deceased</td>
</tr>
<tr>
<td>Last Name</td>
</tr>
<tr>
<td>Work Address</td>
</tr>
<tr>
<td>Home Telephone</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WITNESS INTERVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you the usual caregiver?</td>
</tr>
<tr>
<td>Did you notice anything unusual or different about the infant in the last 24 hrs?</td>
</tr>
<tr>
<td>Did the infant experience any falls or injury within the last 24 hrs?</td>
</tr>
<tr>
<td>When was the infant LAST PLACED?</td>
</tr>
<tr>
<td>When was the infant LAST KNOWN ALIVE?</td>
</tr>
<tr>
<td>When was the infant FOUND?</td>
</tr>
</tbody>
</table>

Where was the infant found? (Specify):
- Crib
- Bed
- Mattress
- Sofa
- Other:

- Other describe:
  - Car seat
  - Chair
  - Stroller
  - Car
  - Floor
  - Playpen
  - Portable crib
  - Washed

[View Full Form](https://www.cdc.gov/sids/SUIDRF.htm)
Sudden Unexplained Infant Death Investigation (SUIDI)

- **Name, age, race, gender**
- **Response to hospital**
  - Names of physician
  - Findings during clinical examination
- **Response to home**
  - Household relationships
    - Identification of caregivers
  - Recent change in behavior
  - Recent illness or injury (condition within 72 hours)
- **Last placed and known alive**
  - Where: bassinet, bed, sofa, crib, etc.
  - Position: back, side, front, including neck and face position, etc.
- **How is the infant found**
  - Position: back, side, front, including neck and face position, etc.
  - Items near infant’s nose, mouth, face
- **Clothing and bedding: blankets, comforter, sheets, pillow**
Doll Scene Reenactments

- Communicate purpose and acknowledge difficulty
- Reaffirm that the process of the Office of the Chief Medical Examiner is to understand all circumstances
- Allow caretaker to place the doll in “Placed” and “Found” locations
- Take Photographs at each step
- Additional scene investigation documentation should follow standard death scene protocol
SUIDI Doll
Autopsy Protocol

- **Complete organ dissection**
  - Photography, weight, and histology

- **Complete head dissection**
  - Neuropathology consultation (routine)
  - Optic nerve dissection
  - Eye globe removal and dissection (as needed)

- **Skeletal assessment**
  - Anthropology consultation (as needed)

- **Cardiac pathology consultation** (as needed)

- **Molecular pathology consultation** (future)

- **Toxicology, microbiology, histology, and metabolic**
Death Certification: Bedsharing/Co-sleeping

- Based upon information found during investigation and autopsy findings
- Looking for evidence of asphyxia
  - Anterior lividity
  - Petechial hemorrhage of the eyes, mouth, and thymus
  - History of “roll-over” as given by the bed-sharing adult
- If this type of information is available or observed, then cause and manner of death are certified as
  - Cause of death: Asphyxia    Manner of death: Accident
- If this type of information is not available or observed, then the cause and manner of death are often certified as
  - Cause of death: Undetermined (bedsharing)    Manner of death: Undetermined
Death Certification: Unsafe Sleep

- Based upon information found during investigation and autopsy findings
- These cases are for infants who are:
  - Placed face down
    - Sleeping on adult beds with soft bedding
    - Sleeping in cribs with soft bedding
    - Sleeping on couches, car seats, recliners, etc.
  - Often these cases have no physical or gross evidence of asphyxia
- Many of these cases are certified as
  - Cause of death: Undetermined  Manner of death: Undetermined
Infant Mortality Review Team Conducts Review and Analysis for Policy Development

Mortality

Circumstances surrounding Death

Sleeping Arrangements for the Infant

Birth History and Health of the Infant

Health of the Mother, Family, and other Caregivers

Family Dynamics and Interaction with Social Services

Socioeconomic Determinants of Health

Surveillance
Collection
Analysis
Interpretation
Dissemination

Public Health Action
Priority Setting
Planning, implementing, and evaluating disease
- Investigation
- Control
- Prevention

Multidisciplinary Board
OCME FQHC
Health OB/GYN
Child Service OAG
Housing Pediatrician
Medicaid Agency
MFM Physician
Community Members

OCME: Office of the Chief Medical Examiner
FQHC: Federally Qualified Health Center
OAG: Office of the Attorney General
Case Example

- 2-month-4-day-old male infant found unresponsive by father bedsharing in a supine position. Father describes placing the baby down and then “dozing off.” Father woke up and found the baby unresponsive in the same position.

- No recent illness or injury
  - Weight: 50th percentile for age
  - Height: 50th percentile for age
  - Developmentally normal
  - No external or internal evidence of injury
  - No anatomic cause of death identified
Hospital
Possible Risk Factors
Possible Risk Factors
Possible Risk Factors
Doll Reenactment
Doll Reenactment
Doll Reenactment

Recording Temperature of the Room
## Death Certification: Case Example

### CAUSE OF DEATH (See instructions and examples)

32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.

IMMEDIATE CAUSE (Final disease or condition resulting in death)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Undetermined – Bedsharing</td>
</tr>
<tr>
<td></td>
<td>Due to (or as a consequence of):</td>
</tr>
</tbody>
</table>

Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST

<p>| | |</p>
<table>
<thead>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>b.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Due to (or as a consequence of):</td>
</tr>
<tr>
<td>c.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Due to (or as a consequence of):</td>
</tr>
<tr>
<td>d.</td>
<td></td>
</tr>
</tbody>
</table>

PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I

**Sudden Unexpected Infant Death**

37. MANNER OF DEATH

- Natural
- Homicide
- Accident
- Pending Investigation
- Suicide

- [x] Could not be determined
Behavior Change and Infant Sleep

Eve R. Colson, MD, MHPE
Professor of Pediatrics
Washington University School of Medicine
Aimed at the risk of sleep-related deaths in infants include always back sleeping, no things in the infant sleep space, for example, no soft blankets, no pillows, no stuffed animals and no bumpers. In addition, infants should “room share” but not bedshare.
Success in Back Sleeping


Opportunities for Prevention

*Increase Back Sleeping*


Opportunities for Prevention

*Decrease Bedsharing*

Room sharing, not bedsharing

Figure 1. Trends in Infant Bed Sharing as a Usual Practice

Understanding Behavior
The Theory of Planned Behavior

- Attitude Toward the Behavior
- Subjective Norm
- Perceived Behavioral Control

Intention

Behavior

Actual Behavior Control

Changing Behavior

Social Media and Risk Reduction Training (SMART)

16 Birth Hospitals
- Randomly assigned to 4 hospitals into 1 of 4 groups
- 400 mothers per group, 1600 total

Group 1 – Control
Breastfeeding Nursery (C)
Breastfeeding mHealth (C)

Group 2 – Nursery Only
Safe Sleep Nursery (I)
Breastfeeding mHealth (C)

Group 3 – mHealth Only
Breastfeeding Nursery (C)
Safe Sleep mHealth (I)

Group 4 – Both interventions
Safe Sleep Nursery (I)
Safe Sleep mHealth (I)

- Control (C) groups received breastfeeding information
- Intervention (I) groups received safe sleep information
- Two-part intervention: 1. In the hospital nursery, after birth
  2. At home, through mobile health texts and videos

Developing the Intervention

- Conducted focus groups and interviews with:
  - Hospital staff
  - Parents of young infants
- Crafted messages:
  - Used social marketing principles
  - Worked with marketing firm
  - Worked with video production company
- Developed a logo and brand
Postpartum Hospital Intervention

- **Safe sleep laminated cards and slides**
  - To aid nurses in teaching mothers about safe infant care practices
  - For slide presentations for staff or email blasts

- **Motivational poster**
  - To be hung in staff common areas and break rooms

- **Sample protocol**
  - To be used to create or modify hospital protocols

- **Announcement letters**
  - Templates for campaign announcement letters for hospital staff and administration

Here the trachea (airway) is above the esophagus (food pipe). Anything that is spit up will be pushed back down by gravity to the lowest point. The airway is protected.

On the stomach, the trachea (airway) is below the esophagus (food pipe). Anything that is spit up will be pushed back down by gravity to the lowest point. On the stomach it is easier to aspirate into the lungs.

Example of Laminated Cards
Memory Prompt for Nursing Staff

SMILE! Today You Can Save a Life

- **Share** the testimonials
- **Model** safe sleep behaviors to decrease risk
  - Always sleep on the back
  - Firm mattress and no soft bedding
  - Room sharing but NOT **bedsharing**
  - Offer a pacifier at sleep time once breastfeeding is established
- **Include** as many family and friends as possible
  - Family and friends may recommend unsafe sleep practices
  - Your advice is very important
- **Learn** about family beliefs
- **Engage** families in discussion of beliefs

Quality Improvement Approach
Plan, Do, Study, Act (PDSA)

Hospitals in the safe sleep intervention went from about 50% recommending to keep soft bedding out of the sleep area to 90% making that recommendation to families.

Mobile Health Intervention: Texts and Short Safe Sleep Videos

- Importance of sleep position
- Choking and sleep position
- Importance of sleep space
- Bedsharing
- Handling advice from others
- Mattress safety

- Soft bedding
- Feeding baby in bed
- Pacifiers
- Dangers of smoking
- Infant sleep patterns

## Intervention Outcome

### Percent of Caregivers Who Self-reported Recommended Behavior

As Usual Practice in 2 Weeks Before Survey, N=1263

<table>
<thead>
<tr>
<th>RECOMMENDATION</th>
<th>Control (BF in hospital and BF in mobile health)</th>
<th>Intervention nursery only (SS in hospital and BF in mobile health)</th>
<th>Intervention mHealth only (BF in hospital and SS in mobile health)</th>
<th>Both interventions (SS in hospital and SS in mobile health)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supine Sleep Position</td>
<td>80%</td>
<td>76%</td>
<td>88%</td>
<td>93%</td>
</tr>
<tr>
<td>Room Sharing Without Bedsharing</td>
<td>70%</td>
<td>74%</td>
<td>80%</td>
<td>86%</td>
</tr>
<tr>
<td>No Soft Bedding Use</td>
<td>68%</td>
<td>68%</td>
<td>79%</td>
<td>82%</td>
</tr>
<tr>
<td>Any Pacifier Use</td>
<td>60%</td>
<td>67%</td>
<td>69%</td>
<td>76%</td>
</tr>
</tbody>
</table>
Nursing Quality Improvement and Mobile Health Interventions Could Reduce Infant Mortality Rates

- A nursing quality improvement intervention improved maternal reports of education and observed infant safe sleep practices in the hospital but did not, on its own, improve adherence to all infant practices.
- Among mothers of healthy term newborns, a mobile health intervention improved adherence to infant safe sleep practices compared with control interventions.
- These interventions, if implemented more widely, may improve adherence to Safe Sleep practices and therefore have the potential to reduce infant mortality rates.

Next Steps

- Randomized control trial with a prenatal component—start safe sleep and breastfeeding education early
- Targeting specific populations to reduce disparities
  - Lower-income
  - Minorities, including Spanish speakers, with tailored messaging and images
- Exploring maternal falling asleep while feeding—a common occurrence and the idea of “planning” for a sleepy feeding space and what that would look like
From Pain to Purpose—Using SUID Families Stories to Promote Safe Sleep Practices

Samuel Hanke MD, MS

*Charlie’s Dad*, President of Charlie’s Kids Foundation

*Pediatric Cardiologist*, Assistant Professor Cincinnati Children’s Hospital

*Chief Patient Experience Officer*, Cincinnati Children’s Hospital
Beyond the Numbers: The Personal Impact


- Combined SUID Rate
  - 1990: 180
  - 2016: 91.4

- Sudden Infant Death Syndrome
  - 1990: 140
  - 2016: 38.0

- Unknown Cause
  - 1990: 120
  - 2016: 31.6

- Accidental Suffocation and Strangulation in Bed
  - 1990: 100
  - 2016: 21.8

Deaths per 100,000 live births

Released June 2017; wonder.cdc.gov/cmf-icd10.html
Charlie’s Story
Charlie’s Story
Charlie’s Story
Charlie’s Kids Foundation

- Founded in 2011, 501(c)3, all-volunteer organization
- Mission
  - Raise awareness for SUID by educating families about SIDS, SUID and safe sleep practices
Sleep Baby Safe and Snug©

- Provides timely and repetitive safe sleep messaging in an approachable, easy-to-read book
- Targets all levels of education, language, and literacy abilities
- Promotes parent and child bonding
- Distributed in bulk through hospitals, health departments, nonprofits
Distributed to over 2.5 million babies across the U.S. since 2013

Increases observed safe sleep behaviors and parent and baby bonding when used as part of a home visiting program

Increases in-hospital safe sleep compliance on direct crib audits

Is associated with fewer sleep-related deaths when distributed through statewide safe sleep campaigns


Tennessee Department of Health, Child Fatality Review Database
The Power of Parents—Why Parents Need to be Engaged

- No clear “brand” of SUID
- Link between SIDS and safe sleep practices is not obvious to parents
- Sharing SUID family stories with statistics → changes the culture of infant sleep
- Integrating families stories should be a critical component of safe sleep interventions
Safe Sleep for Infants