Sudden Infant Death Syndrome: An Update

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Objectives for the Program

• SIDS definition & diagnosis
• Understanding SIDS risks
• SIDS risk reducing strategies
• Health care professionals role
Polina Gelfer, M.D.

Has documented that she has no relevant financial relationships to disclose.
~2,300

~230

National MCH Center for Child Deaths Review
Infant Mortality Statistics

SIDS - The major cause of infant death 1-12 mo/age
3rd cause of death in infancy

- SIDS: 26.5
- Congenital Anomalies: 17.2
- Accident/Adverse Effects: 8.1
- Pneumonia/Influenza: 3.1
- Homicide/Legal Intervention: 3.0
- Septicemia: 3.1
- Meningitis: 1.0
- Respiratory Distress: 0.7
- Bronchitis: 0.7
- Malignant Neoplasms: 0.6

% of total infant deaths
28 - 364 days old
What defines SIDS

• SIDS is the unexpected death of a previously healthy infant under 1 year of age

• No cause of death is determined by
  – Death scene investigation
  – Autopsy
  – Review of baby’s medical history
Death Scene Investigation

- Interview of parents & witnesses
- Reenactment using dolls
- Examination of the bedding
Autopsy

- A thorough postmortem examination
- Full skeletal survey
- Eye examination to r/o retinal hemorrhages
- Blood samples for toxicology and electrolytes levels
Infant’s Medical History

• Previous nutritional and developmental abnormalities
• Unexpected sibling deaths
• History of domestic violence
• CPS and police involvement
Sudden Unexpected Infant Death (SUID)

• Any sudden and unexpected infant death, explained or unexplained (including SIDS)
• Suffocation, asphyxia, entrapment, infection, ingestion, metabolic diseases, cardiac arrhythmia, etc...
History of SIDS

The child “died in the night because she overlaid it” (Bible, First Kings)
History of SIDS

• “Overlaying”- result of a neglectful mother
• **Soranus, 2\textsuperscript{nd} century A.D.** The first medical textbook: “no co-sleeping”
• The term “SIDS”- **1969** Seattle, 2nd international conference on causes of sudden deaths in infants
• **1979** WHO: SIDS is an official cause of death
• **1970s** Federal funding released on SIDS research
• **1992** “Back to Sleep” recommendations
• **1994** “Back to Sleep” Campaign
Back to Sleep Recommendations

1992 Any nonprone position (side/supine) optimum for reducing SIDS

2000 “Back is best.” The risk of side position is less than prone

2005 Only back sleep position during every sleep period; safe sleeping environment
AAP Statement, 2011

- Supine position for sleep (no elevating the head of the crib)
- A firm sleep surface; no sleeping in sitting devices
- Room-sharing without bed-sharing; Ø devices promoted as “safe” for bed-sharing
- No redundant soft bedding and soft objects (Ø bumpers)
- Regular prenatal care
- Avoid smoke exposure
- Avoid alcohol/illicit drug use
- Breastfeeding
- Avoid overheating
- Pacifier use
- Immunizations
- No commercial devices to reduce the risk of SIDS (wedges, positioners...)
- Home monitors- not a strategy to reduce SIDS
- Tummy time
- HC professionals to endorse recommendations
- Media and manufactures to follow safe-sleep guidelines in their messaging
- Expand the national campaign
SIDS Rate and Back Sleeping (1988 – 2006)

SIDS Rate Source: CDC, National Center for Health Statistics,
Sleep Position Data: NICHD, National Infant Sleep Position Study.
SIDS Rate in Texas DSHS, VSU, 1990-2005
SIDS by Sleeping Place and by Sleeping Placement (n 102)

Texas Child Fatality Review Annual Report, 2010
# SIDS Risk Factors Changed since Back-to-Sleep Campaign (Trachtenberg, 2012)

<table>
<thead>
<tr>
<th></th>
<th>Before BTS</th>
<th>After BTS</th>
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<tbody>
<tr>
<td>N= 568 (1991-2008)</td>
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<td></td>
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<tr>
<td>Placed prone</td>
<td>84%</td>
<td>49%</td>
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<tr>
<td>Side sleeping</td>
<td></td>
<td>↑ 133% (42% we found prone)</td>
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<tr>
<td>Bed sharing</td>
<td>19% (29%)</td>
<td>38% (64%)</td>
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<tr>
<td>Prematurity</td>
<td>20%</td>
<td>29%</td>
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<tr>
<td>URTI</td>
<td>47%</td>
<td>25%</td>
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<td># risk factors</td>
<td>The same</td>
<td>The same</td>
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Safe to Sleep Campaign, 2012

- Public educational campaign lead by NICHHD
- Outreach activities in specific communities
- Relationship with community health workers and health care providers
- Tailored material for specific audience
- Safe to Sleep champion initiative
Epidemiology

• ↑↑ risk 2-4 months (91% deaths 1-6 mo/age)
• Seasonal trend: ↑ deaths in winter months (overheating)
• Male infants (3:2 ratio)
• Preterm and low birth infants
• Racial and ethnic disparities
  – American Indians/Alaska Native 112/100,000 Live Births
  – Non-Hispanic blacks 99/100,000
  – Non-Hispanic whites 55/100,000
  – Hispanics 32/100,000
  – Asian/Pacific Islander 23/100,000

National Vital Statistics Report
SIDS Facts/Epidemiology

Maternal risk factors:

• Teenage mother (< 20 y/o)
• Low educational level
• Low socioeconomic status
• Poor prenatal/postnatal care
• Smoking
• Use of illicit substances
• Strong association between infant sleep position, sleep environment & SIDS

• The prone sleeping position is a prime factor associated with SIDS
Triple Risk Model

- Brain stem abnormality, genetic factors
- Critical development period
- Vulnerable infant
- Modifiable Environmental Stressors
- SIDS

0-12 months
- Prone/side sleep position
- Bed sharing
- Nicotine
- Soft bedding
- Overheating

Vulnerable infant
- Prone/side sleep position
- Overheating

Modifiable Environmental Stressors
- Nicotine
- Soft bedding
- Overheating
Possible Brain Stem Abnormalities

- The serotonergic (5-hydroxytryptamine [5-HT]) neurons control autonomic function and breathing
- SIDS may be associated with lower 5-HT and tryptophan hydroxylase
- Abnormal 5-HT neuron firing, synthesis, release, and clearance

Duncan 2010; Paterson 2006
Genetic Predisposition?

• Abnormal variant of gene coding for carnitine palmitoyltransferase in Alaska Natives
• Severe gene polymorphism may affect the immune response in the presence of a mild infection

Berkowitz, 2012
Sleep Position

• Back to Sleep for every sleep
  – may alter autonomic control of CV system and ↓ cerebral oxygenation (Moon 2012)
  – Babies sleep deeper; ability to arouse from sleep is decreased

• Side sleeping is not safe!
  – SIDS risks similar (Li 2003) or even higher (Hauck 2002; Fleming 1996; Mitchell 1997)
  – Risks exceptionally high with the presence of infection (Helweg 1999)

• In newborns: side position does not promote clearance of amniotic fluid (AAP, 2011)
Prone Position, GER, and Risk of Aspiration

- No increased risk of choking/aspiration, even in infants with GER (Malloy 2002; Tablizio 2007)
- **Exception**: infant with upper airway disorders with impaired airway protective mechanisms
- Elevating HOB is ineffective and not recommended (Tobin et al 1997)
Anatomy
Unaccustomed Prone Sleeping

Increases risk of SIDS, as much as 18 times (Mitchell 1999)

– Nonparental caregivers may use prone sleeping
– Less ability to lift head in tummy position
– Later development of upper body strength (Davis 1998)
Barriers to Back Sleeping

- GER and fear of aspiration
- Delay of development
- Plagiocephaly
Crib and Bedding Accessories

- Safety standards of the Consumer Product Safety Commission
- Firm mattress with fitted sheet, no extra soft subjects
- The strong association of SIDS and soft bedding (Hauck 2003)
- Prone sleeping + soft bedding = most hazardous (Kemp 1998; Flick 2001)
- No sleeping in sitting devices
Bed Sharing

Room sharing but not bed sharing!

50% risk reduction (Blair 1999; Carpenter 2004)

- Infant < 3 mo
- Parent is smoker
- Fatigued caretaker
- Caregiver taking certain medications (antidepressants, pain meds, alcohol...)
- Not a parent
- Bed-sharing with multiple persons
- “Safe” bed-sharing devices
Breastfeeding

• Reduces risk of SIDS (Ip, 2009; Vennemann 2009; Hauck 2011)
• The protective effect increases with exclusivity (Hauck 2011)
Pacifiers

- Protective effect; mechanism is unclear (Hauck 2003)
- No forcing, no reinsertion
- Not to be hung around the neck; no stuffed toys attached
- For breastfed infants, delay using by 3-4 weeks
- No evidence that finger-sucking is also protective
Room Ventilation and Fans

• Avoid overheating (Fleming 1990; Ponsonby 1992; Ponsonby 1993)
• Room comfortable for lightly clothed adult
• Prevent sweating, no over bundling
• ?Use of fans decreased SIDS (Coleman 2008)- no recommendations
Swaddling

- Evidence are unclear; no recommendations
- ↑ sleep, ↓ startling, soothe pain
- Better neuromuscular development, motor organization, less physiologic distress for preterms
- Tight swaddling may reduce functional lung capacity
- Loose swaddling → head covering
- Immobilizations of arms and legs may reduce head covering with bedding (risk for SIDS)
- Hyperthermia- possible adverse effect

Bregje 2007
Swaddling Techniques
Immunizations

- Possible protective effect (Mitchell 1995; Jonville 2001; Fleming 2001)
- Infants should be seen for regular well-child checks (AAP, 2011)
SIDS and Prematurity

- Premature and LBW infants at high risk (Malloy 1995; Halloran 2006)
- VLBW infants are more likely to sleep nonsupine after NICU dc (Vernacchio 2003)
- Parental knowledge and acceptance are key
- Medical personnel plays critical role
Back to Sleep for NICUs

NICU should **implement** and **model** safe sleeping practice as soon as the infant is medically stable and significantly before the infant’s anticipating discharge, by **32 weeks’ PMA**

AAP, 2011
Apnea of Prematurity and SIDS

Apnea/bradycardia events are not causally related to SIDS

- Extreme events are not happened at the time of night/early morning
- Asians had higher rate of extreme events
- AA infant with lower number of events
- All events disappeared after 43 wks AGA

Hoppenbrouwers et al, 2008 CHIME study
Use Home Monitors

• Monitors may be of value for infants with CV/respiratory instability
• No evidence that monitoring ↓ SIDS (Ramanathan 2001; Hogman 1988)
• No evidence that infants at ↑ risks can be identified
• No over the counter monitors!
Health Care Professionals’ Role

• Nurses/medical personnel play critical role in parental education (Vernacchio 2003; Colson 2002; Shaefer 2010)
• Staff education
• Practice the right way!
Back to Sleep: Good Advise for Parents but Not for Hospitals?

- 94 hospitals survey (Hein 2001)
  - 85 (89.5%) using back and side positions
- Nurses survey
  - 42-64% always follow safe sleep recs. (Grazel 2010)
  - 50% advise exclusive supine position after dc (Aris 2006)
Right Messages from Media and Manufacturers
QI Initiative: “Back to Sleep” to NICU Practice

Crib audit NICU, CHMH, 2010
Goal

• Back to sleep
• Firm sleeping surface
• No soft objects in bed
Why Develop a Hospital-Based Program?

- Captures 100% of the birthing population for education
- Point of intersection for all members of the health care team (obstetrician, pediatrician, nursing, and lactation) with family
- Nurses are critical role models
- It is efficient and cost-effective
Organizational Chart
Hospital- Based Safe Sleep Program

Program acceptance
- Hospital administration
- Physicians
- Nursing staff
- Other staff (RT, Aides, PT, OT)

Curriculum development
- Unit guidelines
- Initial education
- Maintenance of education
- Family education

Program evaluation
- Crib audits
- Post discharge parental survey
- 3 phases: pre- during-, post-intervention

Community support
- Volunteer fund
- “Cribs for Kids”
Interventions/ Unit Guideline

• When is premature baby physiologically and clinically ready to start SSP?
• Does it contradict developmental care principles?
• Does position affect lung function?
Does the infant have any medical conditions precluding it from starting SSP? (Phototherapy, scalp IV/central lines, Neonatal Abstinence Syndrome, etc.)

Yes

Continue with NICU therapeutic position and re-evaluate periodically

No

Does the infant have respiratory symptoms: tachypnea, retractions, grunting, and oxygen dependency?

For infants with BPD who will be discharged on oxygen therapy consider transition to SSP 2 weeks prior to discharge.

Yes

Introduce SSP modifying positions and blankets to maintain temperature and comfort while transitioning infant

No

Remove Z-Flo, any toys, and unnecessary objects from isolette. Blanket rolls can be used as positioners if swaddling is not adequate

Is the infant ≥ 1500 grams

Yes

No

Is the infant in an open crib?

Yes

Continue with NICU therapeutic position and re-evaluate periodically

No

NICU therapeutic positioning, re-evaluate at 1500 grams
Crib Card

Ready for BACK TO SLEEP

Back to sleep is recommended by the AAP and should be implemented prior to discharge.
Arms in or arms out are both acceptable ways to swaddle an infant based on its needs.
Cold infants are not happy infants. Dress infants appropriately and use extra blankets if necessary.
Keep unnecessary blankets, toys, and soft objects out of the infant’s bed space.

Tummy Time should be encouraged when alert and should be supervised by a parent or caregiver.
Opportunities for tummy time are during an assessment or when a nurse is warming a feed.
Swaddling is safe. Keep the blankets from going above the infant’s shoulder line.
Look through the guideline located on SharePoint for more detailed information on Back to Sleep
Educate parents on a safe sleep environment and practice with the parent crib card, DVD, and discussion.
Encourage the use of a pacifier.
Prevent Plagiocephaly by encouraging Tummy Time when the infant is awake.

NICU Therapeutic Positioning

Examples of when NICU Therapeutic Positioning is Appropriate:
- Respiratory symptoms such as tachypnea, retractions, grunting and oxygen dependency
- Nasal CPAP
- Nasal Cannula requirements other than Home Oxygen requirements
- Phototherapy
- Scalp IV or Central Lines
- Neonatal Abstinence Syndrome
- Lack of handling due to social reasons—(please address with primary team)
- Any medical condition that requires prone or side lying positioning
- If Tummy Time cannot be implemented due to inability to be positioned prone (such as ostomy/surgical site).

Continue to evaluate infant for readiness to start Back to Sleep positioning

Please keep this card attached to the infant’s crib.
Education Campaign

• Nursing education campaign
  – Continuing education program on SIDS risk reduction (NICHD module, 1h CEU)
  – Q&A sessions
  – Safe Sleep Modeling during annual nursing evaluation

• Parental education campaign
  – Safe Sleep DVD (First Candle Foundation)
  – Educational brochure from NIH
  – Discharge class
  – Discharge teaching and modeling by the nurse
Compliance with Safe Sleeping Practice Components

Crib Audits N = 230 cribs (62, 89, 79)
Parental Compliance

(337 parents called, 260 responded)
Lesions Learned

- Communication is a key
- Avoid potential pitfalls: back vs. side sleeping, fear of aspiration
- Address attitudinal barriers
- Focus on evidence-based medicine
Thank you!

“Success is the sum of small efforts, repeated day in and day out.” (Robert Collier)
Questions? Comments…
References

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