Sudden Unexpected Postnatal Collapse (SUPC): Ensuring Safe Skin-to-Skin Contact (S-SSC)

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The Importance of Early Skin-to-Skin Contact (S-SSC)

- Prolonged early mother-baby SSC is widely recommended to improve bonding, facilitate breast-feeding, and promote infant physiologic stability.
- At least one hour of early SSC is an essential component of Step 4 of the Baby-Friendly Hospital Initiative (BFHI) *Ten Steps to Successful Breastfeeding*.
- May 12, 2012 Cochrane Review: "The intervention appears to benefit breastfeeding outcomes and cardio-respiratory stability, and decrease infant crying, and has no apparent short- or long-term negative effects."

Early Reports of ALTEs Associated with SSC

- In 2011, French authors reported 6 cases (2004 - 07) of apparent life-threatening events (ALTEs) among healthy newborns during skin-to-skin contact in a prone position on their mother's abdomen while in the delivery room during the first 2 hours of life.

- In most cases, mother was primiparous. In all cases, the mother and infant were not observed during the initiation of skin-to-skin contact and breastfeeding.

- Outcomes: 3 responded rapidly to stimulation or resuscitation & d/c well; 3 had severe hypoxicisch-emic encephalopathy (HIE) & death @ 15 - 23 days.

Pediatr 2011;127(4):e1073-e1076

Risk Factors for ALTEs During Early SSC

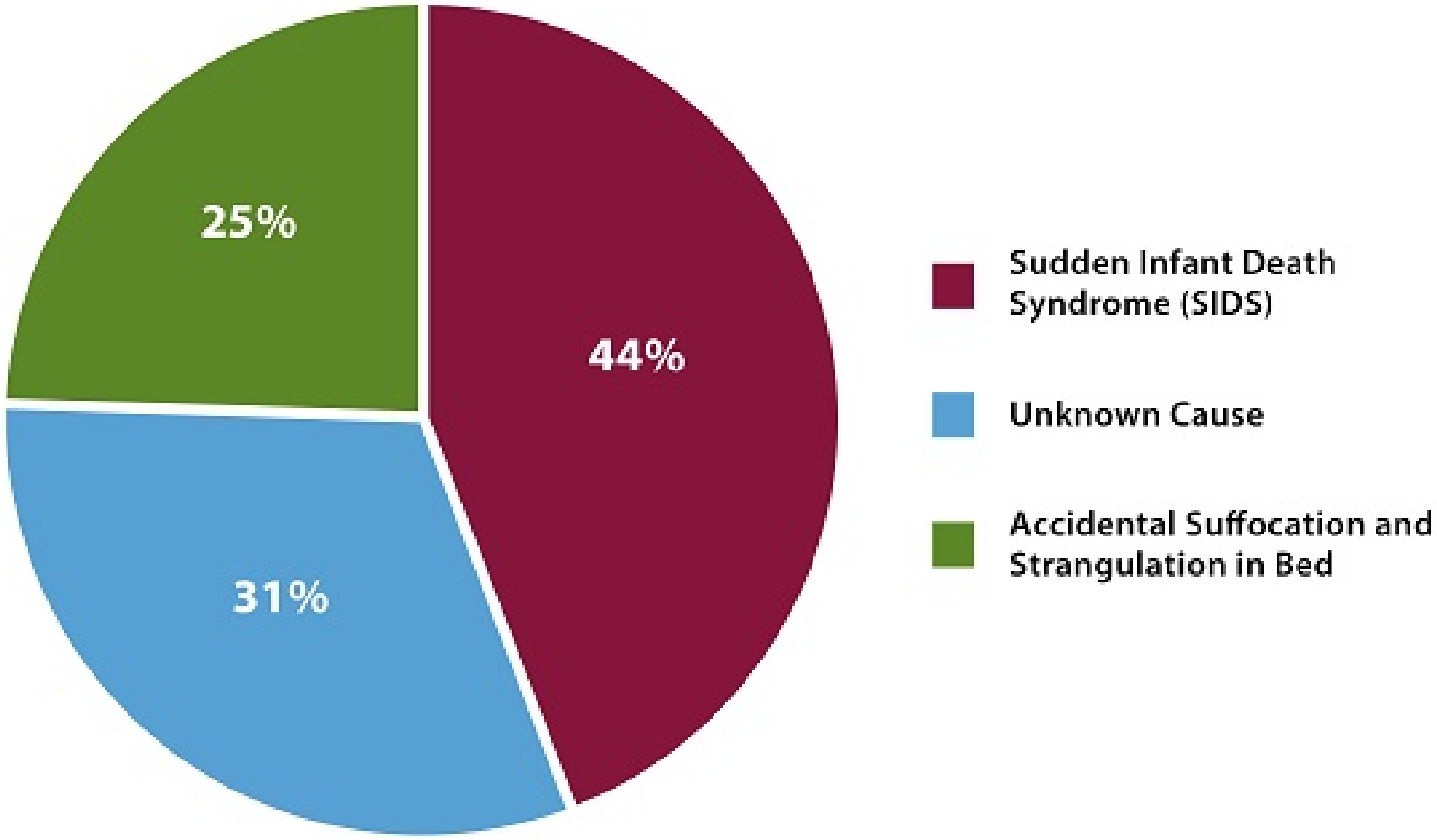
- In most published cases, 3 risk factors have been identified: 1) primiparous mother; 2) mother-baby SSC; and 3) mother and infant left alone in the D.R.
- Proper positioning and surveillance of healthy neonates must be ensured during early SSC. Maternal SSC contraindications (such as exhaustion or sedative use) should be strictly respected.
- It is possible that the risk factors for SIDS may also be risk factors for ALTEs or Sudden Unexpected Deaths of presumable healthy newborns. A standardized investigational workup should be performed after an ALTE. *Pediatr* 2011;127(4):e1073-e1076

Sudden Unexpected Infant Death (SUID)

- Each year in the US, about 3,500 infants under 1 year of age die suddenly and unexpectedly. Sudden Unexpected Infant Death (SUID) refers to any sudden and unexpected infant death without an obvious explanation prior to investigation.
- Just under half of SUIDs are classified as Sudden Infant Death Syndrome (**SIDS**).
- Approximately a quarter of SUIDs are categorized as Accidental Suffocation and Strangulation in Bed (**ASSB**).
- In about 30% of SUIDs, the cause remains **Undetermined**. *http://www.cdc.gov/sids/data.htm*

Most Common Types of SUIDs

Most SUIDs occur while an infant is sleeping in an unsafe sleep environment.



Sleep-Related Infant Deaths

- Sudden Infant Death Syndrome (SIDS) is a cause assigned to SUIDs after a thorough case investigation, including a complete autopsy, examination of the death scene, and review of the clinical history.
- SIDS and other sleep-related infant deaths represent the leading cause of infant death between 1 and 12 months in the U.S.
- Some infant deaths previously classified as SIDS are now more accurately being classified as acute suffocation and strangulation in bed (ASSB) and unknown cause with sleep-related risk factors.

SIDS and other sleep-related infant deaths represent the **leading cause of infant death between 1 and 12 months** in the U.S.

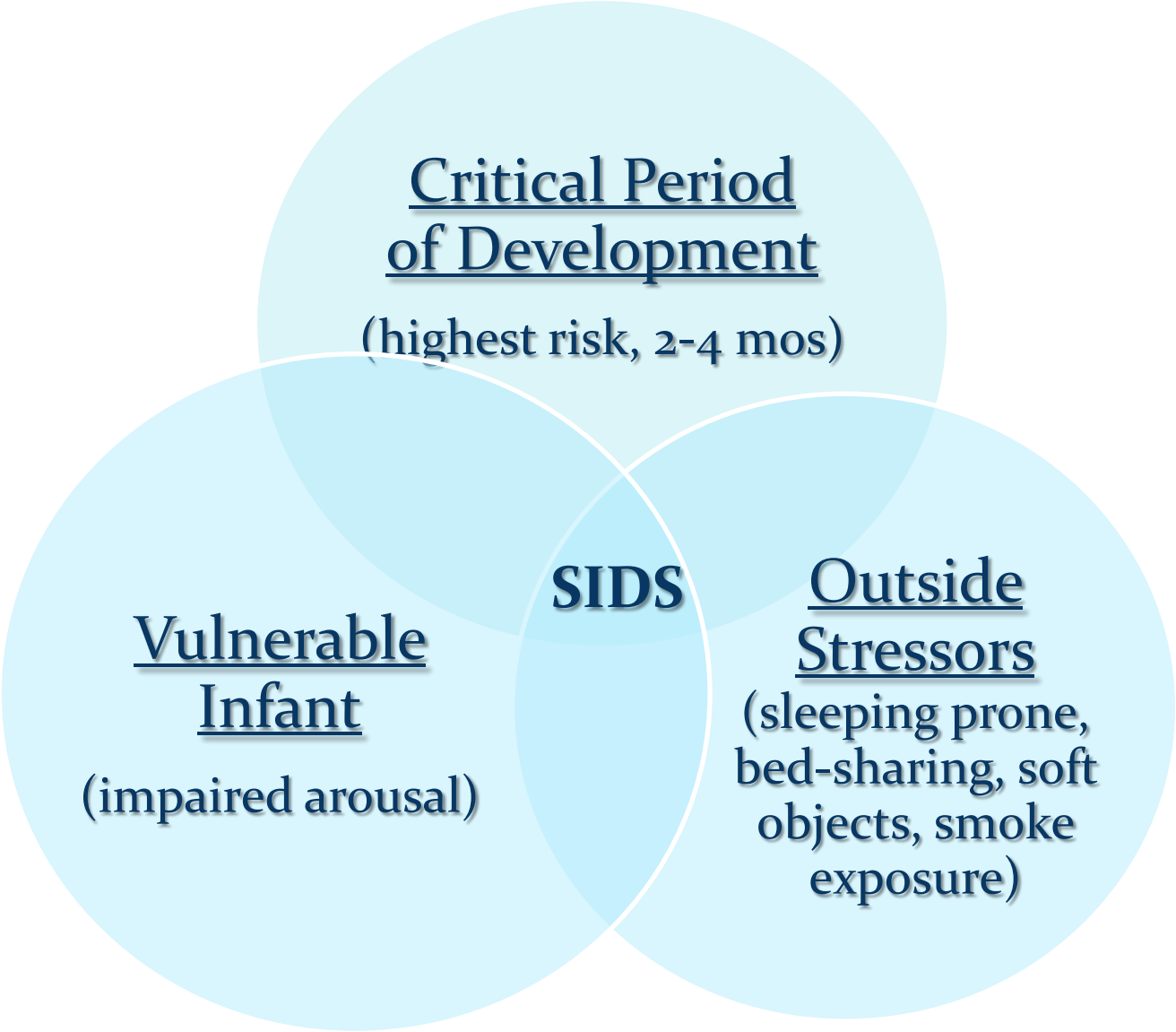
Accidental Suffocation and Strangulation in Bed

Several possible mechanisms can cause sleep-related suffocation by obstructing an infant's airway, including:

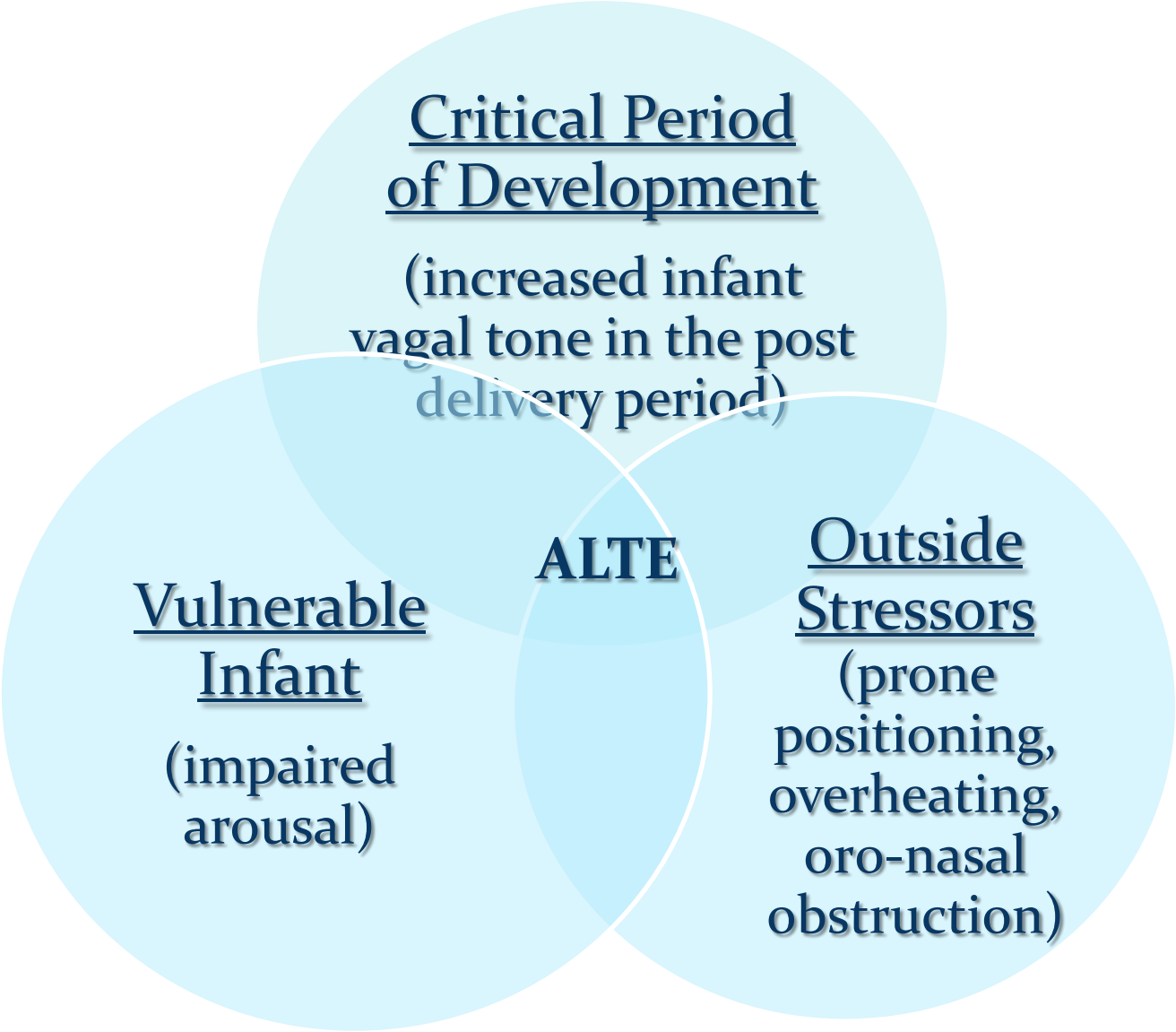
- Suffocation by soft bedding—such as a pillow or waterbed mattress.
- Overlay—another person overlaying or rolling on top of or against the infant.
- Wedging or entrapment—wedging between two objects, such as a mattress and wall, bed frame, or furniture.
- Strangulation—such as when an infant's head and neck become caught between crib railings

http://www.cdc.gov/sids/aboutsuidandsids.htm

Triple Risk Model for SIDS



Triple Risk Model for ATLEs in Newborns



Magnitude of the Problem

- A prospective epidemiologic study was conducted in Germany in 2009 to determine the incidence of unexpected sudden infant death (SID)and severe apparent life-threatening events (S-ALTE) that occurred within 24 hours of birth in term infants (≥ 37) weeks with 10 minute Apgar score ≥ 8.
- A S-ALTE was defined as an acute state of cyanosis or pallor and unconsciousness, requiring bagging, intubation, and or/cardiac compressions.
- Hospitals reporting such an event completed detailed questionnaires about the case.

Pediatr 2011;127(4):e869-e873

German Study of SID and S-ALTEs

- Of 43 cases reported, 17 fulfilled inclusion criteria, yielding an incidence of 2.6 in 100,000 live births. The number of cases would have been higher had the authors included less critical events.
- 7 infants died (3 @ scene; 4 2° to HIE on day 6-52); 6 were neurologically abnormal at discharge.
- 12 infants were found lying on their mother's chest or abdomen, or very close to and facing her.
- 9 of the 17 S-ALTEs occurred in the first 2 hours after birth.

Pediatr 2011;127(4):e869-e873

German Study of SID and S-ALTEs

- 13/17 (76%) mothers were primiparaous.
- 9 events occurred in the delivery suite; 8 on the postpartum ward.
- 6 infants were found by their mother, 4 after Mom awoke from a nap; 3 were found by father.
- 7 were only noticed by a health professional, despite the mother being present and awake.
- No infant had been on a monitor.

Pediatr 2011;127(4):e869-e873

Possible Contributing Factors to SID and S-ALTEs

- Lack of experience among primiparous mothers in positioning their infant and recognizing potentially hazardous situations.
- Postnatal fatigue of mother and child (4/5 infant deaths occurred while mother was asleep).
- Infant safe sleep recommendations often are not being applied to newborns, esp. shortly after birth.
- Infant physiologic changes in the first 2 hours of life may increase the vulnerability to ALTEs.

Pediatr 2011;127(4):e869-e873

Newborn Physiologic Changes in the 1st 2 Hours

- In healthy term infants, the 1st 2 hours after birth are dominated by an initial wave of sympathetic activity following the stimuli of the birth process.
- However, sympathetic activity rapidly dissipates and is followed by a period of diminished responsiveness to external stimuli, perhaps even including potentially asphyxiating situations.
- Close surveillance of the infant's condition by experienced staff, especially in the first 2 hours of life and in primiparas, although costly, may be necessary to prevent S-ALTEs and SID.

Pediatr 2011;127(4):e869-e873

Prospective National Study of a "Missing Cohort" of Neonatal Deaths and Near-Death Events

- 13-month prospective study (2008-2009) to determine the population incidence of and situational factors linked with sudden and unexpected postnatal collapse (SUPC) of healthy newborns in the UK and Ireland.
- Cases were infants ≥ 37 weeks, with 5 min. Apgar ≥ 8, who collapsed w/in 12 hrs. in hospital requiring positive pressure ventilation and either died or required ongoing intensive care.
- Among 45 cases reported, underlying pathology was identified in 1/3 of infants (incidence of 0.05/1000 term live births and 0.035/1000 without pathology).

Arch Dis Child Fetal Neonatal Ed. 2012;97:F30-F-34.

SUPC Among Infants w/o Underlying Pathology

- In 24/30 cases (80%), the diagnosis was airway obstruction during breastfeeding or in prone position.
- 23/30 (77%) mothers were primiparous.
- Only 1 of 8 mothers who were employed in the health profession recognized signs of infant deterioration. Where clinical staff were present, however, staff were always the first to recognize signs of collapse.
- 22/30 (73%) infants developed HIE; 5 died and 5 had neurologic sequelae at 1 year.

Arch Dis Child Fetal Neonatal Ed. 2012;97:F30-F-34.

Risk Factors for SUPC

- 22/30 (73%) collapsed in the first 2 hours, suggesting greater newborn vulnerability to hypoxic stress during the critical period of adaptation after birth.
- Risk factors for conventional SIDS are as important in the immediate newborn period as they are on discharge from hospital.
- Parents should be taught to assess infant airway, breathing, and color. Where parental observation may be impaired by exhaustion or sedation, the responsibility for vigilance resides with the staff.

Arch Dis Child Fetal Neonatal Ed. 2012;97:F30-F-34.

Occurrence and Risk Factors of SUPC in Presumably Healthy Infants

- Retrospective chart review of possible SUPC cases in live infants born during a 30 month period (Jan. 2010-June 2012) in Stockholm, Sweden.
- Cases were infants ≥ 35 weeks, Apgar score > 8 at 10 mins., collapsed within 24 hours after birth, and underwent resuscitation and NICU admission.
- 26 cases were found among > 68,000 life-born infants (incidence of 38/100,000 live births).
- Prone, asphyxiating position, unsupervised breast-feeding during first 2 hrs., primiparity, and also distractions—such as smart cellular telephone use--emerged as risk factors. *Acta Paediatri.* 2013; 102:680-88.

"Informal reports from midwives suggest that the extensive use of smart/mobile phones, messaging and social networking after delivery is an emerging trend, with some mothers writing up to 30 messages during the first 2 hours after delivery."

Acta Paediatrica. 2013; 102:680-88.

Occurrence and Risk Factors of SUPC in Presumably Healthy Infants

- In 15 of the 23 SUPC cases where information was available, the infant's face was covered by their mother's breast.
- Most authors state that published estimates of SUPC are lower than what occurs in the wards and only reflect the most critical events. No consensus exists for coding unexpected postnatal collapse in ICD 10, which no doubt, contributes to underreporting.
- 4 infants underwent hypothermia treatment, with a favorable outcome (3/4 normal at follow-up).

Pejovic NJ, Herlenius E. *Acta Paediatrica*. 2013; 102:680-688.

SUPC: Risk Factors

- The transition from fetal to extrauterine life may make the newborn more vulnerable during the first hours of life. The initial surge of catecholamines after birth is followed by a period of diminished responsiveness to external stimuli and increased vagal tone.
- This study identified previously documented risk factors for SUPC: primiparous mother, infant prone position; first breastfeeding attempt; co-bedding; mother in episoitomy position; and parents left alone with baby during the first hours after birth.
- 3 cases involved breastfeeding mothers who were using their mobile phones in the absence of other caregivers.

Acta Paediatrica. 2013; 102:680-688.

SUPC: Preventive Measures

- The concept of safe early skin-to-skin (S-SSC) could be a step to prevent S-ALTEs and possible SIDS events in the first 24 hours of life. S-SSC integrates the benefits of SSC and gentle monitoring of vulnerable newborns.
- Possible components of S-SSC: 1) checklists for medical and nursing staff; 2) oral and written parent information; 3) a schedule for monitoring of infants' status, especially in the first 3 hours postpartum; 4) observation of first breastfeeding attempts; and 5) reducing the risk of distractions.
- The potential use of unobtrusive wireless heart rate monitors has been raised.

Pejovic NJ, Herlenius E. *Acta Paediatrica*. 2013; 102:680-688.

Hospitals Should Balance Skin-to Skin Contact with Safe Sleep Policies

- Although the advantages of SSC and breastfeeding are important, **HCPs should be aware of the potential dangers when mothers are fatigued or sedated or left unattended.**
- If the baby has **required positive pressure ventilation in the delivery room**, the Neonatal Resuscitation Program advises **"post resuscitation care" in an environment where ongoing evaluation and monitoring** are available.
- Hospitals should evaluate mothers after delivery and prior to early SSC or breastfeeding and **train staff to recognize high-risk situations that require closer monitoring, such as when the mother has received sedatives.**

Goldsmith JP. *AAP News*. 2013; 34(11).

Hospitals Should Balance Skin-to Skin Contact with Safe Sleep Policies

- Babies should be monitored by a hospital employee (not a relative) or electronically if no appropriately trained person can be in the room continuously.
- The AAP recommends that mothers not sleep with babies in their beds, yet this practice is common post-delivery. Hospital staff should be trained to model safe infant sleep practices.
- HCPs' discussions with parents should link early breastfeeding policies with safe sleep practices. Mothers should be reminded not to sleep with the baby in their bed, either in the hospital or at home.

Goldsmith JP. *AAP News*. 2013; 34(11).

A Review of SUPC Causes, Definitions, Risks, and Preventive Measures

- The authors reviewed 398 published cases of SUPC, in 26 studies, occurring during the 1st postnatal week.
- The estimated incidence differs widely, from 2.6 to 133 cases/100,000.
- Case definition, inclusion, and exclusion criteria differ widely among reports.
- SUPC occurs more frequently than expected from recent surveys. SUPC is associated with prone position/skin-to-skin/cobedding in 74% of cases.

Herlenius & Kuhn. *Translational Stroke Research*. 2013; 4:236-247.

A Review of SUPC Causes, Definitions, Risks, and Preventive Measures

- Sudden unexpected postnatal collapse (SUPC) includes both severe apparent life-threatening event (S-ALTE) and sudden unexpected death in infancy (SUDI) occurring in the first postnatal week.
- SUPC is a rare, but potentially catastrophic, event. Half of cases result in death and the majority of survivors have permanent disability.
- When a defined time for the SUPC event is described, approx. 1/3 of reported events occur in the first 2 hrs., another third between 2 and 24 hrs., and 1/3 between 1 and 7 days after birth.

Herlenius & Kuhn. *Translational Stroke Research*. 2013; 4:236-247.

A Review of SUPC Causes, Definitions, Risks, and Preventive Measures

- Case criteria: infants born >35 weeks, with 10 min Apgar >7, considered healthy, who collapsed suddenly and unexpectedly w/in the 1st postnatal week.
- Based on autopsies of SUPC cases, an underlying cause for fatal collapse was found in 58%.
- A mild gliosis (nonspecific reactive change of glial cells in response to CNS damage) in brainstem areas involved in cardiorespiratory control was found in several cases. Dysfunctional or immature brainstem cardiorespiratory control may be involved in some of the unexplained SUPC cases.

Herlenius & Kuhn. *Translational Stroke Research*. 2013; 4:236-247.

Recommendations to Reduce SUPC

- Systematically educate parents about signs of infant well-being and the need to continually ensure upper airway patency in their newborn.
- Appropriate non-obtrusive surveillance of the newborn's clinical condition by caregivers aware of SUPC and continuous supervision of at-risk mothers (primipara, alone and exhausted).
- Medical decisions about SSC when maternal (sedative treatment, infection) or infant (difficult adaptation, mild respiratory distress, suspected infection) risk factors are present.
- Supine positioning of infant in crib for sleep.

Herlenius & Kuhn. *Translational Stroke Research*. 2013; 4:236-247.

Recommendations to Reduce SUPC

- Continuously and unobtrusively ensure surveillance of newborns during their first hours and days of life.
- Three targets on which perinatal healthcare teams could focus: 1)Safe early SSC in the delivery room; 2) Safe breastfeeding establishment in the 1st days of life; and 3) Secure positioning of the infant during sleep.
- Early recognition of underlying disease.
- Structured investigations of all cases for possible preventable causes of the collapse.

Herlenius & Kuhn. *Translational Stroke Research.* 2013; 4:236-247.

Breastfeeding and Delivery Room Neonatal Collapse

- Whereas initial descriptions of such events involved small case studies, principally from Europe, **more frequent reports suggest an increasing incidence.**
- Many US **reports have occurred on the postpartum floors and been associated with bed-sharing**, possibly as a result of maternal suffocation of her infant.
- In one of the two cases described, the **primiparous mother was talking on her cell phone**, unaware that her arm position was causing obstruction of the infant airway. In the **other case, the infant was improperly positioned under Mom's pendulous breasts**.

Journal of Human Lactation. May 2015; vol. 31(2): 230-232.

Infant Assessment and Reduction of SUPC During SSC

- In Neonatal Resuscitation Program (NRP) guidelines: term infants w/good muscle tone and who breathe spontaneously…should be dried and placed in SSC with the mother, and both covered with dry linen."
- NRP recommends HPs observe infant breathing, activity, color, and tone in each newborn. The infant assessment should be ongoing throughout the recovery period in the labor/delivery unit.
- A simplified and rapid newborn assessment tool—the Respiratory, Activity, Perfusion, and Position tool (RAPP)--was developed that incorporates safe position requirements.

Newborn & Infant Nursing Reviews (NINR). 2014; Vol. 14, Issue 1: 28–33.

RAPP: A Rapid Newborn Assessment Tool to Reduce the Risk of SUPC During SSC

Respiratory, Activity, Perfusion, and Position tool (RAPP)

- R Stands for Respiratory Effort: "easy breathing" or "increased work of breathing"
- A Stands for Activity: "asleep," "quiet alert," "active alert," "crying," breastfeeding," or "non-responsive"
- The 1st P Stands for Perfusion: "pink," "acrocyanosis," "pale," "dusky," "gray," or "cyanotic/blue"

Ludington-Hoe and Morgan. *NAIRN.* 2014;14(1):28-33

RAPP: A Rapid Newborn Assessment Tool to Reduce the Risk of SUPC During SSC

- The 2nd P Stands for Position: The mother should be upright and supported by 3-4 pillows. The infant: "head upright and turned to one side," "neck erect in midline," "nares and mouth visible," "well flexed," or "limp, flaccid."
- It is a nurse's responsibility to assess risk factors and implement strategies to reduce the risk of SUPC.
- The RAPP flow sheet can be added to your electronic medical record to serve as a reminder and facilitate swift documentation of RAPP results.

Ludington-Hoe and Morgan. *NAIRN.* 2014;14(1):28-33.

SUPC: Documented Risk Factors

- Prone, asphyxiating position
- Mother in lithotomy position
- SSC contact
- Bed sharing w/mother
- Initial unsupervised breastfeeding attempt
- Sidelying breastfeeding
- Primiparous mother
- Parents alone w/baby in the delivery room
- Maternal fatigue
- Analgesia or sedative use in mother
- Distraction, such as smart phone, TV
- Maternal obesity
- Occluded position of infant's mouth and nose, neck bent
- Mother unobserved by nurse

NAIRN. 2014;14(1):28-33

Safe SSC Resources

The United States Institute for Kangaroo Care has developed a checklist for safe positioning for SSC.

- Face can be seen
- Head is in "sniffing" position
- Head is turned to one side
- Neck is straight, not bent
- Shoulders are flat against Mom
- Chest-to-chest with Mom
- Legs are flexed
- A little upright, not flat, on bed/chair
- Cover the back with blankets
- Both are watched when sleeping, or
- Baby is being monitored

Education

- Include information in parental admission kits, place educational posters in all rooms, and review safe positioning checklist with parents.
- Maternity personnel need to know and vigilantly screen all patients for the high risk factors for SUPC.
- Implement continuous monitoring of dyads during SSC and breastfeeding in L & D and postpartum units.
- Establish a hospital task force, including risk management personnel, to collaboratively implement institutionally-acceptable risk reduction strategies.
- InJoy Videos: Kangaroo Care and Breastfeeding Webinar. Available from www.injoyvideos.com

Preventing SUPC While Promoting Breastfeeding

- Early and prolonged SSC after birth has many benefits.
- However, reports of SUPC in association with SSC have raised concerns about the safety of this practice.
- About half of SUPC cases die, and approx. 50% of survivors have neurologic sequelae. In 2/3 of fatal cases, no etiology is found.
- Multiple risk factors for SUPC have been identified.
- Official guidelines on appropriate monitoring of newborns in the first hours of life and on safe SSC are lacking.

Journal of Human Lactation. February 2015; vol. 31(1):12-14.

Preventing SUPC While Promoting Breastfeeding

- Based on available evidence, the authors developed a surveillance protocol in the delivery room and postnatal ward of the Institute for Maternal and Child Health of Trieste, Italy, to 1) promote safe mother-infant bonding; 2) establish successful breastfeeding; and correct the risk factors for SUPC.
- A Checklist for Newborn Infants in the First 2 Hours of Life was developed, with 7 parameters to be evaluated at 10, 30, 60, 90, and 120 minutes of life.
- AWHONN guidelines recommend 2 professionals in the delivery room (1 for care of mother and 1 for baby).

Journal of Human Lactation. February 2015; 31(1):12-14.

Parameters to be Assessed	10 Mins	30 Mins	60 Mins	90 Mins	120 Mins
Infant's mouth and nose visible and unobstructed					
Pink skin & mucous membranes					
Normal breathing (no retractions, grunting or flaring of the nares)					
Nl respiratory rate: 30-60 per min					
Normal **SpO_2: >90%** (if indicated)					
Subaxillary temperature at 60 and 120 mins. after birth (Normal range: 36.5° C-37.5° C)					
Mother never left alone with infant					

Journal of Human Lactation. February 2015; vol. 31(1):12-14.

Advice to Parents

- Parents must be systematically educated about infant supervision in the 1st hours after birth.
- Oral and written information should be given during antenatal classes and visits.
- Besides health professionals, the presence of a relative or another support person able to check on the infant's wellbeing is highly advised.
- Prenatal information about SUPC may increase parental stress.

Journal of Human Lactation. 2015; vol. 31(1):12-14.

Advice to Mothers

- Place infants to sleep in a crib in the supine position.
- Avoid placing infants in the prone or side position.
- Prone position is accepted during SSC if mother is awake and not drowsy.
- During SSC, the infant's nose and mouth should be visible at all times; head to turned to 1 side; neck straight and not bent; infant placed chest-to-chest and not over a breast, nor between breasts, nor over the abdomen.
- If mother feels tired or sleepy, the infant should be placed in her or her crib.
- Ask for supervision for first and subsequent breastfeeding attempts.

JH L. 2015; vol. 31(1):12-14.

Advice to Health Care Professionals—1st 2 Hrs.

- Do not leave mothers, esp. primigravidas, unattended.
- Verify appropriate infant position during SSC with nose and mouth uncovered and well visible.
- Prone position is acceptable only during supervised SSC and if infant is chest-to-chest (not over a breast nor abdomen nor b/w breasts), with head turned to 1 side, neck straight, and mouth and nose uncovered.
- Avoid SSC when mothers have been given analgesics and/or appear tired unless staff can provide continuous monitoring of the mother-newborn dyad.
- First breastfeeding attempt should be supervised.

Journal of Human Lactation. 2015; vol. 31(1):12-14.

Advice to HCPs--After the 1st 2 Hrs.

- Bed sharing should be discouraged, if the mother is sleepy/sleeping and the dyad is unattended.
- Babies found bed sharing with a sleepy/sleeping mother should be placed in their cribs.
- Infant side or prone position should be discouraged.
- Prone position of the newborn is acceptable only during supervised SSC.
- Recurrent checks of the mother and infant are required, correcting infant positioning, as needed.
- Increased surveillance may lead to more infants being separated from their mothers.

Journal of Human Lactation. 2015; vol. 31(1):12-14.

Does Mother's Posture Play a Protective Role During SSC?

- Visual materials depicting early SSC tacitly promote maternal supine postures, with the naked baby lying prone atop the mother's body, parallel to the floor, a position strongly associated with SIDS.
- Biological nurturing (BN) research, which has examined maternal postural effects on breastfeeding success, suggests that a semi-reclined maternal position is optimal for breastfeeding initiation.
- The maternal body slope ensures that the baby lies tilted upward and maintains the baby's head, shoulders and arms elevated, a position known to promote oxygenation and optimize lung function. This variable has, until now, been ignored in the SSC and SUPC literature. *Clinical Lactation;* 2014; 5(2):41-50.

Biological Nurturing (BN) and Maternal Recline

- BN shares much of the SSC rationale, with different interpretations.
- With BN, the way baby is clothed can vary widely.
- The mother sits semi-reclined with her torso angled from approx. 80° to 35° from the floor.
- Baby's brushing movements against mother's body release some 20 primitive neonatal reflexes (PNR) that promote latch and milk transfer.
- Gravity holds the baby in place, and mothers do not have to hold the baby's back, head, or torso.

Clinical Lactation; 2014; 5(2):41-50.

Biological Nurturing (BN) and Maternal Recline

- Facilitated eye contact and the words *mutual* and *reciprocal* lie at the heart of BN. The baby's face is 8-12 inches from the mother's face when mother's body is semi-reclined.
- In contrast to the birth SSC breast crawl, that may culminate in infant self-attachment to the breast, BN research suggests that latching time is greatly reduced when mothers spontaneously adjust positions, stroke and groom baby, shape their breasts, and occasionally latch the baby.

Clinical Lactation; 2014; 5(2):41-50.

Biological Nurturing (BN) and Maternal Recline

- Two of an infant's inborn defensive reflex behaviors that safeguard breathing--spontaneous head lifting and a variation of head righting—serve to protect the airway or signal the mother.
- These protective antigravity reflexes may be adversely affected when a baby is lying prone in a nearly horizontal position.
- Similarly, supine mothers must lift their head against gravity to gaze at their babies.
- These observations call into question the exclusion of maternal posture from the birth SCC breast crawl and SUPC risk factors.

Clinical Lactation; 2014; 5(2):41-50.

We can save hundreds of infant lives each year by effectively educating health personnel and families concerning:

a) safe positioning of infants during early skin-to-skin contact and the initiation of breastfeeding;

b) creating a safe infant sleep environment; and

c) ensuring appropriate surveillance of newborns during the first days of life.

Time for Questions