

Life threatening events

5/14/2014

- *Aboudiab et al. 2007 **FT**, 2 cases of ALTE within 2 hrs of birth in France occurred in KC, one several mins of birth, the other 45 mins postbirth in tired mom. Nurses must do vigilant observation in immediate postpartum period. It is NURSE'S RESPONSIBILITY!!!
- Amer Acad Ped, 2013 **FT**, PT. Guidelines for SIDS but speaks to ALTEs in first month of life too, says NO SIDE sleeping, have head to one side for one week and then switch to other side to prevent plagiocephaly, USE PACIFIERS, but if BF don't introduce pacifier until infant is one month old to establish BF, and says the predominantly accepted reason for ALTEs/SIDS/SUPC is maldevelopment of or delayed maturation of brainstem neuronal network responsible for arousal and for affecting physiologic responses to life threatening challenges during sleep. Studies have shows deficit in serotonin receptors in a network of neurons throughout the ventral medulla. The ventral medulla is responsible for arousals, chemosensitivity, respiratory drive, thermoregulation and blood pressure.
- Anderson & Swinth 2004
*Andres et al., 2011 Rebuttal re infants sleeping in KC rather than in own bed **FT**., 6 cases of ALTEs within 2 hrs of birth in France. Probs are unobserved mother, primip, maternal fatigue, poor mouth and nose position of infant. Occurred in KC with BF.3 DEATHS occurred but KC did not increase ALTE nor mortality incidence. Birth KC should be Encouraged but vigilance, primip care is needed. Lists **CONTRAINDICATIONS** to Birth KC
- Baker, 2011 **FT**, reports that this is happening with skin-to-skin care with enough frequency that one should not be surprised.
- *Barnes & Roberts,2005
Becher et al., 2011 **PT**. **Commentary** on Kluthe's article and reports ALTEs **FT**, SUPC guidelines (60% of cases cause is known after postmortem which should be done on all dead babies. Lists the tests to do while baby is still alive and in post-mortem.
- *Becher et al., 2012 **FT**. **PROSPECTIVE STUDY** of 13 months of unexpected **FT** infant deaths. 53% (25/45) occurred from airway obstruction during BKC, breastfeeding, or prone position with majority of primip moms. Some occurred in ARMS, in COT. KC and BF should be continued with better vigilance and parents should assess airway, breathing, and color of infant.
- *Branger et al., 2007 **FT**, clinical report of 8 life threatening and eventual deaths in KC in France DEATHS. Has **CONTRAINDICATION**
- Bouloumie 2008 **FT**, quasi Exp of birth KC +3 nights postpartum KC and staff felt that KC was okay as long as **mother was vigilant**

	and KC infants had better cardiorespiratory stability than non-KC group.
Byard, 2011	FT . Commentary on Becher's 2011 article & it states that the high percentage of collapses (53%) that occurred due to airway obstruction during Breastfeeding, skin to skin, and prone position was alarming.
Byard, 2012	Report of sudden infant collapse during BREASTFEEDING in neonatal and infant period
Chisa, 2011	FT , clinical review, talks about safety, how to be safe, but not about ALTE
*Dageville et al., 2008	FT , PROSPECTIVE. 2 neonatal altes (no deaths) among 22 hospitals in first 2 hours of life and some were in Birth KC in France
*Espagne et al., 2004	FT , early French report of ALTE in one infant during chest-to-chest, skin-to-skin contact in first 12 hours post birth. The baby died.
Feldman & Whyte, 2013	FT , 2 case studies of suffocation after BF, one at 9.5 hours and the other at 45 hours postbirth. Says skin-to-skin contact played a role in both cases as did side-lying
Feldman & Whyte 2013	FT , 2 case studies of SUPC at 9.5 and 45hrs 50 mins postbirth in healthy term newborn breastfeeding in side-lying position and in skin-to-skin in primip moms. One died and one had severe CP.
*Fleming, 2012	FT , review of previous reports drawing similarities betw/ the cases. Concludes with "...the routine separation of mothers and infants after delivery...may have significant negative effects on the establishment of normal mother-baby postnatal interactions, most importantly, the establishment of breastfeeding."
Foran et al., 2009	FT . Only mentions that these events can occur in KC
Gatti et al., 2004	FT , 6 term infants in KC skin to skin against mothers' chests and found in cardiorespiratory arrest within 2 hours of birth; 5/6 died.
Gnigler et al., 2013	FT , three deaths from asphyxia in KC in first two hour after birth to primip moms, 2 of whom were awake, but did not recognize anything being wrong with their babies. Need vigilant observation to save Birth KC baby lives
Goldsmith, 2013	FT , AAP newsletter about SUPC and what needs to be Done..
Gomez et al., 2010	Same as Rodriguez Alarcon Gomez below
*Hays et al., 2006	FT , a report of 11 babies with respiratory arrest in first 2 hours post birth while in KC in France. KC is a risk factor for ALTEs. More rigorous initial evaluation and sustained surveillance are needed e especially with PRIMIP moms
Heinmann et al., 2010	PT. KC position compared to prone and supine positions of 120 mins each. No differences in HR, RR, breathing pattern, desat episodes, SaO2 and rectal temperature in KC

from those in prone and supine. Prone is physiologically better than supine for PT so less chance of mortality.

RELATED LITERATURE

- Henderson, 2011 **FT**, PT, reports that WHO says that sleeping in KC is safe and that only intermittent observation is needed. See UK BFHI below.
- Herald Sun Newspaper 2009 PT one infant had “extreme complications at birth” and told parents baby would die, but cuddled him for 8 days while he had 18 episodes of stopped breathing and is now doing well and the report was written at one year of age.
- Kattwinkel et al. 2010 PT, **FT**. Review of 2010 NRP guidelines for resuscitation and says healthy baby who meets three criteria should be placed immediately in skin to skin with mother and continue to be observed for breathing, activity and color while in KC (Lewis 2012 review says same thing).
- Kiger et al., 2014 **FT**, 18 hours post birth Case study of resuscitated newborn who became supraventricular or atrial fib tachycardic while breastfeeding in KC position.
- Kluthe et al., 2004 PT, case study of picking up extra systole from mother. Says watching SaO2 is better indicator. **Not about ALTEs**
- Leow & Platt, 2011. **FT** see full write up below
- Lewis 2012 PT, FT, Review of Kattwinkels et al. 2010 article and it says same as Kattwinkel above, telling nurses which babies can go into KC immediately after birth and what to monitor.
- Ludington-Hoe et al 1993 PT – reports an early case of KC helping sustain the life of a preemie who was dying
- *Melchor-Marcos, 2010 **FT**, Case study??? can’t get this Spanish report!!
- Mori et al. 2010 **FT**, PT, refers to recent life threatening events occurring and gives two citations (Barnes, Nakamura) and it is reason for meta-analysis of HR, T, and SaO2 effects of KC
- *Nakamura 2007 **FT**, Cases of term infants need resuscitation in KC JAPAN
- *Nakamura & Sano, 2008 **FT**, 2 case studies of fullterm
- Pallas-Alonso et al. 2014 FT. risk factors for SUPC in delivery room.
- * Pejovic & Herlenius, 2013 **FT**, descriptive study of Sudden Infant Collapse (sudden Unexpected postnatal collapse) which occurred in 26/ 68,364 live-born infants, an incidence of 38/100,000 live births. Sixteen required resuscitation with ventilation >1min and 14 of these remained unexplained (21/100,000). Fifteen of the 26 children were found in a prone position, during skin-to-skin contact. 5 developed HIE and 24 had good outcome. Some had collapse while mom was on smart phone. SUPC in apparent healthy babies is associated with initial, unsupervised breastfeeding, prone position, primiparity and distractions.

- *Peters et al., 2009 **FT**, case report of ALTE and deaths of 2 infants in KC with primip moms in second hour of birth while episiotomy repair being done but mom and baby were unsupervised.
- *Poets et al., 2011 **FT**, PROSPECTIVE review of data from German hospitals over 2009 that revealed that 17 babies were found limp and lifeless in first 24 hrs postbirth and 12 were in Skin to skin contact. 7 died and 6 had severe neurologic injury. 12 babies had died in KC in first two hours after birth in 2009 in Germany, probably due to fatigued mother and occluded nose as infant fell asleep too.
Don't let baby stay on sleeping mother and watch nose position.
- Poet,Urshitz, 2012 below
Rodriguez -Alarcon1994 **FT**, 29 cases between 1975 and 1991. 21/20 died. All 29 were skin to skin prone on maternal chest and the events were more likely in early morning& on weekends. SPAIN
- Rodriguez-Alarcon et al 2011 **FT**
*Rodriguez-Gomes et al.2010**FT** Chart review of 35 yrs of data. ALTEs occur rarely-recent increase seen during KC within two hours of birth.
- Schrewe et al., 2010 **FT**. Descriptive report of ALTE in one healthy male NSVD newborn on mom's chest in skin to skin contact 10 mins post birth.
- *Singh et al. 2012 **FT**. Correlation between Birth KC and neonatal mortality over first three days of life. Babies in KC were less likely to die.
- Sontheimer et al, 1995 **PT**, will pick up extra systoles from mother if leads are not Placed under the infant's arms.
- Stenson, B. 2009a **FT**, small blurb saying infant collapse is increasingly being reported and there is British Paediatric Surveillance Unit Study being conducted from 2009-2011.Gives website.
- Stenson, B. 2009b **FT.**, **Commentary** of Foran's article in the journal
Thach 2014 **FT**, retrospective review, Baby friendly promotes prolonged bedsharing and 15 Deaths and 3 near deaths during bed sharing in US Postpartum wards have occurred, primarily due to suffocation and more education of moms/vigilant observations needed.
- Tracy et al., 2012 **FT**, Admonishes OBs to learn about SUPC and teach parents. It is summarized below.
- Toker-Maimon et al.,2006 **FT**, relates causes of cardiopulmonary arrest in delivery. USA study
- Tsao et al. 2012 NOT A KC study but several other causes of SUPC . See below
UK BFHI (from Henderson 2011) Recommends: bed sharing is encouraged because it increases duration of breastfeeding and UNICEF/BABY FRIENDLY says when baby is in bed with mother and mother is sleeping, "it's only necessary to provide intermittent observation to monitor for any immediate environmental dangers and promote a safe sleep environment (UNICEF UK BFHI 2004). Do not permit sleeping on couch or recliner, only on firm mattress with light blankets, well-fitting sheet and no bulky objects around baby. No smoking, no ETOH use, no substance use (alters response or sensitivity to

newborn). She gives guidance for prevention of falls, i.e. low bed,, head of bed <45 degrees, tucking in linens, no sleeping between parents, mother sleeping on side to enclose baby and let baby roll onto back after feeding. (pg. 305).

*Van den Bosch& Nalne
1993

PT, 2 babies suffocated when mothers fell asleep in KMC and problems with loose slings in other babies.

Brought from modules:

Barnes & Roberts, 2005

PT. Commentary on Kluthe's article

Branger 2007

FT, clinical report of 8 life threatening and eventual deaths in KC in France. Thought some were in KC. Did Dageville study next.

Dageville et al., 2008

FT, France. Purpose was to determine risk factors for neonatal death within 2 hours of birth. Over one year, 62,968 live births, 2 neonatal life threatening events, no deaths. Rate for life threatening events and deaths was 0.032/1000 live births. Very slight. Less than usual for live births. Risk factors were being left alone in Delivery room while mom gave KC, primiparous mother, , and mother and baby alone in delivery room. Life threatening event in first 2 hours post birth is very uncommon.

Kluthe et al., 2004

PT, case study of picking up extra systole from mother. Says watching SaO2 is better indicator.

Mori et al. 2010

FT, PT, refers to recent life threatening events occurring and gives two citations (Barnes, Nakamura) and it is reason for meta-analysis of HR, T, and SaO2 effects of KC

Nakamura 2007

FT, Cases of term infants requiring resuscitation during KC.

Nakamura & Sano, 2008

FT, 2 case studies of fullterm

Sontheimer et al, 1995

PT, will pick up extra systoles from mother if leads are not placed under the infant's arms and this can lead to misinterpretation of heart rate data. See Kluthe too.

Van den Bosch& Nalne

PT, 2 babies suffocated when mothers fell asleep in KMC 1993 and problems with loose slings in other babies.

Related Literature: Tools to predict SIDS and actual causes of ALTE/SIDS

Mechanism for poor response to hypoxia at birth (See also AAP, 2013 above): At birth the infant moves from oxygen-poor environment, with PaO₂ of 23-27 mmHg, to an oxygen-rich environment after birth that provides a four-fold increase in PaO₂ (Mercer et al., 2007). The postnatal rise in PaO₂ effectively silences peripheral chemoreceptors, resulting in delayed onset of spontaneous breathing when oxygenation is compromised (Vento et al., 2003) (Mercer J.S. Erickson-Owens, D.A., Graves, B, Haley MM. 2007. Evidence-based practices for the fetal to newborn transition. J. Midwifery and Womens Health, 52(3): 262-272. Doi:10.1016/j.jmwh.2007.01.005) (Vento M. Asensi M, Sastre J et al., Oxidative stress in asphyxiated term infants resuscitated with 100% oxygen. J Pediatr 2003, 142(3): 240-246 doi: 10.1067/mpd.2003.91.) Thus, infant has to make quickly adjust ventilation to adapt and infant may have an immature pattern or immature chemoreceptor function (ie. especially if preterm) due to fewer synaptic connections and poor myelination of the immature brainstem (Darnall RA, Ariagno RL, Kinney HC.

2006. The late preterm infant and the control of breathing, sleep and brainstem development. A review. Clin Perinatol 33(4), 883-914.)

The ventilator response to hypoxia after birth elicits an initial transient increase in RR and tidal volume that lasts for 1-2 minutes, followed by a late, sustained decline in spontaneous breathing that can last up to several weeks (31, 59). When oxygen drops, CO₂ increases and high CO₂ stimulates peripheral chemoreceptors to breathe better, but this mechanism may not last long. When CO₂ gets down to 1-13 mmHg below baseline CO₂ level, this is a level that is near the apnea threshold and apneas can occur (42). When the CO₂ level rises (hypercapnia), infants increase ventilation by prolonging the period of expiration, but not increasing breath frequency or overall tidal volume, leading to less minute ventilation. In pigs, hypercapnia caused diaphragm activation prior to upper airway muscle activity, resulting in obstructed inspiratory efforts and prolonged apnea (18).

Activation of laryngeal mucosa due to hypoxia leads to apnea, bradycardia and hypotension (70). This reflex is assumed to be protective, but an exaggerated response may cause prolonged apnea by activation of the superior laryngeal nerve afferents. (41, 83, 87)

And there are neurotransmitters that have an effect on breathing and apnea. Enhanced sensitivity to inhibitory transmitters, such as GABA (gamma-aminobutyric acid), adenosine, serotonin, and prostaglandin. Preterms have enhanced sensitivity to these (50). GABA is major inhibitory neurotransmitter in the CNS, Hypercapnia activates GABAergic neurons (99). Blocking of GABA_A receptors prevents ventilatory depression and increases RR in response to hypercapnia. GABA is an INHIBITORY transmitter, rises in CO₂ activates GABAergic neurons. GABA increases ventilatory depression, Blocking GABA receptors or reducing GABA activation PREVENTS ventilatory depression and INCREASES RR to prevent hypoxia. GABA in the medial prefrontal cortex and dorsal hippocampus is affected by oxytocin (Qi et al. 2012, below). Oxytocin increases basal levels of extracellular GABA in the medial prefrontal cortex and dorsal hippocampus and significantly inhibits hypercapnia-induced GABA decrease in the dorsal hippocampus. These results suggest that oxytocin acts as an inhibitory modulator of GABA, contributing to apnea and asphyxia after birth.

[Qi J](#), [Han WY](#), [Yang JY](#), [Wang LH](#), [Dong YX](#), [Wang F](#), [Song M](#), [Wu CF](#). (2012).

Oxytocin regulates changes of extracellular glutamate and GABA levels induced by methamphetamine in the mouse brain. [Addict Biol](#). 2012 Jul;17(4):758-69. doi: 10.1111/j.1369-1600.2012.00439.x. Oxytocin (OT), a neurohypophyseal neuropeptide, affects adaptive processes of the central nervous system. In the present study, we investigated the effects of OT on extracellular levels of glutamate (Glu) and γ -aminobutyric acid (GABA) induced by methamphetamine (MAP) in the medial prefrontal cortex (mPFC) and dorsal hippocampus (DHC) of freely moving mice, using in vivo microdialysis coupled to high-performance liquid chromatography and fluorescence detection. The results showed that OT had no effect on basal Glu levels, but attenuated MAP-induced Glu increase in the mPFC and decrease in the DHC. OT increased the basal levels of extracellular GABA in mPFC and DHC of mice, and inhibited the MAP-induced GABA decrease in DHC. Western blot results indicated that

OT significantly inhibited the increased glutamatergic receptor (NR1 subunit) levels in the PFC after acute MAP administration, whereas OT further enhanced the elevated levels of glutamatergic transporter (GLT1) induced by MAP in the hippocampus of mice. Atosiban, a selective inhibitor of OT receptor, antagonized the effects of OT. The results provided the first neurochemical evidence that OT, which exerted its action via its receptor, decreased Glu release induced by MAP, and attenuated the changes in glutamatergic neurotransmission partially via regulation of NR1 and GLT1 expression. OT-induced extracellular GABA increase also suggests that OT acts potentially as an inhibitory neuromodulator in mPFC and DHC of mice.

[Addict Biol.](#) 2012 Jul;17(4):758-69. doi: 10.1111/j.1369-1600.2012.00439.x. Epub 2012 Apr 16.

_____. 1992. Asphyxiation of neonate during **breast feeding**. *Australian J. Medic* Dec. 6, 6-7. Cause is **oronasal obstruction** See Byard 2012 too

Becher JC, Bell, J.E., Keeling, J.W., McIntosh, N., & Wyatt, B. (2004). The Scottish perinatal neuropathology study: clinicopathological correlation in early neonatal deaths. *Archives of Diseases of Childhood Fetal Neonatal Edition*, 89, F399-F407. Doi: 10.1136/adc.2003.037606. NOT ABOUT KC AT ALL> A proportion of neonatal deaths from unknown causes of asphyxia have been shown to be associated with pre-existing brain injury. This article reports risk indicators for determining encephalopathy that occurs from asphyxia before or after birth. The key seems to be deaths that occur within 3 days of ONSET of LABOR are usually due to prebirth problems (that will be seen on fetal heart rate tracings and in fact, abnormal fetal heart rate tracing predicts the difference between the dead infant having encephalopathy or not (just acidity and hypoxemia without encephalopathy). See Byard 2012 too

Blair PS, Byard RW, **Fleming PJ**.(2011). [Sudden unexpected death in infancy \(SUDI\): suggested classification and applications to facilitate research activity](#).*Forensic Sci Med Pathol*. 2011 Nov 11. [Epub ahead of print] **GET THIS FOR SURE**

[Blair PS](#), [Mitchell EA](#), [Heckstall-Smith EM](#), [Fleming PJ](#).(2008) **Head covering - a major modifiable risk factor for sudden infant death syndrome: a systematic review**[Arch Dis Child](#). 2008 Sep;93(9):778-83. Controlled observations of head covering for the final sleep were found in 10 studies. The pooled prevalence in SIDS victims was 24.6% (95% CI 22.3% to 27.1%) compared to 3.2% (95% CI 2.7% to 3.8%) among controls. The pooled univariate odds ratio (OR) was 9.6 (95% CI 7.9 to 11.7) and the pooled adjusted OR from studies mainly conducted after the fall in SIDS rate was 16.9 (95% CI 12.6 to 22.7). The risk varied in strength but was significant across all studies. In a quarter of cases and controls head covering had occurred at least once previously (pooled adjusted OR = 1.1; 95% CI 0.9 to 1.4). The population attributable risk (27.1%; 95% CI 24.7% to 29.4%) suggests avoiding head covering might reduce SIDS deaths by more than a quarter. The epidemiological evidence does not fully support postulated causal mechanisms such as hypoxia, hypercapnoea and thermal stress, but neither does it support the idea that head covering is part of some terminal struggle. **Head covering is a**

major modifiable risk factor associated with SIDS deaths and parental advice to avoid this situation should be emphasised.

Burchfield, D.J., Rawlings, D.J. (1991). Sudden deaths and apparent life-threatening events in presumed healthy hospitalized neonates. *Am J Diseases in Childhood* 145: 1319-1322. Description of 10 newborns who had been examined by pediatricians, had been declared healthy, and who later had SIDS or near miss SIDS in the hospital's newborn nursery. Five died and of the five surviving patients, 4 had severe neurologic injury. They describe 10 apparently healthy newborns who were patients in a level 1 nursery and were found by caregivers to be limp, apneic, and requiring resuscitation. All patients were between ages 15 hours and 3 1/2 days, products of term gestations, and of appropriate weight for gestational age. Prenatal or perinatal complications were present in nine of the 10 patients; in no patient was the complication considered a risk for serious, late-onset neonatal problems. All patients had been examined by a physician and were deemed to be in good health before the apparent life-threatening event. Subsequent to the event, each patient required positive pressure ventilation and seven patients received chest compressions. Five patients died. Autopsies were performed on four of the five patients and in none was an adequate explanation for death established. Intrathoracic petechiae were found in one patient whose sibling had died of sudden infant death syndrome at age 11 weeks. Evaluation of the five survivors failed to determine a cause for the episodes. Of the five survivors, one had normal results of developmental examination at age 6 months, while the remaining four survivors had severe neurologic impairment at age 1 year. Apparent life-threatening events occur in hospitalized newborns presumed to be normal and may be a manifestation of early sudden infant death syndrome or early near-miss sudden infant death syndrome NOT a KC study, ALTE in hospital NURSERY. USA study

Burchfield, J.D. (1992). Acute distress in the neonate and postnatal period. In Barkin, R. (Ed.). *Pediatric Emergency Medicine: Concepts and Clinical Practice*. St. Louis, MO: Mosby-Year Book, Inc. pp. 154-170.

Byard RW.(1998). [Is breast feeding in bed always a safe practice?](#)
J Paediatr Child Health. 1998 Oct;34(5):418-9. The answer is no.

Byard, R.W. & Burnell, R.H. (1995); Apparent life threatening events and infant holding practices. *Archives Disease Childhood*, 73, 502-504. Sudden collapse occurred while being held/craddled in GRANDparent's arms of two 4-week old infants (both infants were in grandmother's arms and grandmothers had large breasts and wore quilted dressing gown which obliterated infant's face) and one case during breastfeeding (8 weeks old, cardiorespiratory arrest during BF, unnoticed by mother). Infants gave no signs of struggling. Altering the holding position resulted in cessation of the events. INAPPROPRIATE HOLDING RESULTS IN MECHANICAL AIRWAY OBSTRUCTION and infant's lack of response indicates that infant may have been asleep (sleep reduces arousal response to airway obstruction)P. 503, or it could be due to carbon dioxide accumulation with rebreathing (pg. 503), Discussion relates case of an infant who SLIPPED BELOW BREAST and died (called OVERLAYING) and MOM TOOK SEDATIVES And fell asleep. These authors did carefully supervised reenactment of each case and found it was always due to occlusion of airway. SO, due to INAPPROPRIATE POSITION and LACK OF NORMAL RESPONSE TO AIRWAY BLOCKAGE. FT, BF, some infants are vulnerable,

Cameron, MH & Williams, AL. (1986). Development and testing of scoring systems for predicting infants with high-risk of sudden infant death syndrome in Melbourne. *Australian Paediatric Journal*, 22 (Supple 1), 37-45. Reports an epidemiological study of scoring systems and concludes that the final version of the birth scoring system is capable of identifying a group of future live births which will have a risk of about one in 55 sudden and unexpected deaths. System can also identify infants with relatively low-risk.

Carpenter, RG, Gardner, A., McWeeny, P.M., & Emery, J.L. (1977). Multistage scoring system for identifying infants at risk of unexpected death. *Arch Dis Childh*, 52(8), 606-612. Reports development of a scoring system to predict which future full term birth infants will have increased risk of SIDS based on factors up to one month of age of the child. Two scoring systems are presented: "at birth" and a "combined" scoring system that is used at one month. The multistage scoring system is 50% more effective than the birth score alone. (See also Cameron)

Dageville, C., Casagrande, F., De Smet, S., & Boutte', P. (2011). The mother-infant encounter at birth must be protected. *Archives Pedatric*, epub ahead of print. No DOI. This is a review of literature of mammals and humans and epigenetic research showing life-course changes due to separation. Separation is harmful to the baby. SEPARATION for sure.

Foran et al., 2009 (on KC bib), FT., retrospective case review. NOT A KC STUDY. 12 infants over 14 years had sudden collapse and 6/12 had collapse while BF or within minutes of BF and collapse was generally followed by severe encephalopathy, acute central graymatter injury and poor outcome or severe respiratory illness, slight white matter change and good outcome. BREASTFEEDING COLLAPSE (n=6/12) and SLEEPING with Mom collapse (n=2/12) and antenatal neurological problem to basal ganglia or brain stem. Same as following citation:

Eklund, W. (2012). On Jan. 15 she wrote that as an NNP in Louisiana, she was called to a baby who was sick after birth. Baby had had massive fluid aspiration at delivery (no duodenal atresia but excessive amount of amniotic fluid was in stomach and infant vomited significant amounts immediately upon delivery and massive suctioning could not keep up. Baby became limp, apneic, pale, then dusky. He was resuscitated with bag and mask then bag and mask CPAP, then CPAP through the night and then onto high flow NC. The next day he went to mom for Kangaroo Care. NOT ALL ALTEs are from Positioning.

Gatti, H., Castel, C, Andrini, P., Durand, P., Carlus, C, Chabernaude, J.L., Vial, M., Dehan, M, & Boithias, C. (2004). Cardiorespiratory arrest in full term newborn infants: six cases report [in French]. *Archives de Pediatrie*, 11(5), 432-435. Descriptive case reports of 6 "perfectly normal" (NSVD, normal APGARS and Physical exam) infants who needed cardiorespiratory resuscitation. All were found lying PRONE, face COVERED UP, facing mother's abdomen, breast or neck. All moms were PRIMIPs. All newborns but one died, Biological and bacteriologic samples were normal and no early onset sepsis was found. Autopsy in five infants was not contributive (this study was done in 2004 5 years before Foran's 2009 list of items to be done in the brain during autopsy was out!). All autopsy results were "normal." Found babies

collapsed when VENTRAL, or up against the mother's body, or being held and events occurred 20-120 minutes post birth. On page 434 it states, "The position of the infant at the moment of collapse or death was not studied (recorded)." **Thus, this may not be a KC study at all.** 5/6 infants died, and the "most likely cause was obstruction of the airways, nose and mouth. Perhaps, the infants were not able to turn their heads or reposition themselves, which prolonged the obstruction and confinement of the nose and mouth" (pg. 434). "Our studies suggest that the poor positioning of the face of the infant as to when placed after birth on the belly, at breast, or in the arms of the mother is perhaps the origin of the serious collapse in the Delivery room." P. 434. A risk factor for ALTE is malpositioning of an infant. Most likely cause is airway obstruction. **FT, BirthKC, negative effect, life threatening event, mortality** (Not on charts 6/17/2011).

Grylack, L.J. & Williams, A.D. (1996). Apparent life-threatening events in presumed healthy neonates during the first three days of life. *Pediatrics*, 97(3), 349-351. NO DOI. 20 newborns with ALTEs in the first three days of life were studied among 15,000 deliveries. Apnea was most common presenting symptom, and cyanosis usually accompanied the event. Tactile stimulation and oxygen were the most common treatment with airway clearance, intermittent positive pressure ventilation, and cardiac massage less common. 40% have identifiable causes including CNS abnormality, airway obstruction, persistent fetal cardiovascular shunt. Of the initial multichannel vital sign recordings made after the events, 11 had desaturation of <85%, 10 had apneic pauses >15 seconds, 4 had bradycardia <80 bpm. 18 infants were discharged and had home monitoring and 4 got medication. ALTEs occurred in 4 infants before discharge and in 1 after discharge. No deaths occurred. ALTEs do occur in newborn period in a low risk term group, causes are unknown in the majority of cases, multichannel recording may show abnormalities, and the likelihood of recurrent ALTEs is greater during the first week than during the next two months. **RECURRENT ALTEs HAPPEN IN FIRST WEEK, and BABY SHOULD BE PUT ON MONITORS.** Also, a baby who has an ALTE has an increased chance of apnea >15 seconds later (Brooks, J.G. 1992. Apparent life-threatening events and apnea of infancy. *Clinical Perinatology*, 19, 809-838).

[Herlenius E, Kuhn P.](#) (2013). Sudden Unexpected Postnatal Collapse of Newborn Infants: A Review of Cases, Definitions, Risks, and Preventive Measures. [Transl Stroke Res](#). 2013 Apr;4(2):236-247. This study aimed to review available published reports concerning sudden unexpected postnatal collapse (SUPC) of apparently healthy infants within the first days of postnatal life, establish a structured presentation and delineate recommendations for preventive measures. All published reports of SUPC cases were retrospectively analyzed, and three not previously published SUPC cases at Karolinska University Hospital were detailed to exemplify the varying presentations and outcomes of SUPC. We found 398 published cases of SUPC occurring during first postnatal week. Estimated incidence of the SUPC of a presumably healthy infant after birth differs widely, ranging from 2.6 cases to 133 cases/100,000. However, definition, inclusion, and exclusion criteria vary substantially between reports. Our summary indicates that reported SUPC occurs more frequently than expected from recent surveys. About half of the infants die, and of the remaining survivors, half have neurological sequelae. Of the 233 cases of sudden unexpected death described, no etiology was found in 153 cases. When a defined time for the SUPC event is described, approximately one third of reported events occur during the first 2 h, between 2 and 24 h and between 1 and 7 days after birth, respectively. Adequate education of caregivers and appropriate surveillance during the first days of newborns should enable us to save hundreds of lives.

Krous PH, Chadwick AE, & Stanley C. (2005). Delayed infant death following catastrophic deterioration during breast-feeding. *J. Paediat Child Health*, 41, 215-217. Cause is oronasal obstruction.

Lawn, J.E. Bahl, R., Bergstrom, S., Bhutta, Z.A., Darmstadt, G.L., et al., (2011). Setting research priorities to reduce almost one million deaths from birth asphyxia by 2015. *PLoS Med* 8(1), e1000389. DOI:10.1371/journal.pmed1000389. In the first 28 days after birth more than one million infants die of birth asphyxia 37.% of under 5 child deaths occurred in the neonatal period in 2000 and is now 41% (a total of 3.6 million deaths) currently. Mortality in first week after birth has not changed. The article

poses 51 research questions and were scored by 21 experts and the top one third of the ranked research options was dominated by delivery (implementation) research, and discovery questions (basic science) were not ranked highly. The highest ranked epidemiologic questions addressed prediction of intrapartum hypoxic injury.

Leow, J.Y. & Platt, M.P. (2011). Sudden, unexpected and unexplained early neonatal deaths in the North of England. *Archives of Disease in Childhood Fetal Neonatal Edition*, 96(6). 440-442 doi: 10.11136/adc.2010.206649. **THIS ARTICLE MENTIONS SKIN-TO-SKIN DEATHS.** Early neonatal sudden death is rare (they studied 828,648 live births) and maternity practices over the last 25 years haven't impacted the incidence of sudden unexpected death which is 1.2 deaths per 10,000 live births for deaths between 6 and 100 hours postbirth, and this study found 30 cases of unexplained sudden infant death (rate is 0.35/10,000 live births). Infants with good condition had APGARS of 7 or more at 5 minutes postbirth. Babies may **SHOW NO WARNING SIGNS** before being found dead, or they may show **BRADYCARDIA**, Turning pale, Apneic spells, even while witnessed by their mothers. This study found 30 infants with unexplained sudden infant death. (Pg. F2 of 3) 13 died at home; 17 died in hospital (13 in postpartum ward, 3 in delivery suite, one in NICU). Deaths in hospital were more likely to **OCCUR AT EVENINGS AND NIGHT** (between 6 pm. And 8 a.m. n=15; 2 infants died from 8 a.m. - 6 p.m.) "Eight infants presented dead or collapsed on the breast, all born to **PRIMIPS** (four were found dead at breast after both mother and child fell **ASLEEP** after a feed" (pg. F2 of 3). Four of the deaths which occurred in the hospital on the breast occurred in the early hours of the morning. **PRIMIPS** are over-represented among women whose babies die at the breast, and that deaths occur in **EVENING and NIGHT HOURS** suggests that both maternal inexperience and reduced professional supervision and support may be factors in a proportion of the deaths (pg. F3 of 3). Others (Gatti, Toker-Mainmon) suggest that acute respiratory obstruction may have caused deaths during skin-to-skin contact with primiparous mothers with infant's at the breast. Foran reported severe neuronal damage in six infants who suffered collapse on their mother's breast and suggested that unrecognized asphyxia may have resulted in brainstem or basal ganglia damage which could have impaired coordination of breathing and swallowing.

Enhanced supervision has been recommended but these data (Leow & Platt's) suggest that across the north of England around 25,000 breastfeeding women would have to receive the extra intrusive supervision, mostly at night, to possibly **PREVENT ONE DEATH**" (Pg. F3 of 3). When death occurs, encourage postmortem exams to ascertain the cause because there may be implications for future pregnancies, and all families deserve to have an explanation of these particularly distressing deaths if possible.

Poets A, Urschitz, M.S, Steinfeldt, R., & Poets, C.F. (2012). Risk factors for early sudden deaths and severe apparent life threatening events. *Arch Dis Childhood Fetal Neonatal Ed.* 97(6), 395-397. **THIS LISTS ALL RISK FACTORS.** It may mention KC as a risk factor, but I have to get it and check this out.

Polberger, S., & Svenningsen, M.W. (1985). Early neonatal sudden infant death and near death of full term infants in maternity wards. *Acta Paediatrica Scandinavica*, 74, 861-866. Deaths have occurred on postnatal wards.

Radtke, J.V. (2010). The paradox of breastfeeding-associated morbidity among late preterm infants. *Journal of Obstetric, Gynecologic and Neonatal Nursing*, 40, 9-24. DOI: 10.1111/j.1552-6909.2010.01211.x

Tracy E.E., Haas, S., & Lauria, M.R. (2012). Newborn care and safety: the black box of obstetric practices and residency training. *Obstet Gynecol.* 2012 Sep;120(3):643-6. doi: 10.1097/AOG.0b013e318265af0a EETracy@partners.org. Certain causes of newborn mortality such as sudden unexpected infant death, which includes sleep-related infant death and sudden unexplained infant death syndrome, are potentially preventable. Obstetricians are uniquely positioned to counsel new parents about safe practices regarding newborn sleep, feeding, and transportation. Patients often do not develop a relationship with their pediatricians until the neonate has been discharged, and the newborn period is a time of particular vulnerability. Newborn safety should be routinely taught in obstetric curricula, and the American College/Congress of Obstetricians and Gynecologists and the American Academy of Pediatrics (AAP) should partner to disseminate updated literature and guidelines to health care providers regarding newborn safety. Current guidelines from the Academy of Pediatrics Task Force on Sudden Infant Syndrome are summarized in this article.

[Tsao PC](#), [Chang FY](#), [Chen SJ](#), [Soong WJ](#), [Jeng MJ](#), [Lee YS](#), [Yen HJ](#), [Yang CF](#), [Tang RB](#). (2012). **Sudden and unexpected and near death during the early neonatal period: a multicenter study.** *Journal China Medical Association*, Feb;75(2):65-9. doi: 10.1016/j.jcma.2011.12.009. Epub 2012 Jan 30. To investigate the incidence, clinical presentation and possible etiologies or risk factors of early onset of sudden and unexpected death or near-miss. From 2001 to 2005, a retrospective analysis of observational database of neonates who were younger than one week old without any risk factors at five tertiary medical centers. The demographic data, clinical manifestations, laboratory data and possible etiologies were retrospectively collected and analyzed. Seventeen neonates presumed to be healthy at birth encountered early near death in five medical centers in Taipei city. The mean gestation age (GA) was 38.5 ± 1.2 weeks, mean birth body weight (BBW) was 2948.2 ± 327.8 gm. The median age at event was **26 hours old**. Eleven patients were **rooming-in** babies with **exclusive breast feeding**. Seven patients (41.2%) died; seven patients (41.2%) survived with neurological sequelae, and the remaining three patients (17.6%) survived without complication. Possible causative factors included **infection** in two cases, **urea cycle disorder** in one case, **hypertrophic cardiomyopathy** in one case, **hypocalcemia** only in one case, **hypocalcemia plus airway obstruction** in one case, **dehydration-related diseases** in seven cases and **unknown** in 4 cases; there was no autopsy case. More effort on promotion of autopsy to discover the underlying disease is necessary and helpful. To build up an alarm system or protocol for education and early detection is the basis to prevent this tragedy. NOT mentioned if in KC, must get this article.

Tsao, P.C., Chang, F.J., Chen, S.J. et al. (2012). Sudden and unexpected and near death during the early neonatal period: a multicenter study. Journal of Chinese Medical Association. 75, 65-69 (CHINA) Descriptive report of 17 healthy term newborns in China who also had deaths and severe neurologic injury in the first 24 hours of life (Poets, et al., 2011 also found them in first 24 hours of life but in Poets et al, 12/17 infants were found

limp and lifeless while in skin to skin contact with the mothers and 7/17 died and 6/17 had severe neurologic injury. .

Weber, M.A., Ashworth, M.T., Risdon, R.A et al., (2009). Sudden unexpected neonatal death in the first week of life: autopsy findings from a specialist centre. *J Maternal Fetal Neonatal Medicine*, 22, 398-404. Structural anomalies and metabolic conditions are more likely to cause death in immediate newborn period (first 2 hours) than later.

SCORING SYSTEMS TO PREDICT ALTES/SIDS

Cameron, MH, Williams AL (1986) Development and testing of scoringsystems for predicting infants with high risk of sudden infant death syndrome in Melbourne. *Aust Paediatr J.* 22 (Suppl 1), 37-445. Several refinements have been made to a risk tool that is capable of indentifying a group of future live births which will have a risk of about one in 55 sudden and unexpected deaths. Tools also identifies low risk infants.

Carpenter, RG, Gardner A, McWeeny PM, Emery JL. (1977). Multistage scoring system for identifying infants at risk of unexpected death. *Arch Dis Childh*, 52, 606-612. Doi: 10.1136/adc.52.8.606. Scoring risk at birth and at one month are the stages and scoring for risk at one month is better predictor than birth assessment.