

ORIGINAL ARTICLE

Deaths and near deaths of healthy newborn infants while bed sharing on maternity wards

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OBJECTIVE: Our aim was to evaluate programs promoting bed sharing on maternity wards and determining ways to reduce these risks.

STUDY DESIGN: Members of the National Association of Medical Examiners were contacted requesting information on deaths of healthy infants while bed sharing on maternity wards.

RESULT: Fifteen deaths and three near deaths are reported. One or more factors that increase the risk of bed sharing were present in all cases. Accidental suffocation was deemed the most likely cause of these incidents.

CONCLUSION: Cases of infant deaths and near deaths while bed sharing on maternity wards are under reported. The 'Baby Friendly' (BF) initiative in maternity hospitals to promote breastfeeding is endorsed by the American Academy of Pediatrics and the US Center for Disease Control and Prevention. The BF initiative encourages prolonged skin-to-skin contact and bed sharing. Education of mothers and more efficient monitoring should significantly reduce the risk of maternity ward bed sharing.

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Keywords: infant deaths; skin-to-skin; bed sharing; maternity wards

INTRODUCTION

Although bed sharing with infants is well known to be hazardous, deaths and near deaths of newborn infants while bed sharing in hospitals in the United States have received little attention aside from a recent brief report of a single death and two near deaths.¹ In the recent past, similar deaths and near deaths have been reported in Europe and Britain.^{2–11} The incidence of these events is reported to be as high as 4/1000 live births.¹² These events occurred within the first 24 h of birth during 'skin-to-skin' contact between mother and infant, a practice promoted by the 'Baby Friendly' (BF) initiative endorsed by United Nations Children's Fund, BF, USA and the US Center for Disease Control and Prevention to support breastfeeding.^{13–17} We report 15 deaths and 3 near deaths of healthy infants occurring during skin-to-skin contact or while bed sharing on maternity wards in the United States. Our findings suggest that such incidents are underreported in the United States and are preventable. We suggest ways in which close maternal infant contact to promote breast feeding may be done more safely.

METHODS

In 2011, information on deaths of healthy newborn infants while bed sharing in hospital was requested by email from members of the National Association of Medical Examiners using a listserv. Persons on the Center for Disease Control and Prevention Sudden Unexpected Infant Death listserv were also contacted. Information with identifiers deleted on 15 deaths was forwarded. Information on three near deaths of infants, although not originally requested, was forwarded to us by close colleagues and others who were aware of our interest in such cases. The information we obtained included post mortem reports, hospital records and other sources

(Table 1). This research was approved by an institutional committee for human research.

RESULTS

Data for the cases are shown in Table 2. All infants were presumed to be healthy at the time the incident occurred. The incidents occurred between 1999 and 2013. The infants mean age was 23.9 h (range = 1.15 h to 3 days). The median age was 14.75 h (± 5 and 45.75 h). The mother's pregnancy and delivery were minimally complicated in 10 cases (Table 2). Of the 13 cases where mother's parity was known, 7 were primipara and 6 were multipara. Apgar scores available in 16 cases were all within normal limits. Medical examiners' or physicians' diagnoses included overlaying (one case), sudden infant death syndrome (SIDS) (one case), cause of death undetermined (eight cases), accidental suffocation (five cases) and apnea of undetermined etiology (three cases). Two near deaths resulted in severe lasting brain injury.

In eight cases, the mother fell asleep while breastfeeding (Table 2). In four cases, the mother woke up from sleep but believed her infant to be sleeping when an attendant found the infant lifeless. One or more risk factors that are known or suspected (obesity and swaddling) to further increase the risk of bed sharing were present in all cases.^{17–21} These included the infants' age < 4 months in all 17 cases; maternal sedating drugs in 7 cases; cases excessive of maternal fatigue, either stated or assumed if the event occurred within 24 h of birth in 12 cases; pillows and/or other soft bedding present in 9 cases; obesity in 2 cases; maternal smoking in 2 cases; and infant swaddled in 4 cases (numbers 6, 10, 12 and 16).

Factors presumed to potentially reduce the risk of bed sharing were present in most of the cases. These included mother awake

Table 1. Information sources for cases*

Case number	Case history and post mortem report	Hospital records	Interview with medical examiner	Interview with attending physician	Interview with parent
1	+	+			
2	+	+			
3	+	+	+		
4	+	+	+		
5			+	+	
6	+	+			
7	+		+		
8	+	+	+		
9	+		+		
10	+				
11	+	+			+
12	+		+		
13	+				+
14		+		+	
15	+		+		
16	+		+		
17		+		+	
18	+	+			

*Information available.

when the death or near death occurred in 4 cases and other individuals in the room when the event occurred in 10 cases.

DISCUSSION

This study suggests that the majority or all of the deaths and near deaths reported here were preventable. In six infants, routine screens for metabolic inborn errors were reported as normal (Table 2). For these and the other infants, evidence from the scene indicated suffocation as the most likely cause of death. Therefore, it is unlikely that inherited metabolic disorders had a role in the cases reported here.

In spite of the reports from overseas, it is likely that most maternity hospital personnel and neonatologists are still unaware of the risk of suffocation during close maternal infant contact. In the three near-death cases accidental suffocation was not considered in the differential diagnosis, and in two cases (numbers 17 and 18) the mother was initially accused on totally insufficient grounds of intentionally suffocating her infant. In one of these cases (number 17), the incident was allegedly reported to a child protection agency.

In the European literature, several authors suggest the causal mechanism resulting in the fatal or near-fatal incidents is airway occlusion when the infant's face is in contact with the mother's breast or abdomen.^{2,9} In our study, eight infants were 'on the breast' when discovered. Occlusion of an infant's airway while breastfeeding has been previously reported as a cause of death.^{22,23} Relief from obstruction depends on the mother's responses and/or the infant's neck extension reflex initiated by airway occlusion.²⁴ Breastfeeding in a recumbent position may increase the risk of airway obstruction if the infant's attempt to withdraw from the breast is blocked by the mother's hand or arm.

The incidents reported here are probably a substantial underestimate of such occurrences in past years. We did not request information on near deaths. The three cases reported here were brought to our attention by individuals aware of our interest in such cases. Previous reports of near deaths were nearly twice that of reports of actual deaths.⁹ Furthermore, in four instances information on deaths were not reported to us by National Association of Medical Examiners members but were brought to

our attention by parents or others. In four additional deaths, information was requested but this was not made available to us. In order to know the true incidence of such deaths and near deaths, we feel that in the future reporting to a public health agency should be mandatory as is already the case for other adverse in-hospital events.

Whereas previous reports have been concerned with adverse incidents during the first 24 h of life, the present study indicates that infants are at risk for death or injury throughout the hospital stay. A stated aim of BF USA is to 'help mothers initiate breastfeeding within one hour of birth'.¹⁴ To facilitate this, the American Academy of Pediatrics recommends direct skin-to-skin contact with mothers immediately after delivery and as much as possible throughout the post-partum period.^{15,25} BF USA advises that infants and mothers share a room continuously and that infants be breast fed on demand without restricting the duration of the feeding and with a minimum of 10–12 feedings in 24 h.¹⁴ In addition United Nations Children's Fund encourages in-hospital bed sharing.²⁶ These recommendations will likely result in bed sharing for prolonged periods of time, particularly for mothers who have had cesarean sections or others, who do not wish to leave their beds frequently to breastfeed.

Some professionals see minimal risks in bed sharing, with few exceptions, and this may explain a nurse not taking time to remove the infant from the mother's bed after being requested to do so (case number 10).^{27,28} One hundred fifty hospitals in the United States are already certified 'BF,' and reportedly many more are seeking to become certified (<http://www.babyfriendlyusa.org/find-facilities>). The American Academy of Pediatrics and the Center for Disease Control and Prevention have taken steps to increase the number of BF hospitals in the United States.^{14–17} This stems from the findings that skin-to-skin contact has been shown to be beneficial for mother–infant bonding, and the BF approach reportedly increases breastfeeding rates after hospital discharge.^{29,30}

An important question is: can in-hospital bed sharing be done safely? The presence of other individuals in the room could reduce the risk, but in 10 instances resulting in death or near death other individuals were present. In three of the present cases, the room was dark or dimly lit. This was likely in many of the other cases, a situation hindering the ability to assess the infant's wellbeing. In addition, the finding that in four cases the mother was awake at the time of the incident indicates that wakefulness is not completely protective. It has been previously reported that in 20% of death and near deaths, the mother was awake when the incident occurred.¹⁰ In the United States, breastfeeding during bed sharing is regarded as safe so long as the mother is awake and the United Nations Children's Fund UK BF initiatives concurs with this.^{18,30} The present and prior reports clearly show this is not the case during the immediate post-partum period. Frequent bed checks by nurses at 5–10 min intervals is advocated in the BF literature, but as deaths or injury can occur in a few minutes, such checks would have to become nearly continuous to entirely prevent death or injury.¹³

We have several suggestions to increase the safety of infants on maternity wards. First, hospital personnel and expectant parents should be made aware of potential hazards of skin-to-skin and bed-sharing practices. Mothers should be taught to access breathing, skin color and response to stimuli in their infants, and when in close contact there should be sufficient light in the room to allow assessment. When a mother is in close contact with her infant, one-on-one supervision of infant and mother should be undertaken by a person trained to monitor the infant's wellbeing as well as the mother's wakefulness. In many cases, nurses will be unavailable for these duties. A previous recommendation is that close surveillance is needed especially during the first 2 h after delivery; however, the present findings indicate that close supervision is needed throughout the hospital stay when infants

Table 2. Case histories and relevant data

Case number	Case summary	Diagnosis	Week gestation	Apgar score	Gender	Maternal age	Maternal parity	Inborn error score	Age event occur	Infant < 3 months	Excessive fatigue	Sedating drugs +	Soft bedding/pillows swaddled	Obesity/Lg Breast	Maternal smoking
1	Infant co-sleeping between parents on a standard bed. Father had a pillow on his stomach and placed infant on top of it. Infant found lifeless on its side facing father's back.	Undetermined	40	9.9	M	16	P		19 h	+	+	+	+		
2	Infant breastfeeding in mother's bed. Mother awoke 1 h later and found infant wedged under her breast.	Accidental suffocation	40	8.9	F	25	M		3 Days	+		+			+
3	Infant breastfeeding in mother's bed. Mother fell asleep and 20 min later she finds baby 'blue and not breathing.'	SIDS	37 ^{3/9}	9.9	M	19	M		45 h	+					+
4	Breastfeeding in hospital room, fell asleep 5 to 10 min, infant found cyanotic with mouth on nipple. Partially resuscitated. Survived 12 days then taken off life support.	Undetermined	38 ^{6/7}	8.9	M		P		1 Day	+	+	+	+		
5	Infant breastfeeding in hospital bed. Nurse found mother asleep with infant wedged under 'large pendulous' breast and axilla.	Accidental suffocation							2 Days	+					+
6	Swaddled infant fell asleep on pillow while breastfeeding. Then mother fell into a 'deep sleep'. 15 min later, mother passed baby to grandmother who found baby limp and not breathing.	Undetermined	37 ^{2/7}	8.9	F	30	M	+	3 Days	+		+	+		
7	Mother fell asleep with infant beside her in bed. Later mother awoke and found infant lifeless. Mother fears 'she might have rolled over on her baby.'	Asphyxia accidental overlay	40	6.9	F				24 h	+	+				
8	Mother pretreated during labor with antibiotics for prolonged rupture of membranes and positive group B <i>Streptococcus</i> . After breastfeeding, she did not return infant to crib because infant 'was congested.' She fell asleep, 2 h and 30 min later nurse finds baby 'latched on' to breast but 'blue and floppy.'	Sudden unexplained infant death	42 ^{1/7}		F	42	M	+	32 h	+	+		+		
9	Mother had C-section due to hypertension and pre eclampsia treated with MgSO ₄ . Mother said to be 'intellectually challenged,' and 'obese and large breasted.' Mother breastfeeding when infant 'became quiet' and unresponsive. Mother believed baby had gone to sleep, 5 min later mother calls nurse who finds the baby lifeless.	Accidental suffocation	38 ^{4/7}	9.9	F	21	P		5 h	+	+	+			+
10	Labor was complicated by prolonged rupture of membranes and positive group Strep B <i>Streptococcus</i> treated during labor with IV antibiotics. Labor lasted 30 h. Mother stated 'she had never been so tired in (her) life.' Mother asked the nurse to take the baby to the nursery so she could sleep. Nurse said she might not have time to. Mother then breast fed briefly and fell asleep with her infant latched on to the breast. She awoke in the darkened room believing her swaddled infant to be sleeping. Neither parents noted whether baby was breathing or not. Father laid baby supine in bassinette for 90 mins. Father awoke and the infant found lifeless.	Undetermined	41	9.9	M	29	P		8 h	+	+	+	+		
11	Labor complicated by prolonged rupture of membranes and positive group Strep B <i>Streptococcus</i> and prolonged labor (24 h). Treated with IV antibiotics. Mother complaining of 'extreme exhaustion' breast fed her infant lying on its side on a pillow with the baby rolled toward her. Nurse entered room and found lifeless infant lying beneath her sleeping mother.	Overlay		7.9	F	26	P		5 h	+	+		+		

Table 2. (Continued)

Case number	Case summary	Diagnosis	Week gestation	Apgar score	Gender	Maternal age	Maternal parity	Inborn error score	Age event occur	Infant < 3 months	Excessive fatigue	Sedating drugs +	Soft bedding/pillows swaddled	Obesity/Lg Breast	Maternal smoking
12	Mother fell asleep while breast feeding. 45 min later, mother awoke in the dimly lit room and found the infant unresponsive lying next to her facing her breast. Believing infant to be sleeping she called the nurse to take baby to nursery. Nurse discovered the infant flaccid and cyanotic.	Undetermined	35 ^{4/7}		M	23			2 Days	+			+		+
13	Mother fell asleep 7 h after C-section with infant nursing on her breast. Mother awoke 13 min later and found her infant cyanotic and limp still on her breast.	Undetermined		6.9	M	41	M		7 h	+	+	+			
14	Nurse entered mother's dimly lit room. Awake mother reports infant just breastfed vigorously for 20 min but is now limp and assumes she is now sleeping. Nurse finds the infant grey and not breathing and begins CPR. Infant survives but with severe permanent brain damage. Extensive medical evaluation fails to reveal cause of the infants collapse. Father in the room at the time of the incident. A friend was also in the room.	Clinical Dx-apnea of undetermined etiology	40	9.9		28	P		2.3 h	+	+	+			
15	Labor complicated by maternal fever. Both mother and baby treated with prophylactic antibiotics. After breast feeding, the mother placed her infant between her and the father in a 'tiny' fold out sofa bed. At some point, the mother then placed the infant behind her and continued talking with the father. After some min, she turned over to check her infant and found him cold and unresponsive. Both parents were noted to be obese.	Compression asphyxia	39	8.9	M		M	+	10.5 h	+	+		+	+	
16	Infant noted to be 'grunting' immediately after delivery and as a precaution was taken to the NICU where he was kept briefly, evaluated and returned to the mother's room after the grunting subsided. A blood culture was obtained. Mother was propped on her side using rolled towels and pillows for breast feeding her infant after which she fell asleep. She awoke, found the infant's head cool and placed a hat on its head. Mother then noted face to be 'partially blue' and called for a nurse who found the infant to be deceased. Father was present in the room.	Probable positional asphyxia	40					+	5.5 h	+	+		+		
17	Mother was breast feeding her infant in the delivery room lying supine on delivery bed. Father at mother's side. About 2 h after delivery, the mother noticed that the baby's chest was not moving and called the nurse who found the infant to be apneic and cyanotic and began CPR with intratracheal intubation and mechanical ventilation. Extubated on arrival at the NICU. Normal neurological exam 3 days later	Clinical DX-apnea of undetermined etiology +	40						2 h	+	+				
18	Maternal pregnancy and delivery were uncomplicated. Soon after delivery the infant was given to the mother for 'skin-to-skin' contact. Minutes later, he was observed to be successfully breast feeding. Then about an hour later, a nurse found him lifeless lying on his mother's chest with his face into her chest and shoulder. He was successfully resuscitated but suffered severe, lasting brain injury.	Clinical DX-apnea of undetermined etiology +	39	6.9	M		P	+	1.15 h	+	+				

Abbreviations: F, female; M, male; NICU, neonatal intensive care unit; SIDS, sudden infant death syndrome.
 Fatigue stated or assumed if event occurred within 24 h of delivery.
 + Clinical diagnosis.

are in close contact with their mothers. In some cases, dedicated relatives or friends might perform this function. An alternative approach would be to electronically monitor infants (heart rate or arterial saturation) with alarms referred to the nursing station to avoid disturbing parents with false alarms. This would offer considerable protection for infants in close physical contact with mothers.

In summary, the BF initiative is an important public health program benefiting infants in many ways, including reducing the incidence of childhood obesity.^{16,17} However, any extensive health program needs to be monitored for adverse effects and modified accordingly.

CONFLICT OF INTEREST

The author declare no conflict of interest.

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