



## Promoting Safe Sleeping for Infants

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## Introduction

During the calendar years 2013-2016 inclusive, there were 20 deaths of infants in Northern Ireland due to Sudden Infant Death Syndrome (SIDS). Over the past 30 years the infant death rate has more than halved in Northern Ireland, falling from 10.5 infant deaths per 1,000 live births in 1984 to 4.5 in 2016. However, the rate still remains one of the highest in Europe, with the overall figure for the United Kingdom (UK) being 3.9 (Registrar General, 2016).

SIDS is defined as the sudden and unexpected death of an infant under 1 year of age, with the onset of the lethal episode apparently occurring during sleep that remains unexplained after a thorough investigation including performance of a complete autopsy, and a review of the circumstances of death (Krous *et al.*, 2004).

As noted by Blair *et al.* (2014) the corresponding decrease in the numbers of deaths through SIDS has been accompanied by changes in the characteristic profile of these deaths. The proportion of deaths in families from deprived socio-economic backgrounds, among mothers who smoke during pregnancy and among pre-term infants has risen, while the peak age of death among SIDS infants found sleeping next to a parent has fallen from 3 to 2 months. The Back to Sleep campaign, initiated in the UK in 1991, which advised parents to avoid placing infants in the prone position for sleep has had a dramatic effect on the decrease in the number of SIDS deaths occurring in a cot, but rather less effect on co-sleeping deaths (Blair *et al.*, 2006) which now account for approximately 50 per cent of all SIDS deaths (Carpenter *et al.*, 2013).

## Why is co-sleeping potentially risky to infants?

The 'Triple Risk Model' (Filiano and Kinney, 1994) theorizes that the cause of SIDS is multifactorial, and due to a number of intersecting risk factors. The three factors are: (1) a **vulnerable infant** (*such as an infant born prematurely, with low birth weight, or exposed to maternal smoking in the antenatal and postnatal periods*); (2) enters an unstable **critical developmental period** in their homeostatic control; and (3) when exposed to a further **exogenous stressor** such as being placed in a prone sleeping position or being subjected to overlay through co-sleeping on a sofa, that lead to a failure of an infant's protective responses. The convergence of these factors may

ultimately result in a combination of progressive asphyxia, bradycardia, hypotension, metabolic acidosis, and ineffectual gasping, leading to death. Thus, death may occur as a result of the interaction between a vulnerable infant and a potentially asphyxiating and/or overheating sleep environment, exacerbated by a parents unresponsiveness through substance use to their child's distress (Moon *et al.*, 2016).

These overlapping risks include: infants sleeping in a prone or side sleep position night and day (McGarvey *et al.*, 2003); young maternal age (McKenna *et al.*, 2007); maternal overtiredness (McKenna *et al.*, 2007); low socioeconomic status (Shapiro-Mendoza *et al.*, 2009); male gendered infants (Leach *et al.*, 1999); low birth-weight (Leach *et al.*, 1999); parental drug use such as smoking and consciousness-depressing drugs (Carpenter *et al.*, 2004; Hauck *et al.*, 2003); head and face covering (Blair *et al.*, 2014); soft bedding and mattresses (Lahr *et al.*, 2007; Hauck *et al.*, 2008); and protective factors such as room sharing and pacifier use (Fleming *et al.*, 1996; Hauck *et al.*, 2003; Moon *et al.*, 2012).

The mechanisms responsible for intrinsic vulnerability within the infant (i.e. dysfunctional cardiorespiratory and/ or arousal protective responses) remain unclear but have been posited as arising from in utero environmental conditions and/or genetically determined maldevelopment or delay in maturation. Infants who die of SIDS are more likely to have been born preterm and/or be growth restricted, which suggests a suboptimal intrauterine environment (Moon *et al.*, 2016). Other adverse in utero environmental conditions include exposure to nicotine or other components of cigarette smoke and alcohol. Prenatal exposure to tobacco smoke attenuates recovery from hypoxia in preterm infants, decreases heart rate variability in preterm and term infants, and abolishes the normal relationship between heart rate and gestational age at birth. It is important to also note that prenatal exposure to tobacco smoke alters the normal developmental operation of cardiovascular reflexes, such that the increase in blood pressure and heart rate in response to breathing 4 per cent carbon dioxide or a 60° head-up tilt is greater than expected (Cohen *et al.*, 2008; Fifer *et al.*, 2009; Richardson *et al.*, 2009; Schneider *et al.*, 2008; Thiriez *et al.*, 2009). These changes in autonomic function, arousal, and cardiovascular reflexes may all increase an infant's vulnerability to SIDS (Moon *et al.*, 2016).

Placing infants to sleep in the prone or side position is also known to increase the risk of rebreathing expired gases, resulting in hypercapnia and hypoxia. The prone position also increases the risk of overheating by decreasing the rate of heat loss and increasing body temperature more than the supine position. Evidence suggests that prone sleeping alters the autonomic control of the infant cardiovascular system during sleep, particularly at 2 to 3 months of age, and may result in decreased cerebral oxygenation (Wong *et al.*, 2011).

Risk factors often exist in association with each other. As the cause of SIDS is not known and may involve a number of unknown factors, elimination of a single risk does not mean that the death will be prevented; therefore, in this review we discuss **risk reduction rather than prevention**.

As noted above a large proportion of infant deaths occur when infants are co-sleeping with one or more adults. Co-sleeping and bed sharing are considered the social norm for approximately 90% of the world's population, with two-thirds of the world's cultures habitually practicing mother-infant co-sleeping on the same bed or sleeping surface (McKenna and McDade 2005). Although international studies show that the practice of co-sleeping is common, it is controversial in the public health community. Some consider it unsafe due to the proportion of SIDS deaths in the UK and elsewhere involving co-sleeping, with some arguing for its wholesale elimination (Mitchell, 2009; Carpenter *et al.*, 2013). Others disagree, finding little or no scientific evidence for an association with SIDS, except among smoking mothers (O'Hara *et al.*, 2000; McAfee, 2000; Ball, 2012). On the plus side evidence suggests that co-sleeping has been associated with longer duration of breastfeeding (and all the benefits for children that this entails) and some promote it for this reason (McKenna *et al.*, 1997; Ball *et al.*, 2016).

While deaths through co-sleeping are less common in the first month of life, they peak between 2 and 4 months, and approximately 90 per cent occur by 6 months. There is an increase in the numbers of deaths during the winter months, with the reasons for this previously theorized to be related to increased viral illnesses at this time or overheating due to carers over-bundling the infant (Carpenter *et al.*, 2013). Although many infants' sleep safety messages have been promoted by health care providers and health professionals, and despite widespread media campaigns, co-sleeping or

bed-sharing remain common practices that are increasing in prevalence in both hospital and at home (Hackett and Simons, 2013).

### **What do we mean by co-sleeping?**

While there has been a change over time in how we define co-sleeping (Hall, 2017) it is typically defined as the situation where an adult (usually the infant's mother or father, or both; or sibling/s) brings an infant onto the same sleeping surface (usually a bed or sofa but not limited to these surfaces e.g. couch, futon, armchair, water bed, beanbag chair) when co-sleeping is possible, whether the intention is to sleep or not (Blair *et al.*, 2014). Indeed research indicates that the co-sleeping risk is highest for parents who fall asleep with their infants on a sofa, as sleeping on a sofa with a baby significantly increases the risk and therefore should be avoided. The only sleeping environment in the UK in which SIDS deaths are increasing is those found co-sleeping on a sofa, with a 23-fold pooled risk for sofa-sharing which is almost 8 times the pooled risk for bed-sharing (Fleming *et al.*, 2012). Evidence concludes that bed and sofa sharing are two distinct practices and advice to parents should highlight the differential risk.

### **Are there particular factors associated with an increase in the likelihood of SIDS?**

There is clear and consistent evidence that co-sleeping with an infant on surfaces other than a bed should be avoided in all situations. Studies highlight that infant deaths on sofas are usually asphyxia deaths from entrapment between a person and the sofa cushions, overlay by another person, or wedging against the sofa cushions (Scheers *et al.*, 2003; Li *et al.*, 2009).

Strong evidence suggests that for adults who co-sleep with an infant and smoke tobacco, drink alcohol or take recreational drugs, the risk of SIDS is significantly higher, especially if the infant was of low birth weight or born prematurely. The combination of maternal smoking in pregnancy and later bed sharing is extremely hazardous for infants (Mitchell *et al.*, 2017). When an adult who is under the influence of one or more psychoactive substances co-sleeps with an infant the potential for

entrapment, overlaying, overheating and/or suffocation is increased (Carpenter *et al.*, 2013).

However, evidence differs as to whether, in the absence of these risk factors, co-sleeping represents a risk (Blair *et al.*, 2009; Carpenter *et al.*, 2013; Fleming *et al.*, 2000; 2015). For example, Ball and Volpe (2013) challenge the notion that infant sleep environments are 'good' or 'bad', arguing that simple public health messages which instruct parents NOT to co-sleep are too simplistic and have limited success. Rather parents should be supported to look at the sleep environment and to consider whether infants may become trapped, e.g. when beds are pushed up against walls, or whether infants may overheat, e.g. when bedding covers their head (Fleming *et al.*, 2015).

### **The profile of sudden infant deaths in Northern Ireland**

For this study an audit was undertaken of coronial files of infants who died related to sleeping. During the period January 2007 until December 2013 there were 45 infants aged under 2yrs whose deaths were examined in detail, of which 32 were associated with sleeping. Of the 45 infants 94 per cent were ethnic white and 6 per cent were of Irish Traveller ethnicity. Twenty-two of the infants who died suddenly and unexpectedly were male, and 11 were female (the gender of the remaining child was not recorded on file). The majority (75 per cent) of the children died aged six months or younger, with 32 per cent aged under 2 months (mean 18 weeks; median 14 weeks; range 1-87weeks).

Research indicates that infants are usually found when their parents wake in the morning, having been last seen alive the previous night or in the early hours of the morning (Blair *et al.*, 2006). This was the case with the children in this study, with nearly one-third of the infants being found during the daytime to evening period (40 per cent) from 10am to 12 midnight, and the remaining infants found during the night-time and early morning (12 midnight to 10am).

Most of the infants in this study were located in the parent's room (56 per cent) at the time of death, while 20 per cent were located in the living room on either a chair or sofa, and 2 per cent in a car seat. For 9 per cent of the cases the infant was located in their own room. Some 16 per cent of the infants were not at home at the time of

their death, and they were found either in a bedroom (13 per cent) or a living room not in their own home (3 per cent). Twenty seven per cent of the infants who died while co-sleeping (n=9) were born pre-term. The case review findings are consistent with the literature in that pre-term infants had a higher than expected incidence of unexpected deaths; in this review, by a factor of three.

In total 32 (71 per cent) of the 45 infants were co-sleeping at the time of their death, with 14 of the 32 children aged under 12 weeks. Sixty-three per cent of the 32 infants were co-sleeping with one other person (of these 60 per cent with their mother or 40 per cent with their father), 41 per cent were co-sleeping with two people (of these 66 per cent with both parents and 33 per cent with their mother plus sibling).

In the study 71 per cent of the mothers reported having smoked in pregnancy, and 74 per cent of fathers also smoked at the time of their child's birth. In 59 per cent of cases involving co-sleeping deaths the co-sleeper had consumed alcohol.

In summary, the audit of coronial records of infant deaths demonstrated that co-sleeping was associated with the majority of infant deaths (71 per cent) in Northern Ireland during the period 2007-2013.

### **What are the implications for mothers who are breastfeeding?**

For mothers who did not smoke during pregnancy, who breastfeed, and do not smoke, drink alcohol, or use recreational drugs the evidence of an increased risk from co-sleeping in beds is very limited. No reported case control studies in which data on smoking, alcohol intake and drug use were collected have shown any significant increase in the risk of SIDS associated with co-sleeping in the absence of these known risk factors. Indeed, evidence states that co-sleeping has the potential to benefit babies in that it supports breastfeeding and bonding and therefore develops a baby's health and wellbeing. It has been associated with enhanced maternal infant bonding and maternal responsiveness (Young 1998, 1999; Baddock *et al* 2012; McKenna and McDade 2005); improved settling with reduced crying (Young 1999); improved maternal and infant sleep and increased arousals (Mosko *et al* 1997a, 1997b; Young 1999; UNICEF UK Baby Friendly Initiative 2004); increased duration of breastfeeding (McKenna, Mosko and Richard 1997; McKenna and McDade 2005,

Huang et al 2013); and reduced formula supplementation (Pemberton, 2005). A review of the impact of breastfeeding has identified that breastfeeding reduces the risk of SIDS by 36 per cent in the industrialised world (Ip *et al.*, 2007).

### **What do professionals tell us?**

In interviews with midwives, health visitors and paediatricians for this study there was widespread recognition of safe sleep messages, although also some concern about competing advice that may not be consistent, ranging from never sleeping with your baby to promotion of bed sharing in the context of breastfeeding. Practitioners often reported co-sleeping with their own baby.

Invariably it was mothers with whom practitioners often spoke to about safe sleep practices, rather than including fathers and other adult family members who might be providing care for infants, or be able to place a sleeping infant in a safe sleep environment if another carer had fallen asleep with the child (Ball *et al.*, 2000).

There was also an acknowledgement that consistent messages about safe sleeping should be given regularly both antenatally and postnatally in ways which reduce parents feeling judged less they conceal aspects of sleep practices. It was felt important to consider when and how to give the message in the midst of all the important messages being given to parents, and “having the conversation as opposed to just delivering the message.”

### **What do parents tell us?**

Some researchers have spoken to parents about their sleeping practices, and their awareness of, and adherence to, safe sleep messages from professionals. Pease and colleagues (2017) found factors influencing mothers’ adherence to the safe sleep messages included previous experience and the credibility of the advice given. They described disrupted routines that led to risky scenarios with a belief that occasional risks in relation to sleep practices were acceptable. Where circumstances made following the advice more difficult they found alternative strategies to reduce the risk, including the use of movement monitors, regular checking and a belief a (albeit



erroneously) that lighter maternal sleep in the presence of a baby was protective. The authors concluded that safe sleep messages need to be tailored to fit with the lived realities of mothers, especially those at higher risk. The traditional list of 'do's' and 'don'ts' are not well accepted by this group. Interventions that seek to influence this higher-risk group should acknowledge mothers' own protective instincts and consider their beliefs and understanding behind the safer sleep messages if they are to be effective and encourage this group to change.

### Current best advice for parents

The current research evidence indicates that:

- Pregnant women and their partners should be advised of the risks from tobacco smoking, and drug and alcohol use to their baby's health both before and after birth.
- Sleeping on a sofa or chair with an infant should **always** be avoided because of the significant increase in the risk of SIDS.
- Sitting devices, such as car seats, strollers, swings, infant carriers, and infant slings, are not recommended for routine sleep in the hospital or at home, particularly for young infants.
- Infants should be placed in the supine position for all sleep periods on a firm, safe mattress.
- Infants should be kept in a smoke-free environment before and after birth.
- Infants aged less than 6 months should sleep in their own cot in the parental or adult caregiver's bedroom and not share a sleeping surface with a parent, caregiver, or other child.
- If the infant is less than 6 months of age parents should be advised of the risks of sharing a bed with babies, even if they do not smoke, drink alcohol, or use illicit drugs, and the infant is breast fed.
- Co-sleeping with parents who smoke, even if the smoking does not occur in the bed or bedroom, significantly increases the risk of SIDS.

- Consuming alcohol, or using illicit drugs is particularly dangerous and parents should be warned of the significant increase in risk of SIDS from co-sleeping when under the influence of substances.
- The sleep surface for infants should be covered by a fitted sheet without any soft or loose bedding that could cover a baby's face, heavy blankets, pillows, or cot bumpers that could cover an infant's face. Toys should not be placed in the infant's cot.
- If blankets are used, infants should be placed with their feet at the foot of the cot and the blanket tucked in on three sides to reduce the risk of the head becoming covered.
- A good alternative to blankets is a baby sleeping bag.
- Mothers who want to breast feed should be encouraged and assisted to do so. Infants may be brought into bed to feed but should be placed back in their cot to sleep.
- Other family members should be supported to be proactive in placing an infant in their cot if they have fallen asleep with another family member, such as a breast feeding mother.
- It is far riskier to fall asleep with an infant on a sofa or chair than on a bed.
- Routine use of a pacifier is protective against SIDS; however, among this group of infants it is important to establish breast feeding first for 3-4 weeks before the introduction of a pacifier.
- Immunisations consistent with the standard immunisation schedule for all infants are recommended.

### **Current best advice for professionals**

Advice to parents which is tailored and less authoritative is considered to be more effective where complex behaviours such as sleeping with an infant are involved. With regard to infant sleep safety, message exposure and awareness of sleep-related risk factors represents only one possible reason why sleep-related risks to infants exist. Furthermore, a singular focus on giving advice inhibits the very types of conversations

with health professionals that are necessary for parents to engage in contingency planning. Through communication and conversation GPs, midwives and health visitors will become more aware of the challenges for parents when, for example, they need to transfer recommendations to different sleeping arrangements such as being on holiday, staying at another house, modifying the house for visitors, moving house or an infant being looked after by another relative (Keys and Rankin, 2015).

There are various reasons why parents may sleep with an infant, and this needs to be discussed early with all health professionals. For instance, there may be practical and economic constraints in the family home such as limited rooms and beds for children. There may be cultural reasons why sleeping with an infant is an important tradition. South Asian, Indian and Chinese and Japanese mothers often find the messages provided by health professionals as irrelevant as the messages focus more on risks. Other parents are keen to promote bonding and attachment with their newborn child and will actively bring a baby into their bed.

Parents also say that the risks are never contextualized so that they can work out the absolute risk for their infant. Likewise they are never educated on which risks to prioritize at which developmental stage. Parents want the benefits of co-sleeping to be highlighted such as better attachment, less crying and increased parental sleeping through the night (Ball *et al.*, 2016). Failure to provide adequate cost-benefits of different practices can lead to unintended negative consequences for infant safety outcomes. For instance, parents have been known to follow recommendations and never sleep with their infant in their bed but fall asleep feeding their baby on a sofa which is much more dangerous than sleeping on a mattress.

Midwives, health visitors, paediatricians, GPs and other healthcare staff who have consultations with pregnant women and their partners in the antenatal and postnatal period and parents of new or very young babies at home or in the community should use the opportunity to:

- Talk more openly about SIDS and ask about sleeping arrangements for the infant and promote the safe sleeping messages.
- Provide information to parents and carers on a case-by-case basis, taking individual and family circumstances into account.
- Identify risk factors, and put measures in place to minimize the impact of these.

- Assist fathers, grandparents and older siblings to understand and apply the advice.
- Model and discuss safe sleeping practices.
- Promote and support breastfeeding, and the right of parents to make informed choices about their infant's care.
- Talk sensitively around cultural differences for infant's sleep environments.

## **Conclusion**

The risk of an infant dying suddenly is low, but it does happen. As such it is important that factors which are modifiable are understood by parents, carers and health professionals. The research evidence is clear in respect of some simple measures which can increase parents' understanding about risks to their child, and how they can mitigate these. Safe sleep messages need to be tailored to the particular needs and circumstances of both an individual infant and their parents/carers, and that while consistency in the message given is important, the manner in which it is delivered needs personalised. In doing so it is hoped that further decreases in the numbers of SIDS deaths can be achieved.

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