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The Practice of Bed Sharing: A Systematic Literature and Policy Review

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Introduction

Sudden infant death syndrome (SIDS) continues to be a devastating form of infant death in Canada. The risk of dying from SIDS has been dramatically reduced over the last decade in large part because researchers and practitioners have been able to identify modifiable risk factors for SIDS. The infant's sleep position is the modifiable risk factor that has demonstrated the most noteworthy reduction in SIDS rates. Encouraging infants to be placed to sleep on their backs via the *Back to Sleep* campaigns across North America, Europe, the United Kingdom, Australia and New Zealand have been credited with reducing SIDS rates from 50-90%.[1]

Since then, additional modifiable risk factors have become the focus of study in order to reduce the rates of SIDS even further. Bed sharing, the practice of an infant sharing a sleeping surface with a parent and/or sibling, has become one of the most controversial risk factors identified and has been the focus of increased study and debate. While there is general consensus that particular types of bed sharing expose the infant to the greatest risk, such as bed sharing on a sofa and bed sharing with a parent that smokes, the debate is focused on the risk that may or may not exist when an infant bed shares in a relatively safe sleep environment with a parent, particularly a breastfeeding parent. This literature review will summarize the current literature on the topic of bed sharing with infants, the relative risks and benefits of bed sharing, the impact of breastfeeding on SIDS and provide recommendations that may inform future Public Health Agency of Canada policies and programs.

Methodology

A systematic literature review on bed sharing and infant (up to 12 months old) deaths was conducted. The literature search was conducted on February 2, 2009 on EBHOST Database using 360 Search Results within the Medicine, Nursing, Sciences, Psychology and Social Sciences disciplines. Using the key words of **bed sharing**, **co-sleeping**, **co-bedding**, **safe sleeping**, **infant safety** and **infant death** in combinations of two and three, the 360 Search accessed 56 sites (see Appendix 1) and found 47 unique abstracts that displayed one or more of the key words. Full text articles were obtained for the abstracts that met the literature search eligibility criteria of:

- Published in the English language since February 2006.
- Case-control or cohort studies looking at the risk and benefit factors of bed sharing with an infant under 12 months of age.
- Historical reviews, meta-analyses, literature reviews and retrospective descriptive studies on bed sharing and safe sleep for infants.
- Any surveys or studies on the prevalence of bed sharing between a parent and infant.

- Government documents/recommendations such as coroners' reports and professional association recommendations (e.g. Canadian Paediatric Society, American Academy of Pediatrics).
- Any government guidelines (Canadian [including provincial and municipal level] and International-industrialized world) and/or recommendations regarding bed sharing.

The literature was reviewed and subsequent sources of information were gathered from the reference lists of the reviewed articles.

A second literature search was conducted on February 4, 2009 on EBHOST Database using 360 Search Results within the Medicine, Nursing, Sciences, Psychology and Social Sciences disciplines adding the key word **breastfeeding** to the previous key words and resulted in the identification of 60 abstracts with only 3 being unique to the previous search.

In total 60 abstracts, 57 papers, 1 summary of conference proceedings, 10 professional organizations guidelines/advisories/coroner's reports and 10 government newsletters/brochures/guidelines/policies were reviewed. From this collection**,** 36 studies were identified for the systematic literature review. The remaining documents, such as recognized professional societies' policy statements on safe infant sleep practices, provided background information and insight into how the current literature is being used in practice.

Terminology

Terminology regarding bed sharing, room sharing and co-sleeping used both in the scientific literature and the popular literature is inconsistent and potentially problematic. For the purposes of this paper the following terms and definitions will be used:

> **Bed sharing**: a sleeping arrangement in which the infant **shares** the same sleeping surface (e.g. bed, couch, futon, armchair, water bed, beanbag chair) with another person (parent, sibling).
>
> **Room sharing**: a sleeping arrangement in which the infant **does not share** the same sleeping surface as a parent or sibling but sleeps in the same room separate but proximate to the parents.

Co-sleeping is a term used with inconsistent definitions that can be misleading and confusing. Some authors use the term to refer to the broad range of infant sleeping practices inclusive of bed sharing **and** room sharing while other authors use this term as a distinct alternative practice to bed sharing.[2 3 4] In reporting the findings from the literature, every effort has been made to categorize the author's terminology into bed sharing or room sharing, as defined above, while maintaining the integrity of the author's message.

Defining Sudden Infant Death Syndrome (SIDS) and Sudden Unexpected Infant Death (SUID)

Sudden infant death syndrome (SIDS) occurs when a sleeping, seemingly healthy infant less than one year of age, dies for no apparent reason. SIDS is defined as "the sudden death of an infant under one year of age, which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene and review of the clinical history".[5] If any part of the case investigation is unanswered, such as an incomplete death scene investigation or an incomplete review of the clinical history, then the death cannot be classified as SIDS. The death may then be classified in another category such as 'other'.[6]

Sudden unexpected infant death (SUID), also known as sudden unexpected or unexplained death (SUD), refers to a broader category of infant deaths which include SIDS, accidental injury, non-accidental injury due to neglect or abuse and previously undiagnosed natural disease processes.[4 6 7] The distinction between SIDS and other SUID is complex.[8] In recent years, changes in how death-scene investigations are conducted and stricter adherence to the criteria for SIDS may have impacted how the diagnoses of SIDS and SUID are assigned. The result is that infant deaths that might have been classified as SIDS in the past may now be attributed to SUID, the broader category. An additional layer of complexity can be introduced depending on a coroner's or medical examiner's interpretation of the case findings, as some feel that the SIDS diagnosis should be used only when it is certain that no additional factors contributed to the death. The context of bed sharing creates such a scenario.[9]

In the United States, the Centers for Disease Control and Prevention (CDC) recognize the shift in SIDS and SUID rates and propose that the more recent decline in SIDS rates may be partly explained by the increasing rates of other forms of infant death that are included in the broader SUID classification (e.g. overlaying, suffocation, and wedging). Indeed, while the overall SUID rate, of which SIDS is a part, decreased quite dramatically since the early to mid-1990s, likely resulting from the impact of *Back to Sleep* campaigns on the SIDS rates, the SUID rate has remained relatively stagnant in more recent years (between 1997 and 2004). The apparent stability in the overall SUID rate between 1997 and 2004 was evident even while the rate of SIDS continued to decrease and can be explained by a three-fold increase in the rate of infant deaths due to accidental suffocation and strangulation deaths in bed (ASSB), as well as, an increase in infant deaths with unknown cause, both offsetting the decrease in SIDS. ASSB includes suffocation by soft bedding, pillow or waterbed mattress, overlaying or rolling on top of or against an infant while sleeping, wedging and entrapment of an infant between two objects such as a mattress and wall, bed frame or furniture and strangulation by asphyxiation. Between 2003 and 2004, *overlay* was the most frequently reported reason for infant ASSB deaths (33.8%), followed by *wedging and entrapment* (14.2%) and *suffocation by bedding materials* (13.8%). Beds, cribs and couches were reported as the most common sleep surfaces where ASSB deaths occurred. Co-sleeping or bed sharing was reported in 53.3% of the cases. These results are similar to what has been reported in Ontario where increasingly the findings of 'unsafe sleeping environment' and 'bed sharing' are being identified in the death investigation, negating a SIDS classification.

To add further complexity in creating a distinction between the diagnosis of SIDS and SUID, the socioeconomic factors that appear to most commonly occur in SIDS cases are similar to those that occur for the broader category of SUID. Mothers of infants who die from SIDS are more likely to be younger, have no partner, have more children, consume alcohol and smoke during their pregnancy, and engage in prenatal care later than control mothers. They are also less likely to attend prenatal classes and are generally poorer compared to the rest of the community.[10] Research has also identified these risk factors for SUID deaths, possibly indicating the socioeconomically deprived circumstances in which some SIDS and SUID families live.[11] [12]

Clearly understanding the issues related to the diagnoses of SIDS and SUID is important because of the impact that bed sharing has on both of these outcomes. With respect to SIDS, bed sharing has been identified as a modifiable risk factor that increases the risk for SIDS, especially in situations such as bed sharing on a sofa, armchair or futon; bed sharing with a parent that smokes, is under the influence of consciousness-depressing drugs or alcohol, or is overly tired; as well as, bed sharing with other siblings or animals.[13] [14] [15] [16] [17] As recent studies have identified a shift in the causes of infant mortality, with decreases in SIDS and increases in SUID, it is important for researchers and practitioners to simultaneously examine the impact of bed sharing on both SIDS and SUID, especially when the sleeping circumstances surrounding both can be so similar. Limiting the discussion of bedsharing only as it relates to SIDS would not be examining the full impact of bed sharing on the overall mortality rates of infants.

Change in classification may impact the SIDS rates, but other factors have also been demonstrated to impact SIDS rates. The Office of the Chief Coroner in the Province of Ontario, reporting similar trends in the decrease in the number of SIDS deaths and an increase in the number of SUID deaths, attribute these findings not only to the stricter adherence to the definition of SIDS but also to the public education effects of the *Back to Sleep* campaigns. In Canada (excluding Ontario), the number of SIDS cases has been dramatically reduced from 120 cases (0.6/1000 live births) in 1999 to 52 cases (0.3/1000 live births) in 2004, a 50% reduction.[18] While the statistics related to SIDS are very encouraging, other causes of death such as 'asphyxia' and other 'unexplained infant death', deaths that may occur in situations similar to SIDS such as in adult beds and cribs, have remained static or even increased. Deaths due to asphyxia have not changed since 1999 with rates at 0.5/1000 live births in 2004, but other unexplained infant deaths has increased from 0.1/1000 live births in 1999 to 0.2/1000 live births in 2004.

Despite dramatic reductions in SIDS deaths over the last decade in Canada and as reported in industrialized countries, SIDS remains the third leading cause of infant death in Canada (excluding Ontario) in the postneonatal period (28 days to one year of age) at 17.2% of all postneonatal deaths. The leading causes of infant death during the postneonatal period are 'congenital anomalies' and 'other', at 22.3% and 20.5% respectively. In light of the growing body of evidence from the United States regarding the possible shift in SIDS diagnoses to other causes of infant death in the broader SUID classification, the Public Health Agency of Canada's Canadian Perinatal Surveillance System is currently undertaking a study to examine whether this change in coding

practice may be influencing the rate of SIDS in Canada. Preliminary data from this analysis is expected in late 2009 (J. Anderson, personal communication, May 8, 2009).

Bed Sharing

Bed sharing between infants and family members has a long history, and families have a broad range of reasons why they choose to bed share or not to bed share. Bed sharing, in the industrialized world, has generally been viewed as a controversial practice and recently has become a focal point in SIDS prevention. Once thought of as a practice for the very poor who could not afford separate sleeping accommodations, bed sharing has resurfaced as a practice that is believed to contribute to longer periods of breastfeeding, increasing infant arousals, decreasing the times the infant spends in deep sleep and increasing the mother's awareness of the infant. [19] Opponents of the practice of bed sharing focus on the potential hazards of bed sharing such as sleeping on an adult bed that has not been approved for infant sleep. Included in these hazards are the risks that have been identified for both SIDS and SUID such as entrapment, overheating, overlays, and the infant's proximity to soft bedding such as pillows and comforters. [20] [21]

Bed sharing is reported to be increasing in popularity, but studies examining the prevalence of bed sharing are limited in numbers. The National Infant Sleep Position Study was completed in the United States between 1993 and 2000 and 8453 interviews were conducted. The study found that there was an increase in infants sharing a bed for more than half the night from 5.5% to 12.8% between 1993 and 2000.[22] While the incidence of bed sharing for more than half the night still appears relatively low, it is augmented by the fact that 44.7% of all respondents stated that while their baby may not spend more than half the night on an adult bed, infants did spend some time on an adult bed. Of those that spent time on an adult bed, 91.6% of the infants slept with their parents. A more recent publication of a bed sharing survey conducted of 1867 Oregon women between 1998 and 1999 identified that the incidence of infants bed sharing 'always', 'almost always', or 'sometimes' was as high as 76%.[23] A more recent study that analyzed data collected in the United States by the Centers for Disease Control and Prevention in the Infant Feeding Practice Study II looked at a sample of approximately 2300 mothers of a singleton birth and found that incidental bed sharing was between 59-65% and was most commonly on a bed but was also reported to be on a couch or another place such as a waterbed. Approximately 30-40% of the bed sharing pairs reported they slept together all night, every night. The study also identified that part time bed sharing most commonly occurred during the last part of the night and is consistent with the reasons mothers gave for bed sharing which were to calm a fussy infant, to facilitate breastfeeding and to help the infant and mother sleep.[24] All of the studies indicate an increasing trend for parents to share their bed with their infants. A recent literature review conducted by Toronto Public Health did not identify any Canadian studies on the prevalence of bed sharing with infants nor was any Canadian study identified since then in the current literature review.

Certain countries, such as Japan, report a relatively high incidence of bed sharing accompanied by a remarkably low incidence of SIDS. The rate of SIDS reported in Japan for 2005 was 0.16% [25] with rates of bed sharing reported as high as 37.3% (Stephanie

Fukui, SIDS Family Association Japan, personal communication, April 1, 2009). Understanding the relationship between the low incidence of SIDS related to the relatively common practice of bed sharing in this and other populations is an area for further research. Also, examining the extent and intricacies of bed sharing in North American and European cultures are needed to fully understand the impact of bed sharing on infant mortality, either from SIDS or SUID.

Risk Factors Associated with SIDS and SUID

An examination of the relationship between bed sharing and SIDS and SUID can not be completed without recognizing the complex nature of the many socioeconomic, physiologic and sociologic factors that impact SIDS and SUID. Several large scale case-control studies such as the New Zealand Cot Death Study, [26] the European Concerted Action on SIDS (ECAS), the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI), [27] the Chicago Infant Mortality Study and more recently the German Study of Sudden Infant Death (GeSID),[28] [29] have been integral in identifying a broad range of factors that impact SIDS. Certain risk factors such as infants sleeping in a prone or side sleep position, [30] young maternal age, low socioeconomic status, male gendered infants,[11] [26] low birthweight,[11] [26] maternal drug use such as smoking and consciousness-depressing drugs,[15] [16] [30] soft bedding,[24] [27] as well as, protective factors such as room sharing and pacifier use[16] [27] [31] have been cited in the literature. Various reviews of the literature have examined the broad range of studies in order to summarize the collective thinking on risk and protective factors related to SIDS and SUID.[9] [20] [32] [33] [34]

Many of the identified factors such as prone, side or supine sleep, maternal smoking, maternal overtiredness, presence of pillows and duvets in the adult bed, and low socioeconomic status often co-exist with other factors such as bed sharing and breastfeeding and, as such, many studies have tried to isolate risk factors. Unfortunately, in the absence of experimental studies, researchers are forced to identify groups of factors that are identified at the death scene for those infants that succumb to SIDS or SUID. Some factors are inherently associated with other factors. This is often the case when a SIDS case is identified as bed sharing on the last sleep because the presence of other confounding factors such as head covering, soft bedding, overheating and sleep position must also be considered.

Why Is Bed Sharing an Issue?

As researchers have worked to identify modifiable risk factors related to SIDS and more recently related to SUID, bed sharing has been identified as a practice more common in SIDS and SUID cases than in control cases. The data regarding bed sharing and SIDS is sobering. The prevalence of bed sharing in the SIDS population is nearly three times as frequent as in the general population[35] and SIDS infants were found bed sharing in the parental bed more than expected in the general population.[36] The prevalence of SIDS deaths when an infant slept with a parent rose from 12% in the 1980s to 50% in 1999-2003. While the actual numbers of SIDS deaths in the parental bed has halved, the rate of SIDS deaths in cribs and cots has decreased more dramatically, by 6 times, thus shifting the rates towards those infants that share a sleeping surface. The data implies that

researchers and practitioners have been more successful in reducing SIDS in cribs and cots than for those infants sharing a bed.

Bed Sharing Environment

It is difficult to separate the practice of bed sharing from the bed sharing environment. As discussed earlier, even the definition of bed sharing can vary greatly so it is logical there is debate over the actual risks in the practice of bed sharing versus the bed sharing environment and how these two concepts are represented and studied in the literature. Some argue that research has not adequately segregated the known unsafe bed sharing environments, such as sharing a sleeping surface on a sofa, waterbed, futon or armchair, from the ones where there is a committed caregiver sharing a sleeping surface where potential risk factors have been addressed, and consequently, misrepresenting the risk for those infants in the latter group. In fact, some researchers who have worked with large data sets in the United Kingdom propose that the vast majority (90%) of the bed sharing deaths occurred in an unsafe bed sharing environment (parents smoke, have recently consumed alcohol or taken drugs, slept on a sofa, or a combination of these factors) and feel there is weak evidence that the few SIDS deaths that occurred in a relatively safe bed sharing environment are more than would have happened if the infants had slept alone in cribs.[37]

Defining what is a relatively safe bed sharing environment is the challenge and even if the data excluded any bed sharing environment that involved a sofa, futon, waterbed or armchair, bed sharing in an adult bed that was not designed with infant safety in mind still exposes the infant to a variety of risks. The risk of overlaying, suffocation, entrapment, overheating, soft bedding, and falls, as well as, the impact of sleep position related to the adults in the bed, particularly when breastfeeding, have all been identified as potential risk factors for SIDS and SUID.[31 36 38 39] While there may be debate about what presents the most risk and which aspects can be controlled in a harm reduction model, the data indicate that during the last sleep period **49% of SIDS** cases were found bed sharing in an adult bed compared to **12% of control** cases. This risk did not extend to those infants that may have bed shared for a short interval, such as to breastfeed, and were placed back in their own cribs or cots.[40]

The parental bed was not designed with infant safety in mind and poses a risk beyond any association with SIDS in terms of overlaying, entrapment and infants falling out of the bed. The adult bed presents a greater risk than cribs for suffocation, entrapment and strangulation as adult beds are not required to meet the same safety standards that are required for cribs and cradles. Perhaps as a result of the lack of standards not only for the adult bed, but also for the bedding and the placement in the room, the adult bed has been identified as being 40 times more of a risk for infant sleep than cribs. Adult beds were also found to be hazardous because of their location near a wall, the presence of pillows or soft bedding or because of bed sharing. Infants may also be at greater risk in the adult bed because of their immature motor skills and lack of ability to escape threats in the sleep environment such as entrapments or overlays. When studied, 70% of infants overlain were younger than 3 months old and more than half of these deaths occurred in an adult bed.

Bed sharing and sleep position

When studying bed sharing and sleep position in relationship to SIDS, bed sharing infants are less commonly placed and found prone and researchers speculate that this is in preparation to feed, especially in the breastfed population.[3 30 36 40] Research, not specifically related to SIDS or SUID, observed 40 bed sharing infants and 40 infants that slept in a crib and found the prone sleep position was not significantly different for either group at the end of the observed sleep, but side sleeping was the most predominant sleep position for bed sharing infants (61%) and supine sleep was the most predominant position for crib sleeping infants (85%). Other research of smaller samples of mother and infant bed sharing dyads observed that routinely bed sharing mothers almost always placed their infants to sleep in the supine position, but the infants spent an average of 83% of the night facing their mothers. This may be of note as side sleeping has been identified as risky for SIDS as a prone sleep position.[20 31 36 39]

Bed sharing and head covering/overheating/use of duvets

While overheating, head covering and soft bedding have previously been identified as risk factors for SIDS, bed sharing contributes to the issue in a unique manner, as more often than not, heavy duvets and soft bedding are a part of the parental bed and the mechanics of having an infant share bedding with an adult are inherently problematic. The use of heavy duvets has been identified as a risk factor with bed sharing SIDS cases and a strong interaction has been identified between prone sleep and soft bedding. A similar significant interaction was also found between bed sharing and high tog values, the thermal resistance measurement of fabric that describes warmth. Similar to the prone sleeping position, head covering, a modifiable risk factor, despite a lack of a complete explanation for the causal mechanism involved,[41] appears to occur less often in the bed sharing population than in the solitary sleeping group. A United Kingdom study found that bed sharing SIDS infants were discovered less often with their head covered (7%) than solitary sleepers (19%) indicating a protective effect from the parental presence, but the authors concluded that despite the observations, bed sharing, particularly among parents who smoke, is strongly associated with SIDS and it would be dangerous to recommend bed sharing as a strategy to reduce the prevalence of head covering.

Bed Sharing and Breastfeeding

There is agreement regarding the overall benefits of breastfeeding, but the controversy arises when the choice is made to breastfeed while bed sharing. Some argue that discouraging bed sharing may negatively impact breastfeeding rates. Others support breastfeeding but believe that any protective factor found in breastfeeding does not outweigh the risks of bed sharing and promotes breastfeeding without bed sharing. The argument is sometimes fueled by a skewed perspective of what is causing the decrease in the rate of SIDS over the last decade. For example, some cite that the historic high numbers of women initiating breastfeeding and practicing bed sharing coincide and explain the dramatic decreases in SIDS rates. [42] Unfortunately, no reference is made to the impact of the *Back to Sleep* initiatives that have occurred during the same time frame. It is important to examine all the data regarding how breastfeeding impacts the rate of SIDS in the context of all the other factors, including bed sharing, that have been identified and initiatives that have taken place in the last decade.

In trying to understand breastfeeding in the bed sharing environment, observational studies of small numbers of mother and infant dyads have provided some insight into the dynamics of breastfeeding and bed sharing. The research has identified the beneficial effect of bed sharing on the duration and frequency of breastfeeding, as well as, frequent maternal checking and responses to infant cues.[3 19] It was noted that mothers of bed sharing and crib sleeping infants checked their infants for a similar duration, but the bed sharing mothers had an increased frequency of infant checking. The authors hypothesized that the increased maternal touching, breastfeeding and frequency of responses in the bed sharing group may not occur at the same level if there was overtiredness or with the use of alcohol or drugs impairing the mother's ability to respond.

Breastfeeding has been linked positively to a variety of infant outcomes such as reduced acute otitis media, reduction in gastrointestinal and respiratory infections, reduction in the incidence of asthma, leukemia, and even adult obesity.[43] In addition, infant mortality has been found to be 26% higher for bottle fed than breast fed infants. Researchers have attempted to identify if the protective effect of breastfeeding can be specifically related to SIDS or is it just a reflection of the demographic that chooses to breastfeed. The strongest support identifying a reduced risk of SIDS and breastfeeding was from a meta-analysis of four studies examining the relationship between SIDS and breastfeeding. The meta-analysis was completed as part of a report describing breastfeeding and maternal and infant health outcomes prepared for the U.S. Department of Health and Human Services. The authors of the meta-analysis concluded from the four studies they analyzed from developed countries there was a direct relationship between breastfeeding and a reduced risk of SIDS. A more recent study using data from the German Study of Sudden Infant Death (GeSID) supported these findings and even quantified that breastfeeding reduced the risk of SIDS at all ages by approximately 50%. The authors of the study found that because 73% of the infants died from SIDS before 6 months of age, they recommend that breastfeeding should be continued until at least 6 months of age when the risk of SIDS diminishes.

While both these studies identified a direct protective link between breastfeeding and SIDS, neither examined the impact of bed sharing on the outcomes. Other case-control studies examining risk factors for SIDS often found that the risk of bed sharing was so profound the protective effect identified from breastfeeding did not significantly influence the magnitude of the risk of bed sharing. In fact, some research continued to identify a risk for bed sharing, regardless of whether the infant was breastfed [44] and others were still unable to identify if there is a protective effect of breastfeeding at all when related to SIDS.

In some cases, bed sharing has been identified to positively impact breastfeeding, but the protective link cannot be found especially when SIDS is considered in the dynamic. Bed sharing was found not to impact breastfeeding rates in SIDS cases and, in fact, higher breastfeeding rates were not associated with bed sharing. Other research has found no association between breastfeeding and the infant's sleep location.[45] Recent reviews of the literature related to SIDS found the risk of SIDS while bed sharing was hardly

modified by the presence or absence of breastfeeding, indicating a dominant influence of bed sharing.[32 33 36]

In an attempt to further understand the protective effect of breastfeeding with regards to bed sharing and SIDS rates, characteristics of breastfeeding mothers have emerged and some groups believe that breastfeeding may be a marker for a lifestyle and socioeconomic class that ultimately impacts SIDS rates.[1 33] Breastfeeding mothers have been identified as less likely to smoke and are more likely to bed share. [46 47] When surveyed, breastfeeding mothers will identify the primary reasons they breastfeed and bed share are convenience and ease of breastfeeding, better sleep for the mother and infant and to settle the infant.[48] They will also be able to identify the risks associated with bed sharing, but the risks seem to be outweighed by the perceived benefits and convenience of breastfeeding and bed sharing.

As with many of the other factors, it is difficult to isolate breastfeeding and bed sharing from other risk factors related to SIDS. The breastfeeding infant that bed shares is also exposed to the same risk factors of the bed sharing environment and, specifically, for breastfed infants, the most common risk in the bed sharing environment is related to pillows, blankets, and other soft surfaces.

Bed Sharing and Smoking

Next to prone sleeping, smoking is the most commonly accepted risk factor for SIDS. Bed sharing has been found to be particularly hazardous when mothers smoke.[9 31 32 39 40 44] The risk of SIDS is significantly increased with the combination of bed sharing and smoking, but recent research has also identified a dose response in that the more parents that smoked or the more they smoked, the higher the risk of SIDS. The risk was increased four times if the infant was low birthweight.[31 36] The same association between bed sharing and SIDS among smokers has not been convincingly established for nonsmokers but is speculated to be a result of the lack of specific research to date rather than the actual identification that there is no risk of SIDS among non-smokers when bed sharing.[9 32] Of note, the methodology in a recent Canadian review of the literature conducted by Horsley et al which could not identify an association between the risk of bed sharing and non-smoking parents was questioned as it compared bed sharing to non-bed sharing, including sleeping alone in a separate room, a known risk factor for SIDS, thus reducing the comparative risk of bed sharing.[49] There is increasing evidence that the risk of bed sharing is not significant once the infant reaches 4-5 months of age, an age also associated with an overall decrease in the risk of SIDS.

Bed Sharing and Infant Characteristics

The risk of SIDS and bed sharing is more strongly associated with younger infants.[32 35] SIDS cases found sharing a sleep surface (12.8 weeks for bed sharers and 8.3 weeks for sofa sharers) were significantly younger than SIDS cases found in cribs (21 weeks). Bed sharing infants less than or equal to 10 weeks of age are at greater risk for SIDS than non-bed sharers, even when maternal smoking is considered. [50] In fact, bed sharing for infants 30-61 days old with non-smoking parents is reported to have a nine-fold risk of SIDS. In

addition, prematurity and low birth weight quadruple the risk of SIDS, as does the evidence of a recent upper respiratory infection in the last four weeks.[31 39]

Recent study of the physical characteristics of the infant that may predispose them to SIDS and how these characteristics specifically relate to bed sharing, at this point, is inconclusive. There is some belief that when a vulnerable infant in a critical developmental period in homoeostatic control is exposed to an exogenous stressor, such as bed sharing, the situation may lead to an outcome of SIDS. Contrary to this theory, the bed sharing parent with their increased maternal checks and faster and more frequent maternal responses may be more responsive and ultimately more protective to the infant with physical characteristics, such as arousal abnormalities, that may make the infant susceptible to SIDS.

Bed Sharing and Protective Effects

Identifying that bed sharing has an overall protective effect for SIDS will be extremely difficult. The subset of infants that are bed sharing, breastfed by a parent who is not overtired, has not consumed alcohol or drugs, does not smoke, and has removed any potential hazards from the sleeping environment such as soft bedding, is so small and not statistically significant to support bed sharing as protective in the same way as room sharing has been found to be protective.[51] Still, parents who bed share identify several reasons for bed sharing and one is the enhanced ability to respond to their infants. When bed sharing mother and infant dyads are observed, the infant is often side sleeping at breast level diminishing the chance of the infant's face pressing into an adult's pillow but increasing the likelihood of the infant's head being covered.[52] It was also observed that the mother's actions, often triggered by the infant, rather than the infant's own movements were effective to reduce head covering thereby reducing the risk. As noted previously, both mothers of bed sharing and crib sleeping infants were similar in their duration of checking their infants, but bed sharing mothers checked more frequently. The authors of the study proposed that this could be part of the explanation for a decrease in SIDS for room sharing infants as it increases the opportunity for increased maternal checking.

Bed Sharing and Maternal and Socioeconomic Factors

Certain maternal and socioeconomic factors have been identified as being more closely associated with SIDS such as young maternal age, single mothers, African American and North American Indian and gravida greater than 2 plus there is a higher than normal incidence of bed sharing in these same populations.[33 39 45] In a cohort of infants born to families in the United States with a socio-demographic profile associated with a higher risk for SIDS, 48% reported routine sleeping of an infant with a parent or other adult. Bed sharing SIDS cases have also been identified to more commonly occur in overcrowded households.

Harm Reduction in SIDS and Bed Sharing

When making recommendations regarding the risk of SIDS related to bed sharing, a harm reduction approach is often considered to satisfy both those that support bed sharing and those that do not. Harm reduction has traditionally been a public health philosophy that

was designed to reduce the exposure to harm without expecting the activity to stop. A noteworthy example of a harm reduction approach is to reduce drug-related harm via a methadone or needle exchange program without stopping drug use.[53] In bed sharing and SIDS reduction, the harm of bed sharing is a choice that is being made by an adult for an infant, potentially placing the infant at risk when other successful options, such as room sharing, are available. There is a level of pragmatism that is involved with any harm reduction strategy and the acceptance that a certain number of parents choose to bed share, regardless of the documented risk, would fit in this category. A harm reduction approach is a tertiary prevention approach, accepting that the condition of SIDS while bed sharing will exist, and attempts to lessen the risks whereas, a primary prevention approach addresses the health issue before it is created by providing parents with options that are known to be protective for SIDS, such as room sharing.

Some have proposed that bed sharing can be conceptualized in terms of a benefits-risks continuum ranging from less risk and, perhaps, protective on one end to risky or lethal on the other end. To date, the only SIDS related protective aspect of bed sharing is limited to reducing infant head covering and the risky or lethal factors of bed sharing identified in the literature are numerous and range from strangulation, suffocation, entrapment, and overlays, at worst, and, at best, being consistently associated with higher SIDS rates. Harm reduction strategies would need to significantly reduce the risk posed to infants by the adult bed, identified as a 40 times greater risk than cribs and cradles approved for infant sleep, as well as, address maternal issues of overtiredness, a reason often used for bringing the infant to bed, and smoking and alcohol and drug use. Since not all risk factors associated with bed sharing can be controlled, such as the level of caregiver exhaustion and infant overheating, recommendations for *safe* bed sharing cannot be provided.

It is up to health professionals, using the most recent research, to determine whether it is primary or tertiary prevention that will have the greatest impact on infant mortality. Strategies to educate and support parents regarding best parenting practices are required. Time is more aptly spent in helping to support parents to successfully breastfeed their infants and place them to sleep in a manner where the least amount of risk from SIDS occurs; **in a crib or cradle that meets current safety regulations, in the same room, separate but proximate to the parents, day or night**,[36 46] following guidelines from the Canadian Paediatric Society and the American Academy of Pediatrics.[24 36 46]

Current Recommendations For Parents

Many organizations have used research to develop recommendations for reducing the risk of SIDS and providing guidance regarding safe infant sleep practice and trying to address the issue of bed sharing and breastfeeding. Guidelines and parent information sheets that were distributed at the Roundtable Session on *Back to Sleep* co-hosted by the Public Health Agency of Canada and the Canadian Foundation for the Study of Infant Deaths, in October 2008, as well as, guidelines and parent information sheets posted on the Internet from Australia, New Zealand, England, Canada and the United States were reviewed. Many of the guidelines have used position statements from national professional bodies, such as the Canadian Paediatric Society,[54] the American Academy of Pediatrics, the

National Health Service (United Kingdom) and *SIDS and Kids* (the Australian non-government organization working with the Australian Government, Maternal and Child Health) as the foundation for their recommendations. Without exception, all provided the following recommendations:

- the back to sleep position for infant sleep
- a smoke free environment
- infants should not be placed to sleep on chairs, sofas, waterbeds, or cushions, with or without sleeping with someone else.[1 34 54 55 56 57 58 59 60 61 62 63]

Recommendations, based on the research findings that there is a protective effect from room sharing, offer very specific advice to parents that the safest place for an infant to sleep for the first six months of life is in their own crib or cot, near their parents in their room and advise against bed sharing because of the potential risk of SIDS or SUID.[1 54 56 57 58 59 60 62 63] Sometimes guidelines and parent information sheets provide additional advice about bed sharing conditions that pose the greatest risk for SIDS and give strategies to mitigate against some of the risks such as entrapment and soft bedding, as well as, advising the parents not to smoke, drink alcohol or take drugs.[56 58 60 61 63] The issue of overtiredness is not addressed, possibly as this state is common for new parents and one of the reasons they report choosing to bed share. Often the joy of cuddling or feeding the baby in the parental bed is recognized and strategies to support parents while reducing risk are provided by advising parents to place the baby back to sleep in their own crib or cot, proximate to the parents' bed after the feeding.[55 63] Sometimes advice is given to alert others sleeping in the bed that infant feeding is taking place to facilitate the mother not falling asleep and ensuring the infant is returned to the crib.[59] In some instances, documentation of a parent's choice to bed share was required in the infant's file. Overall, most recommendations advised parents to room share with their infants as a first choice.

In addition, general recommendations that were frequently identified but were not consistently provided in the information that parents received were things such as keeping babies head uncovered, avoid overheating the infant [55 57 59 60 61] and the use of a pacifier at bed time and nap time after breastfeeding is established at approximately one month of age.[1 56 58 62]

Future Recommendations

The specifics of what creates the safest sleep environment for an infant can be very confusing, especially to parents that are overwhelmed with the responsibilities of a new baby and suffering from information overload and exhaustion. Often parents, in their desperation for both their infants and themselves to get some sleep, will find wisdom and comfort in advice from friends, family and the media that can be ill advised and anecdotal and does not consider scientific findings. Research has shown that parents are not always well informed of the specific risk and protective factors related to SIDS. In fact, when mothers were surveyed in New Zealand, the protective benefits of room sharing were not well known and only 39% of infants were sleeping in the crib in the parents' room.[64]
It is the job of health professionals to provide information about the risk of SIDS and strategies that will assist parents in providing the safest possible sleep environment for

their infants while still recognizing the parents' needs. In much the same way that injury related deaths can be prevented by promoting safe environments for infants, SIDS deaths can be reduced if risk factors are addressed. Research has repeatedly identified the safe, breast feeding friendly option of room sharing as a way to reduce the incidence of SIDS, but the controversy regarding bed sharing has overwhelmed researchers and practitioners in the pursuit of finding the answer to whether bed sharing is safe or not. While the literature has not been able to provide a causal relationship between bed sharing and SIDS, bed sharing has been identified in relation to SUID and is still strongly associated with a greater proportion of SIDS deaths than for those infants sleeping in cribs or cots. The link between bed sharing and the higher prevalence of SIDS, even when parents do not smoke currently has many variables (e.g. sleep environment, status of parental smoking, alcohol, drugs and overtiredness) and the harm reduction messages regarding how to bed share safely are complex and confusing. Focusing prevention efforts on the known protective strategy of room sharing for SIDS reduction may be the only choice until such time as the relationship between bed sharing and SIDS is more fully understood.

Bed sharing has been shown to increase the duration and frequency of breastfeeding and augment the opportunity for bonding, but these benefits are outweighed by the risk attributed to bed sharing. Many families have breastfed and developed strong infant bonds without bed sharing, supporting the notion that bed sharing is not imperative for the success of either breastfeeding or bonding. It is also important to examine whether the same beneficial effects of bed sharing on breastfeeding can be found when the infant room shares, the safest infant sleeping environment that is found to half the risk of SIDS.[49]

There is no doubt a need for further research to fully understand the impact of bed sharing on SIDS and SUID. Specific information on the frequency and duration of bed sharing in Canadian and other industrialized nations' households, as well as, the impact of bed sharing and room sharing on breastfeeding will help us better understand the effect on SIDS and SUID. Further understanding the practice of bed sharing is not only important in the effort to reduce SIDS and SUID but also to better understand cultures that may be new to North America and have practiced bed sharing as the norm in their own countries. The data sets of many of the large case-control studies are almost a decade old and it would be important to see what influence the recommendations from the last ten years have had on SIDS. Further study is also required to understand the impact of SIDS and SUID on low socioeconomic families as they are over-represented with regard to SIDS and SUID and bed sharing.

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Appendix 1

Abstracts in Social Gerontology
Ageline (Ovid)
AGRICOLA
Allied & Complementary Medicine Database (AMED)
Alt-Health Watch
Animal Behavior Abstracts (Full Archive)
Applied Science & technology (Full Text)
Agualine
Biological & Agricultural Index Plus
Biological Sciences
Biosis Review
Books 24 X 7 Referenceware for Professionals
CAB Abstracts (Ovid)
Canadian Newstand
CBCA Current Events
CBCA Reference
Child Development & Adolescent Studies
CINAHL Plus with Full Text
Computers & Applied Sciences Complete
CSA Illustrata: Natural Sciences
Environment Complete
Environmental Sciences & Pollution Mgt.
Evidence Based Medicine (EBM) Reviews-ACP Journal Club (Ovid)
Evidence Based Medicine (EBM) Reviews Cochrane Controlled (Ovid)
Faulker Advisory for IT Studies (FAITS)
Geo Ref.
Health and Psychosocial Instruments (HAPI) (Ovid)
Health & Wellness Resource Center
Health Source: Nursing/Academic Edition
Health STAR (Ovid)
History of Science, Technology & Medicine
IEEE Electronic Library Online
International Pharmaceutical Abstracts (Ovid)
Knovel Library: Engineering, Life Sciences & Chemistry collections
MEDLINE (Ovid)
New York Times Online
Newspaper Source
Oxford Journals
Petroleum Abstracts
PILOTS (Published International Literature on Traumatic Stress)
Pollution Abstracts
Psychology & Behavioral Sciences Collection
Psyc INFO (Ovid)
Pub Med
Regional Business News

Safari Technical Books
SAGE Health Sciences
SAGE Psychology
Science Direct Journals
Scopas
Springer Link Contemporary
Wall Street Journal
Web of Science
Wildlife & Ecology Studies Worldwide