REVIEW

Recommendations for sudden infant death syndrome prevention: a discussion document

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This article reviews the evidence for the current UK Department of Health recommendations for prevention of sudden infant death syndrome (SIDS) and suggests other factors that should be considered. The wording of the Department of Health recommendations for SIDS prevention has changed over the past 6 years, but the specific recommendations are largely consistent with the scientific evidence. The emphasis on thermal and illness factors and immunisation could be reduced. Bed sharing and sharing the parental bedroom should be given more emphasis. Two major recommendations need to be discussed in greater detail: (1) breast feeding and (2) pacifier use. Meta-analyses or reviews looking at each risk factor or a combination of risk factors are required. Further, it is recommended that a committee is established that reviews the recommendations and publishes the evidence that leads to these recommendations, as is done by the American Academy of Pediatrics Taskforce on Sudden Infant Death Syndrome.

tion of cot death. The Foundation for the Study of Infant Deaths definition equates cot death with sudden unexpected death in infants (SUDI).⁸ Some SUDI cases can be explained after a thorough autopsy and examination of the circumstances of death. Those that remain unexplained are certified as SIDS. However, this definition of cot death is not used by others. The World Health Organization International Classification of Diseases (ICD) classifies cot death (or crib death in the US) under the rubric SIDS (ICD9 797.0; ICD10 R95), and thus cot death is synonymous with SIDS, not with SUDI. The pamphlet mixes SIDS-specific prevention messages with general advice, and yet omits other advice that is associated with reduced infant mortality, such as breast feeding⁹ and immunisations.¹⁰

This paper reviews the recent changes in recommendations as they relate to SIDS, reviews the evidence for the current recommendations and suggests other factors that should be considered. The aim is to stimulate debate and encourage the establishment of a committee to advise the Department of Health on strategies to prevent SIDS.

THE CHANGING RECOMMENDATIONS

Table 1 summarises the recommendations of the Department of Health in 2000, 2004 and 2005, and whether they have changed. I found no changes in the messages between 2004 and 2005, although there were minor changes in the layout of the pamphlet ("Reduce the risk of cot death"). Although some of the wording changed between 2000 and 2004/5, many of the recommendations in essence remain the same.

DEPARTMENT OF HEALTH RECOMMENDATIONS

Sleeping position

That there is a causal association between prone sleeping position and SIDS is beyond dispute. Many case-control studies identified the association,^{11–12} and there has been a close temporal relationship between when the "Back to Sleep" recommendation was made and the fall in SIDS and total postneonatal mortality.^{13–14}

Most studies^{15–19} but not all²⁰ find an association between side sleeping position and SIDS. The reduction in side sleeping position is probably resulting in the ongoing but smaller fall in SIDS

Abbreviations: ICD, International Classification of Diseases; SIDS, sudden infant death syndrome; SUDI, sudden unexpected death in infants

The "Back to Sleep" campaign began in December 1991 in England and Wales, following the lead of The Netherlands, New Zealand and Australia. The campaign has been spectacularly successful, with mortality from sudden infant death syndrome (SIDS) more than halved. However, SIDS remains a leading cause of mortality in the first year of life. On the basis of evidence that sleep position is causally related to SIDS, advice has been offered to parents on other infant care practices that might be implicated in SIDS. The UK Department of Health has issued advice on the prevention of cot death three times since 2000.^{1–3} The statements usually provide simple messages for the public, but the evidence for these recommendations has not accompanied this advice. In most instances, the new advice is offered because there is new information. At times, specific messages are dropped without explanation. In my opinion, some of the current advice is based on limited information. The American Academy of Pediatrics Taskforce on Sudden Infant Death Syndrome periodically provides evidence-based advice.^{4–6} Its advice may stimulate heated debate,⁷ but at least it enables others to judge the evidence for themselves.

The advice given to parents by the Department of Health is in the pamphlet entitled "Reduce the risk of cot death". Although it is not specified in the pamphlet, the Department of Health uses the Foundation for the Study of Infant Deaths defini-

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Table 1 The Department of Health recommendations for SIDS prevention in 2000 and 2004, and whether they have changed

2000 ¹	2004 ² and 2005 ³	Changes
Place baby on its back to sleep	Place your baby on the back to sleep	No change
Create a smoke-free zone around your baby	Do not let anyone smoke in the same room as your baby	No change
Do not smoke or let your partner smoke near you when you are pregnant	Cut smoking in pregnancy,—fathers too!	No change
Do not let your baby get too hot	Do not let your baby get too hot	No change
Place your baby in the “feet to foot” position	Keep your baby’s head uncovered—place your baby in the “feet to foot” position	No change
Have your baby immunised, there is evidence to show this reduces the risk of cot death		Dropped
Do not fall asleep on a sofa with your baby		Now included in the section on keeping head uncovered
If you are a smoker, have been drinking alcohol, are very tired or if you are taking drugs or medication that may make you sleepy do not share a bed with your baby	Do not share a bed with your baby if you have been drinking alcohol, take drugs or if you are a smoker	No change
Keep your baby’s cot in your bedroom for the first six months of life		Now included in the section on keeping head uncovered: ‘The safest place for your baby to sleep is in a cot in your room for the first six months of life’
	If your baby is unwell, seek prompt advice	Previously included in general advice

and all-cause postneonatal mortality. Side sleeping position doubles the risk of SIDS, probably owing to the side position being relatively unstable, resulting in some infants turning to the prone position.

Maternal smoking in pregnancy

More than 60 studies have shown that maternal smoking in pregnancy is associated with an increased risk of SIDS, and the magnitude of the effect seems even larger since the reduction in SIDS.^{21–24} Many of the studies show a dose effect; the more that is smoked the higher the risk of SIDS. This is often displayed on a linear scale as in the “Reduce the risk of cot death” pamphlet (fig 1). The recommendation to reduce the amount smoked is valid, but fig 1 shows that the greatest benefit is obtained by reducing the amount smoked by those who smoke the most. In fact, the odds ratios (ORs) are additive on a logarithmic scale, and thus the greatest benefit is achieved by getting light smokers to stop rather than heavy smokers to reduce the amount smoked. Using the ORs in the Department of Health figure, reducing maternal smoking from >20 cigarettes per day to 10–19 per day lowers the risk by one quarter, whereas getting those who smoke 1–9 per day to stop lowers their risk by three quarters.

The recommendation that partners should not smoke near the mother when she is pregnant is based on limited evidence. The effect of paternal smoking in the absence of maternal smoking on birth weight is estimated to be <30 g,²⁵ it is thus unlikely that sufficient tobacco products would cross the placenta and alter SIDS risk.

Environmental tobacco smoking

It is difficult to separate the effects of postnatal environmental tobacco smoke exposure from earlier effects of smoking in pregnancy.²⁶ One way to do this is to examine the effects of paternal smoking where the mother is a non-smoker. The summary OR has been estimated to be 1.47, which is considerably less than that for maternal smoking, suggesting the predominant effect is in utero.²⁴

Alternatively, one can look at the effect of smoking by household members other than that of the parents. Four studies have examined smoking by other household members and either adjusted for maternal smoking^{27–29} or restricted the analysis to maternal non-smokers.³⁰ Two studies showed a small statistically significant increased risk,^{27 30} and two showed no additional risk.^{28 29}

Thermal factors

Case-control studies before the “Back to Sleep” campaigns showed that there was an increased SIDS risk with thermal factors, such as heating being on all night and excess clothes and bedding.^{31–34} Further examination of these studies has shown that the increased risk with thermal factors is predominantly among infants sleeping in the prone position. In recent studies where few infants sleep prone, there is limited evidence that these thermal factors are important.^{16 35} The emphasis on this factor could be considerably reduced, and possibly removed.

Head covering

Many case series have reported that 25–40% of infants found dead have their heads covered by bedding.^{16 19 36–38} Whether this is an agonal event or part of the causative pathway has never been established. If it is causally related to SIDS, then attempts to avoid this occurring makes excellent sense. Beal³⁹ recommended not having any bedclothes. It has been postulated that placing infants in a sleeping sack reduces the risk of head covering and thus their risk of SIDS.³⁶ Placing infants at the foot of the cot (“feet to foot”) and thus reducing the chance of head covering is an attractive idea, but there is no evidence suggesting that this lowers the risk of SIDS.¹⁶ Unfortunately, if the cots are large enough that the infant can be placed at the foot, they are often wide enough to allow the infant to twist sideways under the blankets. These suggestions are based on little evidence and need further study before they are recommended.

Figure 1 The risk of sudden infant death syndrome and the number of cigarettes smoked on a linear scale (A) and the correct logarithmic scale (B).

Bed sharing

This remains controversial although the epidemiological evidence is clear. Bed sharing increases the risk of SIDS.^{19 40–44} Most^{19 40 41 43 44} but not all⁴² studies show that the increased risk of SIDS with bed sharing is predominantly among infants of mothers who smoke. The major controversy is whether infants of non-smoking mothers are at increased risk. Individually, only some studies have shown an effect,^{20 44} but a meta-analysis has shown an increased risk.¹⁵ More recently, however, the European Concerted Action on SIDS Study has shown an interaction among infant age, smoking and bed sharing.¹⁹ Infants aged <12 weeks born of non-smokers are at increased risk of SIDS with bed sharing compared with infants of non-smoking mothers not bed sharing.⁴⁵ However, this increased risk is quite small compared with infants of maternal smokers who bedshare.

Some have argued that it is the type of families that share beds that increases the risk rather than bed sharing itself,⁴⁶ but this is unlikely. The fact that infants who are placed back in the cot after breast feeding or cuddles are not at increased risk, and that the risk increases with the duration of bed sharing, suggests that the problem is related to bed sharing rather than other factors.

Sleeping with older siblings is especially dangerous. No data are available on whether twins sleeping together are at similar high risk.

The mechanism by which cosleeping increases the risk of SIDS is unknown. Postulated mechanisms include airway obstruction, thermal stress, head covering and hypoxia due to rebreathing of expired gases. Cosleeping promotes infant arousals,⁴⁷ which does not support the hypothesis that arousal defects may be part of the causal pathway for SIDS.⁴⁸

Sofa

Infants sleeping on a sofa have been shown in UK studies to be at risk, both in itself and when sharing the sofa with an adult.^{16 42} Although the attributable risk is between 6% and 10%, the risk is high and avoidable. It would therefore seem reasonable to maintain this message.

Sharing the parental bedroom

Sharing the parental bedroom, but not the parental bed, has been shown in several studies to be associated with a reduced risk of SIDS compared with infants sleeping in a separate bedroom with or without siblings.^{19 42 43 49} It is not clear why babies sleeping in the parent's bedroom are at reduced risk of SIDS. The recent advice from the Department of Health "The safest place for your baby to sleep is in a cot in your room for the first six months of life" covers this and cosleeping, but the advice is not explicit as to which components are most important.

Illness and infection

"If your baby is unwell, seek prompt advice" was added to the specific SIDS prevention advice in 2004. Although there is a relationship between illness, usually mild, and SIDS, mild illness is prevalent among the controls, and thus few infants who are unwell will subsequently die of SIDS^{32 33 35 50} or an explained cause. Infection has been shown to interact with sleeping position, so that infection is only a risk for SIDS in prone-sleeping infants.³³ A recent study from Germany has shown that infection is not a risk factor for SIDS in a population where few infants sleep prone.⁵⁰ Thus, illness recognition might be dropped from SIDS prevention advice, although retained in general advice to parents. Although the Department of Health pamphlet provides guidelines as to which symptoms families should take particular notice of, this is not readily available. In New Zealand, a list of such symptoms and signs ("Danger signals") are on the back of the parent-held *Well child health book*, and thus are readily available.⁵¹

Immunisation

As immunisations in the first year of life are given around the time of the peak incidence of SIDS, it is not unexpected that some deaths will occur in close temporal relationship with immunisation, which has led to the suggestion that immunisations cause SIDS.^{52 53} Several studies have examined this relationship, and most suggest that the risk of SIDS is lower in immunised infants than in those not immunised.^{54–57} The association is weakened after controlling for socioeconomic status. Probably, the reduced risk is explained by socioeconomic factors and children who had minor illnesses were not immunised. The UK is the only country that included this among its recommendations for SIDS prevention. It seems appropriate to drop this recommendation as a SIDS prevention strategy, but of course maintain it in the general advice to parents.

Safe sleeping environment

Avoidance of soft sleeping surfaces, pillows, duvets and sheepskins has been recommended by the American Academy of Pediatrics.^{5 6} Infants using an adult pillow seem to be at increased risk of SIDS,^{41 58 59} but the association with duvets is complex. Duvets vary in size from being the size of the mattress as in Australia to being larger and able to be tucked in as in the UK and New Zealand.⁶⁰ This makes extrapolation from one study to another more difficult. Most studies,^{19 37} but not all,⁶⁰ have shown an increased risk of SIDS with duvets, which may partly be related to the thermal properties and partly to the risk of head covering and rebreathing of expired air. The increased

risk may also be related to bed sharing with an adult, but this has not been examined in detail.

OTHER RECOMMENDATIONS

Breastfeeding

Advice to breast feed if possible is included in the SIDS prevention programme in New Zealand, but is not mentioned in the UK Department of Health advice. Almost all studies show that breast feeding is associated with a reduced risk of SIDS.⁶¹ However, in countries such as the UK where breast feeding rates are low and strongly associated with socioeconomic status, adjustment for socioeconomic status decreases the level of protection, leading some authors to conclude that there is no reduced risk.^{16–62} However, the larger studies consistently show a reduced risk of SIDS with breast feeding even after adjustment for socioeconomic status.^{20 63–65} Breastfed infants have more arousals than bottle-fed infants, which may explain a possible protective effect.⁶⁶ In addition, breast feeding reduces infection, which could also be the protective mechanism.⁶⁷

Even if the recommendation to breast feed is not included in the specific SIDS prevention advice, it should be included in the general advice, as it reduces morbidity and mortality in infants even in developed countries.⁹

Pacifiers (dummies)

For several years now, The Netherlands has recommended the use of pacifiers in bottle-fed infants. In October 2005, the American Academy of Pediatrics recommended the use of a pacifier throughout the first year of life. Two recent meta-analyses have shown that pacifier use in the last sleep is associated with a reduced risk of SIDS.^{68 69} Hauck *et al.*⁶⁸ recommended pacifier use up to 1 year of age. Concerns about possible adverse effects, especially on breastfeeding, and an increase in otitis media, led the other review⁶⁹ to recommend that pacifier use should not be discouraged, but not specifically recommended.

CONCLUSIONS

The wording of the Department of Health recommendations for SIDS prevention has changed over the past 6 years, but the specific recommendations are largely consistent with the scientific evidence. Two major recommendations need to be discussed in greater detail: (1) breastfeeding and (2) pacifier use. The evidence that breastfeeding is protective is consistent in the larger studies and there is a plausible biological mechanism. Breastfeeding rates in the UK are poor, and thus the proportion of SIDS that might be attributable to bottle feeding is high. Although sleeping in the parent's bedroom is implied in the recommendation "The safest place for your baby to sleep is in a cot in your room for the first six months of life", this needs to be made more explicit.

General practitioners and health visitors provide advice to parents. They have access to the Department of Health recommendations, but have to go to the original literature to find the evidence supporting these recommendations. Meta-analyses or reviews looking at each risk factor in turn are required, as has been done recently with pacifiers and SIDS, and previously with prone sleeping position and SIDS. Further, the establishment of a committee that reviews the recommendations and publishes the evidence that leads to these recommendations, as is done by the American Academy of Pediatrics Taskforce on Sudden Infant Death Syndrome, is required.

Although mortality due to SIDS has decreased, application of current knowledge is predicted to reduce SIDS further.

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