

REVIEW ARTICLE

## Updated Swedish advice on reducing the risk of sudden infant death syndrome

Göran Wennergren (goran.wennergren@pediat.gu.se)<sup>1</sup>, Kerstin Nordstrand<sup>2</sup>, Bernt Alm<sup>1</sup>, Per Möllborg<sup>1</sup>, Anna Öhman<sup>1</sup>, Anita Berlin<sup>3</sup>, Miriam Katz-Salamon<sup>4,\*</sup>, Hugo Lagercrantz<sup>4</sup>

1.Department of Paediatrics, University of Gothenburg, Queen Silvia Children's Hospital, Gothenburg, Sweden

2.National Board of Health and Welfare, Stockholm, Sweden

3.Centre for Family and Community Medicine, Department of Neurobiology, Care Sciences and Society, Karolinska Institute, Stockholm, Sweden

4.Department of Women's and Children's Health, Karolinska Institute, Stockholm, Sweden

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### Correspondence

Professor G Wennergren, Department of Paediatrics, University of Gothenburg, Queen Silvia Children's Hospital, SE-416 85 Gothenburg, Sweden.

Tel: +46-31-343-46-12, +46-705-37-46-12]

Fax: +46-31-84-34-53]

Email: goran.wennergren@pediat.gu.se

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\*Deceased.

### ABSTRACT

This article reviews updated advice and factual material from the Swedish National Board of Health and Welfare on reducing the risk of sudden infant death syndrome. Issues covered by the guidance for parents and healthcare professionals include sleeping positions, smoking, breastfeeding, bed sharing and using pacifiers.

**Conclusion:** The guidelines conclude that infants under three months of age are safest sleeping in their own cot and that a pacifier can be used when they are going to sleep.

In the winter of 2013–2014, the Swedish National Board of Health and Welfare published updated advice for parents on ways to reduce the risk of sudden infant death syndrome (SIDS) (1). The aims were to maintain the current low Swedish incidence of SIDS and reduce it still further. A few months later, the National Board of Health and Welfare supplemented the advice with a comprehensive publication on SIDS called *Reducing the risk of cot death – a guide for healthcare professionals* (2,3). This review presents, and comments on, the new advice for parents and the guide for healthcare professionals. For definition of SIDS, see Box 1.

### HISTORICAL PERSPECTIVE

What we call SIDS has always existed. The first known description of a case of SIDS can be found in the Old Testament, in the First Book of Kings. In a story that illustrates the wisdom of King Solomon as a judge, it says: 'And this woman's child died in the night; because she

overlaid it' (4). The view that the deaths were caused by the mother lying on top of her infant is also reflected in the old Swedish provincial laws from the 13th and 14th centuries. A woman who had laid on her child could be punished (5).

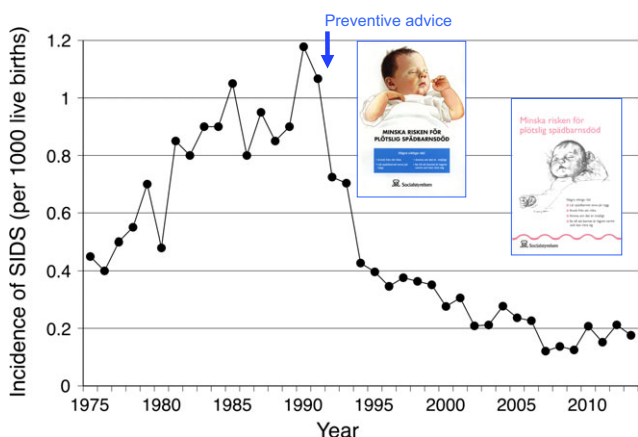
When child mortality due to infections became rare in the mid-20th century, it became more obvious that some infants died suddenly and unexpectedly. In Sweden, cot deaths started to attract attention in the 1960s (6). The incidence of cot deaths was around one per 2000 live births from 1960 to the beginning of the 1970s. The incidence then started to rise during the 1970s (7). During the 1980s, the increase in SIDS incidence became wor-

### Box 1

Sudden infant death syndrome (SIDS) denotes the sudden and unexpected death of an infant where the cause of death cannot be determined despite a thorough history, inspection of place of death or forensic autopsy.

### Key Notes

- This article reviews updated advice and factual material from the Swedish National Board of Health and Welfare on reducing the risk of sudden infant death syndrome.
- Issues covered by the guidance include sleeping positions, smoking, breastfeeding, bed sharing and using pacifiers.
- The guidelines conclude that infants under three months of age are safest sleeping in their own cot and that a pacifier can be used when they are going to sleep.



**Figure 1** Incidence of SIDS in Sweden, 1975–2013. Statistics from the Swedish National Board of Health and Welfare from 1990 to 2013. The cover pages of previous parental brochures from the National Board of Health and Welfare, *Reducing the risk of cot death* [Minska risken för plötslig spädbarnsdöd], are inserted. Figure from (ref. 2).

rying both in the Scandinavian countries and in other Western countries (Fig. 1).

#### APPEARANCE OF PREVENTIVE ADVICE

A change in childcare practices that occurred at the beginning of the 1970s was that babies were no longer put on their backs or sides to sleep but in a prone position. Unfortunately, the possible consequence of a prone sleeping position in terms of the increased risk of SIDS did not start to be understood until the second half of the 1980s (8–10).

The breakthrough in reducing SIDS came around 1990. Two pivotal case–control studies, one in England and the other in New Zealand, convincingly demonstrated that prone sleeping increased the risk of SIDS (11,12). This insight rapidly spread throughout the Western world and parents started to place their babies on their backs to sleep. In early 1992, the National Board of Health and Welfare in Sweden issued advice against prone sleeping for infants (13). It resulted in a rapid decline in the incidence of SIDS (Fig. 1). Maternal smoking during pregnancy was shown to be another important risk factor for SIDS (12,14–18). The welcome reduction in smoking during pregnancy in the last two decades has certainly contributed to the continued reduction in the incidence of SIDS even when few infants sleep prone.

Today, SIDS is uncommon in Sweden. The number of SIDS cases has decreased from 146 cases in 1990 to 24 cases in 2012 and 20 cases in 2013. This means that the incidence has gone down from 12 infants per 10 000 live births to two infants per 10 000 births. Since 1992, the National Board of Health and Welfare has provided advice to reduce the risk of SIDS (13). As time has passed, the advice has been updated. The preventive SIDS advice has been very successful. However, in recent years, new knowledge has appeared, making a new update necessary.

#### Box 2

The new advice from the Swedish National Board of Health and Welfare on reducing the risk of SIDS (1,2):

- The infant should sleep on its back.
- Smoking and nicotine should be avoided.
- The infant's face should be kept free, overheating should be avoided, and movement should not be restrained.
- The safest place to sleep for an infant under three months is in its own cot.
- Mothers should breastfeed if possible.
- A pacifier (dummy) can be used when the infant is going to sleep.

A systematic review of the literature on SIDS led to six pieces of advice to parents, fully referenced in the following sections, to reduce the risk of SIDS (see also Box 2):

- The infant should sleep on its back.
- Smoking and nicotine should be avoided.
- The infant's face should be kept free, overheating should be avoided, and movement should not be restrained.
- The safest place for an infant under three months to sleep is in its own cot.
- Mothers should breastfeed if possible.
- A pacifier (dummy) can be used when the infant is going to sleep.

#### THE BABY SHOULD SLEEP ON ITS BACK

A large number of studies show that the back is the safest sleeping position for babies (11,12,19–21). Moreover, being placed on their side involves a greater risk than being placed supine. A side position as such does not appear to carry an increased risk of SIDS, but the side is a less stable position (22). The increased risk occurs if the baby rolls into a prone position (23).

#### SMOKING AND NICOTINE SHOULD BE AVOIDED

It is well known that smoking during pregnancy increases the risk of SIDS (24) and that the relationship is dose dependent (18). Due the possible dangers of other nicotine-containing products, such as snuff and nicotine chewing gums, these should also be avoided during pregnancy.

One mode of action appears to be that babies who have been exposed to smoking when they were foetuses appear to have impaired arousability (25,26). Impaired arousal of this kind could explain why the risk of SIDS is greater in the babies of smoking mothers, when the mother and the baby sleep in the same bed (23,27). Maternal smoking also appears to affect the autonomic nervous control of cardiovascular function and blood pressure (28). This impairs the baby's ability to maintain autonomic balance, that is homeostasis.

### THE SAFEST PLACE FOR AN INFANT UNDER THREE MONTHS TO SLEEP IS IN ITS OWN COT

This statement has strong scientific support. An extensive study based on individual data from a large number of studies demonstrated that this also applies to breastfed infants and when the mother does not smoke (27). The mechanism can be that the baby's breathing may be obstructed if its face lies against the skin of the adult or is covered by an arm or by bedclothes. Furthermore, it has been speculated that there is a risk of thermal stress for a baby lying next to a warm sleeping adult.

However, we acknowledge that this advice has been questioned. One criticism has been that it makes breastfeeding more difficult. One option is to breastfeed in bed and then place the baby in a cot next to the parent's bed. The baby should sleep in the same room as the parents, as this carries a lower risk of SIDS than if the baby sleeps in a room by itself (23,29–31).

Another criticism has been that the risk of bed sharing is linked to specific hazardous circumstances. In a recent analysis based on two case-control studies conducted in the UK, Blair et al. found that the risk associated with bed sharing was not significant in the absence of hazards like bed sharing with a smoker or with a person who had consumed alcohol or sleeping together on a sofa (32). This applied to infants of less than three months old as well.

If the mother chooses to keep the baby in her bed, bed sharing should be made as safe as possible, by creating a space of its own for the baby, for example. Furthermore, bed sharing should always be avoided during obviously hazardous circumstances, such as when the parents have consumed alcohol.

### MOTHERS SHOULD BREASTFEED IF POSSIBLE

Breastfeeding is associated with a reduced risk of SIDS (33,34). The mechanism mediating the effect is not totally clear. One possible explanation is that breast milk via its antibodies reduces the risk of virus infection, a factor that is often present in cases of SIDS (35). It has recently been demonstrated that interleukin-1 $\beta$ , which is produced during infection, induces the release of prostaglandin E<sub>2</sub>, which impairs respiration via receptors in the brainstem (36,37).

### A PACIFIER (DUMMY) CAN BE USED WHEN THE INFANT IS GOING TO SLEEP

Many studies have found that the use of a pacifier when the baby is going to sleep reduces the risk of SIDS (38,39). One possible explanation could be that the sucking activates muscles in the mouth and pharynx, thereby promoting the patency of the upper airways. Another mechanism could be that the pacifier keeps the airways open mechanically (40). It has also been suggested that use of a pacifier increases arousability from sleep (41). This was, however, not found in later studies (42,43).

A recent review of pacifier use and SIDS from the Physiology and Epidemiology Working Groups of the International Society for the Study and Prevention of Perinatal and Infant Death (ISPID) supported the consistent evidence that pacifier use reduces the risk of SIDS (44). However, the review questioned the explanations of how pacifiers confer protection because the pacifier often falls out of the infant's mouth, often within minutes of the infant going to sleep (41). The authors of the ISPID review asked whether the association between the lack of a pacifier being used by the infant for the final sleep and SIDS could be a marker for something as yet unmeasured (44).

The use of pacifiers has been criticised, as pacifiers have been said to affect breastfeeding negatively. It is, however, difficult to say whether the use of a pacifier *per se* is negative for breastfeeding. It could be that the pacifier merely satisfies the baby's need to suck, especially if the baby is not breastfed.

### ADVERSE EFFECTS

The use of a supine sleeping position has increased the incidence of acquired cranial asymmetry, nonsynostotic plagiocephaly (45–47). The asymmetry falls into three main groups: plagiocephaly (skewed occipital flattening), brachycephaly (symmetric occipital flattening) and combined plagiocephaly-brachycephaly. The advice for parents and the factual material for healthcare professionals focus on how to prevent the development of acquired cranial asymmetry. The most important factor is that the position of the head is varied. The risk of acquiring skull asymmetry is also further reduced if the baby spends time awake in the prone position (48).

### HOW TO COMMUNICATE PREVENTIVE ADVICE

Effective communication on ways to reduce the risk is essential for the successful prevention of SIDS. This information is primarily provided at child welfare centres. One chapter in the guide for healthcare professionals deals with the best way for the nurse at the clinic to inform parents about ways of reducing the risk of SIDS. The guide also discusses ways of talking to parents who have lost their babies.

### APPARENT LIFE-THREATENING EVENTS

The guide for healthcare professionals also addresses related conditions like apparent life-threatening events (ALTE). In recent years, there have been several reports of ALTE affecting newborn babies in the maternity ward (49–52). Many of the events have occurred immediately after birth during early breastfeeding attempts. When placed skin-to-skin, the newborn baby can have problems keeping its airways free. This has resulted in suffocation accidents. To avoid these accidents, it should be stressed that, when a newly born baby is placed skin-to-skin to promote

breastfeeding, checks must be made to ensure that breathing is free.

### BEST HYPOTHESIS OF SIDS PATHOGENESIS

As a result of epidemiological research, the incidence of SIDS has been drastically reduced. In spite of this, we still do not know the exact mechanism, or mechanisms that cause the deaths. The guide for healthcare professionals has a chapter that discusses previous and current hypotheses of the cause of SIDS at length (2,53). The best explanation of SIDS pathogenesis appears to be offered by the triple-risk model originally proposed by Filiano and Kinney (54), and more recently highlighted in other papers (55,56). In this model, findings from different epidemiological studies are brought together to form a plausible pathophysiological scenario.

According to this model, interaction between different risk factors is needed to result in SIDS: (i) a critical developmental period; (ii) a vulnerable infant and (iii) an exogenous stressor (extrinsic risk factor). In a model of this kind, one hypothetical scenario could be a three-month-old baby boy, with a mother who smoked during pregnancy, who sleeps prone with his face towards the mattress. Breathing is obstructed and oxygenation deteriorates, but the expected arousal does not occur, as nicotine exposure has led to a blunted arousal response. A vicious circle with apnoea, bradycardia and asystole is initiated.

### CONCLUSION

Updated Swedish advice and guidance on reducing the risk of SIDS conclude that infants under three months of age are safest sleeping in their own cot and that a pacifier can be used when they are going to sleep.

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