Suffocated Prone: The Iatrogenic Tragedy of SIDS

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ABSTRACT

Epidemiologic research has shown that prone sleeping is a major risk factor for sudden infant death syndrome (SIDS). In a public health review from Sweden, we explored the historical background of the SIDS epidemic, starting with the view of the Catholic Church that sudden infant deaths were infanticides and ending with the slowly disseminated recommendation of a prone sleeping position during the 1960s, 1970s, and 1980s.

The story of the SIDS epidemic illustrates a pitfall of preventive medicine—the translation of health care routines for patients to general health advice that targets the whole population. False advice, as well as correct advice, may have a profound effect on public health because of the many individuals concerned.

Preventive measures must be based on scientific evidence, and systematic supervision and evaluations are necessary to identify the benefits or the harm of the measures.

The discovery of the link between prone sleeping and SIDS has been called a success story for epidemiology, but the slow acceptance of the causal relationship between prone sleeping and SIDS illustrates the weak position of epidemiology and public health within the health care system. (*Am J Public Health*. 2000;90:527–531)

Sudden infant death syndrome (SIDS) increased in Sweden from between 30 and 40 cases per year during the 1970s to almost 155 cases per year in the late 1980s and early 1990s. The rate increased from 0.4 to 1.0 per 1000 live births, becoming the most frequent cause of postneonatal death in infants (Figure 1). The rise of SIDS in Sweden was paralleled in other Nordic countries and also in other Western countries. During the 1960s and 1970s, the incidence of SIDS in the United States, Canada, and England was between 2 and 3 deaths per 1000 children.[1–3] As a result of the increased rate, research on the causes of SIDS became a priority. Most research concentrated on possible physiologic, neurologic, and infectious causes, but several epidemiologic studies also indicated risk factors such as low socioeconomic status and smoking.[4,5] In this complicated multifactorial web, the comprehensive perspective needed to identify the major cause behind the increase in SIDS—the prone sleeping position—was lacking

In 1944, Abramson had proposed in a descriptive study that sleeping prone could be a risk factor in SIDS,[6] and this hypothesis was later supported by 2 case–control studies in 1965 and 1970.[7,8] In an ecologic study published in 1985 that compared the incidence of SIDS in Hong Kong and Europe, sleeping prone was regarded as the crucial difference.[9] In 13 case–control studies of SIDS between 1958 and 1987 in which sleeping position was noted, 7 showed a significant association between sleeping prone and SIDS.[2]

These studies formed the background for the first intervention campaign against SIDS in Holland in 1987, where lectures by pediatricians, arguing against the prone sleeping position, received widespread public attention. Before these lectures, about half of the infants in Holland were sleeping prone. The following year, only 19% of the infants were sleeping prone, and SIDS cases had declined by 40%.[2] However, this uncontrolled result was not accepted as conclusive. Not until the publication of findings from 2 case–control studies in England and New Zealand that showed a SIDS risk increase of 8.8 and 3.5, respectively, for infants sleeping prone[10,11] and a prospective cohort study from Tasmania[12] was the causal link between prone sleeping position and SIDS finally accepted.[13]

Preventive actions varied greatly between countries, however. In New Zealand, a national intervention campaign to change the advice to parents on infants' sleeping position was started in the beginning of 1991, followed by actions in England and Australia later the same year. As a result of these actions, the incidence of SIDS was reduced by 50% within a couple of years in many countries.[14] In the Norwegian county of Hordaland, after an information campaign that started in January 1990, the proportion of infants sleeping prone was reduced from 64% to 8%, and the incidence of SIDS was halved.[15] In Sweden, the decision to change the advice came somewhat later, starting in 1992 and reinforced in 1994, with the same dramatic decrease in incidence.[16]

Later analyses of the decline in SIDS have confirmed that sleeping position was the only factor that had changed, whereas other known risk factors, such as mother's smoking, had not changed.[17] The decline in SIDS has been called a success story for epidemiology.[18] The new recommendation that infants sleep on their backs probably has prevented many thousands of infant deaths in Western countries. A crude estimation shows that in Australia, England, New Zealand, and Norway alone, about 850 infants were "saved" annually as a result of the changed advice.

A Historical Review of Sleeping Position

The iatrogenic tragedy of the SIDS epidemic has similarities to the epidemics of puerperal sepsis in 19th-century lying-in hospitals. Therefore, it is not only of historical interest but also of public health interest to examine the reasons for the introduction of well-intended advice for sleeping prone into the child health care system of a Western country such as Sweden. In a compre-

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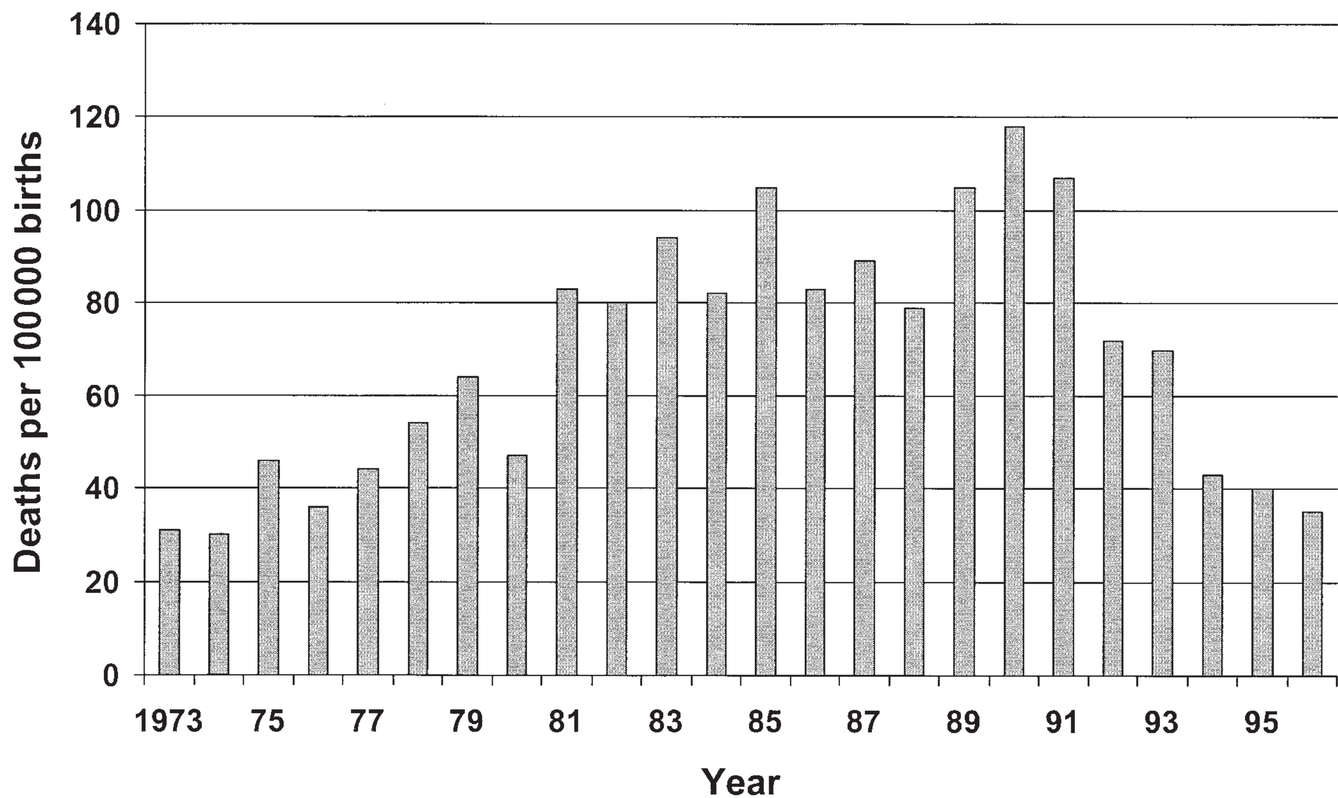

Source. Swedish National Board of Health and Welfare.

FIGURE 1—Incidence of sudden infant death syndrome per 100 000 live-born infants: Sweden, 1973–1996.

hensive historical, country-specific review of Swedish records, we explored the documentation of the sleeping position and sleeping location of infants and the common perceptions of the causes of sudden infant death. The objective of this study was to assess the historical background of the advice on sleeping prone.

For this review, data and information relevant to the subject were systematically extracted by means of key words such as "Sweden," "SIDS," "cot death," "infant suffocation," "child care," "child sleeping," and "prone sleeping." Information was retrieved from the following sources: English bibliographies (1950–1996), MEDLINE (1966–1996) and SPRILINE (1983–1996), and the *Swedish Medical Journal* (1960–1978). Retired child nurses and pediatricians were used as key informants. Questions considered during the review of the literature were (1) What opinions existed about the causes of infant suffocation/SIDS, and what preventive actions were taken throughout history? and (2) What is known about earlier supine sleeping among infants, and why and when did the prone sleeping position begin to be recommended?

Infant Suffocation—Accident or Infanticide?

In Latin translations of the Old Testament, sudden infant death was referred to as *infant suffocation* (*oppressio infantium*). The Catholic Church stated in the ninth century that infant suffocation was closely related to infanticide and was a crime against the Fifth Commandment. Infant suffocation was considered to be related to the practice of a mother's having her child in bed with her during the night. Pope Stefan V, who died in A.D. 891, declared that infants were not to be kept with their mothers during the night.[19]

Only 2 Swedish medieval county codes mentioned infant suffocation. The Code of Guta stated that "the mother should care for the child at every drinking bout, put it in the cradle beside her or keep the infant on her knee or put it in the bed and lie beside the child. . . . If the woman goes to bed with a child where drunkards are and the child is suffocated in the crowd, the woman should not pay a penalty, even though she lay beside the child."

Unlike the Swedish medieval county codes, the Catholic church instituted punishment in Sweden for mothers' "suffocating their child," a penance according to canon law. The Catholic Church's view on infant suffocation was taken over by the Protestant Church and the Swedish State. In the Swedish canon law of 1686, no penalty was stated, except that a convict should have the public penance at a general service in which she confessed her guilt and begged forgiveness of God and the congregation and promised to mend her way. The wet nurses who had been responsible for the care of the dead infant should go before a civil judge and receive a strong punishment as a warning to herself and to others.

The Swedish state law of 1734 specified that a mother who had accidentally smothered her child was to be tried by a clergy and by the old man of the parish, with the sheriff present. If the infant had died accidentally, the mother was to be warned but not made to pay a penalty. Otherwise, the case was to be brought before a judge. If the wet nurse had had the child in her bed, she was to pay a penalty, even if the child had not been hurt. If the child had been suffocated or killed by the nurse's neglect, she was to be punished by flogging or sent to prison with water and

bread.[19] Swedish parish deathbooks showed that Protestant clergy did know that infant suffocation was not necessarily deliberate but could be an unintended, lamentable event. Ancient hymnbooks also had prayers for the mother who had accidentally "suffocated her child."[20]

Early Swedish historical research indicated that infant suffocation was a method of family planning, but modern research has not found proof that it was practiced to any great extent.[19] The association between infant suffocation and negligence can be explained by the observation that childhood accidents have always been more common among socially disadvantaged families. Before the increase in the rate of SIDS in Sweden, sudden infant death was described in relation to social misery and neglect,[3] and an international trend in the relationship between sudden infant death and low social status has been described.[4]

In 1755, the Swedish statistician Pehr Wargentin discussed infant suffocation in his analysis of vital statistics. In his analysis, Wargentin found a 0.76% incidence of all live-born infants dying from suffocation, and he thought that this occurred only accidentally. Also in 1755, the peasants stated in the Swedish Parliament that it was self-evident that "when mothers suffocated their children, it was, as a rule, non-intentionally."

In 1740, the Royal Swedish Science Academy discussed the Italian arc (*arccucio*) that the Florentine upper class provided for their children when the wet nurses kept the children in their beds. The Royal Academy proposed that the arc should be introduced in Sweden because "when the child is in this machine, the arc can, in the winter, be covered with bed clothes without fearing that the child will be suffocated." The Italian arc was not used much in Sweden, however. In 1757, the Swedish government instituted an official Wet Nurse's Office, where an employed midwife educated wet nurses on how to swaddle infants and about child care in general. The Wet Nurse's Office also was supposed to educate wet nurses on how to build a cradle so that the child would not be suffocated by the wet nurse.[21]

For children to have their own bed was considered to be a major reform measure to prevent suffocation in the common bed. A campaign to separate mother and child, and wet nurse and child, was started and spread to the parish level. The Parish Church Council stated that "because of the accidents in which mothers unintentionally suffocated their children . . . clergy and the county council members as well as midwifes should use every occasion to make known the dangerous consequences of the child sleeping together with her mother and that the child should have a special sleeping place."[21] The proposal to engage midwives to warn mothers about the risk of child suffocation had been made as early as 1686 but did not become part of the midwifery regulations until 1819, when one of the midwife's duties was to see that the child had his or her own bed. However, ethnologic research from the early 20th century with respondents of very advanced age showed that this health advice was not easily followed. Lactation was facilitated when the mother had her child in her bed, and during the cold winters it was thought necessary to have the infant in the common bed.

Swaddling of infants was common practice among Swedish country people. They thought that swaddling could prevent distortion of legs from rickets, made it easier to keep the infant warm, and allowed the infant to be more easily handled by his or her elder brothers and sisters. They also thought that the newborn could be injured by lying loosely after he or she had just left the cozy womb. Professor David Schultz von Schultzenheim commented on swaddling of infants in his introductory oration to the Swedish Royal Science Academy in 1760. He stated that if parents would stop swaddling their infants, the infants could freely move their arms and legs, and many infants might be saved from being suffocated or accidentally smothered. This view was not accepted by the country people, who said, "I have not heard of any child being smothered by his mother, but I have heard of children who were not swaddled who became entangled in a sheet, or in a quilt, and were suffocated in this way."[22]

Supine Sleeping

Among the Swedish country people in the 19th century, most infants slept on their backs. The infants sometimes lay on their sides, but this was much less common because it was popular knowledge that children lying on their sides could turn onto their stomachs and suffocate. Respondents being interviewed in an ethnologic survey in the early 20th century stated that lying prone increased the risk of suffocation. One respondent reported that most children were lying on their sides and regularly being turned from one side to the other and that they very seldom were laid on their backs because, in that position, the children could be suffocated by their own vomit. The relationship between infants lying on their side and deformation of the skull was well known, and one respondent reported that infants usually lay on their backs so that their skull would not become oval. Other respondents reported that infants should be turned from one side to the other to keep their skull from becoming oval.[20]

The Royal Swedish Science Academy annually published an almanac, and almost every household had a copy. The pediatrician Nils Rosén von Rosenstein[23] wrote chapters on "Information on Children's Disease and Their Cure," but he did not say anything about whether children should sleep prone or supine. He did state, however, that children always should lie with their head a little higher than the rest of their body and that otherwise there could be a risk of stroke. He added that children should not always lie on the same side but should be turned to the other side as soon as they started to grunt during sleep or when they woke up. In this, Rosén von Rosenstein agreed with Soranus from Ephesus (A.D. 100), who said that the infant should have a little pillow in his or her bed—indirect evidence that it was not recommended for children to sleep prone.[24]

In the early 20th century, Swedish pediatricians still recommended that "in his bed the child should lie with the head a bit up, preferably on his back and fully extended."[25] The first shift in this recommendation was noted in the education of Swedish midwives in the 1950s: "If the child lies on his back, vomits could enter the trachea and the child could be suffocated. . . . The child's face should always be free so that nothing can hinder the air from entering the child's mouth and nose." It also was stated that the child should have his or her own bed and that it could be life threatening to sleep with his or her mother, because the child could be suffocated easily in his or her sleep.[26]

The classic book by Benjamin Spock, *The Common Sense Book of Baby and Child Care,* still proposed in 1946 that children should lie on their backs.

> Some say it is a little safer for the baby to sleep on his back in the first six months, so it is better to get him used to that position if you can. There is only one slight disadvantage. A baby on his back tends to turn his head always toward the same side and this may flatten the back of his head on that side. This would not hurt his brains and the head will gradually straighten out as he grows older. If you start early you may be able to get him used to turning his head to both sides by putting his head where his feet were every other sleeping period.[27(p100)]

Prone Sleeping

The good results from transporting critically injured and unconscious soldiers during World War II and during the Korean War while they were lying prone are considered to be one source of the later US recommendation that infants should lie prone. During the

1960s, it was generally believed that American infants slept prone, whereas European infants slept on their backs or sides.[2] In Sweden, the advantage of lying prone to prevent aspiration in injured adults was spread through the Swedish Defense Forces and nongovernmental organizations, such as the Red Cross, into intensive care units and emergency medical units.

In the 1960s, lying prone was considered optimal for the infant and was incorporated into the medical education of students in Sweden. The big turning point in Europe is said to be the pediatric congress in Vienna in 1971, at which several advantages of lying prone were proposed.[14] Physiologic research during the 1960s on preterm children showed that the advantages of lying prone included less risk of gastroesophageal reflux, prevention of scoliosis, better psychomotor development, and relief of infant colic.[2,14] It was also noted that children slept better in the prone position, with fewer screaming periods and less fatigue.[28] Aspiration of food was not considered unusual and was thought to be perhaps related to strict bottle-feeding and to lactation feeding at intervals that did not take into account the child's own demand. Lying prone thus was recommended to prevent aspiration, pneumonia, and death by suffocation. It was also suggested that lying prone prevented subluxation of the hips. Thus, parents, especially parents of children with colic pains and sleeping disturbances, were advised to let their children lie prone.

One reason for the acceptance of the advice on prone sleeping positions was that children who lay prone were noted to sleep better. The 1957 edition of *The Common Sense Book of Baby and Child Care* stated the following:

> A majority of babies seem, from the beginning, to be a little more comfortable going to sleep on their stomachs. This is particularly true of the baby who develops colic; the pressure on the abdomen seems to partly relieve the gas pains. Others either do not care at first or prefer sleeping on their backs. If they vomit, they are more likely to be choked by the vomits. Also they tend to keep their head turned toward the same side—usually toward the center of the room. . . . Within a few weeks babies usually develop such a strong preference for their usual position, stomach or back, that it is quite a struggle to change them. I think it is preferable to accustom babies to sleeping on their stomach from the start if they are willing. They may change later when they learn to turn over. Use no pillow, in crib or carriage. . . . Some physicians recommend that, to avoid the disadvantages to back or stomach sleeping, a baby should be taught to sleep on his side with the aid of firm pillows. In my experience this is very difficult to accomplish; the baby always slides away from the pillow and ends up on the back or stomach. By six months, however, some babies begin to sleep on their side by preference.[27(p163)]

This paragraph was unchanged in the 1972, 1979, and 1985 editions, which were translated into Swedish.[29–31]

The Swedish translation of Penelope Leach's book *Babyhood* also was widely read by the generations giving birth during the 1970s and 1980s. Leach stated that many children preferred to lie prone, but she was also open to children lying on their side as long as they were turned regularly to avoid flattening of the head. However, to prevent aspiration, she cautioned that children should not lie on their backs.[32]

The Swedish Social Medicine Child Care Delegation stated in their publication of 1964 that "some children prefer sleeping prone. Sometimes it could be good for colic."[33] The Swedish Consumer Authority stated in their publication of 1970 that "the infant should be laid on the side or on the stomach to sleep and . . . you should change the sleeping position regularly. Very soon it will be shown how the child prefers to lie; some children lie on their back, others on their stomach."[34] This text was unchanged in the 1979 and 1981 editions.[35,36] The Child Environmental Council's 1980 booklet *For Safety Reasons* included nothing about sleeping position but showed an illustration of an infant sleeping on his back.[37]

It seems that the advice on sleeping prone was informally disseminated among doctors, from doctors to children's nurses, and from doctors and nurses to parents. The advice about which position was most advantageous, however, was not clear-cut. No paper in the *Swedish Medical Journal* from 1960 to 1978 discussed infant sleeping position, and the Swedish National Board of Health and Welfare did not publish any recommendation about sleeping position between 1960 and 1993. Indirect evidence of the unevenness with which prone sleeping was advocated in Sweden comes from the observation that the incidence of SIDS varied substantially among 4 counties from 1968 to 1972.[4] The rate of sleeping prone among Swedish infants during the SIDS epidemic of the 1970s and 1980s is unknown. Case–control studies of SIDS from 1976 to 1987 showed that about 25% to 68% of the infants had been sleeping prone.

The shift in the sleeping position of infants who were born in the 1960s and 1970s is illustrated by the personal experience of one of the authors (E.B.). In 1965, he left his firstborn son sleeping prone in the baby carriage outside a shop, as he had been advised to do in accordance with child health care policy. After a while, an elderly woman came running into the shop, agitatedly explaining that "she had found a child sleeping prone in a carriage." Another example of generations' different views about infant sleeping positions is a report of grandmothers' becoming very upset at seeing their grandchildren sleeping prone in a Laplander sleigh during winter.

Conclusions

What can be learned from the story of the rise and fall of SIDS? In hindsight, we can see how popular knowledge and clinical observations about the hazards of sleeping prone were forgotten, and to some extent ignored, delaying the discovery of the causal link to SIDS. We can also see how advice and measures in public health may be potentially harmful and thus must be adequately evaluated before being introduced. Although the practice of sleeping prone worked well for most infants, it resulted in tragedy for some. The story of the SIDS epidemic is also an example of the contribution that epidemiology can make to the understanding of a major cause of an important public health problem (another such example is smoking). Finally, the history of the SIDS epidemic shows that it is important to differentiate between caring measures for sick individuals and preventive advice targeting the whole population. □

Contributors

U. Högberg and E. Bergström planned the review, performed the analysis, and wrote the paper. U. Högberg compiled the historical material.

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