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Asphyxia in young children

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QISU collects and analyses data from emergency department injury presentations on behalf of Queensland Health. Participating hospitals represent three distinct areas of Queensland.

QISU publications and data are available on request for research, prevention and education activities.

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Summary

- Q 51 deaths were attributed to non-drowning asphyxia in children aged less than five in Queensland during 1994-2000.
- Q Two thirds of these deaths involved infants aged under one year.
- Q Sleep related deaths were the most frequent cause amongst infants.
- Q Amongst toddlers 41% involved rope, cord or strap, 29% foreign body and 29% were sleep related.
- Q 192 children aged less than five presented to QISU hospital EDs with asphyxia related injuries.
- Q Almost half of the children presenting were aged less than one year.
- Q Food, coins and toys were the most frequently identified items involved in these presentations.
- Q 42% of the presentations resulted in hospital admission.
- Q 80% of the infant sleep related deaths were either co-sleeping or not sleeping in an appropriate infant sleeping container.

Introduction

The recent banning in Australia of a jelly confectionary which has been responsible for 15 deaths worldwide, mostly children, highlights the problem of asphyxiation amongst young children. In Australia during 2000, 170 children aged less than five died as a result of injury of which 26 (15%) were attributed to non-drowning asphyxia, which includes choking, strangulation and suffocation¹.

This report examines all unintentional deaths from non-drowning asphyxia amongst children aged under five years in Queensland and presentations to Queensland hospital Emergency Departments (EDs) by children under five years with asphyxia related injuries.

Mortality

During the period 1994 to 2000 there were 51 asphyxia deaths of children aged 28 days to four years in Queensland representing 15% of all injury deaths at that age. Two thirds of these deaths occurred in infants aged less than one year of age.

Although deaths due to injury are relatively uncommon amongst infants, comprising only 10% of all deaths at this age, almost half of

Cause of death	Infant (28-364 days)	Toddler (1-4 years)	Total
Injury			
MV Passenger	6 (8%)	30 (12%)	36 (11%)
Pedestrian – Low speed	2 (3%)	26 (10%)	28 (8%)
Pedestrian – High speed	0 (0%)	25 (10%)	25 (8%)
Drowning – Pool	2 (3%)	56 (22%)	58 (17%)
Drowning – Bath	10 (14%)	7 (3%)	17 (5%)
Drowning – Other	1 (1%)	39 (15%)	40 (12%)
Asphyxia	34 (47%)	17 (7%)	51 (15%)
Fire, flames, smoke	1 (1%)	20 (8%)	21 (6%)
Struck by	3 (4%)	4 (2%)	7 (2%)
Intentional*	12 (16%)	22 (8%)	34 (10%)
Other	2 (3%)	14 (5%)	16 (5%)
Total Injury	73 (100%)	260 (100%)	333 (100%)
SIDS	248	8	256
Medical	388	236	624
All deaths	709	504	1213

Table 1 Queensland child deaths, 1994-2000, children aged 28 days to 4 years, by cause
* Of the intentional deaths 3 were due to asphyxia

these deaths reported were due to asphyxia. This contrasts with the situation for children aged one to four years where over half of all deaths were due to injury but less than 10% of these were due to asphyxia. Drowning was responsible for 40% of the deaths at this age (Table 1)².

The mechanism of asphyxia was different for the two age groups involved. Amongst the older children (1 to 4 years) the most common mechanism reported was Rope, Cord or Strap (41%) followed by Foreign Body (FB) (29%) and Other Sleep Related (29%), while for infants most of the deaths were attributed to Other Sleep Related (85%) the remainder being attributed to Entrapment (Figure 1).

The objects involved among the foreign body asphyxia included a coin and a condom. Amongst the rope, cord or strap asphyxia deaths, two were associated with blind cords, three with rope

swings, one involved a nappy bag strap and one an electric blanket tape.

Of the five entrapment deaths amongst infants one involved a cot, two a portable cot, two a pram or stroller and one an adult bed. The remaining 29 infant deaths were described as *Other Sleeping Related*; that is they were not attributable to SIDS or any medical condition. Two of these deaths were associated with water beds and one with a portable cot.

Hospital Presentations

For the period 1998 to 2001 there were 192 presentations by children aged under 5 years to participating EDs in Queensland with a nature of injury of *Foreign Body in the Respiratory Tract* or *Asphyxia*.

Almost half of the 192 presentations for Asphyxia or FB in Respiratory Tract involved children less than one year of age and almost a third involved those aged one year. Almost 40% of the presentations involved aspiration of food, followed by coins (8%) and toys (3%) (Figure 2). Not surprisingly almost all cases

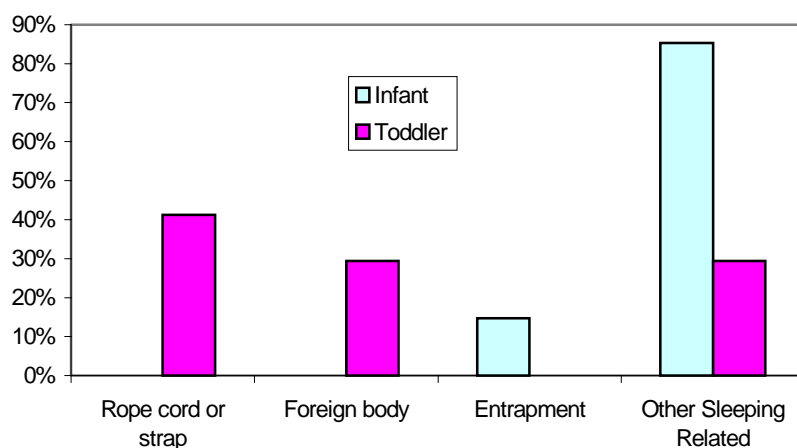


Figure 1 Queensland non-drowning asphyxia deaths, 1994-2000, children 0-4 years, by mechanism.

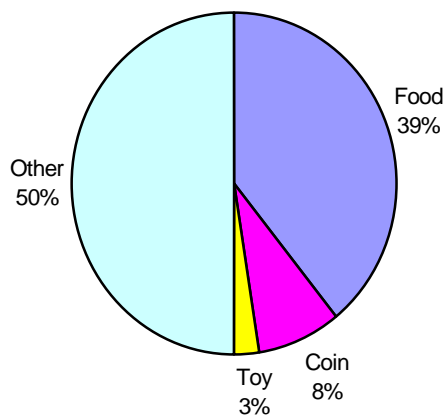


Figure 2 QISU Emergency Department presentations 1998-2001, asphyxia, children 0-4 years, by injury factor.

occurred at home with the most frequent location within the home being the kitchen (23%), bedroom (20%), living or dining room (19%), family room (8%), and garden (5%).

The most common food items inhaled were nuts, fish bones, carrots, apples and sweets. Besides food, coins and toys, other items reported as having been aspirated were beads and other jewellery, insects, seeds and other parts of plants, bean bag beads, staples and stones. Two presentations were as a result of strangulation, one involved a highchair harness and the other a blind cord.

Forty two per cent of the presentations resulted in admission to hospital and 17% had a triage category of Emergency or higher. The relatively high admission rate is an indication of the serious nature of these types of injuries.

Discussion

Morbidity and mortality as a result of non-drowning asphyxia amongst young children fall into four groups. The first group involves aspiration of a foreign body mainly amongst children aged under two years and in most cases does not result in a fatality. The second group often referred to as *other sleep related deaths* or positional asphyxia is almost exclusively confined to infants under one year of age. A third much smaller group involves strangulation by a rope, cord or strap and often results in death. The last group is associated with entrapment usually while sleeping and is often difficult to differentiate from the other sleeping related deaths.

Foreign body

In this study only 3% of asphyxia or FB in respiratory tract injuries involved toys with food being by far the most common cause of choking in young children. These results are similar to that observed in the UK where 5.5% of choking ED presentations and 4% of choking deaths involved toys in children under 3 years³. However, non-food items, although less frequently involved, are more likely to have fatal consequences. Other than food and toys a variety of com-

mon household items have been implicated in asphyxia amongst young children the most common being coins. In 1999 a toddler died in Queensland as a result of aspirating a 10c coin.

Choking episodes with food amongst young children is a common occurrence. Fortunately it is seldom serious enough to require medical attention. However on the few occasions where aspiration of solid food may not resolve itself the situation may require prompt first aid and a trip to the hospital. To avoid such eventualities it is important that caregivers adopt safe food practices and be encouraged to learn emergency first aid for choking in infants⁴.

Rope, cord or strap

A less common but more often fatal mechanism of asphyxia in young children is as a result of strangulation from rope, cord or strap. The seven deaths from this cause reported here highlight the necessity for parents and caregivers to ensure their children do not have unsupervised access to rope swings, that all blind and curtain cords are kept out of reach of toddlers and that their sleep environment is safe from strangulation hazards. A US study found that window covering cords posed an equal or greater hazard to children compared with other hazardous household fixtures or furniture and resulted in the introduction of voluntary standards in that country⁵. Currently in Australia there are no standards covering these products.

Sleeping related

The largest number of asphyxia deaths particularly amongst infants was *sleep related*. The classification of these deaths is problematic in that they are virtually impossible to differentiate from SIDS deaths without a thorough death scene investigation^{6,7}. In Queensland there is no standard protocol in place for investigation of these deaths as there is in other states. This means that some deaths that have been attributed to SIDS may have been in fact *sleeping related asphyxia*.

Details of sleeping arrangements of sudden unexpected deaths in infants since 1997 were ascertained and show 63% of the 30 infant sleep related deaths were cosleeping or bedsharing. There is little data available on the prevalence of bedsharing in Australia but two reports from South Australia and North Queensland put the figure at 1.5% and 13% respectively^{8,9}. Using the North Queensland figures for the non-indigenous population given above the risk of asphyxia for cosleeping is estimated to be 18 times compared to sleeping alone in a cot. Cosleeping is also recognised as a possible risk factor for SIDS particularly amongst infants of parents who smoke or are under the influence of alcohol or drugs¹⁰. A recent followup study looking at long term outcomes relating to bedsharing found that it had neither adverse nor beneficial consequences¹¹.

Of the 10 infants sleeping alone five (50%) were not sleeping in an infant sleeping container. Three were in an adult bed, one a pram or stroller and one on a sofa. The risk of infants sleeping alone not in an infant sleep container, particularly an adult bed, has been highlighted by previous studies into infant deaths^{8,12}.

A significant sub-group of sleep related deaths result from some form of entrapment involving the actual bed, cot or pram (five deaths). The deaths of two infants after becoming entrapped in a stroller indicate that this situation may be a suboptimal sleeping environment for infants. The two deaths associated with portable cots are more problematic as these items are intended for infant sleeping and particular portable cots have been associated with deaths elsewhere¹³. Unfortunately, no information is available on the make or model of cots involved with the deaths reported here.

Conclusion

Non-drowning asphyxia deaths of young children is a significant problem being the second most frequent cause of death due to injury amongst children aged under five years. Although there were a variety of mechanisms involved the high number of sleep related injuries is of concern. The majority of these being associated with cosleeping. Also of concern was the three deaths associated with rope swings. Almost all of these deaths are amenable to prevention either through product modification or standards or changes in infant care practices and supervision.

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Prevention

Safe Sleeping Environment

Information to parents on how to best minimise the risk of SIDS and create a safe sleeping environment is available from SIDS and Kids (National SIDS Council of Australia Ltd) and on their website¹⁴.

Infants should be placed on their back to sleep in their own cot. Ensure that your baby's face remains uncovered and that the cot meets Australian Standards (AS 2172, AS 2195), the mattress fits the cot and is firm, the bedding is safe and the environment is smoke free.

Infants should not be placed alone on adult beds, water beds, bean bags or sofas and parents are encouraged not to co-sleep with their infants particularly if they smoke, have consumed alcohol or drugs or the sleeping environment is unsafe such as on a waterbed or sofa.

Food and other choking hazards

Infants should not be fed small, round, firm or pliable foods that may lodge in the airways but soft foods that dissolve easily, or grated or tiny pieces that do not require chewing. Dangerous foods include chunks of meat or raw carrots, nuts, grapes, hard sweets, bubblegum and popcorn.

Care should be taken with small objects such as coins, batteries and parts from toys and games.

Rope swings

Young children should not have unsupervised access to rope swings.

Cords and strings in the nursery

Strings and cords on infant toys, clothing and bedding should be avoided.

Parents and carers need to ensure that blind and curtain cords are kept out of reach of young children. As in the US, Australia needs to introduce standards for window covering cords.

First Aid

Parents and care givers should be encouraged to learn first aid.

