



# Hazards Associated with Sitting and Carrying Devices for Children Two Years and Younger

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**Objective** To analyze reported mechanisms of injury and characterize risk factors for infants and young children  $\leq 2$  years of age who died in sitting and carrying devices.

**Study design** A retrospective review of deaths involving sitting and carrying devices (car seats, bouncers, swings, strollers, and slings) reported to the US Consumer Product Safety Commission between 2004 and 2008.

**Results** Of the 47 deaths analyzed, 31 occurred in car seats, 5 in slings, 4 each in swings and bouncers, and 3 in strollers. The reported elapsed time between the last time a child was seen by a caregiver and found deceased varied greatly, with a mean of 26 minutes in slings; 32 minutes in strollers; 140 minutes in car seats; 150 minutes in bouncers; and 300 minutes in swings. The cause of death was asphyxiation in all cases except one. Fifty-two percent of deaths in car seats were attributed to strangulation from straps; the others were attributed to positional asphyxia.

**Conclusion** Infants and children 2 years of age and younger should be properly restrained and not be left unsupervised in sitting and carrying devices. Car seats should not be used as sleeping areas outside of the vehicle, and children should never be in a car seat with unbuckled or partially buckled straps. Infants in slings should have their faces visible and above the edge of the sling, should not have their faces covered by fabric, and their chins should not be compressed into their chests. (*J Pediatr* 2015;167:183-7).

Sleep-related infant deaths are the most common cause of post-neonatal infant mortality.<sup>1</sup> Sleep-related death is defined as death occurring during sleep or in a sleep environment, including sudden infant death syndrome (SIDS), accidental suffocation and strangulation in bed, and ill-defined deaths. It is recommended that infants sleep in a crib or bassinet, on their backs, and without loose bedding.<sup>2</sup>

Parents often perceive that their infant does not sleep well in the supine position in a crib, and alternative sleeping environments may be used by parents to calm their child or help the child sleep. Sitting and carrying devices, which include car seats, bouncers (reclined infant seats that allow the occupant who cannot yet sit up unassisted to bounce), swings, strollers, and slings, are purchased by most parents for the primary purpose of transporting infants or confining them. However, many parents find that this may be a convenient and presumably safe place for the infant to be, whether awake or asleep. Indeed, Callahan and Sisler<sup>3</sup> found that 94% of infants younger than 5 months spent 30 minutes or longer in seating devices daily, with a mean time of 5.7 hours per day. He also found that 44% of infants spent some time sleeping in the devices.

There is potential for injury when sitting devices are not used for their intended purpose or as originally designed. Closed-head injuries, skull fractures, broken bones, and suffocation have been reported in various sitting and carrying devices.<sup>4-7</sup> In addition, others have discussed “SIDS” and “sudden unexplained” deaths in sitting devices.<sup>8,9</sup> As early as 1994, sitting devices were noted to be potentially hazardous when infants and young children were placed there for sleep.<sup>10</sup> Specific details surrounding the mechanisms of death in these devices are not known. The goal of this report is to describe particular hazard patterns so that guidance might be provided about using these devices. Accordingly, we reviewed cases from the US Consumer Product Safety Commission (CPSC) to elucidate specific mechanisms of injury of sitting and carrying devices for infants and young children and to develop anticipatory guidance that would be useful for counseling parents regarding the use of these products.

## Methods

We performed a retrospective review and analysis of deaths of children 2 years and younger that occurred in sitting and carrying devices (car seats, swings, bouncers, strollers, and slings) and that were reported to the CPSC from April

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CPR	Cardiopulmonary resuscitation
CPSC	US Consumer Product Safety Commission
INDP	In-Depth Investigation
SIDS	Sudden infant death syndrome

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**Table I.** Hazards of sitting and carrying devices for children 2 years and younger (gender and age ranges for each device)

Device	No.	Male	Female	Unknown	% of total in study	Mean age at death, mo	Median age at death, mo	Age range
Car seats	31	14	16	1	66	9.7	9	1-24 mo
Slings	5	3	2	0	11	2	1	10 d to 5 mo
Swings	4	3	1	0	9	3.6	2.9	18 d to 8 mo
Bouncers	4	3	1	0	9	2.5	2.5	2-3 mo
Strollers	3	2	1	0	6	5.7	7	2-8 mo
Total	47	25	21	1		7.5	7	

2004 to December 2008. Data were obtained through a Freedom of Information Act request to the CPSC. CPSC staff searched the following CPSC databases: the In-Depth Investigation (INDP) file, the Injury or Potential Injury Incident file, and the Death Certificate file. Reporting to the CPSC is voluntary and can be done by anyone, including consumers, medical examiners, retailers, health care personnel, and emergency personnel. Two of the databases (Injury or Potential Injury Incident and Death Certificate) contain information from death certificates and reports from medical examiners, coroners, emergency personnel, and media.<sup>11</sup> In addition, based on reports in these 2 databases, the CPSC conducts INDPs, which include interviews with family members, witnesses, and other local officials about specific cases; the investigation reports are housed in the third database, the INDP. INDPs are assigned by CPSC staff on an as-needed basis depending on resources and the discretion of multidisciplinary teams tasked with reviewing incident information and, as such, do not represent any systematic sampling of the data coming into the agency and cannot be used for statistical purposes. The cause of death determination was abstracted from the reports.

## Results

We analyzed records for 47 deaths associated with sitting and carrying devices for infants and children 2 years and younger. The records received included 22 CPSC INDPs. Two-thirds (31, 66%) of the cases occurred in car seats. The remainder of the cases occurred in slings (5, 11%), swings (4, 9%), bouncers (4, 9%), and strollers (3, 6%) (Table I).

The “elapsed time” is defined as the time between when the infant was discovered and when last seen alive (when available from the records) and is summarized in Table II. The

elapsed time is recorded from the reports, as described by the investigators or witnesses. The elapsed time for all devices ranged from 4 minutes to 11 hours, with both of these extremes associated with car seats. The case that was 4 minutes was for a 22-month-old girl whose mother had left the room; it was unclear whether a 3-year-old sibling partially unbuckled the car seat restraint during that time.

Twenty-seven cases had information about why the child was placed in a device. Of these, 17 documented that the child was placed in the device with the intention of having the child fall asleep, 5 cases involved children being placed in car seats to travel, 4 stated the reason was to contain the child, and in one case a child died while playing with other children after she crawled into the car seat that subsequently flipped over.

With regards to deaths that occurred in the slings, none were reported to have occurred during breastfeeding. In one case, the infant was nursing and then the mother noticed that he had stopped suckling and apparently had fallen asleep. Ten minutes later she found him lifeless.

The cause of death was asphyxiation (positional asphyxia or strangulation) for 46 of the 47 cases. All deaths in slings, bouncers, and strollers were attributed to positional asphyxia. Fifty-two percent of deaths associated with car seats were attributed to strangulation from straps, and the other 48% were attributed to positional asphyxia. Three of the 4 deaths in swings were attributed to positional asphyxia, and 1 had an unclear cause of death. In that case, premature twins were placed in a swing, which was found tipped over, with the deceased twin under the other twin.

The location of death was listed as a home for 100% of the deaths associated with bouncers and swings. Two of the 3 stroller deaths occurred in a home, and 1 occurred at a workplace. Of the sling deaths, 2 occurred in a home, 1 in a church, and 1 in another public setting, with one case not listing where the death occurred. Of the 31 deaths associated with car seats, 18 cases documented location, with 16 of those outside of the car (13 in a home, 3 in a daycare) and 2 in the car.

Four of the devices (car seats, swings, bouncers, and strollers) in the study have restraints/straps. Of the 42 cases involving these devices, 15 listed whether the straps were present and whether they were being used properly at the time of death. Ten car seat cases and three stroller cases described improper use of the restraints/straps. One swing and one bouncer case noted that the straps were used properly. Seven devices were found in a position that is different from their

**Table II.** Hazards of sitting and carrying devices for children 2 years and younger (mean and median elapsed time)

Device	No. cases with elapsed time	Mean elapsed time	Median elapsed time	Range
Car seats	10	2.3 h	55 min	4 min-11 h
Slings	4	26 min	18 min	10-60 min
Swings	4	5 h	5 h	1-9 h
Bouncers	3	2.5 h	2 h	1.5-4 h
Strollers	3	32 min	30 min	5-60 min

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