Deaths and Injuries Attributed to Infant Crib Bumper Pads

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Objective To document deaths attributed to bumper pads and injuries from their use that are potentially preventable.

Study design The US Consumer Product Safety Commission maintains files on cases voluntarily reported to them of deaths and injury related to commercial products. These cases represent an unknown fraction of total occurrences. We searched this database for deaths related to crib bumpers for the years 1985 to 2005. We also searched other Consumer Product Safety Commission databases for crib-related injuries that potentially might have been prevented by bumpers. Additionally, we examined 22 retail crib bumpers and described features that could be hazardous.

Results Twenty-seven accidental deaths reported by medical examiners or coroners were attributed to bumper pads. The mechanism of death included suffocation and strangulation by bumper ties. Twenty-five nonfatal injuries were identified, and most consisted of minor contusions. All retail bumpers had hazardous properties.

Conclusions These findings suggest that crib and bassinet bumpers are dangerous. Their use prevents only minor injuries. Because bumpers can cause death, we conclude that they should not be used. ***(J Pediatr 2007;151:271-4)***

Most infant cribs sold in the United States are used with bumper pads. Whether crib bumper pads pose a risk to infants for accidental suffocation is controversial. Recently, the Juvenile Product Manufacturing Association (JPMA) asked the US Consumer Products Safety Commission (CPSC) to review crib deaths involving suffocation or strangulation. On the basis of their own analysis of an unpublished CPSC review, representatives of the JPMA independently concluded, "there were no deaths directly related to the traditional use of crib bumper pads."[1] However, several organizations, including the CPSC and the American Academy of Pediatrics, have stated that crib bumpers are a potential risk when they are "pillow like."[2,3] In addition, the First Candle Sudden Infant Death Syndrome Alliance cautions that bumper pads should be "thin, firm but not pillow like."[4] These are subjective assessments and open to interpretation; thus caregivers may have difficulty in applying these criteria to their purchases of bumper pads. Because there are no detailed and systematically gathered data on hazards of crib bumper pads, we searched for cases of accidental death attributed to crib bumpers in CPSC databases.

Also, because crib bumpers are intended to reduce the risk of injury, we searched CPSC's injury database for non-fatal crib injuries that conceivably might have been prevented by crib bumpers. Finally, we have examined crib bumpers currently on the market for features that might be construed as pillow-like or otherwise potentially dangerous.

METHODS

Bumper-related suffocation deaths were identified through a search of CPSC databases from Jan 1, 1985, through Dec 31, 2005, made available to the public. Three CPSC databases were searched. These include the Death Certificate, Injury and Potential Injury Incidents, and In-Depth Investigations databases. The CPSC receives death certificates from all 50 states, the District of Columbia, and New York City; these include deaths from all suffocation codes, with the exception of the suffocation code for "falling earth" that was in use with the *International Classification of Diseases, Ninth Revision* coding system. This information is stored in the Death Certificate database. The CPSC also collects information on deaths from medical examiners, coroners, and other sources such as police and fire departments and media articles that are stored in the Injury and Potential Injury Incidents database or stored in the In-Depth Investigations database. The information in the 3 databases contains unique information about deaths and duplicates

CPSC	US Consumer Products Safety Commission	NEISS	National Electronic Injury Surveillance System
JPMA	Juvenile Product Manufacturing Association		

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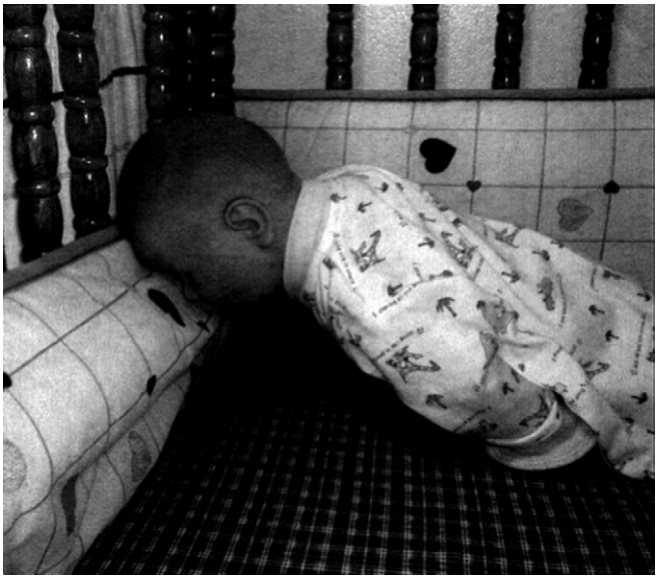

Figure 1. Death scene reconstruction of case #1. Infant's neck was actually extended with his face pressed into the bumper. This is not shown in photo because of inability to extend mannequin's neck.

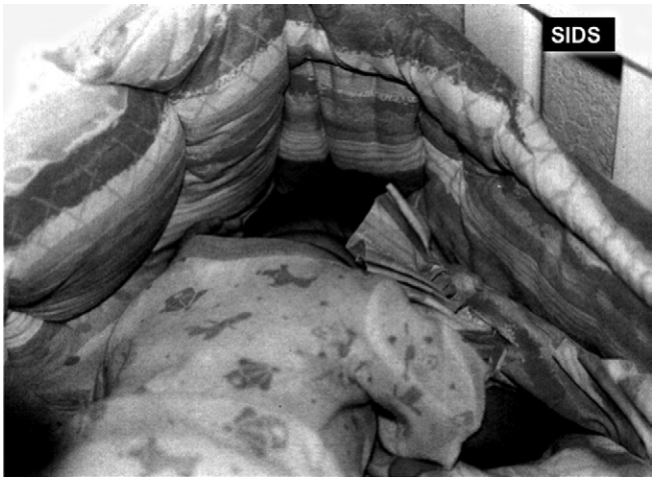

Figure 2. Death scene reconstruction of case #15. Mannequin placed in position in which the infant was found dead.

reports that may provide additional information about deaths. Because the CPSC does not receive all deaths reported in the United States, the deaths in the study should be considered a minimum number.

The databases were searched for the keywords "bumper," "pad," and "padding" for deaths involving infants aged from 1 month through 2 years. The search was not restricted in sleeping location, external cause of death code, or other identifier. Deaths identified in all of the databases were combined and sorted by state, age, and sex to identify duplicate cases, and deaths were removed that were duplicates or out-of-scope (eg, mattress pad, heating pad), yielding a final dataset of 27 deaths.

Crib-related injury cases were identified though CPSC's National Electronic Injury Surveillance System (NEISS). NEISS is a probability sample of US hospital emergency departments stratified by emergency department size and geographic location. This database was searched from Jan 1, 2000, through Dec 31, 2004, by using product codes for cribs, portable cribs, crib extender rails or youth bed rails, and cribs not specified for infants aged ≤6 months. This age range was selected because after 6 months it is doubtful that bumpers would prevent head injury because most infants can raise their heads above the bumper pad. Although it is possible to determine national estimates using the NEISS, we made no attempt to do so because of the small number of cases identified.

Files on these deaths and injuries were obtained and reviewed. Cases with evidence of non-traditional use of bumper pads were excluded.

The authors assessed infant bumpers for sale at a St. Louis, Missouri, retail store; 22 different bumpers were examined and graded for softness, potential space between bottom of bumper and mattress, bumper width, and length of fabric fasteners that attach the bumper to the crib. Softness was graded on a scale of 1 to 3, with 3 being the consistency of a comforter or soft pillow and 1 being that of a typical couch cushion. We considered a typical cushion to be firm enough to provide comfort when a person otherwise would be sitting on or against a hard surface. It was obvious that softness varied a great deal from bumper to bumper. However, the site of the investigation necessitated a subjective assessment of this property.

RESULTS

In this search, we found 27 cases of infant death involving bumper pads or similarly padded bassinets (4 of the 27 cases). In 26 cases, a death scene investigation was conducted. In 1 case, it was uncertain whether a formal investigation was made. Additionally, CPSC personnel conducted an additional scene investigation in 18 of the 27 cases. In all cases except 1 (#14), an autopsy was performed.

Three types of infant death involving crib bumpers pads were found: 1) face against bumper (Figure 1); 2) infant wedged between bumper and other object (Figure 2), and 3): bumper tie around infant's neck. There were 11 deaths in type 1 cases; 13 deaths in type 2 cases, and 3 deaths in type 3 cases (Table I; available at www.jpeds.com).

There were 25 non-fatal crib injuries in the database (Table II; available at www.jpeds.com). It was unclear in most reports whether bumpers were present or not. Summaries in Tables I and II are those of the medical examiner or other health care workers (Table II).

Twenty-two different crib bumper pads were evaluated for relevant properties at a retail outlet store in St. Louis (Table III; available at www.jpeds.com).

DISCUSSION

Recently, the Canadian Healthy Environment and Consumer Safety Bureau in a brief report cited 23 "incidences" involving bumper pads, including 1 suffocation and 1

strangulation death.[5] The present report provides details of multiple infant deaths in which crib or bassinet bumper pads were thought to play a causal role. Also, it is a report of nonfatal injuries that might have been prevented had crib bumper pads been used. It must be emphasized that our search of the crib database reveals only an undetermined fraction of the actual incidents occurring in the United States in the period studied, because incidents are inconsistently reported to the CPSC and may or may not be published in media sources. Data on accidental deaths from US Vital Statistics are not coded by product. Thus CPSC data is the only resource at the national level with codes allowing for the identification of bumper-related deaths. The degree of underreporting is indicated by cases coming from only 17 states, with some states with large populations (New York, Texas) contributing only 1 case each and other less-populated states (Wisconsin, Missouri) reporting 3 cases each.

It is important to consider limitations of our study. Underreporting of cases is one obvious limitation. In addition, scene investigations and autopsies were performed by different individuals, so there was no consistent protocol for these procedures.

We have divided the bumper- and padded bassinet-related deaths into 3 categories. The first are those in which the infant's face was in close contact with the bumper surface, and death was either judged or could be assumed to be caused by asphyxia possibly resulting from re-breathing expired air or by nasal and oral compression.[6,10] From past studies, the softest of the retail bumpers examined that had the characteristics of comforters or soft pillows would pose the greatest risk for this type of death.[6-10] Case #6 in Table I is of particular interest because the bumper had a plastic covering, and it was suggested in the death scene report that moisture on the plastic caused the face to adhere to the bumper surface. This indicates that applying a nonporous covering over a bumper might not make it safer.

Half the cases were in category 2. Here the infant's head was determined to be wedged between a bumper and another surface. Death caused by wedging is a traditional diagnosis, and cases continue to be reported.[11-13] An important contributing factor in wedging deaths is that many infants lack the motor development needed to extricate themselves.[14] Death presumably results from asphyxia caused by re-breathing, nose and mouth compression, or a combination of these. Wedging occurs when the baby pushes his/her head into a narrow space between 2 surfaces. An important feature of the surface is that it is elastic and can spring back to its original shape after deformation. This characteristic provides the force pressing against the infant's head, which causes the entrapment. Couch cushions are elastic and are universally recognized as a common cause of wedging deaths.[12,13] Because the firmer and thicker retail bumpers we evaluated were elastic, like couch cushions, we deemed them to be more hazardous for wedging than the softer thinner bumpers. Considering this, it would not seem to be helpful to suggest that crib bumper pads be firm.[4]

The last category of death was strangulation. Infant deaths involving neck compression by cords, ribbons, or bands of various kinds is well-recognized, and frequent warnings to eliminate this hazard have been issued in past years. Current manufacturing standards state that "ribbons, strings, and ties on bumper guard should not exceed 9 inches."[15] It is relevant that in our own survey of commercially available bumpers there were 2 with fabric fasteners longer than 9 inches (case #5 and #10). Therefore, a strangulation hazard may still exist for some bumpers on the market.

In theory, bumpers prevent injury from a baby's head hitting crib bars or from extremities projecting through the bars. We cannot tell from the reports of crib injuries how effective bumpers are in protecting infants, because we do not know whether a bumper was present. The exception is the 1 case in which, ironically, the infant's knee was reportedly contused when it struck a crib bumper pad (Table II, case #14). In the remaining cases, contusions and abrasions to the face and head conceivably could have been prevented had a bumper been in place. However, it is unclear whether a bumper would have prevented an arm or leg from passing through the crib rails, because we found an open space between the bumper and the crib mattress in all the bumper pads we examined. It is conceivable that a bumper might have contributed to the arm and leg injuries because it could provide a mechanism for limb entrapment. This could amplify the force on the limb exerted by an infant struggling to free itself. The seven reported cases of limb fractures or closed head injury were likely not caused by accidents. It is difficult to imagine an infant exerting a force sufficient to cause a limb fracture or hitting its head against a wooden slat with force enough to cause closed head injury. Currently, such cases would immediately raise a pediatrician's suspicion of intentional injury.

In summary, we report a number of fatal accidental infant deaths directly attributable to crib bumper pads. In direct contradiction to the JPMA interpretation of a CPSC staff data review that there were no incidents directly related to normal bumper use, we found 27 cases of death reported in the same CPSC databases. Moreover, an examination of commercial bumper pads indicates that these products continue to have characteristics that appear to be dangerous. Furthermore, a review of cases of non-fatal injuries in cribs indicates that these are not serious and might or might not have been prevented by bumper pads.

This case series provides evidence that the risks from crib bumper pads or padded bassinettes (death) outweigh the possible benefits provided by such padding (minor bruises and contusions). Furthermore, our data does not suggest any way in which changes in bumper design can reduce risk of death. We conclude that bumpers should not be placed in cribs or bassinets.

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Table I. Medical examiners' summaries of deaths

1. "Face obstructed by crib bumper pad- positional asphyxia. A male infant, age 2 months, died after he was found with his face against a bumper pad in his crib at home by his mother."
2. "Died of asphyxiation caused by pressure against an overstuffed crib bumper during sleep. A 7-month old female was found unresponsive in her crib by her mother. The victim was placed on her back in the crib."
3. "A coroner determined a 7-month-old male infant died in a crib due to positional asphyxiation—face in corner of crib against bumper pad. Victim was on his back with head turned to right, and his face was up into the corner of the bumper pad."
4. "This incident involved the death of a 4-month-old infant due to positional asphyxia. The infant was found unresponsive by his mother. He had crawled face first into the corner of his crib with his nose and mouth pressed against the protective bumpers."
5. "A 14-month-old baby boy died sleeping in a crib with his face pressed firmly against a bumper pad."
6. "Baby got face into plastic bumper pad of cradle. Crib pad was much too large for this size of bed. Night was very hot, and it was felt that the crib pad adhered to the victim due to the heat. Baby got face into plastic bumper pad. Anoxia consistent with accidental suffocation."
7. "A 13-month-old male was found dead in his crib while he and his mother were visiting at his grandmother's house. The infants face was resting against a properly installed plastic bumper pad."
8. "A 3-month-old male died of SIDS in his crib with his face against the bumper pad."
9. "A 2-month-old female was found dead in her wicker infant basket for a nap after being fed at noon. She was found on her stomach, head turning to the left with face pressed slightly against the padded basket liner. The medical examiner found no anatomic cause and attributed the death to probable suffocation."
10. "A 2-month-old male died of anoxia when he was sleeping and his face was pressed against the bumper of the 'bassinet/carrier' (cradle). The victim was dead on arrival. Note: Mother stated that the baby died due to the tilt of the bassinet/carrier."
11. "Baby suffocated at home in the corner of the crib against the crib bumper. Suffocation—accidental."
12. "Baby found face down in crib, pinned between bumper pad and sibling sister. A male infant, age 4 months, placed for a nap in a crib with a twin sister was found wedged between the bumper pad and his sister. Cause of death asphyxia due to positional crib accident."
13. "A 4-month-old male was found dead in his crib at home. Reports indicated that the victim became wedged between the mattress and the bumper pad of his crib. The death was declared an accident; cause of death was listed as asphyxia by suffocation."
14. "A 10-month-old male died of positional asphyxia, wedged between his crib railing and a dresser 6 inches away. He apparently stood on the crib bumper pads and climbed over the crib railing." *Author's note*: This case indicates yet another hazard of bumper use. The bumper allowed the infant to climb from a relatively safe environment into a hazardous one.
15. "Found unresponsive wedged between pillow and bumper pad. Positional asphyxia. Note: Mother reported the baby's head had slipped off the edge of the pillow. His head was wedged between the pillow and the bumper pads inside the bed."
16. "Seven-month-old girl was placed in her crib for a nap after being fed by her mother. Child was found later in her crib with her head wedged between the mattress and the bumper pad attached to side slats. Child was pronounced dead on arrival at hospital."
17. "Found by mother with face wedged between crib mattress and bumper pads. COD: asphyxia."
18. "An 11-month-old female slid off a day bed mattress. The crib bumper pad is believed to have become caught around the victim's neck, and as she slid forward and she was unable to breathe and suffocated. The cause of death is mechanical asphyxia, the manner of death is considered accidental."
19. "A 2-1/2-month-old male died due to probable suffocation. According to an investigator with the sheriff's department, the infant's mother found him face down in his crib. The investigator stated the baby's head got caught between a baby blanket and the bumper pads in his crib. He was pronounced dead at the scene."
20. "Face wedged in crib between pillow, mattress, and bumpers, external facial compression (suffocation)."
21. "An 8-month-old female died after being trapped tight against a side rail padding and mattress in her crib."
22. "A 6-day-old female was found not responsive in her infant basket. She was on her stomach with her head turned to one side. Her face was pressed into the crevice between the basket mattress and padded sideliner. After an autopsy was preformed, the medical examiner ruled that death was caused by probable suffocation due to an external airway obstruction."
23. "The baby was found wedged between adult pillows and crib bumper. The baby had originally been placed on her side and was found on her stomach."
24. "A 2-month-old male was found dead in his crib. Autopsy examination revealed no cause of death, but findings frequently seen in sudden infant death syndrome. Based on circumstances surrounding the death as currently known, this death meets the criteria for sudden infant death syndrome." *Author's note:* The original death scene investigation makes no mention of infant's head position at death, and so the medical examiner lacked this important information. A subsequent CPSC death scene investigation (Figure 2) indicated that the baby's face was covered by a comforter, and his head was wedged between the mattress and the bumper pads.
25. "A 6-month-old female was strangled by the strings of her bumper pads while sleeping in her full size crib. She had placed her head through a loop formed by the tied fabric attachment strings of the bumper pad."
26. "Asphyxiation by string-ligature. Father noted the string around baby's neck. He pulled baby from crib, pulling the string from the bumper pad in the process. Police surmise that the baby had grasped the loosened tie in his hand then rolled over pulling the tie across the front of his neck. A mark was made."
27. "Tie of bumper pad became tangled around neck. Cerebral anoxemia and anoxia; ligature compression of vessels."

Table II. Consumer Product Safety Commission file summaries of crib accidents

1. "Patient struck face on side of a crib at home, contusion on face."
2. "Child has a dent in side of head after pushing against bars of crib at home."
3. "Hit head on crib Dx. Head abrasion."
4. "Patient struck left knee against side of a crib, knee contusion."
5. "Patient fell forward in crib, bumping head on crib at home 7 days ago; head injury, head contusion."
6. "Four-month-old male, contusion to head, hit head on crib."
7. "Patient was in crib; mom came home, and patient had a bump on her forehead. Dx: mild head injury."
8. "Patient sustained head injury hit head on crib."
9. "Patient hit head against metal bassinet at home 2 days ago, has abrasion in forehead, crying, minor head injury, abrasion."
10. "Contusion to head when struck on crib."
11. "Patient's legs were sticking out of crib bars this AM. Now his hip is making a popping sound. DX: sprain right leg."
12. "Mother states child hit face on side of crib. Dx: nasal contusion."
13. "Patient hit mouth on crib and sustained cut injury to inner mouth."
14. "Knee contusion—hitting bumper pads in baby bed-home."
15. "Left arm caught between bars in crib, contusion left arm."
16. "Trauma (R) forearm; patient got forearm stuck in the baby crib rail, crying and pain. Patient got arm struck in crib, was alone in bedroom, strain elbow."
17. "Contused head on bassinet."
18. "Patient caught arm in crib at home, not using arm; nursemaids elbow."
19. "Fx (Left Forearm), patient got her arm caught in the rails of the crib, cried a lot of pain."
20. "Patient got leg caught in crib, twisted thigh, arrives with swollen thigh, Lt femur fracture."
21. "Patient accidentally hit head against crib side. Dx: closed head trauma."
22. "Patient's arm got stuck between crib and wall, and father states he heard a crack. Dx: Lt humerus fracture."
23. "Patient pushed against crib, dad heard snap. Femur fractured."
24. "Patient hit head on crib; closed head injury."
25. "Five-month-old female with fractured femur. Patient got leg caught in baby bed rails at home. Patient admitted."

Table III. Features of 22 retail crib bumper pads

	Softness scale	Thickness (inches)	Length of bands attaching bumper to crib bars (inches)	Potential for head wedging
1	3	1-1/16	6-1/2	
2	2	1-1/4	8	
3	1	1-3/4	8-1/4	high
4	2	1-3/4	6-3/4	
5	1	1-1/4	9-1/4	high
6	2	1-5/8	7-1/2	
7	1	1-1/2	8	high
8	1	2-3/4	7	high
9	2	2-1/8	7	high
10	2	1-3/4	9-1/8	
11	3	1-3/4	8-3/4	
12	3	1-5/8	8-1/4	
13	2	2-3/4	8-1/4	high
14	1	2-1/4	7	high
15	2	3-3/4	8	high
16	1	2-3/4	7-1/2	high
17	3	1-3/4	6-1/4	
18	1	1-7/8	7-1/2	high
19	1	2	6	high
20	2	1-1/2	8-1/2	
21	3	1-5/8	8-1/2	
22	3	1-3/4	8-1/2	

In the assessment of softness, 1 is the hardest and 3 the softest; 2 is intermediate. The hardest and thickest (>2 inches) bumpers were deemed to have the highest potential for wedging.