Babywalker-related Injuries Continue Despite Warning Labels and Public Education

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ABSTRACT. *Objective.* **To describe the epidemiology of babywalker-related injuries to children treated in a pediatric emergency department despite current prevention efforts, and to investigate the beliefs of parents regarding babywalker use.**

Design. **A descriptive study of a consecutive series of patients.**

Setting. **The emergency department of a large, academic children's hospital.**

Participants. **Children treated for babywalker-related injuries during the 3-year period of March 1993 through February 1996.**

Results. **There were 271 children treated for babywalker-related injuries. The mean age was 9.2 months, and 62% of patients were boys. Ninety-six percent of children were injured when they fell down stairs in their babywalker. The number of stairs that a child fell down was significantly associated with skull fracture and admission to the hospital, and a fall down more than 10 stairs had a relative risk (RR) of skull fracture = 3.28 (95% confidence interval, 1.35 < RR < 7.98). There were 159 children with contusions/abrasions (58.6%), 35 concussions/head injuries (12.9%), 33 lacerations (12.2%), 26 skull fractures (9.6%), 9 epistaxis (3.3%), 4 nonskull fractures (1.5%), 4 avulsed teeth (1.5%), and 1 burn (0.4%). Three of the skull fractures were depressed, and three also had accompanying intracranial hemorrhage. Ten patients (3.7%) were admitted to the hospital, and all had skull fractures resulting from falls down stairs. Supervision was present in 78% of cases, including supervision by an adult in 69% of cases. Forty-five percent of families kept the walker, and 32% used the walker again for the study patient or another child after the injury episode. Fifty-nine percent of parents acknowledged that they were aware of the potential dangers of babywalkers before the injury event. Fifty-six percent of parents favored a national ban on the sale of walkers, and 20% were opposed.**

Conclusion. **Despite the currently used prevention strategies, including adult supervision, warning labels, care giver education programs, and stairway gates, serious injuries associated with babywalkers continue to occur to young children. The US Consumer Product Safety Commission should promulgate a rule, similar to the voluntary standard adopted in Canada, regarding design requirements for babywalkers that will prevent their passage through household doorways at the head of stairs. The manufacture and sale of mobile babywalkers that do not meet this new standard should be banned in the US. A recall or trade-in campaign should be conducted nationally to decrease the number of existing babywalkers.** *Pediatrics* **1997;100(2). URL: http://www.pediatrics.org/cgi/content/full/100/2/e1;** ***babywalker, pediatric trauma, falls, injury prevention.***

ABBREVIATIONS. ED, emergency department; CI, confidence interval; RR, relative risk; CPSC, Consumer Product Safety Commission.

The use of babywalkers dates back to at least the mid-1600s,[1] and the hazards associated with their use have been increasingly recognized during the last two decades. An estimated 25 000 children are treated in hospital emergency departments (EDs) annually in the US for babywalker-related injuries.[2] The annual cost of these injuries is approximately $90 million.[3] The rate of injury per 1000 babywalkers has continued to increase since 1984 according to data from the National Electronic Injury Surveillance System.[2] The annual incidence of walker injuries resulting in an ED visit was 8.9 per 1000 children <1 year of age in one study.[4] The number of injuries attributable to babywalkers exceeds that associated with other baby products, including strollers, carriages, high chairs, playpens and cribs.[2,3] Eleven deaths associated with walkers were reported during the 5-year period from 1989 through 1993.[2] Studies indicate that 55% to 92% of infants use babywalkers, primarily between the ages of 5 to 15 months,[3,5–11] and 12% to 40% of these infants experience an injury related to their use.[3,5,7,11,12] Boys are twice more likely than girls to be placed in a babywalker.[12] More than 3 million walkers are sold annually, representing an estimated $115 million per year in consumer spending.[2]

More than 75% of babywalker-related injuries are attributable to a fall down a flight of stairs, and head injuries predominate.[1–3,7,13–16] Studies indicate that 60% to >90% of stairway injuries among infants are related to the use of babywalkers.[12,17] Other injuries associated with babywalkers include finger entrapment, tip-overs, and burns or ingestions resulting from the infant's increased ability to reach previously inaccessible areas.[2–4,18–28]

Although prevention strategies, such as warning labels and public education, have been widely implemented, this study describes the epidemiology of young children with babywalker-related injuries, who continue to be treated in a pediatric ED despite

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Received for publication Sep 13, 1996; accepted Feb 26, 1997.
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these prevention efforts. This study also investigates the beliefs of parents regarding babywalker use.

METHODS

This investigation was conducted by reviewing the medical records of all children treated for a babywalker-related injury in the ED of Children's Hospital in Columbus, Ohio, during the 3-year period from March 1993 through February 1996. Children's Hospital is a 313-bed tertiary care facility affiliated with The Ohio State University College of Medicine. More than 75 000 children are treated in its ED annually. This study was approved by the Human Subjects Research Committee.

Data were obtained from the ED medical records for all patients. Inpatient medical records were reviewed for the 10 patients admitted to the hospital. Attempts were made to contact parents of all study patients by mail or telephone to obtain information not contained in patient medical records. Follow-up occurred approximately 2 months after the ED visit, and was completed for 57.2% of patients, including 20.7% by mail and 36.5% by telephone.

Data were analyzed using EpiInfo software.[29] Statistical evaluation included χ^2 analysis with Yates' correction, the two-tailed Fisher's exact test, and the two-tailed Mann-Whitney test. Comparisons were considered to be statistically significant for P values $< .05$. Computation of relative risk (RR) with a 95% confidence interval (CI) was also done.

RESULTS

From March 1993 through February 1996, 271 children were treated in the Children's Hospital ED for a babywalker-related injury. Children ranged in age from 4 to 20 months, except for one outlier who was 36 months old. The mean age was 9.2 (standard deviation, 3.1) months with a median age of 8 months. Sixty-two percent of patients were boys (Fig 1). An average of eight children (range 2 to 17) with a babywalker-related injury were treated each month, or approximately one child every 4 days.

The vast majority (95.9%) of children were injured when they fell down stairs in their babywalker. Another 1.5% fell off of an elevated surface, such as a curb or porch. The remaining 2.6% of patients were injured attributable to various mechanisms, including falling out of the babywalker, burning a hand on a kerosene heater while in a walker, or shutting a finger in a door while in a walker.

The number of stairs that children fell down ranged from 1 to 30 (mean, 9.5; standard deviation, 4.6), and was more than 10 stairs in almost one-half (47.6%) of cases. The number of stairs that a child fell down was significantly associated with skull fracture (Mann-Whitney, $P = .004$) and admission to the hospital (Mann-Whitney, $P = .02$). When the number of stairs was grouped into more than 10 stairs and less than or equal to 10 stairs, a fall down more than 10 stairs was associated with a significantly increased risk of skull fracture (χ^2, $P = .01$; RR = 3.28; 95% CI $1.35 < RR < 7.98$). When the type of surface struck at the end of the fall (Table 1) was grouped as concrete versus nonconcrete, 14.6% of patients who struck concrete sustained skull fractures compared with 8.1% in the nonconcrete group (χ^2, $P = .21$; RR = 1.80; 95% CI $.82 < RR < 3.97$). Children who struck concrete at the end of the fall were admitted to the hospital 7.3% of the time compared with 3.2% in the nonconcrete group (Fisher's exact test, $P = .20$; RR = 2.25; 95% CI $.66 < RR < 7.73$). The number of stairs that a child fell down was significantly associated with skull fracture (Mann-Whitney, $P = .02$) and admission to the hospital (Mann-Whitney, $P = .02$) among children who landed only on concrete, demonstrating the effect of the number of stairs on outcome while holding constant the influence of surface.

Supervision, defined as observing the child in the same room at the time of injury, was provided by an adult in 69.2% of cases. Supervision by a person under 18 years of age was present in another 8.7% of cases.

The types of babywalker-related injuries sustained by patients are identified in Fig 2. Of the 26 patients with skull fractures, 17 fractures were parietal (65.4%), 8 frontal (30.8%), and 1 occipital (3.8%). There were three patients with a depressed skull fracture, and two of these children also had a second nondepressed skull fracture. Three patients (1.1%) had intracranial hemorrhage on a head CT scan, including two children with subdural bleeds. One patient had possible generalized brain swelling, and another child had frontal lobe edema. One patient

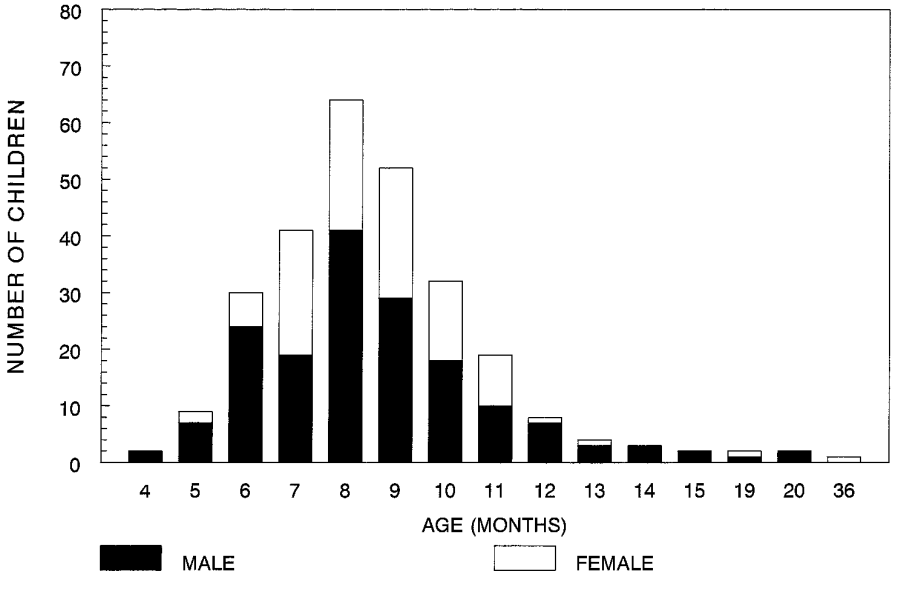

Fig 1. Number of patients by age and gender.

TABLE. Number and Percent of Patients by Type of Surface Struck at Base of Stairs

Surface Struck at Base of Stairs	Number	Percent
Concrete	86	42.0%
Carpet	53	25.8%
Wood	30	14.6%
Tile/Linoleum	26	12.7%
Other	10	4.9%
Total*	205	100.0%

* The surface struck was unknown in 54 cases.

with a subdural hemorrhage later developed a subdural effusion, and another child developed a leptomeningeal cyst as a delayed complication of a skull fracture. The four nonskull fractures included three clavicular fractures and one child with fractures of the radius and ulna.

Ten patients (3.7%) were admitted for inpatient treatment of their injuries, including one patient admitted to the intensive care unit. All 10 admitted patients had skull fractures resulting from falls down stairs. None of the study patients required surgical intervention in the operating room.

The fate of the babywalker after the injury episode was known in 143 cases (52.8%). Sixty-five of these families (45.4%) kept the babywalker. Sixty-one parents (42.7%) reported destroying or discarding the babywalker. Eight families (5.6%) gave the walker away to another person, and 6 (4.2%) returned it to the person from whom it was borrowed. Three parents (2.1%) removed the wheels from the walker.

Information was available in 157 cases (57.9%) regarding whether the babywalker was used again by the child after the injury. Of these children, 46 (29.3%) used the walker again after the injury episode. In addition, five families (3.2%) used the babywalker for another child after the study patient's injury. Among the 46 cases in which the babywalker was used again by the patient after the initial injury, 16 parents (34.8%) indicated that the walker was used again only in association with the use of stair gates; 13 parents (28.2%) indicated that they did so while providing closer supervision than in the past; 9 parents (19.6%) indicated that the babywalker was used only in the basement or in rooms without stairs; and 8 parents (17.4%) indicated that there were no changes in how the babywalker was being used. One patient was reinjured in the babywalker within 6 weeks of the initial injury.

The reasons given for continued use of the babywalker after the initial injury included: "the baby likes using it"; "it gives the baby a chance to move and learn to walk"; and "the injury was attributable to the stairs, and not the babywalker." One parent stated that the babywalker was "a safe place, and keeps the child from getting stepped on." Another parent indicated that "babywalkers are safer than crawling or walking," and another stated that it was a gift from a relative "who would be angry if the babywalker was thrown away or given away."

Of the 135 parents (49.8%) who responded when asked during mail or telephone follow-up if they believe that babywalkers help infants learn to walk, 40 parents (29.6%) stated "yes," 68 (50.4%) stated "no," and 27 (20.0%) were undecided. Of the 155 parents (57.2%) who responded when asked if they were aware of the potential dangers of babywalkers before the injury event occurred, 92 (59.4%) replied "yes," and 63 (40.6%) stated "no." Of the 154 parents (56.8%) who responded when asked if they would be in favor of a national ban on the sale of babywalkers, 87 (56.5%) indicated that they support a ban, 30 (19.5%) were opposed to a ban, and 37 (24.0%) were undecided.

DISCUSSION

To our knowledge, this series of 271 babywalker-related injuries is the largest described in the medical literature. The vast majority (95.9%) of children were injured when they fell down stairs in their babywalker. The amount of energy transferred to a child's body in a fall is determined by the distance of the fall and the energy-absorbing characteristics of the surface on which the child lands. The clinician should

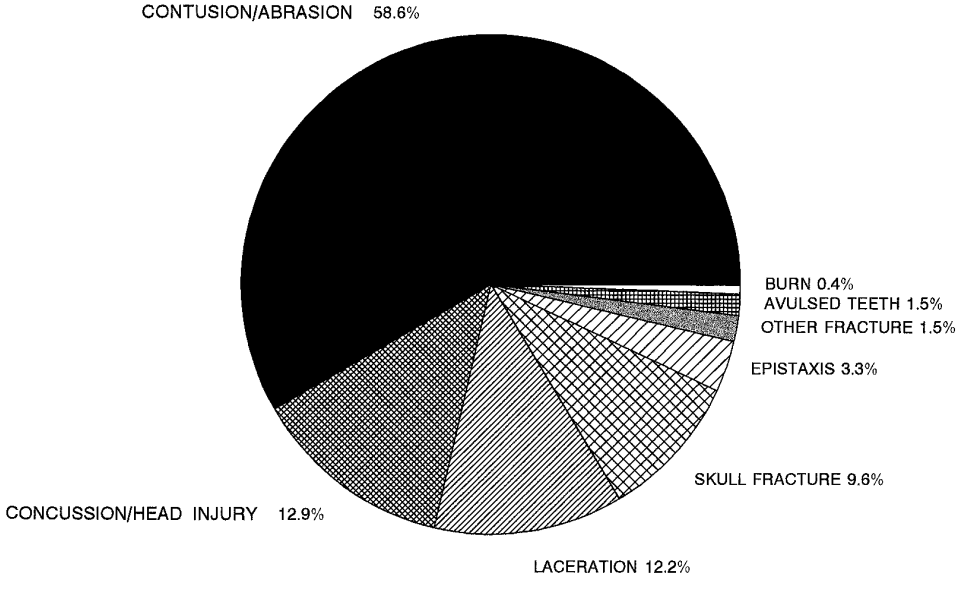

Fig 2. Percent of patients by type of injury.

consider these factors during patient evaluation. The number of stairs that a child fell down was significantly associated with skull fracture and hospital admission in this study, independent of the influence of the surface on which a child landed. The relative risk of skull fracture was more than threefold higher for children who fell down more than 10 stairs. Children who landed on concrete were more likely to sustain a skull fracture and be admitted to the hospital compared with children who landed on other surfaces, but these differences were not statistically significant.

Although 30% of parents in this study believed that babywalkers help young children learn to walk, there is no evidence to support this commonly held belief.[30] In fact, studies suggest that the opposite may be true.[10,31,32] In a study of twin infants, the child who was placed in a babywalker had marked electromyographic changes in locomotive motor pattern, because the walker allowed gross mechanical errors to be committed without impeding successful bipedal locomotion.[10]

Adult supervision is a strategy commonly suggested for the prevention of babywalker-related injuries, but data do not support its effectiveness. An infant in a babywalker can move at a speed of one meter per second,[33] and is developmentally unable to control this increased mobility. Because even the best care giver cannot watch a child 100% of the time, these injury episodes can, and do, occur in the time it takes to reach for something from the refrigerator. Moving at one meter per second, an infant can be across the room before the care giver has time to react. Indeed, 78% of children in this study were being supervised at the time of the injury, and this supervision was by an adult in 69% of cases. This clearly demonstrates that adult supervision will not adequately prevent these injuries. These findings agree with those of others,[2] and with injury prevention theory, which states that prevention strategies requiring frequent human action and vigilance are least likely to succeed.[34]

Existing voluntary industry standards (American Society for Testing and Materials 977–89), which address babywalker-related falls by use of warning labels, do not adequately prevent these injuries. The lack of effectiveness of these standards is demonstrated by the steady increase in the rate of babywalker-related injuries since their implementation.[3] Public education efforts also fail to deter parents from using walkers. Fifty-nine percent of study parents acknowledged that they were aware of the potential dangers of babywalkers before the injury event; and because this information was obtained after the injury, it is likely to be an underestimate. Twenty-nine percent of care givers in this study also continued to use the device for the study child after the injury episode, and another 3% used it for another child. Therefore, increasing efforts to educate parents, and even parents of children injured in a walker, about the hazards of babywalkers will not be effective in preventing these injuries.

Stairway gates also do not adequately prevent babywalker-related injuries. Studies indicate that 60% to >90% of stairway injuries among infants are related to the use of babywalkers.[12,17] More than 75% of babywalker injuries result from a fall down a flight of stairs,[1–3,7,13–16] and approximately one-half of these stairways have gates.[12]

Babywalker-like alternatives, that do not roll across the floor on wheels, have been recently marketed in the US. These stationary devices allow children to bounce, swivel and tip, and provide parents an alternative to the use of a babywalker. Although no injury data are available yet on these products, they eliminate the stairway-related fall hazard, and therefore, should be a safer alternative.

The American Academy of Pediatrics has joined with other health care organizations, child advocacy groups, and consumer groups calling for a ban on the manufacture and sale of mobile babywalkers in the US.[3] The American Medical Association also supports a ban and has called infant walkers a "lethal form of transportation" (*Columbus Dispatch*, December 10, 1992:6B). A petition was filed with the US Consumer Product Safety Commission (CPSC) in August 1992 requesting a ban. In April 1993, the CPSC rejected this request and recommended that further studies be done on this issue. Fifty-six percent of parents in this study favored a ban, and only 20% were opposed.

In recognition of the dangers associated with babywalkers, a voluntary standard went into effect in June 1989 in Canada that requires the width of babywalkers be 900 mm (35.4 inches) or greater. This is wider than standard household doorways.[35] This strategy effectively addresses stairway falls, the cause of most babywalker-associated injuries, without a ban on babywalkers. However, it does not address the problem of future injuries associated with existing babywalkers that do not meet this new standard. A national recall or trade-in campaign, supported and promoted by a coalition of manufacturers, governmental agencies, child advocacy groups, and consumer groups, could decrease the number of existing babywalkers. Our hospital coordinated a well-received city-wide babywalker bash in October 1994, when babywalkers were collected from parents and then crushed. Parents were given a bicycle helmet in exchange for the walker.

This study was subject to the limitations of missing data and other problems associated with retrospective chart review. Because there is a potential selection bias regarding which children are treated in a tertiary pediatric care facility like ours, patients in this study may not be representative of children treated for babywalker-related injuries in other health care settings, or children with walker-related injuries who do not receive medical care. Data obtained from parents after the ED visit could have been affected by recall bias or by a respondent's wish to please the investigators.

CONCLUSION

Despite the currently used prevention strategies, including adult supervision, warning labels, care giver education programs, and stairway gates, serious injuries associated with babywalkers continue to

occur to young children. Similar to the voluntary product design standard adopted in 1989 in Canada, a rule should be promulgated by the US CPSC regarding design requirements for babywalkers that will prevent their passage through household doorways at the head of stairs. The manufacture and sale of mobile babywalkers that do not meet this new standard should be banned in the US. A recall or trade-in campaign should be conducted nationally to decrease the number of existing babywalkers.

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