FALLS AND CHILDHOOD DEATHS: Sorting Real Falls From Inflicted Injuries

—by David L. Chadwick

This article reviews the literature on children's falls, with emphasis on the contribution of falls to childhood death, and will also include a practice guideline for physicians dealing with fatally injured children with fall histories.

Falls constitute a very common cause of injury in infancy and childhood. Kravitz et al. (1969) queried 536 parents of infants and found that 255 of them recalled falls occurring prior to the first birthday. All of the falls occurred indoors and most were falls from elevated surfaces such as beds, changing tables, cribs, highchairs, and other furniture. No deaths occurred in Kravitz's series, although 15 children (2.8%) required hospitalization. In a 1985 review, Garretson and Gallagher indicate a declining mortality from childhood falls, but state that falls are still the fourth most frequent traumatic cause of childhood death, and a very important cause of injury. The relationship of fall height to mortality was not addressed in their article.

Helfer (1977) was the first author to show that short falls were unlikely to cause serious injury; his work, which utilized highly documented falls in hospitals, has been replicated by Nimityongskul and Anderson (1987) and by Lyons and Oates (1993). Studies of children's falls from heights (Smith et al., 1975; Barlow et al., 1983; Musemeche et al., 1991) indicate that deaths occur in falls from the fourth floor and up, but usually not from lower floors. In the 1960s and 1970s in New York City, these long "window falls" caused 123 deaths in four years, and accounted for 12% of all accidental deaths in children under 15 years of age. Spiegel and Lindaman (1977) described a program that controlled this problem, which is more prevalent in cities in which large numbers of children live at great heights.

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Chadwick, et al. (1991) reviewed 317 cases of children less than five years of age brought to a trauma center with a history of falling. Seven deaths occurred in 100 children whose histories indicated falls of four feet or less, and one death occurred in 118 children who fell 10 to 45 feet. The authors concluded that the short fall histories associated with fatal outcome were inaccurate. Subsequent to that study, 523 additional children have been admitted to the Children's Trauma Center at Children's Hospital-San Diego with a history of a fall and a history or condition which justified hospital admission. Children with diagnosed inflicted injuries were excluded from this set. Of the children studied, 188 fell 10 feet or more, and the longest fall was 40 feet; yet no deaths occurred. The six most severely injured children had Injury Severity Scores (ISS) of 22-26, and all of these children fell 8 feet or more. ISSs in this range indicate very serious injury, but many children survive who have such scores.

In a study of multiply-witnessed falls, Williams (1991) found no deaths among 106 children who fell from one to 40 feet, and one death in a child who fell 70 feet. Chadwick and Salerno (1993) found that 35,000 children in San Diego day care centers with multiple caretakers incurred only a single head injury with an Abbreviated Injury Score (AIS) of three (and none greater) in a seven year period. The single case with an AIS of three achieved it by being unconscious for over one minute, but recovered promptly without sequelae. Other authors have observed that short falls abound in day care centers, so this observation strengthens the position that short falls rarely cause serious injury.

Hall et al. (1989) reviewed the medical examiner's files in a large county and found 44 child deaths attributed to falls in a four-year period. Eighteen of these were reported to have been falls of less than three feet; however, the historical details of these cases were not provided, and the pathology leading to death was not described. Without such details it is not possible to generalize from Hall's article. Root (1992) cites Weber's (1984) experiment, in which it was shown that the infant cadaver was likely to sustain a skull fracture in a short fall, as a reason to be cautious in excluding short falls as a cause of fatal head injury. The Weber experiment adds nothing to our knowledge of what is required to produce a fatal head injury in an infant, and Root's article blurs an area of knowledge that is becoming quite clear. Each year pediatricians and emergency physicians see numerous infants and young children with skull fractures and short fall histories. Most of these children are asymptomatic except for local swelling and some pain, and most recover uneventfully. It seems absurd to argue that this easy fracturability of the infant skull means that short falls kill.

Schutzman, et al. (1993) described 53 children with epidural hematoma diagnosed by CT scans. Twenty-four children had histories of falls of less than five feet, and 21 had exhibited "acute neurologic deterioration." It appears highly probable that serious neurologic consequences and even death might follow short falls if epidural hematoma is present; however, none of Schutzman's cases died and none had severe long-term impairment.

Conclusions

Given the availability of prompt and appropriate medical care, falls contribute minimally to deaths in childhood. Death from a fall is now considered very unlikely when the fall is less than 20 feet, and accumulating experience may soon extend that. Epidural hematoma may occur as a result of a short fall and may cause death occasionally when care is delayed or the condition is not recognized. Long free falls of young children can largely be prevented, but long falls of older children who climb to heights will continue to be a problem.

Older statistics indicating that falls are an important cause of death in children less than five

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years of age may well be substantially contaminated by cases of inflicted injuries presented as falls. This effect is probably diminishing as improved diagnosis of inflicted injury joins improved prevention and care in reducing the number of children who die from falls.

Practice Guideline

The physician faced with a young child with signs of serious or life-threatening head injury and a history of a fall of less than ten feet should first exclude epidural hematoma. CT scanning is an efficient method for the diagnosis of epidural hematoma. In some cases, it may also be desirable to exclude non-traumatic causes of intracranial bleeding such as arteriovenous malformation. The case should be reported promptly to a child protective agency and a law enforcement agency. Investigators should be advised that a careful scene description and careful and sensitive interviews with potential witnesses are likely to be needed. Investigators should proceed promptly in such cases, using the most skillful interviewers available, and collecting information from a wide range of persons who may have been near the place of the injury event.

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The initial history provided by the caretaker and the injury pathology in the head and elsewhere should be thoroughly documented. The circumstances of later history changes should also be described. In many cases a syndrome of inflicted injury may be recognized on the basis of typical findings for shaken infant syndrome or from injuries at other sites or from other dates. Coagulation tests should be performed if the case is seen early, but they are almost always abnormal in children dying of head injuries once infarction of brain tissue is present.

Whenever possible, consultation should be obtained from a physician experienced in syndromes of inflicted injury. In fatal cases, autopsies are mandatory, and pathologists who are not experienced with childhood injuries should seek additional consultation.

When epidural hematoma has been excluded, and in the absence of a long fall or some other (usually obvious) event such as a motor vehicle accident, the vast majority of young children with life-threatening head injuries have inflicted injuries. The physician should provide this conclusion in written documentation.

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THE ROLE OF LAW ENFORCEMENT IN FATAL CHILD ABUSE CASES

—by Bill Walsh

The Role of Law Enforcement

A child's death places unique demands on law enforcement. The investigator's role is to investigate the death thoroughly and determine how it happened, if a crime occurred, and if so, who is responsible. Investigations of child abuse deaths are demanding, difficult, and stressful. They present the investigator with problems on both technical and emotional levels. In addition to the obstacles found in nonfatal forms of abuse (no witnesses, child's developmental level, etc.), they have issues associated with homicide cases (autopsies, cause and manner of death, etc.). Emotionally, the death of a child from abuse can affect even the most seasoned investigator. This combination of factors results in complex investigations with their own unique set of problems and solutions.

Since fatal child abuse cases are a combination of issues found in both child abuse and homicide cases, the question is often asked, Who is best to do the investigation—child abuse or homicide detectives? It has been the author's experience that these investigations require more training and expertise related to children and child abuse than they do to homicide. Detectives who work on child abuse cases know more about children. They know about Battered Child Syndrome, Shaken Baby Syndrome, head trauma, scald burns, child development, neglect, and Sudden Infant Death Syndrome (SIDS). They know how children are injured and the excuses people will offer for their injuries, and how to work jointly with CPS, a necessity the importance of which cannot be underestimated.

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