

Current Comments[®]

Child Safety. Part 1. So Your Children Will Not Be Victims

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The ISI[®] Caring Center for Children and Parents, now beginning its second year, was designed to provide quality day care for children of working parents. The environment is cheerful, of course, and encourages the emotional and intellectual growth of children. But the foremost consideration in the design of the facility was that the building and its equipment be as safe and accident-proof as present technology would allow.¹

Outside of school, whether at home or traveling, child safety becomes a real challenge to those who care for youngsters. Too often we learn the hard way that, by chance or carelessness, there are endless ways for children to get hurt. Children do not hurt themselves—it is negligence that does the job.

Each year in the US alone, 15,000 children are killed in accidents. That is more than from the four most fatal childhood afflictions combined—pneumonia, cancer, congenital malformations, and cerebrovascular disease. In industrialized nations, trauma is the leading cause of death for children over one year of age.² And while mortality from disease and other health hazards has dropped in recent decades, accidental death has not.³

But accidents do not always kill. Roughly one third of US children under 15 years of age, 19 million each year, are injured severely enough to require medical attention. Roughly two million suffer incapacitation for two weeks or longer,

and more than 100,000 are handicapped permanently.³

School-age children suffer many of the same kinds of injuries as adults. Like adults, they are capable of taking precautions. But preschoolers present special problems because they have little understanding of what can hurt them. Moreover, they have other traits that predispose them to trauma. Among these traits, says Philip R. Zelazo, Tufts University, are insatiable curiosity, vivacity, and clumsiness from "the instability of newly acquired motor skills."⁴ Like older children, preschoolers often sustain cuts, bruises, and abrasions. But unlike them, preschoolers are particularly vulnerable to burns, poisonings, head injuries, internal injuries, chokings, and drownings.⁵

Children fall victim to different types of injuries as they mature because, at each stage of their growth, they learn new skills and try new activities.³ As Zelazo comments, with increasing ability to use their hands, children begin trying "to open doors in cars and houses, to turn on stoves, to take things apart and to stick objects into holes, such as hairpins into electric outlets. By age three, when children can climb and run, stairs and wide streets are attractive, but dangerous, playgrounds."⁴

A variety of factors predispose certain preschoolers to injury. One of these is sex. From early infancy on, boys suffer

more injury than girls.⁶ Personality may play a role as well. Children who are the most active, temperamental, and least attentive during play seem to have the most accidents.⁷ Economic status affects accident rates: children in depressed, urban areas and among populations with little formal education have more accidents.⁸ Accidents are more likely when the family routine has been upset by illness or another stress.⁹ More accidents happen just before mealtime, when parents are busiest.¹⁰ There is also a significant correlation between the frequency of accidents and the mother's menstrual cycle.¹¹ And Frederick P. Rivara and David Howard, University of Tennessee Center for the Health Sciences, Memphis, have shown that accidents are more likely to occur when parents do not tailor a child's activities and environment to his or her capabilities and limitations.¹²

The most common location for preschooler injury is the home. Seventy percent of all injuries to preschoolers occur there.¹³ But the largest proportion of serious or fatal accidents occurs in or near motor vehicles.¹⁴

Among the one- to four-year-olds, motor vehicle related accidents cause almost twice as many deaths as any other category of accident. In 1981, the number of deaths was 1,300. Another 29,000 sustained serious injuries. Nearly half of the children killed by motor vehicles were pedestrians.¹⁴ Everyone "knows" that it is dangerous for children to play in the street, where they risk being run over. While parents may realize the danger, they often overestimate their children's ability to watch out for themselves.

For example, a child's height may make it impossible to see oncoming traffic from behind parked cars or over the crest of a hill. Children also have trouble localizing sounds. They have trouble concentrating on one thing at a time.

They are very poor at estimating the distance and speed of motor vehicles. Many have trouble distinguishing right from left, and do not know in which direction to look first when crossing a street.¹⁵ Stina Sandels, Research Institute of Child Psychology, Stockholm, Sweden, has estimated that children cannot safely cross the street alone until they are 11 or 12 years old.¹⁶

While the child pedestrian is especially vulnerable, he or she is at even greater risk as a passenger.¹⁴ For people of any age, automobile transport is risky. It is significantly riskier to ride without a seat belt. For young children unrestrained by a child safety seat, there is double jeopardy. Jerome A. Paulson, Case Western Reserve School of Medicine, Cleveland, Ohio, has reviewed the case for mandatory child restraints in automobiles. He notes that 35 percent of children in auto accidents are thrown from the vehicle onto the street. Children tend to land headfirst. Their high centers of gravity make their soft, elastic skulls particularly susceptible to injury.¹⁷

Children also are more vulnerable to serious blunt impact injuries, because their internal organs are not well protected. A child's rib cage, because it is highly compressible and small relative to the size of the organs it protects, does not shield the upper abdomen as it would in an adult.¹⁷

In auto accidents, the youngest children are most likely to be killed. Susan P. Baker, Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland, demonstrated the inverse relation between risk and age in a study of 1,562 deaths among preteen auto occupants. Among six- to 12-year-olds, Baker found the death rate to be three per 100,000. For one-year-olds, the ratio was double. For infants under six months old, it was three times as high.¹⁸

A contributing factor to the high infant mortality is the misconception that

the baby is safest in its mother's lap. This is actually the *most dangerous* place. If the car crashes, and the adult is not wearing a seat belt, the child may be crushed between the car interior and the adult's body. During impact, even an adult in a seat belt may find it impossible to hold on to a child. At only ten miles per hour, a head-on crash thrusts a newborn forward with a force of 200 pounds. Holding on to the infant is the equivalent of lifting 200 pounds. At 30 miles per hour, the force is 600 pounds. Holding on then seems like lifting that weight.¹⁹

Children riding in backseats are somewhat safer than those traveling in the front. According to Allan F. Williams and Paul Zador, Insurance Institute for Highway Safety, Washington, DC, riding in the backseat reduces the injury rate by 28 percent.²⁰ But a far more important factor in determining the likelihood of injury or fatality is whether the child is in a safety seat. Robert G. Scherz, Mary Bridge Children's Health Center, Tacoma, Washington, studied a sample of 40,000 one- to four-year-olds involved in auto accidents between 1970 and 1979. He concluded that restraining children in safety seats or belts would result in a 93 percent reduction in fatalities.²¹

After motor vehicle accidents, burns are the injuries most often fatal to preschoolers. Children under age five run a greater risk of dying from burns than all other people up to age 65.²² Furthermore, young children are twice as likely as adults to die after hospitalization for serious burns. Most fatal burns result from a child's often inappropriate reactions to a house fire. Children sometimes hide under beds or in closets.²³ Ann McNamara, National Fire Protection Association, recommends installing smoke detectors in the home and practicing escape plans with the family. If children immediately remember what to

do when fire breaks out, they are more likely to survive.²⁴ Children can start fires themselves by playing with matches or other flammables. These, of course, should be kept out of reach.

The majority of burns in children younger than four years old, however, are not fatal. Scalds cause 75 percent of them.²⁵ Three quarters of these occur in the kitchen, where a hot liquid can spill from the stove or tabletop as a youngster pulls on a handle, tablecloth, or electric cord.²³ Scalds can be devastating to a child's facial features, and sometimes require plastic surgery. If children must be in the kitchen when parents prepare meals, they should be secured in playpens or high chairs.

Hot tap water is an even more insidious source of scalds because no one expects it to be sufficiently hot. But water heaters in most American homes are set at 140°F (60°C). At this temperature, water will burn all the way through adult skin in six seconds—and through a child's skin even faster.²⁶ Burns that reach deep into tissues leave permanent scars. They can be fatal if they cover a large enough area of the body.²⁷ Most serious tap water accidents involve children in bathtubs. Either the child falls into a tub of scalding water, or inadvertently turns on the hot water while bathing. These accidents can be eliminated by diligent supervision of children in the tub. Better yet, water heater thermostats can be lowered to 120°F (49°C), at which temperature it takes ten minutes to sustain a deep burn.²⁶

Most homes contain a variety of objects that can burn children. Stove doors, kerosene or space heaters,²⁸ wood burning stoves, and radiators, for example, may burn toddlers who steady themselves on them. If toddlers play near open flames, their clothing may ignite. Loose clothing catches fire easily, particularly if made of cotton or a flammable synthetic. Silk and flame retar-

dant fabrics are safer. Children can also suffer burns by sucking or biting plugged-in extension cords.²⁹

Like motor vehicle accidents and burns, drowning claims lives among all age groups. But the rate of drowning among small children is high—higher than for any group except teens and adults under age 25.¹⁴ Swimming pools are the most common sites for drownings of young children at home. Marc I. Rowe, University of Miami, Florida, studied drownings of children less than 13 years old in Dade County, Florida. He found that the average home pool drowning victim was three years old. More than 80 percent of all victims in Rowe's study were preschool age. In many cases, the children fell into the pool while playing, unsupervised, nearby.³⁰ Drowning accidents can, however, be prevented. Keep an eye on your child when he or she is near the pool. Teach your child to swim at about three years of age. Fence in the pool and make sure there is nothing near the fence that a child can mount. Raise the water level in the pool, so that it is easier for a struggling child to climb out.³⁰

Another common site for toddler drownings is the bathtub. According to John H. Pearn, Royal Children's Hospital, Herston, Australia, "In most studies of home hazards to children, the potential of the ubiquitous bath is overlooked."³¹ A study by Pearn revealed that the median age of children who drown in bathtubs is nine months. At this age, children can sit without aid and pull themselves up to stand. This may lull a parent into thinking they can hold their heads out of the water. The unsuspecting parent may leave the child unattended, or under the care of an older sibling. Pearn calls attention to six drownings which occurred when older siblings under four years old either left the scene, did not notice trouble, or could not help their younger brother or

sister.³¹ Even a bucket of water can drown a child. One study of children hospitalized after near-drowning accidents determined that four out of 26 had inadvertently immersed themselves in buckets. Typically, children under two years old are prone to bucket drowning.³² And some children have drowned by falling headfirst into the commode.³³

Water is only one of the substances which can asphyxiate a child. In fact, a foreign object or food caught in the respiratory tract kills more children under one year of age than any other cause. For children one to four years old, choking is the fourth most common accidental killer.¹⁴ Young children run a high risk of choking because they tend to put everything into their mouths. And since most youngsters do not develop good chewing habits until age four, they often do not chew food adequately before swallowing.¹⁰

An inordinate number of choking deaths are caused by only a few types of objects. Baker and Russell S. Fisher, Johns Hopkins School of Hygiene and Public Health, studied cases of childhood asphyxiation in Maryland between 1970 and 1978. They found that out of 12 deaths in which children choked on food, six were caused by hot dogs.³⁴ Among nonfood items, they found the worst offender was the balloon, which caused more deaths in small children than any other object.³⁴

Balloons, hot dogs, peanuts, gumdrops, and other items frequently implicated in choking deaths share certain features. They are often round, increasing the likelihood that they will block the entire windpipe. And they are small—97 percent of objects which choke young children are 32 mm or less in diameter.³⁴

The Consumer Product Safety Commission (CPSC) has set minimum dimension standards for toys and parts of toys to help reduce the risk that they will lodge in a child's windpipe. The CPSC

has no jurisdiction, however, over the size and shape of food, balloons, and many other items often responsible for choking deaths. Nor can CPSC regulations safeguard against materials which children can tear or dissect into "bite-sized" pieces and ingest.³⁴ For example, one fatal accident occurred when a child chewed and ingested pieces of a Styro-foam cup.³⁵ Parents should exercise vigilance during mealtimes. Older children should not be allowed to share solid foods with infants. And they, like adults, should never talk or frolic with a mouth full of food.¹⁰

Suffocation causes nearly as many deaths in children under one year of age as choking does.¹⁴ Suffocation is the exclusion of air due to entrapment in an airtight space, pressure on the throat or chest, or the covering of the nose and mouth.³⁵ Accidental suffocations, like choking deaths, frequently can be traced to a few hazardous objects. The most prevalent of these is the plastic bag, such as those used on dry-cleaned garments and for trash disposal. Plastic bags should not cover pillows and mattresses that infants sleep on. Two children in Baker and Fisher's Maryland study suffocated when they pressed their faces into plastic mattress covers.³⁴ Another hazard is a crib mattress that does not fit snugly against the crib frame. An infant can wedge him- or herself in the small space and suffocate.³⁶

Small children are no better at freeing themselves from objects which are strangling them than they are at escaping suffocation. Children have often strangled by catching their heads between two objects, such as two bannister supports. Hundreds of children have strangled while trying to climb or slide out of cribs. The slats at the sides were spaced so widely that everything but their heads could slip through. Over a decade ago, pediatricians first called attention to the importance of placing crib slats at safe

intervals.³⁴ The CPSC now regulates newly manufactured cribs. But broken cribs and old cribs continue to cause strangulation deaths.

Children also can strangle when they slip down from high chairs, catching their heads between the tray and the seat. For this reason, children in high chairs should be securely restrained.³⁶

A hinged toy chest can be dangerous if it has a heavy lid. The lid may fall against the child's head or neck and cut off the air supply.³⁷ The cords of window shades and toys should not dangle near cribs and playpens, because children can die by entangling their necks in them. Finally, parents should be aware that loose bedding in an infant's crib, or the strings and hoods on clothing, or strings that hold pacifiers around the neck, are dangerous. Any of these may catch on protruding objects as children fall, and cause strangulation.³⁶

Not surprisingly, children fall quite often. Although falls from beds and other low furniture do not cause severe injury,³⁸ falls down stairs can be serious. Many parents barricade the top of the stairs. What they sometimes forget is that children can climb up the stairs from the bottom, and then fall down. Falls from windows are, of course, potentially fatal. In highrise apartments especially, windows should not be left open when children are present.³⁹

Poisoning is another common childhood accident. Preschoolers are especially apt to be poisoned. According to the Food and Drug Administration's (FDA) National Clearinghouse for Poison Control Centers, nearly 60 percent of the poisonings reported in 1979 involved children under five years of age.⁴⁰

Young children are prone to poisoning because they have an immature taste discrimination and because they explore their environments by putting objects in their mouths. Most begin mouthing ob-

jects in the middle of their first year and continue into their second year and sometimes longer.⁴¹ The FDA frequently receives reports of preschool children swallowing insecticides, antifreeze, oven cleaner, bleach, rat poison, mothballs, gasoline, turpentine, and a host of other substances that adults would never dream of putting into their mouths.⁴⁰

Before the advent of child-proof packaging, aspirin was the leading cause of poisoning among children. In the US today, aspirin overdose kills ten to 25 children per year.⁴⁰ Antihistamines, cough syrup, and vitamin supplements poison many children as well.

The way in which parents present medicines to children can play a role in the children's poisoning. It is dangerous, for instance, to tell children that medicines are "candy." It is also risky to allow children to take medicines without supervision.²³ Alcohol, of course, should always be kept away from children. But toddlers often drink colognes and mouthwash, which contain alcohol. The National Poison Center Network estimates that 600 children aged five and under are poisoned each year by mouthwash.⁴² A particularly dangerous symptom of alcohol poisoning may occur hours after intoxication has worn off. The child's blood sugar level drops dangerously low, sometimes resulting in fainting and seizures.⁴³

Poisonings not only occur when children get into the laundry cupboard or medicine cabinet. They also happen when the child ingests common household objects. For instance, many children eat cigarettes. And house and garden plants, such as philodendron and daffodil, can cause vomiting, dizziness, and a host of other symptoms.²³ Ingestion of houseplants, though usually not serious, is now the most common household poisoning reported for children under five years of age.²³

Another serious threat to children is the firearm, especially the handgun. Each day in the US, one child under ten years old is killed in a handgun accident. In most cases, children find guns in the house. Believing them to be toys, they shoot themselves or friends.⁴⁴ Air guns, sold as children's toys, also can cause serious injury. The pellets leave the barrel at velocities high enough to penetrate internal organs. While air guns are intended for older children, they easily find their way into the hands of younger ones.⁴⁵

We have discussed the various means of unintentional death and injury among youngsters. What about suicide? Suicide is statistically nonexistent in children under age five, virtually nonexistent in children between the ages of five and nine, and very rare (one per 100,000) in children between the ages of ten and 14. These figures may be deceiving, however, because their source, the US Office of Vital Statistics, does not record suicide for children under eight, regardless of the manner of death. Suicide is the third leading cause of death, however, among adolescents. Only accidents and homicides claim more adolescents' lives.⁴⁶ For more information on adolescent depression and suicide, see my earlier essay on the subject.⁴⁷

There are no journals devoted entirely to child safety. Most reports of child-

Table 1: Selected list of journals in which key articles on child safety appear.

Accident Analysis and Prevention
American Journal of Diseases of Children
American Journal of Public Health
Archives of Disease in Childhood
Australian Paediatric Journal
Child: Care, Health and Development
Child Care Quarterly
Clinical Pediatrics
Human Toxicology
Journal of Pediatrics
Pediatrics
Veterinary and Human Toxicology
Young Children

hood trauma appear in pediatrics, toxicology, public health, and child care journals. In Table 1, I have listed 13 journals in which child safety articles often appear.

Some of the most serious dangers children face were itemized here. But the list is by no means exhaustive. In Part 2, I will examine the ways in which government, science, and lay organizations have tried, or failed to try, to make the world a safer place for children. I will also furnish names and addresses of a number of organizations that disseminate information on child safety.

A litany of potential childhood disasters may seem like lugubrious subject matter compared with the more "interesting" medical causes of infant and

child mortality. But the death of a child, no matter what the cause, is a tragedy. If it could have been prevented, it is all the more lamentable. As parents, we assume responsibility for more than our share of guilt for the problems of our children as they grow up. There is no need to compound the problem by neglecting to make sure our children are safe. Child safety requires constant diligence.

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REFERENCES

1. Garfield E. Child care: an investment in the future. Part 2. The ISI Caring Center for Children and Parents. *Current Contents* (7):5-13, 14 February 1983.
2. Baker S P. Prevention of childhood injuries. *Med. J. Australia* 1:466-70, 1980.
3. Gratz R R. Accidental injury in childhood: a literature review on pediatric trauma. *J. Trauma* 19:551-5, 1979.
4. Zelazo P R. Personal communication. 11 November 1983.
5. Manheimer D I, Dewey J, Mellinger G D & Corsa L. 50,000 child-years of accidental injuries. *Public Health Rep.* 81:519-33, 1966.
6. Rivara F P, Bergman A B, LoGerfo J P & Weiss N S. Epidemiology of childhood injuries. II. Sex differences in injury rates. *Amer. J. Dis. Child.* 136:502-6, 1982.
7. Matheny A P, Brown A M & Wilson R S. Behavioral antecedents of accidental injuries in early childhood: a study of twins. *J. Pediat.* 79:122-4, 1971.
8. Chisolm J J. Accidents and poisoning. (Cooke R E, ed.) *The biologic basis of pediatric practice.* New York: McGraw-Hill, 1968. Vol. II. p. 1591-608.
9. Meyer R J, Roelofs H A, Bluestone J & Redmond S. Accidental injury to the preschool child. *J. Pediat.* 63:95-105, 1963.
10. Mofenson H C & Greensher J. Childhood accidents. (Hoekelman R A, ed.) *Principles of pediatrics: health care of the young.* New York: McGraw-Hill, 1978. p. 1791-823.
11. Dalton K. Children's hospital admissions and mother's menstruation. *Brit. Med. J.* 2:27-8, 1970.
12. Rivara F P & Howard D. Parental knowledge of child development and injury risks. *Develop. Behav. Pediat.* 3:103-5, 1982.
13. Soman S C. *Let's stop destroying our children.* New York: Hawthorn, 1974. 274 p.
14. National Safety Council. *Accident facts—1982 edition.* (Brochure.) Chicago, IL: National Safety Council, 1982. NSC Publ. No. 021.62.
15. Jackson R H. Hazards to children in traffic. *Arch. Dis. Child.* 53:807-13, 1978.
16. Sandels S. Young children in traffic. *Brit. J. Educ. Psychol.* 40(Part 2):111-6, 1970.
17. Paulson J A. The case for mandatory seat restraint laws. *Clin. Pediat.* 20:285-90, 1981.
18. Baker S P. Motor vehicle occupant deaths in young children. *Pediatrics* 64:860-1, 1979.
19. Scherz R G. Restraint systems for the prevention of injury to children in automobile accidents. *Amer. J. Public Health* 66:451-6, 1976.
20. Williams A F & Zador P. Injuries to children in automobiles in relation to seating location and restraint use. *Accid. Anal. Prevent.* 9:69-76, 1977.
21. Scherz R G. Fatal motor vehicle accidents of child passengers from birth through 4 years of age in Washington State. *Pediatrics* 68:572-5, 1981.

22. Clark W R & Lerner D. Regional burn survey: two years of hospitalized burned patients in Central New York. *J. Trauma* 18:524-32, 1978.
23. Arena J M & Bachar M. *Child safety is no accident*. Durham, NC: Duke University Press, 1979. 292 p.
24. McNamara A. Personal communication. 19 October 1983.
25. O'Shea J S, Collins E W & Butler C B. Pediatric accident prevention. *Clin. Pediat.* 21:290-7, 1982.
26. Feldman K W, Schaller R T, Feldman J A & McMillon M. Tap water scald burns in children. *Pediatrics* 62:1-7, 1978.
27. Langley J, Dodge J & Silva P A. Scalds to preschool children. *N.Z. Med. J.* 93:84-7, 1981.
28. Rissmiller R. Kerosene heaters—a new burn threat to children. *Clin. Pediat.* 22(3):203, 1983.
29. Young T L & Rehsinger K S. Wall socket electrical burns: relevance to health education? *Pediatrics* 65:825-7, 1980.
30. Rowe M I, Arango A & Allington G. Profile of pediatric drowning victims in a water-oriented society. *J. Trauma* 17:587-91, 1977.
31. Peara J H, Brown J, Wong R & Bart R. Bathtub drownings: report of seven cases. *Pediatrics* 64:68-70, 1979.
32. Walker S & Middelkamp J N. Pail immersion accidents. *Clin. Pediat.* 20:341-3, 1981.
33. Jay M. Telephone communication. 11 October 1983.
34. Baker S P & Fisher R S. Childhood asphyxiation by choking or suffocation. *J. Amer. Med. Assn.* 244:1343-6, 1980.
35. Reisman R. Letter to editor. (Danger of Styrofoam cups.) *Pediatrics* 55:746-7, 1975.
36. Feldman K W & Simms R I. Strangulation in childhood: epidemiology and clinical course. *Pediatrics* 65:1079-85, 1980.
37. Singer W D & Lutner L. Trauma from toy boxes. *J. Pediat.* 100:242-3, 1982.
38. Helfer R E, Slovis T L & Black M. Injuries resulting when small children fall out of bed. *Pediatrics* 60:533-5, 1977.
39. Spiegel C N & Lindaman F C. Children can't fly: a program to prevent childhood morbidity and mortality from window falls. *Amer. J. Public Health* 67:1143-7, 1977.
40. Fenner L. Into the mouths of babes... *FDA Consumer* 16(1):27-8, 1982.
41. Lin-Fu J S. Vulnerability of children to lead exposure and toxicity. II. *N. Engl. J. Med.* 289:1289-92, 1973.
42. Weller-Fahy E R, Berger L R & Troutman W G. Mouthwash: a source of acute ethanol intoxication. *Pediatrics* 66:302-5, 1980.
43. Scherz R G. Personal communication. 11 October 1983.
44. Lautman B. Personal communication. 7 October 1983.
45. Harris W, Luterman A & Curren P W. BB and pellet guns—toys or deadly weapons? *J. Trauma* 23(7):566-9, 1983.
46. Cantor P. Depression and suicide in children. (Walker C E & Roberts M C, eds.) *Handbook of clinical child psychology*. New York: Wiley, 1983. p. 453-74.
47. Garfield E. What do we know about depression? Part 3: children and adolescents. *Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 157-63. (Reprinted from: *Current Contents* (27):5-11, 6 July 1981.)