

AMERICAN ACADEMY OF PEDIATRICS

Committee on Injury and Poison Prevention and Committee on Sports Medicine and Fitness

Trampolines at Home, School, and Recreational Centers

ABSTRACT. The latest available data indicate that an estimated 83 400 trampoline-related injuries occurred in 1996 in the United States. This represents an annual rate 140% higher than was reported in 1990. Most injuries were sustained on home trampolines. In addition, 30% of trampoline-related injuries treated in an emergency department were fractures often resulting in hospitalization and surgery. These data support the American Academy of Pediatrics' reaffirmation of its recommendation that trampolines should never be used in the home environment, in routine physical education classes, or in outdoor playgrounds. Design and behavioral recommendations are made for the limited use of trampolines in supervised training programs.

ABBREVIATIONS. CPSC, Consumer Product Safety Commission; NEISS, National Electronic Injury Surveillance System; NPTR, National Pediatric Trauma Registry.

Review of the literature and the previous policy statements by the American Academy of Pediatrics—"Trampolines" and "Trampolines II"—were critical in placing the currently available data on trampoline-related injuries and deaths in perspective.^{1,2} Injuries have been reported on trampolines ranging from 3 feet in diameter to running or tumbling trampolines that may be as long as 30 feet.³ Previous data have shown that injuries are likely to occur equally on large or small trampolines.⁴

Access to accurate longitudinal data about the incidence and severity of injuries resulting from trampoline use is critical in making sound policy recommendations. Although a variety of articles about trampoline-related injuries have been published,⁴⁻¹⁶ many lack consistent data sources, overlap in reporting of case series, lack an accurate measure of exposure to trampolines, and often lack detail on the circumstances of injury. Two data sources are available to help guide the present policy statement: 1) the Consumer Product Safety Commission (CPSC) National Electronic Injury Surveillance System (NEISS) and other files of product-related incidents; and 2) the National Pediatric Trauma Registry (NPTR).

TRAMPOLINE INJURIES

In 1996, an estimated 83 400 trampoline-related injuries were treated in US hospital emergency departments, a rate of 31.5 injuries per 100 000 popula-

tion (Tables 1 and 2).³ The figures represent a 140% increase over the 1990 rate of injury (13/100 000). The NEISS data showed that for all years (1991-1996), incidents were about evenly divided between boys and girls. In 1996, more than 66% of victims were ages 5 through 14 years; about 16% were 15 through 24 years; and about 10% were 4 years or younger (Table 2). Children younger than 5 years had the second highest rate of injury. Strain/sprain was the most common diagnosis, and was involved in 40% of the injuries. Fractures accounted for 30% of injuries; contusions/abrasions, 13%; lacerations, 11%; and other, 6%. Of the estimated injuries, 45% occurred to the lower extremity (leg or foot) and 30% to the upper extremity (arm or hand); 14% were head or face injuries. The majority of injuries to the leg or foot were strains or sprains (58%), whereas the majority of injuries to the arm or hand were fractures (58%). Most injuries to the head or face were lacerations (61%). Fractures, concussions, and internal injuries to the head accounted for about 15% of all head injuries. For the most severe injuries resulting in hospitalization, fractures (most frequently to the arm and leg) were diagnosed in almost 90%. Two percent of trampoline-related injuries treated in the emergency department resulted in hospitalization, compared with 4% for other product-related injuries reported to NEISS. Table 1 summarizes the number of cases of trampoline-related injuries, the number of hospitalizations, and the number of head and neck injuries for the years 1991 through 1996. The CPSC data indicate that in 1996, head (excluding face) and neck injuries accounted for 9.8% of trampoline-related injuries, 7.2% of skateboard-related injuries, and 4.9% of in-line skating-related injuries.³

Most trampoline-related injuries have occurred on home trampolines (Table 3). The proportion of injuries for which the location was unknown increased from 1991 to 1996 and deserves further study. Review of NEISS 1996 descriptive comments showed that victims were injured when they landed incorrectly while jumping or while performing stunts. Other injuries occurred when the victims fell from the trampoline to the surface below or collided with another person on the equipment. Victims also were injured when they contacted the frame and/or springs while near the edge of the jumping surface. A limited NEISS in-depth study of people in hospital emergency departments in September 1995 revealed that in 57% of cases, the victims were on the trampoline with one or more other persons when they were injured.³ Many of these multiple-user incidents seemed to result from contact with another user.

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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TABLE 1. Trampoline-Related Injuries*

Years	Actual No. of Cases	Estimated No. of Injuries*	Rate per 100 000	Actual No. Hospitalized		No. of Patients With Head and Neck Injuries Hospitalized†
				Total	<15 y	
1991	651	38 800	15.4	19	12	1
1992	780	44 700	17.1	24	16	4
1993	873	46 200	17.9	18	17	4
1994	1065	52 900	20.3	29	20	2
1995	1383	66 200	25.2	25	21	5
1996	1728	83 400	31.5	43	34	2

* From the US Consumer Product Safety Commission, National Electronic Injury Surveillance System, which gives a probability sample. Each injury case has a statistical weight.

† The number of cervical spine injuries in children were 6 for the years 1991–1995.

TABLE 2. Estimated Injuries and Injury Rates From Trampolines, by Age of Victim (1996)*

Age of Victim, y	Estimated No. of Injuries	Percentage of Total	Rate per 100 000
Total	83 400	100	31.5
0–4	8470	10	43.5
5–14	55 400	66	143.7
15–24	13 270	16	37.0
25–44	5740	7	6.9
45–64	520	<1	1.0
65+	0	—	—

* From the National Electronic Injury Surveillance System; US Census Population Estimates; US Consumer Product Safety Commission.

Most injuries involved relatively new full-size trampolines in residential yards. Most trampolines were at least 2 feet high.

The NPTR is a database of trauma cases treated in a set of pediatric trauma centers or in children's hospitals with a pediatric trauma unit. In October 1996, there were 78 participating hospitals. During the period July 13, 1988, to June 30, 1996, 149 trampoline-related injuries were reported to the NPTR (unpublished data, 1996). About 50% of these patients were transported directly to the operating room. The leading diagnosis was fracture of an extremity. In 16% of cases, the head and neck were involved. One spinal cord lesion without vertebral injury was reported, and one fracture of the vertebral column occurred without spinal cord injury. The majority of head and neck injuries were skull fractures with intracranial injury or concussion.

A recent epidemiologic study of trampoline-related injuries in New Zealand, during a 10-year period 1979 through 1988, revealed an increase in

TABLE 3. Percentage of Trampoline-Related Injuries by Location of Trampoline*

Year	Location of Trampoline				
	Home	School	Sports	Other	Unknown
1991	65	1	3	1	30
1992	60	1	1	2	36
1993	63	1	2	1	33
1994	58	1	2	<1	38
1995	58	1	3	<1	38
1996	54	<1	3	<1	42

* From the US Consumer Product Safety Commission, National Electronic Injury Surveillance System.

incidence of hospitalization rate from 3.1 to 9.3 per 100 000.⁴ Of hospitalized victims, 71% were injured on home trampolines, and in contrast to other studies, 80% fell from the trampoline to the surrounding surface. Fractures were the most common type of injury, and the incidence of severe head and neck injuries was low. Two deaths and 2098 hospitalizations occurred. Most injuries occurred when the victims fell from the trampoline and sustained injury on impact with the surface below.

A recent review of trampoline-related injuries to children in the United States from 1990 through 1995 provided a retrospective analysis of data from the NEISS. The data indicated that an estimated 1400 children, or 2.0 per 100 000, required hospital admission or interhospital transfer because of a trampoline-related injury. This represented 3.3% of all children with a trampoline-related injury.¹⁶

TRAMPOLINE DEATHS

Since 1990, the CPSC has received reports of six deaths involving trampolines. Victims ranged in age from 3 years through 21 years, although the 21-year-old died 6 years after being injured on a trampoline. Most deaths occurred when victims fell from the trampolines, and most involved the cervical spinal cord.

CONCLUSIONS

The following conclusions may be drawn from the data and literature review:

1. In the United States, the largest proportion of trampoline-related injuries has occurred on home trampolines.
2. Most trampoline-related injuries occur from falls sustained on and off the trampoline.
3. Many trampoline-related injuries occur when there are simultaneous multiple users.
4. The most likely injuries resulting in hospitalization sustained while using a trampoline are fractures to the upper and lower extremities; these injuries may be severe, often resulting in surgery.
5. Catastrophic cervical spine injuries are rare. However, head and neck injuries constitute a notable number of the more serious injuries requiring hospitalization.
6. More data are needed about the incidence, circumstances, and mechanism of catastrophic injuries, such as those to the cervical spine.

RECOMMENDATIONS

Despite all currently available measures to prevent injury, the potential for serious injury while using a trampoline remains. The need for supervision and trained personnel at all times makes home use extremely unwise.

1. The trampoline should not be used at home, inside or outside. During anticipatory guidance, pediatricians should advise parents never to purchase a home trampoline or allow children to use home trampolines.
2. The trampoline should not be part of routine physical education classes in schools.
3. The trampoline has no place in outdoor playgrounds and should never be regarded as play equipment.

The limited use of trampolines under direct supervision of physical therapists, athletic trainers, or other appropriately trained individuals for specific medical conditions, including conditioning and/or rehabilitation of injuries, is not addressed in this statement. The limited use of trampolines in supervised training programs (eg, gymnastics, diving, and other competitive sports), should include the design and behavioral recommendations that follow.

DESIGN

- A safety pad should cover all portions of the steel frame and springs.
- The surface around the trampoline should have an impact-absorbing safety surface material.¹⁷
- The condition of the trampoline should be regularly checked for tears, rust, and detachments.
- Safety harnesses and spotting belts, when appropriately used, may offer added protection for athletes learning or practicing more challenging skills on the trampoline.
- Setting the trampoline in a pit so the mat is at ground level should be considered.
- Ladders may provide unintended access to the trampoline by small children and should not be used.

BEHAVIOR

- Only one person should use the trampoline at a time.
- In supervised settings, the user of the trampoline should be at the center of the mat. The user of the trampoline should not attempt maneuvers beyond capability or training, thereby putting them at risk for injury.
- Personnel trained in trampoline safety and competent spotters should be present whenever the trampoline is in use.
- Even in supervised training programs, the use of trampolines for children younger than 6 years of age should be prohibited.¹⁸
- The trampoline must be secured and not accessible when not in use.

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