

## Home Treadmill Injuries in Infants and Children Aged to 5 Years: A Review of Consumer Product Safety Commission Data and an Illustrative Report of Case

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Approximately 8700 injuries from home exercise equipment occur annually in children in the United States. Home treadmills, which have been growing steadily in popularity during the past decade, pose a specific hazard to infants and children aged 5 years or younger, a population at increased risk of injury to the upper extremities (ie, arm, forearm, wrist, hand, and fingers). The authors also provide an illustrative report of case of a 2-year-old boy whose hand injury resulted from a home treadmill.

Analysis and frequency reporting of United States Consumer Product Safety Commission data for home treadmill injuries in this demographic group are presented. From January 1, 1996, to September 30, 2000, the number of home treadmill injuries reported to the National Electronic Injury Surveillance System was 1009. Three hundred of these (29.7%) were in infants and children aged to 5 years. Abrasions or contusions (or both) of the upper extremities were the most common injury.

Although the number of home treadmill injuries to children being reported is low, the potential for costly and serious complications has been demonstrated previously. The authors conclude that additional home treadmill safety measures and guidelines must be established.

In the past 20 years, several studies have demonstrated the dangers of home exercise equipment to children. Estimates of annual emergency department visits in the United States for injuries related to home exercise equipment are around 25,000.<sup>1,2</sup> The extent of this problem has had even greater consequences because, on an annual basis, 8700 children younger than 5 years are estimated to be injured from home exercise equipment.<sup>3</sup>

Although most studies on the dangers of home exercise equipment have focused on injuries to children from stationary exercise bicycles, little attention has been paid to injuries from treadmills. One study of the United States Consumer Product Safety Commission's (USCPSC's) National Injury Information Clearinghouse (NIIC) found 89 cases from 1981 to 1991 that involved injuries due to home exercise equipment; most were due to stationary exercise bicycles (56.2%).<sup>4</sup> Although home treadmill injuries accounted for a small number of emergency department visits (2.2%) during this time, advances in treadmill design and decreasing prices have resulted in increased sales.

### Report of Case

After an emergency department visit at The Children's Medical Center in Dayton, Ohio, a 2-year-old boy was brought to a family practice office by his mother for a follow-up visit. In the emergency department, the child received treatment for a friction burn to his right hand after he got it stuck in a moving home treadmill. The patient unintentionally wedged his hand between the moving belt and the support bar at the rear end of the treadmill. His mother, who had been jogging on the treadmill at the time, disconnected the safety key, but not in time to prevent the injury. The treadmill has safety instructions and precautions that are located on the

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**Table 1**  
**Demographic Characteristics of Infants and Children**  
**Aged to 5 Years Who Had Treadmill Injuries**  
**January 1, 1996, to September 30, 2000 (N=300)\***

Characteristic	No. (%)
<b>■ Age, y</b>	
<input type="checkbox"/> <1	3 (1)
<input type="checkbox"/> 1 to 2	89 (30)
<input type="checkbox"/> 2 to 3	78 (26)
<input type="checkbox"/> 3 to 4	55 (18)
<input type="checkbox"/> 4 to 5	49 (16)
<input type="checkbox"/> 5	26 (9)
<b>■ Sex</b>	
<input type="checkbox"/> Female	111 (37)
<input type="checkbox"/> Male	189 (63)
<b>■ Year of Injury</b>	
<input type="checkbox"/> 2000	68 (23)
<input type="checkbox"/> 1999	76 (25)
<input type="checkbox"/> 1998	66 (22)
<input type="checkbox"/> 1997	59 (20)
<input type="checkbox"/> 1996	31 (10)

\* Source: National Electronic Injury Surveillance System [database online]. Washington DC: US Consumer Product Safety Commission; 2002.

underside of the machine and are therefore not visible to operators.

The family physician found that the burn was a deep partial-thickness burn that spanned over the distal interphalangeal joint of the right index finger and middle finger, and the proximal interphalangeal joints of the middle finger. Burn blisters were also present on the skin overlying the distal portion of the second and third right metacarpal bones. The patient had no other complaints. Radiographs of the right hand taken in the emergency department showed no fractures.

The patient was referred to a plastic surgeon who treated the injury conservatively with sulfadiazine silver and gauze dressing. The parents obtained a second opinion from a hand surgeon who referred the boy to a hand therapist. The wound was debrided by the hand therapist after consultation with the orthopedic hand surgeon, and the parents were instructed on home physical therapy. At a 6-week follow-up visit, the boy's wound was healing well and no flexion deformity or ischemic contracture was evident.

## Methods

We conducted a review of US CPSC's databases to determine the extent of the problem of home treadmill injuries in young children. Data of home treadmill injuries collected by the National Injury Information Clearinghouse (NIIC) from January 1, 1996 to September 30, 2000, and the National Electronic Injury Surveillance System (NEISS) from January 1, 1996 to September 30, 2000 were obtained from US CPSC.<sup>5,6</sup> According to the US CPSC printout, information contained in the NIIC is "...intended to be a concise report of actual complaint, newspaper clipping, or other source of incident information."<sup>5</sup> Furthermore, the US CPSC provided us with a list of accident investigations from NIIC. The NEISS is a database of information that is collected from hospital emergency departments and maintained by the US CPSC.

## Results

The NEISS reported 1009 home treadmill injuries in infants and children from January 1, 1996 to September 30, 2000 (*Table 1*). During this time, there was a trend of an increase in the reporting of home treadmill injuries for infants and children aged to 5 years.

The most common injuries reported for this demographic characteristic (*Table 2*) were contusion or abrasion, or a combination of both (46%), followed by lacerations (30%) and burns (10%).

Of injuries to the upper extremities (ie, arm, forearm, wrist, hand, and fingers), which accounted for 56% of all injuries by body part injured (*Table 3*), damage to fingers and hands accounted for the most cases (90%). The head was the second most commonly injured body part or region (31%), followed by lower extremities (ie, thigh, leg, ankle, foot, and toes) (9%), and the trunk (4%).

Reports to the NIIC of home treadmill injuries in infants and children aged to 5 years during the period from January 1, 1996 to September 30, 2000 were much lower (*Tables 4 and 5*). Twelve reports were made and 12 independent accidents were investigated (though not on all the cases that were reported in that time) by the US CPSC. Of the 12 cases reported, only one case (ie, Case No. 1) did not involve the upper extremities.

## Comment

Although literature about injuries to children from home exercise equipment is mostly limited to the study of stationary exercise bicycles, data reported by the US CPSC on injuries to children from home treadmills is consistent with data available for stationary exercise bicycles.

Two retrospective studies<sup>7,8</sup> dealt with the issue of sta-

tionary exercise bicycles and hand injuries. In a study of 34 children with hand injuries, Lehrer et al<sup>7</sup> found that the mean age of children injured by stationary exercise bicycles was 3.4 years, that most of the injured children (62%) were boys, and that crush or an avulsion was the most common mechanism of injury.<sup>7</sup>

In Australia, Perks et al<sup>8</sup> conducted a study of the Victorian Injury Surveillance System (now the Victorian Injury Surveillance and Applied Research System) and found that 17 injuries occurred in a 21-month period as a result of stationary exercise bicycles.<sup>8</sup> The study also found that 88% of those injured were younger than 5 years, there was a male-to-female ratio of 5:1, and the index finger was involved in 13 injuries (77%).<sup>8</sup>

For this demographic group, the upper extremity is also the body part most often injured by home treadmills. The mechanism of injury to hands and fingers from home exercise treadmills has been reported by Carman and Chang<sup>10</sup> and Attalla et al<sup>11</sup> and is further illustrated in our current case report.

Most documented cases involve the fingers being wedged between the conveyor belt and rear end bar. As noted, abrasion or contusion or both accounted for a majority of injuries to the hand and fingers. Outcomes from abrasion and contusion injuries are good, however, with limited long-term disability.

One retrospective study of 477 patients with hand injuries who were seen in pediatric emergency departments during a 6-month period found that hand trauma accounted for only 1.7% of all emergency department visits.<sup>9</sup> Among those patients, however, lacerations were the most common type of hand injury (38.1%), and burns accounted for 4.7% of all hand injuries.<sup>9</sup> Bhende et al<sup>9</sup> further found that children with hand lacerations were younger (mean age, 7.6 years) than those with other types of hand injuries (mean age, 9.5 years). Of the 477 patients studied, 105 (22%) were brought to the emergency department because of injuries that occurred while they were engaged in athletic and sport-related activities.

Data compiled by the NIIC and NEISS are both limited by reporting bias and errors. Furthermore, many injuries from home treadmills might go unseen and untreated by medical personnel, and therefore, many cases are underreported to the US CPSC. Even though these limitations exist, the data obtained from NEISS demonstrate that infants and children aged to 5 years still account for a greater number of those injured by home treadmills.<sup>6</sup>

The severe injuries that children have from home treadmills can be life-altering, with graft surgery and

**Table 2**  
Treadmill Injuries in Infants and Children Aged to 5 Years  
January 1, 1996, to September 30, 2000  
by Injury (N=300)\*

Injury	No. (%)†
Amputation	1 (<1)
Avulsion	9 (3)
Burn	29 (10)
Contusion and/or abrasion	137 (46)
Crush	3 (1)
Fracture	15 (5)
Laceration	90 (30)
Loss of consciousness	7 (2)
Strain or sprain	3 (1)
Not specified	6 (2)

\* Source: National Electronic Injury Surveillance System [database online]. Washington DC: US Consumer Product Safety Commission; 2002.  
† Percentages reported were rounded for each body part injured. Therefore, the sum of these percentages may not equal 100%.

**Table 3**  
Treadmill Injuries in Infants and Children Aged to 5 Years  
January 1, 1996, to September 30, 2000  
by Body Part Injured (N=300)\*

Body Part Injured	No. (%)†
■ Head	94 (31)
■ Trunk	12 (4)
■ Upper Extremity	167 (56)
□ Finger	84 (50)
□ Hand	67 (40)
□ Elbow	4 (2)
□ Arm	12 (7)
■ Lower Extremity	26 (9)
■ Not specified	1 (<1)

\* Source: National Electronic Injury Surveillance System [database online]. Washington DC: US Consumer Product Safety Commission; 2002.  
† Percentages reported were rounded for each body part injured. Therefore, the sum of these percentages may not equal 100%.

**Table 4**  
**Treadmill Injuries Reported in Children Aged to 5 Years**  
**January 1, 1996, to September 30, 2000 (N=12)\***

Case No.	Year of Injury†	Age, y	Sex‡	Body Part Injured	Injury‡
1	1996	3	M	Leg	NS
2	1996	2	F	Hand	NS
3	1997	3	M	Fingers	Laceration
4	1997	2	M	Hand	Abrasion
5	1997	1.5	F	Fingers	Laceration
6	1997	4	F	Hand	Burn
7	1997	4	F	Hand	NS
8	1997	2	NS	Hand	Burn
9	1999	3	F	Hand	NS
10	1999	2	M	Hand	NS
11	1999	2	M	Head	Contusion
12	1999	3	F	Hand	Burn

\* Source: National Injury Information Clearinghouse [database online]. Washington DC: US Consumer Product Safety Commission; 2002.  
† No cases of treadmill injuries in children aged to 5 years were reported to or investigated by the US Consumer Product Safety Commission in 1998.  
‡ NS indicates not specified.

long-term disability possible. Carman and Chang,<sup>10</sup> in a retrospective review of 12 charts of patients treated at the Hand Clinic at The Children's Hospital of Philadelphia (Pa) between September 1996 and March 2000, demonstrated that most hand injuries were either abrasions or lacerations—results that are similar to our findings based on US CPSC data. However, in the Philadelphia study, half of the children injured required surgical intervention, either for the release of scar contracture or for delayed healing of the wound. Attalla et al<sup>11</sup> described friction burns due to home treadmill injuries in three children. Two of the these children had poor initial outcomes and required skin grafts.<sup>11</sup>

Carman and Chang further reported that in 50% of the cases they reviewed, an adult was using the treadmill when the child's hand got caught at the rear end of the treadmill. The remaining injuries resulted when either the injured child or another child operated the home exercise treadmill without adult supervision.

Carman and Chang recommend that safety features of home exercise treadmills be updated to include pro-

tection for small hands. In addition, they recommend that home treadmills be difficult to operate, rollers stop on soft tissue contact, and adults be further educated to remain aware of children's activities and take better steps to keep machines out of children's reach.<sup>10</sup>

In 1992, Benson et al<sup>12</sup> recommended that safety guidelines from the American Society for Testing and Materials be updated for home exercise equipment. We would further recommend that additional industry guidelines be established to require manufacturers to install additional safety features—and require retailers to educate customers about the dangers home exercise treadmills pose to infants and children. We further recommend that safety precautions be made highly visible to the operator of the treadmill while the machine is running.

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**Table 5**  
**Investigations of Treadmill Injuries Reported in Children Aged to 5 Years**  
**January 1, 1996, to September 30, 2000 (N=12)\***

Case No.	Year of Injury†	Age, y	Sex	Body Part Injured	Injury‡
1	1996	2	F	Hand/arm	Burn
2	1997	4	F	Finger	Burn
3	1999	2	M	Finger	Laceration
4	1999	4	F	Finger	Contusion/abrasion
5	1999	5	M	Finger	Burn
6	1999	4	M	Hand	Contusion/abrasion
7	1999	5	F	Finger/knee	Contusion/abrasion
8	1999	3	F	Hand	Burn
9	1999	1.8	F	Finger	Burn
10	2000	3	M	Arm	Contusion/abrasion
11	2000	3	F	Hand	Contusion/abrasion
12	2000	2	M	Hand	Contusion/abrasion

\* Source: National Injury Information Clearinghouse [database online]. Washington DC: US Consumer Product Safety Commission; 2002.

† No cases of treadmill injuries in children aged to 5 years were reported to or investigated by the US Consumer Product Safety Commission in 1998.

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