Childhood Accidents in a Rural Community: A Five-Year Study

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Childhood accidents were monitored over a five-year period in a rural West Virginia primary care center. A population of 1,410 families with children up to 12 years of age was followed. Lacerations, musculoskeletal injuries, and head injuries were the most common injuries. Accidents were relatively more frequent within families with lower income levels and in single-parent households. The data suggest specific preventive strategies for this rural population.

Accidents are the leading cause of death in childhood. Only acute infections rank higher as a cause of physician visits and morbidity in this age group.[1] Despite this, literature concerning nonfatal accidents in defined populations of children is scant.[2] According to Izant and Hubay, "accidental injury is one of the poorest understood and most serious social, economic, and medical phenomena of current times."[3]

The importance of accidents as a major cause of mortality in children is well documented. Fifteen thousand children under the age of 15 years die of accidental injuries yearly in the United States, constituting the leading cause of death after one year of age.[4] Less well understood is the importance of nonfatal accidents. One hundred thousand children are permanently disabled each year.[5] The cost of less serious accidents in terms of dollars and days missed from school is enormous.

This study documents the nonfatal accidents occurring among a group of children in a rural Appalachian community. Such studies may be important in identifying potentially high-risk families for planning accident prevention and education programs. This type of research can also have significant implications for the preparation of physicians for rural practice.

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Methods

Childhood accidents were documented over a five-year period in Lincoln County, a heavily forested, low mountainous area in rural West Virginia. The economy is largely based on timber and agriculture. It ranks 51st out of 55 counties in per capita income.

The study population consisted of 1,410 families identified as receiving all outpatient medical care at the rural primary care center. Each family had at least one child 12 years of age or younger during the study period.

In this medically underserved area, utilization of the primary care center by the community is consistently high. The nearest hospital emergency room is a one-hour drive away. The only other accessible medical facility is a part-time, solo practice seven miles away. Little trauma is treated in this practice, but such cases were potentially missed in this study. No attempt was made to document accidents occurring while traveling outside the community.

Following treatment for each accident, a data sheet was completed by the health providers at the primary care center. Providers included four physicians and a family nurse practitioner. Data collected included family name, patient name, age, sex, marital status of the household head, family income level, and type and circumstance of accident. Information was collected on all childhood

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Table 1. Accidents by Type and Sex Distribution

Type	No. (%)	Sex		Sex Ratio (Male-to-Female)
		Male	Female	
Lacerations	285 (39.4)	220	65	3.4-1
Musculoskeletal	139 (19.2)	88	51	1.7-1
Head injuries	104 (14.3)	63	41	1.5-1
Burns	46 (6.4)	29	17	1.7-1
Crush injuries	28 (3.9)	17	11	1.5-1
Eye injuries	28 (3.9)	21	7	3-1
Toxic ingestions	25 (3.5)	18	7	2.6-1
Animal bites	24 (3.3)	14	10	1.4-1
Foreign bodies	18 (2.5)	13	5	2.6-1
Bicycle injuries	16 (2.2)	9	7	1.3-1
Automobile related	10 (1.4)	6	4	1.5-1
Total	723 (100.0)	498	225	2.2-1

accidents occurring between January 1, 1976, and January 1, 1981. Only data concerning the study population are presented.

In this study an accident was defined as an unplanned event resulting in tissue damage or metabolic derangement requiring medical treatment, observation, or diagnostic studies.[6] Accident classification was designed to facilitate recognition of preventive factors. Accidents were classified by type of injury (lacerations, sprains or fractures, burns, crush injuries, foreign bodies, etc), anatomical site (head, eye), and circumstance (bicycle, automobile related, animal bites, toxic ingestions). Each accident was placed in one category using the following preferential order: circumstance, anatomical site, and type of injury. Contusions and abrasions, when not classified by circumstance or anatomical site, were classified as lacerations or musculoskeletal injuries at the discretion of the health provider. Minor injuries were excluded if the health provider decided professional medical care was unnecessary. Multiple injuries were classified by most important type in the opinion of the provider.

Patterns of accident occurrence were studied by family as well as by individual child. Families were grouped into the following categories: (1) those with no documented accidents during the surveillance period and (2) families with one or more accidents. Each family was grouped according to income, based on an annual income of greater or less than $10,000.

Table 2. Distribution of Frequency of Accidents (n = 1,410 families)

Number of Accidents Per Family	No. (%)
0	975 (69.2)
1	274 (19.4)
2	95 (6.7)
3	35 (2.5)
4	15 (1.1)
>4	16 (1.1)

Results

A total of 1,762 children representing 1,410 families were followed. Most (95.2 percent) of these families remained under surveillance at the end of the study period. Seven hundred twenty-three (723) accidents were documented in 527 (29.9 percent) children. Lacerations were the most common injury. Musculoskeletal injuries (sprains or strains, fractures) and head injuries ranked second and third, respectively (Table 1). There was a marked predominance of male patients in recorded accidents, as had been reported by previous investigations.

Analysis of family data is necessary for accident prevention. It is at the family level that many accidents can be prevented. Of the families studied, 274 (19.4 percent) had one childhood accident, 95 (6.7 percent) had two accidents, and 66 (4.7 percent) had more than two recorded accidents in the study interval (Table 2).

Table 3. Accident Occurrence Compared With Family Income

	Income Level		
	≤$10,000	>$10,000	Total
Families with accidents over 5-year period	367 (84%)	68 (16%)	435
Families without accidents over 5-year period	752 (77%)	223 (23%)	975
Total	1,119	291	1,410

$\chi^2 = 8.33$, 1 *df*, $P < .01$

Table 4. Accident Occurrence in Single- and Two-Parent Households

	Single-Parent Household No. (%)	Two-Parent Household No. (%)	Total
Families with accidents over 5-year period	110 (25)	325 (75)	435
Families without accidents over 5-year period	186 (19)	789 (81)	975
Total	296	1,114	1,410

$\chi^2 = 5.736$, 1 *df*, $P < .05$

Families with a yearly income of less than $10,000 experienced a significantly greater number of accidents than those with a higher yearly income ($\chi^2 = 8.33$, 1 *df*, $P < .01$) (Table 3).

Childhood accidents were significantly more frequent in single-parent households over the study period ($\chi^2 = 5.736$, 1 *df*, $P < .05$) (Table 4).

Results by Type of Accident

During the surveillance period, 285 lacerations (39.4 percent) occurred. This injury was more common in spring and summer. Lacerations to bare feet accounted for 18 percent of the total. The mean age for lacerations was 6.8 years and the male-to-female ratio was 3.4 to 1. Thirteen percent of lacerations were repeat injuries.

Musculoskeletal injuries ranked second in prevalence, with 139 reported. Fractures made up 46 percent of this type of injury. Older children, aged 9 to 12 years, accounted for 60 percent of all musculoskeletal injuries. Radial subluxation (6 percent) clustered about the two- and three-year age group. The male-to-female ratio was 1.7 to 1.

Of the 104 head injuries (14.3 percent), most were found in younger age groups, decreasing sharply after five years of age. Eleven percent involved striking a coffee table. Male predominance was less marked, with a male-to-female ratio of 1.5 to 1.

Forty-six burns (6.3 percent) were recorded, with a male-to-female ratio of 1.7 to 1. Younger children were most susceptible; one half were under five years of age. Burns occurred more often in the winter months (58 percent). Stoves or ranges were involved in 30 percent of the cases. Four children were seriously burned during the study period, requiring prolonged hospitalization.

Twenty-eight eye injuries (3.8 percent) showed a male-to-female ratio of 3 to 1. Eleven were corneal abrasions and six were chemical burns. Three of these injuries were severe and required immediate hospitalization. As opposed to adults, few occurred in settings where safety glasses would be appropriate.

Twenty-five toxic ingestions (3.5 percent) were recorded, with a male-to-female ratio of 2.5 to 1. Sixty-five percent of these injuries occurred be-

tween the ages of one and three years. Medications (33 percent) and household products (25 percent) were the most commonly ingested substances. Three children in the study were three-time repeaters of toxic ingestions.

Twenty-eight crush injuries showed a 1.5 to 1 male-to-female ratio. Seven (28 percent) were wringer washer accidents, showing that this is not an outdated injury. Car door injuries accounted for 25 percent of all crush injuries.

Twenty-four animal bites (3.3 percent) showed an almost equal male-to-female ratio of 1.4 to 1. Few involved animals known to be previous biters. Seventy-five percent of those children bitten were five years or younger.

Eighteen (2.5 percent) foreign bodies requiring medical intervention for removal were documented during the study period. The male-to-female ratio was 2.6 to 1, with male predominance. Sixty-five percent of these accidents occurred between the ages of two and six years.

Injuries from ten moving automobile accidents (1.4 percent) were seen in the primary care center, with a male-to-female ratio of 1.5 to 1. There were three pedestrian accidents. Of the seven passenger accidents, no child was using a restraint at the time of the injury.

Discussion

Nonfatal childhood accidents take a heavy toll in dollars, missed school days, and temporary or permanent loss of function. Because these accidents are less well studied than fatal accidents, prevention strategies are difficult to formulate.

The current study analyzes accident by family as well as by individual patient occurrence. The family is the unit of preventive intervention. In the rural community studied, there is a greater risk among families with one accident for further accidents when compared with families with no previous accident. In this patient group, it would be reasonable to regard any family as high risk following a second significant accident. Educational efforts and environmental intervention can be more effectively focused on such groups. Index of suspicion for abuse and neglect may be appropriately higher concerning such families. Multiple accidents may be symptomatic of underlying disorders. Following identification of high-risk families, providers may encourage counseling and provide opportunities for discussions of family problems.

Many factors undoubtedly influence the likelihood of childhood accidents within families. Family income and single-parent status were considered in this study. Family size is probably a major predictor, but it was not considered.

Specific patterns of accident occurrence may suggest general educational efforts. For instance, the relatively high occurrence of lacerations involving the feet of shoeless children and head injuries involving a coffee table may suggest educational strategies. These might include placing in the clinic appropriate posters or visual aids promoting the wearing of shoes during the summer months or a discussion with family members on how to make their home safer by temporarily removing certain high-risk objects such as the coffee table.

The mere occurrence of specific types of accidents may alert providers to health educational needs. Warnings for parents and children concerning wringer washers were common before the advent of the automatic washer. The occurrence of these types of injuries in this rural population probably indicates the need to revive the warnings.

It is uncertain how this childhood accident profile applies to other populations. Comparisons among other studies indicate similarities.[3] The results underscore the need for highly developed skills in suturing, office orthopedics, and neurological evaluation of head injuries by the rural practitioner. They also point to relatively commonly required skills in the ambulatory care of eye injuries, burns, and toxic ingestions.

More information is needed on nonfatal childhood accidents as they occur in defined populations. Data are also needed on the effectiveness of various strategies for prevention. Accident indices can be useful in determining needs of communities, specific subgroups, and individual families.

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