ORIGINAL ARTICLE

Recreational injuries among older Americans, 2001

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Objective: To describe the epidemiology of non-fatal recreational injuries among older adults treated in United States emergency departments including national estimates of the number of injuries, types of recreational activities, and diagnoses.

Methods: Injury data were provided by the National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP), a nationally representative subsample of 66 out of 100 NEISS hospitals. Potential cases were identified using the NEISS-AIP definition of a sport and recreation injury. The authors then reviewed the two line narrative to identify injuries related to participation in a sport or recreational activity among men and women more than 64 years old.

Results: In 2001, an estimated 62 164 (95% confidence interval 35 570 to 88 758) persons ≥ 65 years old were treated in emergency departments for injuries sustained while participating in sport or recreational activities. The overall injury rate was 177.3/100 000 population with higher rates for men (242.5/100 000) than for women (151.3/100 000). Exercising caused 30% of injuries among women and bicycling caused 17% of injuries among men. Twenty seven percent of all treated injuries were fractures and women (34%) were more likely than men (21%) to suffer fractures.

Conclusions: Recreational activities were a frequent cause of injuries among older adults. Fractures were common. Many of these injuries are potentially preventable. As more persons engage in recreational activities, applying known injury prevention strategies will help to reduce the incidence of these injuries.

It is well known that the demographics of the United States population are changing due to the growing proportion of older Americans.¹ It is also well known that regular physical activity throughout life is important for maintaining a healthy body, enhancing psychological wellbeing, and preventing premature death.^{2–3} Injuries are an unintended consequence of physical activity. Little is known about sport and recreational injuries (referred to as recreational injuries in this paper), particularly among older persons. This paper describes recreational injuries among older adults age ≥ 65 years.

Increasing physical activity among all Americans is a national health goal and there have been successful efforts to improve rates of participation.⁴ A Healthy People 2010 (HP2010) objective for the United States is to raise to 30% the proportion of all Americans who engage in moderate physical activity for 30 minutes at least five times a week. The 1997 baseline showed 15% of Americans, including 14% of older Americans, met this goal.⁵ One significant effort to achieve this objective is the *National Blueprint, Increasing Physical Activity Among Adults Age 50 and Older*.⁶ This proposal was developed by a collaboration of governmental and private organizations interested in physical fitness and aging. Implementation will lead to greater numbers of older persons engaging in physical activity. While increased physical activity will have an overall positive effect on health, it also will increase exposure to the possibility of injury.

We know very little about recreational injuries, especially among older adults. Gotsch *et al* analyzed National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) data and reported that during July 2000 to June 2001 there were 4.3 million recreational injuries treated in United States emergency departments.⁷ The recreational injury rate for persons ≥ 45 years old was 4.3/1000 for men and 2.2/1000 for women.⁷ However, these authors did not examine injury rates for adults age ≥ 65 years. Hootman and colleagues surveyed a select population of seniors that included 1569 community dwelling persons ≥ 60 years old who were enrolled in a

preventive medicine clinic exercise program. They found that 17.5% of the respondents reported they had sustained an activity related lower extremity injury to soft tissue or bone.⁸ For the general population of older persons, many of whom are not engaged in fitness activities, the recreational injury rate likely is markedly lower.

The rapid growth in the proportion of Americans age ≥ 65 years old suggests that the number of recreational injuries treated in emergency departments will grow if efforts at increasing physical activity among older Americans succeed. It is important to characterize recreational injuries to help us understand the activities associated with higher risk for injury and the mechanisms of injury so that strategies can be developed and implemented to prevent these injuries. In this paper, we analyzed NEISS-AIP data to describe non-fatal recreational injuries among older adults treated in emergency departments and provide national estimates of the number of injuries, types of recreational activities, and diagnoses.

METHODS

We analyzed data from the NEISS-AIP from 1 January 2001 to 31 December 2001 to estimate the number and rate of recreational injuries among older adults in the United States (defined as adults age ≥ 65). The Northeastern Ohio Universities College of Medicine Institutional Review Board exempted this secondary analysis of public data from review.

NEISS-AIP is operated by the United States Consumer Product Safety Commission and collects data on initial visits for all types and causes of injuries treated in United States emergency departments.⁹ NEISS-AIP data are drawn from a nationally representative subsample of 66 out of 100 NEISS hospitals, selected as a stratified probability sample of hospitals in the United States and its territories with a minimum of six beds and a 24 hour emergency department. NEISS-AIP provides data on approximately 500 000 injury

Abbreviations: CI, confidence interval; NEISS-AIP, National Electronic Injury Surveillance System-All Injury Program

and consumer product related emergency department cases each year.

Each case was assigned a sample weight based on the inverse probability of the hospital being selected. Confidence intervals (CIs) were calculated by using a direct variance estimation procedure that accounted for the sample weights and complex sample design. Rates were calculated by using 2001 United States Census Bureau population estimates.

NEISS-AIP defines a recreational injury as one occurring during organized and unorganized activity whether or not work or product related. Injury is defined as bodily harm resulting from exposure to an external substance. NEISS classified each case into one of 39 mutually exclusive sport/recreation categories (see box 1) based on an algorithm that included the consumer product involved (for example, bicycle or golf cart) and a two line description of the event. Falls occurring on pool decks were classed as recreational injury when there was clear evidence from the two line summary that the person was swimming. Golf carts are battery powered four wheel vehicles frequently used for transportation of players and equipment during golf matches. Their use is mandatory on many courses that cater to retirees. They also are used for transportation in retirement communities and elsewhere. We classified golf cart injuries as recreational unless there was clear evidence that it was not. We elected to define all falls while walking as recreational injuries.

Cases were excluded if the cause was violence related or the principal diagnosis was illness. Also excluded were cases of pain only, psychological harm only, contact dermatitis, adverse effect of surgery or therapeutic drugs, or the patient was dead on arrival or died in the emergency department.

Potential cases in our analyses were ≥ 65 years old and initially identified using the NEISS-AIP definition of a recreational injury. The authors then independently reviewed the two line narrative and identified injuries related to participation in a recreational activity. Differences were discussed and resolved.

Excluded cases were those that:

- Involved sports/recreation equipment or apparel but had no evidence in the narrative that the person was engaged in a recreational activity at the time the injury occurred (for example, was moving or repairing equipment, had equipment fall on them, was injured near a swimming pool with no evidence of swimming).
- Involved a powered scooter, a four wheeler or all-terrain vehicle at home because these were regarded primarily as forms of transportation.
- Resulted from, or was incidental to, a “grand parenting activity” (for example, struck by a child who fell off a swing).

Also excluded were cases in which the person was a spectator at a sport or recreational event or when an injury was related to an occupational activity.

RESULTS

There were an estimated 62 164 (95% CI 35 570 to 88 758) persons ≥ 65 years old treated in emergency departments for injuries sustained while participating in recreational activities. Six thousand two hundred (10%, 95% CI 5.8% to 14.2%) of these were hospitalized. Table 1 shows that the injury rate for men was 60% higher than the rate for women, and the rates for both sexes decreased as age increased. Forty percent (95% CI 6.4% to 73.8%) of the injuries occurred in a sports venue, 13% at home, and 11% in the street (data not shown).

Figure 1 depicts the distribution of activities associated with non-fatal recreational injuries for men and women. Approximately 70% of injuries occurred as a result of five

Box 1: Categories of sport/recreational injury

- Amusement attraction.
- All-terrain vehicle.
- Baseball.
- Basketball.
- Bicycle.
- Billiards.
- Bowling.
- Camping.
- Combative.
- Exercise.
- Fishing.
- Football.
- Go-kart.
- Golfing.
- Gymnastics.
- Hockey.
- Horseback.
- Miscellaneous ball games.
- Moped/powered minibike/off*.
- Non-powder gun.
- Personal watercraft.
- Playground.
- Racquet sports.
- Scooter.
- Skateboarding.
- Skating, ice.
- Skating, in-line.
- Skating, other.
- Snow skiing.
- Snowmobile.
- Soccer.
- Softball.
- Swimming.
- Toboggan/sled/disk.
- Tack and field.
- Trampoline.
- Volleyball.
- Waterskiing/surfing.
- Other, specify.

*Two wheeled off-road powered vehicles including dirt bikes and trail bikes.

categories of activity: bicycling, exercising, fishing, golfing, and snow skiing. However, older men and women were injured in a wide variety of activities as seen by the large proportion characterized as “other” injuries (see box 1). Exercise was the activity most often associated with injury occurrence. Thirty percent of women and 16% of men were injured while exercising (which included walking, running, Tai Chi, equipment, and exercise classes). Bicycling, snow skiing, and exercise were virtually equal as sources of injury for men, closely followed by golf and fishing. Bicycling was the second leading source of recreational injuries among women. Snow skiing ranked fourth for women, but the frequency was similar to bicycling and golf. Fishing was a common source of injuries for men but not for women. Most of the fishing injuries were foreign body (fishhook) injuries

Table 1 Number and rate of recreational injury for persons ≥ 65 years old, United States, 2001

Patient characteristic	Unweighted No	Weighted No	95% CI	Rate/100 000	95% CI
Female	317	26745	15147 to 38343	151.3	73.1 to 184.9
65-74	185	15953	7796 to 24110	160.5	77.8 to 240.6
75-84	106	8936	5385 to 12487	120.3	71.0 to 164.6
85+	26	1856	642 to 3070	60.1	20.5 to 98.2
Male	436	35420	19790 to 51049	242.5	135.8 to 349.2
65-74	308	25247	13329 to 37166	307.2	160.6 to 447.7
75-84	116	9295	5404 to 13186	184.3	108.2 to 263.9
85+	12	877	338 to 1416	65.1	25.6 to 107.2
Total	753	62164	35570 to 88758	177.3	100.6 to 251.1
65-74	493	41200	21516 to 60885	226.9	117.4 to 332.3
75-84	222	18231	11324 to 25138	146.2	90.0 to 199.8
85+	38	2733	1271 to 4185	61.6	28.8 to 94.1

but exposure and insect bites were also sources of injuries. Many of the golf cart injuries common among men and women resulted from inappropriate operation of golf carts (for example, tipping on a slope, driving while impaired).

The single most common type of all non-fatal injuries treated in emergency departments was fracture (table 2). Fractures comprised 27% of all injuries and were more common among women. One third of women were treated for fractures compared with one fifth of men. Women also were more likely to suffer sprains and strains, the second leading injury diagnosis for both sexes. Internal injury was the least common consequence of recreational activities and occurred in less than 5% of all cases.

Table 3 presents the distribution of non-fatal injuries among different body sites. The pattern for location of injuries was similar for men and women. Extremities were the most common site and accounted for half of all injuries. While the overall picture is similar, it is worth noting that one third of injuries for women compared with one fifth of injuries for men were to the leg and foot.

DISCUSSION

To our knowledge, this is the first report of non-fatal recreational injuries sustained by older adults treated in emergency departments. The injuries sustained by persons in this study reflect the current population based rates of

participation in sports and recreational activities by older adults. With the changing demographics and the promotion of physical activity, these rates will likely increase and recreational injuries among older adults will become a more pressing public health issue.

Older adults engaged in a variety of recreational activities. Exercise (including walking, equipment use, and exercise classes), bicycling, snow skiing, golf, and fishing were responsible for the majority of recreational injuries. These injuries ranged from serious that are associated with significant morbidity and mortality (for example, fractures) to minor that required little medical attention (for example, a fishhook in the finger).

While many injuries to older adults that are treated in the emergency department may appear to be minor, they may have important long term consequences. Such injuries can seriously affect an older person's ability to function independently. Shapiro and coworkers followed up a group of persons ≥ 65 years old who were treated in the emergency department for minor injuries (including 26% fracture.) They found that 7% of them had decreased scores in fundamental activities of daily living and 23% had decreased scores in instrumental activities of daily living.¹⁰

Older people are not commonly the focus of injury prevention programs. Given these results, it appears that designing injury prevention programs for older adults would

Figure 1 Distribution of activities that cause recreational injuries to persons ≥ 65 by sex, United States, 2001.

Table 2 Number and percent distribution of diagnoses for recreational injury to persons ≥ 65 by sex, United States, 2001

Diagnosis	Unweighted No	Weighted No	95% CI	%
Male				
Contusion/abrasion	73	5883	2678 to 9087	16.6
Fracture	96	7449	3808 to 11091	21.1
Laceration	47	4505	2470 to 6541	12.7
Internal injury	29	1738	953 to 2524	4.9
Strain/sprain	90	6937	2963 to 10912	19.6
Other	100	8882	4355 to 13409	25.1
Female				
Contusion/abrasion	56	4144	2313 to 5974	15.6
Fracture	101	8957	5082 to 12832	33.6
Laceration	38	3320	1752 to 4888	12.5
Internal injury	13	1059	207 to 1912	4.0
Strain/sprain	71	6542	2201 to 10884	24.6
Other	37	2611	1474 to 3748	9.8
Total				
Contusion/abrasion	129	10026	5320 to 14732	16.2
Fracture	197	16406	9619 to 23193	26.5
Laceration	85	7826	4531 to 11120	12.6
Internal injury	42	2798	1357 to 4238	4.5
Strain/sprain	161	13480	5494 to 21465	21.8
Other	137	11493	6278 to 16708	18.5

be worthwhile now—and probably more so in the future. Bicycling, a common source of recreational injuries, can be made safer through environmental modifications that separate bicycles from traffic.¹¹ Such efforts will benefit cyclists of all ages. Wearing protective equipment when cycling is another effective injury prevention strategy,¹² and older adults should be encouraged to adopt such safety measures. Operating golf carts inappropriately (for example, striking objects, tipping the cart, and attempting to board a moving cart) resulted in many recreational injuries. Strategies such as education programs that focus on using golf carts safely may reduce such injuries.

Our estimates of the number of recreational injuries among older adults are subject to some important limitations. First, we did not have information on how frequently older adults participated in the various recreational activities. Thus, we did not have the ability to calculate the true risk for the information that we reported. We used census data to calculate rates for population groups. Rates calculated with

time engaged in an activity (exposure) as the denominator may reveal a different picture.

Second, the report included only non-fatal injuries treated in hospital emergency departments. We are missing injuries that were treated in physicians' offices, free standing medical centers or other clinics, those that did not require medical attention, and fatal injuries. People who are injured are likely to go to the emergency department for treatment. Injuries accounted for 37% of initial emergency department visits¹³ compared with about 7% (56.4 million) of physician visits (including both initial treatment and follow up care).¹⁴ No doubt many of the office visits are to follow up care received in the emergency department. Additionally, Kinney and Gerson reported that in a Midwestern midsize city, 80% of persons who had a private physician were first treated for an injury at a free standing emergency medical center.¹⁵ This adds further support that private physicians' offices are often not the first place injured persons visit for treatment. We elected to focus on non-fatal injuries because information

Table 3 Number and percent distribution of body part injured for recreational injury to persons ≥ 65 by sex, United States, 2001

Body part injured	Unweighted No	Weighted No	95% CI	%
Male				
Head/neck	97	7842	4449 to 11234	22.3
Upper trunk	72	6085	1465 to 10706	17.3
Lower trunk	59	4026	2040 to 6011	11.4
Arm/hand	104	9139	5859 to 12418	26.0
Leg/foot	92	7273	4023 to 10523	20.7
Other	10	816	21 to 1610	2.3
Female				
Head/neck	59	4353	2791 to 5916	16.3
Upper trunk	27	2728	1108 to 4347	10.2
Lower trunk	42	3658	1477 to 5839	13.7
Arm/hand	79	7063	3956 to 10169	26.4
Leg/foot	108	8893	4110 to 13675	33.2
Other	2	50	0 to 117	0.2
Total				
Head/neck	156	12195	7898 to 16492	19.7
Upper trunk	99	8813	3039 to 14586	14.2
Lower trunk	101	7684	3821 to 11547	12.4
Arm/hand	183	16202	10347 to 22056	26.2
Leg/foot	200	16165	8362 to 23969	26.1
Other	12	866	63 to 1668	1.4

Key points

- This study is the first to focus on non-fatal recreational injuries among persons ≥ 65 years old treated in emergency departments.
- Although many activities were responsible for injuries, bicycling and exercise were the largest contributors to the burden of injury. Fractures and sprains were the most common injuries.
- The lack of information about the frequency, duration, and intensity with which older adults engaged in these activities (exposure) seriously limited our ability to identify high risk activities.
- Accurately documenting the circumstances surrounding recreational injuries, including the use of protective devices, is crucial to our understanding both the sources of injuries and possible preventive interventions.
- We need to pay more attention to preventing sports and recreational injuries in this increasingly active population.

about deaths is not well captured by NEISS-AIP. Categorizing fatal recreational injuries would require details that are often missing in emergency department records of fatal events.

A third limitation was that the algorithm used to classify an injury relies on both the product involved and a two line description of the event. These descriptions often were sketchy and it was difficult to determine if the person was engaged in a recreational activity or if the event was classified as recreational because of the product. For example, there were a number of cases where a person fell on a pool deck. It was difficult to determine if the person was on the deck because they were swimming or they just happened to fall while on the deck for other reasons. We included as recreational injury only those cases in which there was clear evidence from the two line summary that the person was swimming. Similarly, for injuries that involved golf carts, it was not always clear whether the person was using the cart as part of a golf game or for transportation. We assumed that it was recreational unless there was clear evidence that it was not. Another difficult decision was if a fall occurred while walking. We elected to define all falls while walking as recreational injuries. Although we did our best to classify injuries, the limited information likely contributed to some misclassification.

NEISS-AIP is an important injury surveillance system. However, it is constrained by the information available in the medical record as well as the limited space provided by the two line narrative description. It would be helpful if information about the use of safety equipment were included in the medical record. It is important for emergency physicians to ask about use of protective equipment and to record whether it was used. In addition to recording valuable information, this interaction provides an opportunity for the physician to counsel the patient and family about safety and

the importance of using protective equipment. Although only one complete year of data is currently available, NEISS-AIP will provide ongoing surveillance of recreational injuries and in future permit analyses of injury trends.

CONCLUSIONS

We described the epidemiology of recreational injuries among older adults treated in emergency departments. Older adults were injured while participating in a wide variety of recreational activities, particularly while bicycling and exercising. Fractures were common and women were more likely than men to suffer fractures. Many of these injuries are potentially preventable. As more persons engage in recreational activities, applying known injury prevention strategies will help to reduce the incidence of these injuries.

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