

Unintentional Fall Injuries Associated with Walkers and Canes in Older Adults Treated in U.S. Emergency Departments

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OBJECTIVES: To characterize nonfatal, unintentional, fall-related injuries associated with walkers and canes in older adults.

DESIGN: Surveillance data of injuries treated in hospital emergency departments (EDs), January 1, 2001, to December 31, 2006.

SETTING: The National Electronic Injury Surveillance System All Injury Program, which collects data from a nationally representative stratified probability sample of 66 U.S. hospital EDs.

PARTICIPANTS: People aged 65 and older treated in EDs for 3,932 nonfatal unintentional fall injuries and whose records indicated that a cane or a walker was involved in the fall.

MEASUREMENTS: Sex, age, whether the fall involved a cane or walker, primary diagnosis, part of the body injured, disposition, and location and circumstances of the fall.

RESULTS: An estimated 47,312 older adult fall injuries associated with walking aids were treated annually in U.S. EDs: 87.3% with walkers, 12.3% with canes, and 0.4% with both. Walkers were associated with seven times as many injuries as canes. Women's injury rates exceeded those for men (rate ratios = 2.6 for walkers, 1.4 for canes.) The most prevalent injuries were fractures and contusions or abrasions. Approximately one-third of subjects were hospitalized for their injuries.

CONCLUSION: Injuries and hospital admissions for falls associated with walking aids were frequent in this highly vulnerable population. The results suggest that more research is needed to improve the design of walking aids. More information also is needed about the circumstances preceding falls, both to better understand the contributing fall risk factors and to develop specific and effective fall prevention strategies. *J Am Geriatr Soc* 2009.

Key words: cane; elderly; fall; injury; unintentional injury; walker

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Falls are the leading cause of unintentional injuries in older adults and are associated with excess mortality, functional limitations, loss of independence, and reduced quality of life.¹⁻³ In 2005, falls in people aged 65 and older resulted in 15,800 deaths and 1.8 million visits to U.S. hospital emergency departments (EDs).¹ Walking aids such as canes and walkers are frequently prescribed for high-risk older adults with limited mobility to help prevent falls. Of the 35 million older adults in the United States, approximately 12% use at least one assistive device such as a cane, crutch, walker, wheelchair, or scooter to help maintain their mobility.⁴

In 1994, 4.7 million older adults reported that they used walking aids; 155,000 used crutches, 3,150,000 used canes, and 1,398,000 used walkers.⁴ Canes generally are prescribed for people with moderate levels of mobility impairment, and walkers are prescribed for people with generalized weakness, poor lower-limb weight bearing, debilitating conditions, or poor balance control.⁵ Although some studies have demonstrated that these devices are effective in improving balance and mobility⁶ and reducing falls,⁷⁻⁹ others suggest that they may be associated with greater fall risk because they can cause tripping or interfere with a person's balance control.¹⁰⁻¹² Falls associated with walking aids are probably an underrecognized public health problem. Using ED data, one study estimated that, in 1992, there were 29,509 injuries related to walkers,¹³ whereas a later study estimated that, from July 1999 to June 2000 in all ages, there were 69,000 fall injuries associated with crutches, canes, or walkers.¹⁴ The current study provides national annual estimates of the incidence, rates, locations, and circumstances of fall-related injuries associated with canes and walkers in adults aged 65 and older.

METHODS

This study analyzed data from the National Electronic Injury Surveillance System All Injury Program (NEISS-AIP). The U.S. Consumer Product Safety Commission operates NEISS-AIP with support from the Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control. NEISS-AIP collects data on initial visits for all types and causes of injuries treated in U.S.

hospital EDs from a nationally representative stratified probability sample of 66 hospitals in the United States and its territories that have a minimum of six beds and operate a 24-hour ED.¹⁵ For each initial ED visit, coders record one principal diagnosis, usually the most severe, as determined by the physician or healthcare provider and recorded in the medical chart, and one primary part of the body injured, based on a fixed number of categories. International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes¹⁶ are not available in the medical record at the time these data are collected; therefore, specific types of injuries, such as hip fractures, cannot be accurately identified. Two-line narratives about the circumstances of the injury and up to two product codes are recorded for each case. Each case is assigned a sample weight based on the inverse probability of the hospital being selected, and these weights are summed to produce national estimates.

NEISS-AIP¹⁷ defines a fall injury as one received when a person descends because of the force of gravity and strikes a surface at the same or lower level. For this analysis, a case was defined as a person aged 65 and older who was treated in an ED for a nonfatal unintentional fall injury that occurred between January 1, 2001, and December 31, 2006, and whose record included the product code for a cane or walker. The two-line narrative was reviewed for each case to identify the circumstances and location of the fall. The location described in the narrative was used preferentially if it differed from the more-general location variable or if the location variable was missing. If the narrative did not include a location, the location variable was used. Stairs and steps were considered a fall hazard and were given priority over other locations (i.e., if the person fell walking up stairs at home, the location was designated "stairs/steps").

The circumstances variable was based solely on information in the narrative. If a person fell while using a walker or walking with a cane and there was no further description, the circumstance was coded as "walking, not otherwise specified." "Tripped" included tripping, stumbling, catching feet on objects, stepping into curbs, becoming tangled up in a walker, or falling because the walker or cane hit an object (i.e., furniture, door frame) or part of their body (i.e., leg, foot, shoe). Intrinsic factors included the person letting go of or slipping out of a walker, fainting, losing consciousness, becoming dizzy, and losing balance. If a person reported they slipped, lost their footing, or slid, the circumstance was coded as a slip. The "problem with aid" category included falls caused by the walker rolling away, the walking aid slipping out from under the person, and mechanical problems with the walker. Entering and exiting were considered potentially hazardous activities and were given priority over other activities (i.e., "walking through a doorway" or "tripped while going into the bathroom" were coded as "entering/exiting"). In addition to the location and circumstance, fall injuries that occurred in bathrooms or elevators, involved rugs or carpets, and when the person fell backward were noted.

Estimates were based on weighted data for 3,932 ED visits. Forty-four cases whose falls were not associated with their own walking aids were excluded, (i.e., a person was excluded if he or she fell over a spouse's walker or was not using their walker or cane at the time of the fall). Estimates

were annualized by dividing the weighted totals by 6. Rates were calculated as cases per 100,000 population, using U.S. Census Bureau population estimates;¹⁸ 95% confidence intervals (CI) were calculated using a direct variance estimation procedure that accounted for the sample weights and complex sampling design.¹⁹ Estimates with coefficients of variation (CVs) greater than 30% were considered unstable, and rates and confidence intervals were not reported.

RESULTS

Based on 3,932 cases, an estimated 47,312 older adult fall injuries associated with canes or walkers were treated annually in U.S. EDs (Table 1). Approximately 87.3% of the injuries were associated with walkers, 12.3% with canes, and 0.4% with both (although the last estimate was unstable). Women's injury rates exceeded the rates for men, with a rate ratio of 2.6 for walkers and 1.4 for canes. Rates increased sharply with age for men and women, but women had consistently higher injury rates for each age category. The most prevalent injuries were fractures and contusions or abrasions. Men most often injured the head or neck, followed by the lower trunk, whereas for women, this order was reversed. Diagnosis rates for women exceeded those of men. Rate ratios were greatest for strain or sprain (2.8), fracture (2.7), and contusions or abrasions (2.6). Women's injury rates also were higher for all parts of the body injured. Rate ratios ranged from 1.8 (head or neck) to 3.0 (arm or hand). Approximately one-third of men and women were hospitalized for their injuries.

Overall, walkers were associated with seven times as many injuries as canes (Table 2). A larger proportion of women suffered injuries associated with walkers than men (78.2% vs. 21.8%); this sex difference was less pronounced for canes (66.3% vs. 33.7%). Injury rates for men and women increased with age and was highest for walkers in people aged 85 and older. For both types of walking aids, the injury rates for men and women increased sharply with age; the rate ratio of walkers to canes increased from 2.9 to 5.3 for men and from 6.4 to 10.2 for women.

Comparing walkers and canes, the proportion of each diagnosis was similar, although the rates were considerably higher for walker injuries. The most frequent injury was fracture, followed by contusions or abrasions. Rate ratios for injury diagnoses ranged from 5.3 (internal injury) to 10.0 (strain or sprain). For walkers and canes, the most frequent parts of the body injured were the lower trunk and head or neck, although rates for walker injuries were approximately six to eight times as high as for cane injuries. A slightly higher proportion of people injured while using walkers (32.9.3%) than of those injured while using canes (28.9%) were hospitalized.

Sixty percent all fall injuries occurred at home, and one out of six injuries (16.3%) associated with walkers occurred at nursing homes (Table 3). Approximately 8.3% of injuries involving walkers and 12.8% of injuries involving canes happened in public places. Approximately 1.6% of walker injuries involved falls on stairs or steps. For injuries associated with walkers, the most frequent activities were "walking, not otherwise specified" (35.1%) and "tripped" (20.9%); for canes it was "tripped" (31.8%) and "walking, not otherwise specified" (21.3%). The proportion of falls

Table 1. Annual Estimates and Rates of Nonfatal Unintentional Fall Injuries Associated with Walkers and Canes in Men and Women Aged 65 and Older Treated in U.S. Emergency Departments, 2001–2006

| Characteristic | Overall | | | Men | | | Women | | | Rate Ratio |
|------------------------------|-----------------|-------|-------------|-----------------|-------|-------------|-----------------|-------|-------------|------------|
| | Annual Estimate | Rate* | 95% CI | Annual Estimate | Rate* | 95% CI | Annual Estimate | Rate* | 95% CI | |
| Total | 47,312 | 130.7 | 102.5–158.8 | 10,986 | 72.8 | 56.4–89.2 | 36,326 | 172.0 | 134.0–210.1 | 2.4 |
| Type of walking aid | | | | | | | | | | |
| Walker | 41,287 | 114.0 | 89.4–138.6 | 8,988 | 59.6 | 46.2–72.9 | 32,300 | 153.0 | 119.0–187.0 | 2.6 |
| Cane | 5,839 | 16.1 | 12.2–20.1 | 1,970 | 13.1 | 8.9–17.2 | 3,869 | 18.3 | 13.8–22.8 | 1.4 |
| Both | 186 | † | † | 28 | † | † | 157 | † | † | — |
| Age group | | | | | | | | | | |
| 65–74 | 6,599 | 35.7 | 26.7–44.6 | 1,824 | 21.6 | 15.7–27.5 | 4,775 | 47.4 | 34.1–60.8 | 2.2 |
| 75–84 | 18,123 | 140.6 | 109.3–171.9 | 4,909 | 94.9 | 69.5–120.2 | 13,214 | 171.3 | 133.2–209.4 | 1.8 |
| ≥85 | 22,590 | 469.0 | 363.9–574.1 | 4,253 | 286.9 | 219.6–354.2 | 18,337 | 549.9 | 423.1–676.7 | 1.9 |
| Primary injury diagnosis | | | | | | | | | | |
| Fracture | 17,856 | 49.3 | 36.3–62.3 | 3,719 | 24.6 | 18.3–31.0 | 14,137 | 67.0 | 48.2–85.7 | 2.7 |
| Contusions or abrasions | 14,106 | 39.0 | 31.0–46.9 | 3,078 | 20.4 | 15.3–25.4 | 11,028 | 52.2 | 41.0–63.4 | 2.6 |
| Laceration | 6,590 | 18.2 | 14.6–21.8 | 1,978 | 13.1 | 9.3–16.9 | 4,612 | 21.8 | 17.7–26.0 | 1.7 |
| Strain or sprain | 3,213 | 8.9 | 6.7–11.1 | 647 | 4.3 | 2.7–5.9 | 2,566 | 12.2 | 9.1–15.2 | 2.8 |
| Internal injury | 3,003 | 8.3 | 5.2–11.4 | 899 | 6.0 | 3.2–8.7 | 2,104 | 10.0 | 6.1–13.8 | 1.7 |
| Other or unknown | 2,544 | 7.0 | 4.9–9.1 | 664 | 4.4 | 2.7–6.1 | 1,879 | 8.9 | 6.2–11.6 | 2.0 |
| Primary part of body injured | | | | | | | | | | |
| Lower trunk | 15,360 | 42.4 | 31.4–53.4 | 3,399 | 22.5 | 16.8–28.3 | 11,960 | 56.6 | 41.5–71.8 | 2.5 |
| Head or neck | 13,165 | 36.4 | 29.0–43.8 | 3,690 | 24.4 | 17.8–31.1 | 9,475 | 44.9 | 36.0–53.7 | 1.8 |
| Leg or foot | 6,720 | 18.6 | 14.3–22.9 | 1,370 | 9.1 | 6.4–11.7 | 5,350 | 25.3 | 19.3–31.4 | 2.8 |
| Arm or hand | 5,996 | 16.6 | 12.5–20.6 | 1,168 | 7.7 | 5.5–9.9 | 4,828 | 22.9 | 16.7–29.0 | 3.0 |
| Upper trunk | 5,360 | 14.8 | 11.4–18.2 | 1,236 | 8.2 | 5.6–10.8 | 4,124 | 19.5 | 14.9–24.2 | 2.4 |
| Other or unknown | 712 | 2.0 | 1.0–3.0 | 123 | † | † | 589 | 2.8 | 1.4–4.2 | — |
| Disposition | | | | | | | | | | |
| Treated and released | 31,385 | 86.7 | 69.1–104.2 | 7,522 | 49.8 | 38.2–61.5 | 23,863 | 113.0 | 90.0–136.0 | 2.3 |
| Hospitalized or transferred | 15,297 | 42.2 | 31.1–53.4 | 3,287 | 21.8 | 16.3–27.3 | 12,010 | 56.9 | 41.2–72.6 | 2.6 |
| Other or unknown | 630 | † | † | 177 | † | † | 453 | † | † | — |

* Per 100,000 population.

† Unstable estimate because coefficient of variation > 30.

CI = confidence interval.

due to intrinsic factors was similar for both types of aids. Falls caused by catching or hitting the walking aid occurred in 4.9% of walker injuries and 6.2% of cane injuries. Falling backward was noted in 4.7% of walker-related falls.

DISCUSSION

This study provides the first national estimates of older adult fall injuries associated specifically with walkers and canes and includes falls that occurred in all settings. An estimated 47,312 older adult fall injuries associated with walkers and canes were treated in EDs annually, although the extent to which walkers and canes contributed to these injuries could not be determined. Although more than twice as many older adults use canes as walkers,²⁰ this study found that seven times as many injuries were associated with walkers. Women are more likely to use walkers than men.⁴ In this study, women's fall injury rate with walkers was 2.6 times as high as men's, whereas women's injury rate with canes was only 40% higher. Some of this difference may be attributable to differences in usage patterns.

People who use walking aids tend to be older; use increases with age and is more common after age 75.²¹ People who use walking aids also tend to be single, poorer, less educated, and generally in frail health.²⁰ Falls associated with walkers and canes represented fewer than 3% of older adult fall injuries, although 33% of walker injuries required hospitalization, compared with 27% of the 1.8 million older adult injuries treated in EDs in 2006.¹ This is consistent with the expectation that people who use walking aids are frail and more likely to sustain serious fall injuries. People who use walkers are weaker, frailer, and have poorer balance and greater mobility limitations than those who use canes.^{22,23} This is reflected in their uniformly higher injury rates. A higher proportion of people using canes than of those using walkers sustained arm or hand injuries. Wrist and forearm fall injuries, especially Colles fractures, are seen more often in healthier older adults who are able to use their arms to cushion a fall.²⁴

People with walkers were injured most often while "walking, not otherwise specified." The limited information from the medical record did not allow the circumstances to

Table 2. Annual Estimates and Rates of Nonfatal Unintentional Fall Injuries Associated with Walkers and Canes in People Aged 65 and Older Treated in U.S. Emergency Departments, 2001–2006

| Characteristic | Walker | | | | Cane | | | | Rate Ratio | |
|------------------------------|-----------------|--------|-------|-------------|-----------------|--------|-------|-----------|------------|--|
| | Annual Estimate | (%) | Rate* | 95% CI | Annual Estimate | (%) | Rate* | 95% CI | | |
| Overall | 41,287 | (100) | 114.0 | 89.4–138.6 | 5,839 | (100) | 16.1 | 12.2–20.1 | 7.1 | |
| Gender and age group | | | | | | | | | | |
| Men | 8,988 | (21.8) | 59.6 | 46.2–72.9 | 1,970 | (33.7) | 13.1 | 8.9–17.2 | 4.5 | |
| 65–74 | 1,361 | (3.3) | 16.1 | 10.9–21.4 | 463 | (7.9) | 5.5 | 3.3–7.6 | 2.9 | |
| 75–84 | 4,065 | (9.8) | 78.5 | 58.0–99.0 | 830 | (14.2) | 16.0 | 9.3–22.7 | 4.9 | |
| 85+ | 3,562 | (8.6) | 240.3 | 184.1–296.4 | 677 | (11.6) | 45.7 | 28.4–62.9 | 5.3 | |
| Women | 32,300 | (78.2) | 153.0 | 119.0–187.0 | 3,869 | (66.3) | 18.3 | 13.8–22.8 | 8.4 | |
| 65–74 | 4,088 | (9.9) | 40.6 | 28.9–52.3 | 635 | (10.9) | 6.3 | 4.2–8.5 | 6.4 | |
| 75–84 | 11,523 | (27.9) | 149.4 | 115.7–183.1 | 1,590 | (27.2) | 20.6 | 15.5–25.7 | 7.3 | |
| 85 | 16,690 | (40.4) | 500.5 | 385.8–615.2 | 1,643 | (28.1) | 49.3 | 32.2–66.4 | 10.2 | |
| Primary injury diagnosis | | | | | | | | | | |
| Fracture | 15,463 | (37.5) | 42.7 | 31.1–54.3 | 2,332 | (39.9) | 6.4 | 4.7–8.2 | 6.7 | |
| Contusions or abrasions | 12,363 | (29.9) | 34.1 | 27.4–40.9 | 1,702 | (29.1) | 4.7 | 3.2–6.2 | 7.2 | |
| Laceration | 5,748 | (13.9) | 15.9 | 12.9–18.8 | 842 | (14.4) | 2.3 | 1.5–3.2 | 6.9 | |
| Strain or sprain | 2,904 | (7.0) | 8.0 | 5.9–10.1 | 295 | (5.0) | 0.8 | 0.4–1.2 | 10.0 | |
| Internal injury | 2,519 | (6.1) | 7.0 | 4.2–9.7 | 470 | (8.0) | 1.3 | 0.7–1.9 | 5.3 | |
| Other or unknown | 2,291 | (5.6) | 6.3 | 4.6–8.1 | 198 | † | † | † | — | |
| Primary part of body injured | | | | | | | | | | |
| Lower trunk | 13,588 | (32.9) | 37.5 | 27.8–47.2 | 1,737 | (29.7) | 4.8 | 3.3–6.3 | 7.8 | |
| Head or neck | 11,408 | (27.6) | 31.5 | 25.1–37.9 | 1,718 | (29.4) | 4.7 | 3.2–6.3 | 6.7 | |
| Upper trunk | 4,644 | (11.2) | 12.8 | 9.9–15.8 | 692 | (11.9) | 1.9 | 1.2–2.6 | 6.7 | |
| Arm or hand | 5,067 | (12.3) | 14.0 | 10.5–17.5 | 911 | (15.6) | 2.5 | 1.6–3.4 | 5.6 | |
| Leg or foot | 5,933 | (14.4) | 16.4 | 12.4–20.3 | 739 | (12.7) | 2.0 | 1.2–2.9 | 8.2 | |
| Other or unknown | 647 | (1.6) | 1.8 | 0.9–2.7 | 43 | † | † | † | — | |
| Disposition | | | | | | | | | | |
| Treated and released | 27,206 | (65.9) | 75.1 | 59.9–90.3 | 4,073 | (67.8) | 11.2 | 8.4–14.1 | 6.7 | |
| Hospitalized or transferred | 13,564 | (32.9) | 37.5 | 27.5–47.5 | 1,653 | (28.3) | 4.6 | 3.0–6.1 | 8.2 | |
| Other or unknown | 517 | † | † | † | 113 | † | † | † | — | |

* Per 100,000 population.

† Unstable estimate because coefficient of variation > 30.

CI = confidence interval.

be characterized more precisely. People using walking aids had almost five times as many fall injuries from tripping as from slipping. This large difference may reflect the way incidents were reported or be due to the mechanical requirements of the walking aids. The proportion of fall injuries attributed to intrinsic factors was similar for canes and walkers. A fall was characterized as due to intrinsic factors if the two-line narrative did not describe any external precipitating event. Some misclassification probably occurred if a fall involved an external factor that was not mentioned in the medical record (e.g., if “lost balance” was caused by tripping.) This finding suggests that extrinsic or environmental factors may play a greater role in falls in people using walkers. Although bathrooms were presumed to be particularly hazardous, only 3.1% of falls associated with walkers were reported to have occurred in bathrooms.

The frequency of fall injuries, especially in people using walkers, suggests that people may have problems using walking aids effectively. Approximately 4% of injuries occurred when people were sitting, standing, or transferring

and an additional 5% to 6% while people were bending, reaching, or carrying objects. It might be beneficial to increase the amount of time devoted to fitting aids and educating people how to use canes and walkers safely, especially when performing these types of activities. It is worrisome that almost 5% of injuries occurred when falling backwards, a situation that can result in serious, potentially fatal, traumatic brain injury. The high injury rates associated with walkers, especially in women, may indicate additional problems. Women tend to be physically weaker than men and may have more difficulty maneuvering or holding on to a walker. More-specific information is needed about the circumstances and locations of fall events to better understand the fall risk factors associated with canes and walkers and to develop specific and effective fall prevention strategies.

In this study, men most often injured the head or neck, whereas women injured the lower trunk. The most prevalent diagnosis was fracture, as has been reported previously,²⁵ although women’s fracture rate was 2.7 times the

Table 3 Annual Estimates of Nonfatal Unintentional Fall Injuries Associated with Walkers and Canes Among People Aged 65 Years and Older Treated in U.S. Emergency Departments, by Location and Circumstance, 2001–2006

| Situation | Walker | | | Cane | | |
|------------------------------------|-----------------|--------|---------------|-----------------|--------|-------------|
| | Annual Estimate | (%) | 95% CI | Annual Estimate | (%) | 95% CI |
| Location | | | | | | |
| Home | 25,144 | (60.9) | 19,420–30,867 | 3,289 | (56.3) | 2,373–4,206 |
| Nursing home | 6,713 | (16.3) | 4,465–8,961 | 544 | (9.3) | 316–772 |
| Public place | 3,426 | (8.3) | 2,496–4,357 | 749 | (12.8) | 479–1,020 |
| Stairs or steps | 673 | (1.6) | 378–968 | 319 | * | * |
| Other | 340 | (0.8) | 139–541 | 73 | * | * |
| Unknown | 4,992 | (12.1) | 3,145–6,838 | 864 | (14.8) | 431–1,298 |
| Circumstance | | | | | | |
| Walking, not otherwise specified | 14,478 | (35.1) | 10,636–18,320 | 1,242 | (21.3) | 839–1,645 |
| Tripped | 8,610 | (20.9) | 6,590–10,629 | 1,856 | (31.8) | 1,281–2,432 |
| Intrinsic factors | 5,114 | (12.4) | 3,564–6,665 | 825 | (14.1) | 387–1,263 |
| Reaching, bending, or carrying | 2,129 | (5.2) | 1,528–2,731 | 332 | * | * |
| Caught or hit aid on object | 2,037 | (4.9) | 1,500–2,573 | 364 | (6.2) | 210–517 |
| Slipped | 1,826 | (4.4) | 925–2,727 | 422 | (7.2) | 243–601 |
| Sitting, standing, or transferring | 1,692 | (4.1) | 1,127–2,257 | 59 | * | * |
| Problem with aid | 1,440 | (3.5) | 1,025–1,856 | 278 | (4.8) | 149–407 |
| Entering or exiting | 607 | (1.5) | 400–815 | 59 | * | * |
| Other | 1,081 | (2.6) | 670–1,492 | 139 | * | * |
| Unknown | 2,273 | (5.5) | 1,337–3,210 | 264 | * | * |
| Special circumstances | | | | | | |
| Fell backward | 1,941 | (4.7) | 1,406–2,477 | 180 | * | * |
| Fell in bathroom | 1,271 | (3.1) | 843–1,698 | 80 | * | * |
| Involved rug or carpet | 619 | (1.5) | 391–847 | 106 | * | * |

* Unstable estimate because coefficient of variation > 30.

CI = confidence interval.

rate for men. Although NEISS-AIP does not include ICD-9-CM diagnostic codes, this result, along with a similar rate ratio for lower trunk injury, probably reflects the sex difference in hip fracture rates. Hip fractures occur most often in older women²⁵ and contribute significantly to excess mortality and disability and a poorer quality of life.^{26,27}

This study of fall-related injuries is subject to a number of limitations. First, it includes only injuries treated in EDs and not injuries treated in physician's offices or other outpatient settings or that did not receive medical attention. However, the majority of significant fall-related injuries were probably included, because most serious injuries are treated in EDs. Second, information about the circumstances surrounding the fall was limited to the two-line narrative, which often contained little information about the patient's activity at the time he or she was injured, the direction of the fall, or the type of walker or cane used. Third, injury rates were calculated using the entire population aged 65 and older as the denominator, because there were no recent data on the number of older adults in the United States who used canes and walkers. A report that estimated the number of older adults who used specific types of mobility devices was based on a sample of the noninstitutionalized population and did not include persons in nursing homes who would be more likely to use assistive devices.²⁰ Fourth, fatal injuries that occurred before or in the ED were excluded because NEISS-AIP does

not provide detailed information about injury deaths or about deaths that occur after leaving the ED or hospital. However, deaths represent fewer than 1% of fall-related injuries.¹ Finally, NEISS-AIP includes only one injury (generally the most severe) and one part of the body injured. Some underreporting may occur if there are multiple injuries. Because ICD-9-CM diagnosis codes¹⁶ were not included in the medical record at the time these data were collected, specific injuries (e.g., hip fracture, traumatic brain injury) could not be accurately identified.

CONCLUSION

This study highlights the frequency of injuries and hospital admissions for falls in this highly vulnerable population. Older women were particularly susceptible; they constituted 59% of the population aged 65 and older¹⁸ yet suffered 77% of the fall injuries associated with walking aids, the majority involving walkers. Women aged 85 and older constituted only 15% of the older population yet sustained almost 39% of the injuries.

Although falls associated with walkers and canes represented just 2.6% of older adult fall injuries treated in EDs,¹ the population affected were the frailest and most-vulnerable older adults. The majority of these injuries happened at home, and 21% to 35% occurred while the person was walking. Research is needed to understand the physical

and cognitive demands that walking aids place on users. Additional studies are needed to identify potential design problems so as to improve walkers and reduce the incidence of fall injuries in this high-risk population. In addition, more information about the immediate circumstances preceding the fall is needed, such as through postinjury interviews, both to better understand the contributing fall risk factors—whether behavioral, intrinsic, environmental, or a combination of the three—and to develop and test specific and effective strategies to prevent fall injuries in people who use assistive devices.

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