

Falls and Dilemmas in Injury Prevention in Older West Virginians

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Abstract

Falls are the number one cause of injury-related morbidity and mortality in West Virginia senior citizens. Poor outcomes following falls are exacerbated by numerous comorbidities which are prevalent in the elderly population in West Virginia. This study describes the injury patterns, resource utilization and dispositions of WV seniors injured in a fall. *Methods:* This is a descriptive retrospective cohort study utilizing the West Virginia State Trauma System registry; which collects trauma data from 33 acute care facilities in West Virginia. *Results:* Data from 5498 cases were reviewed for patients enrolled in the Registry in 2010. Fall victims aged 65 and older were included. Most falls occurred in the home (75.2%) or in a residential institution (11.3%). Femur fractures (36.3%) and intracranial hemorrhages (8.2%) were the most common injury diagnoses. Disposition back home declined from 58.6% in the 60-65 age group to 20.9% returning home following falls in the age 90-94 group. Conversely, disposition to a skilled nursing facility rose from 20.1% in the age 60-65 group to 49.1% in the age 90-94 group. The case

fatality rate for all the seniors enrolled in the trauma system was 3.3%. *Discussion:* Fall was the mechanism of injury for 83.3% of traumatic injuries in persons over the age of 65 enrolled in the WV trauma system. Older West Virginians suffer from numerous comorbidities that increase the risk of fall as well as the severity of injuries from a fall. *Conclusion:* In West Virginia, there is a correlation between increasing age and less desirable outcomes and dispositions from trauma centers for senior citizens after a fall. West Virginia patients, families and care providers must frequently face complicated treatment dilemmas, especially as the related risk of falling and the co-morbid conditions are commonly seen in older West Virginians. Multi-modal fall prevention programs can reduce the risk of falls in senior citizens.

Introduction

Falls are the number one cause of nonfatal injury in adults over 65.¹ It is estimated that 1 in 3 community-dwelling adults over 65 years of age will fall each year.² The biggest risk factors for falls appear to be a history of prior falls and disturbances in gait and balance.² Fractures have been found to be the most common injury after a fall in the elderly, with femoral neck fractures being the most prevalent.³ Older adults have a higher injury severity score and different pattern of injury from falls than younger patients and have a higher rate of mortality.⁴ Furthermore, the rate of death from falls in the elderly is rising.⁵ Of those

who survive, there is a higher rate of placement in skilled-nursing facilities than among those without falls.⁶ Falls among the elderly account for significant economic cost.⁷ The estimated direct medical cost of falls in 2010 was \$28 billion dollars.⁸ Even without injuries, older adults who have fallen often develop a fear of future falls and therefore may become less active.⁹ The high rate of falls in the elderly, which frequently leads to debilitating injuries such as hip fractures and intracranial hemorrhages (ICH), raises a significant public health dilemma. Questions arise such as suitability to return to home versus placement in a nursing home or assisted living. The availability of long-term care facilities is a significant issue, especially in some of the more rural counties. In addition, placing elderly patients who may be at risk for falls on anticoagulating agents for comorbid conditions also represents a treatment dilemma. This study sought to characterize injuries occurring as the result of falls in elderly adults in the state of WV during 2010 using data from the WV State Trauma Registry. Specifically, we examined age, gender, location of fall, mortality, emergency department and hospital disposition, as well as patterns of injury in these patients.

Objectives

Falls are the leading cause of injury in older West Virginians. The goal of this article was to investigate the injury patterns, resource utilization and discharge dispositions of older West Virginians who were injured in a fall. We discuss some of the dilemmas older West Virginians, their families and health care providers face in trying to prevent these injuries.

Methods

Design and Setting

The current research is a descriptive, retrospective cohort study of data extracted from the West Virginia Trauma Center System statewide registry for the year 2010. Thirty-three acute care hospitals in West Virginia continually submit medical records information for all trauma patients seen and treated at the centers for inclusion in the registry. This study was approved by the West Virginia University Institutional Review Board (Protocol Number H-23492).

Selection of Cases

Cases were included in the analyses if "Fall" was present in the Blunt Cause of Injury field and if age was greater than 65 years in the abstraction forms. Age, gender, location of fall, disposition

from the emergency department, disposition from the trauma center and injury frequencies and percentages were analyzed.

Data Analysis

Descriptive statistics, such as means and standard deviations and frequencies and percentages, were calculated for each study variable. Data were analyzed using SPSS version 19 (SPSS Inc., 2011, Chicago, IL).

Results

In 2010, there were 6604 patients aged 65 or older who were enrolled in the West Virginia State Trauma Registry. Of these, 5498 (83.3%) of these patients were injured in a fall. Their ages ranged from 65 to 105 with a mean age of 80.5 years ($SD = 8.2$). Approximately 72% (3974) of the cases were female and almost 28% (1524) were

male. Table 1 displays the gender differences and age distribution by five year intervals. The gender disparity continues to widen with increasing age. Most (86.5%) of the falls occurred at the primary residence (home or residential institution) of the senior (Table 1).

Less than 1% (35) of the seniors evaluated with a trauma team activation in the emergency department went home from the emergency department (Table 2). The majority (78.4%) were admitted to a floor bed, 8.5% of the patients were admitted to the ICU, 3.7% were admitted to step-down and 2.9% went directly to the operating room from the emergency department. The disposition following admission to the trauma center was as follows: 37.3% went home, 36.9% went to a skilled nursing facility, 13.1% went to a rehabilitation facility, 4.1% went to a residential institution

Electroconvulsive Therapy

ECT can be beneficial in the following situations:

- A person's depression is resistant to antidepressant therapy.
- Patients with other medical problems that prevent the use of antidepressant medication.
- Persons who have had a previous response to ECT.
- Patients with other clinically diagnosed psychiatric disorders that have been shown to benefit from ECT.

ECT at Beckley ARH Hospital is administered and monitored by trained staff in an area adjacent to the Operating Room on the 2nd floor.

ECT treatment is available on both an inpatient and outpatient basis, and ECT is the treatment of choice for pregnant patients with severe depression.

For more information, contact Jeff Lilly at **304-255-3557**.

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Table 1. Demographics and Location of Injury

Age and Gender Distributions			
Age Range	Number (%)	Female (n, %)	Male (n, %)
65-69	662 (12.0)	423 (63.9)	239 (36.1)
70-74	810 (14.7)	540 (66.7)	270 (33.3)
75-79	921 (16.8)	668 (72.5)	253 (27.5)
80-84	1266 (23.0)	937 (74.0)	329 (26.0)
85-89	1044(19.0)	760 (72.8)	284 (27.2)
90-94	631 (11.5)	511 (81.0)	120 (19.0)
95-99	144 (2.6)	115 (81.6)	26 (18.4)
Total All Ages	5498	3974 (72.3)	1524 (27.7)

Location of Injury Distributions		
Location	Number	(%)
Home	4133	(75.2)
Residential Institution	621	(11.3)
Public Building	238	(4.3)
Street	79	(1.4)
Other*	427	(7.8)

*Includes locations of "farm", "industry", "mine", recreation", "unknown" and "unspecified"

and 3.3% died. Disposition from the emergency department broken down by five-year age groups and for all ages can be seen in Table 2.

When disposition from the trauma center was analyzed by 5-year age intervals, significant

trends were noted with increasing age (Figure 1). A steady decline in the number of persons able to return to their home is noted as is a steady increase in the number of persons going to skilled nursing facilities. These trends are seen up

to age 95, where a variance is noted in the patients aged 95 and older.

Frequencies and percentages of various injuries sustained during falls can be seen in Table 3. The five most common injuries sustained were femur fractures (36.3%), intracranial hemorrhages (8.2%), head and neck soft tissues injuries (6.9%), and forearm (6.3%), lower leg (6.1%), and upper arm (6.0%) fractures/dislocations.

Discussion

In 2010, for persons over the age of 65 enrolled in the WV State Trauma Registry, the number one cause of injury was a fall (83.3%). The most common place for these falls to occur was in the primary residence of the individual, with 75.2% of falls occurring at home and 11.3% in a residential institution. Ambulatory residents of long term care facilities are at increased risk of falling compared to community dwelling seniors, although patients in these long term care facilities probably have a higher level of functional decline than those living at home.¹⁰ Many older West Virginians

Table 2. Disposition from the Emergency Department by Age

Disposition (n %)	65-69	70-74	75-79	80-84	85-89	90-94	95-99	100+	All Ages
Home‡	11 (1.7)	8 (1.0)	5 (0.5)	6 (0.5)	3 (0.3)	2 (0.3)	--	--	35 (0.6)
Admit to Floor*	470 (71.0)	606 (74.7)	700 (76.0)	1016 (80.2)	849 (81.3)	529 (83.8)	123 (87.2)	18 (82.3)	4312 (78.4)
Admit ICU	63 (9.5)	74 (9.1)	90 (9.8)	100 (7.9)	93 (8.9)	45 (7.1)	3 (2.1)	2 (8.7)	470 (8.5)
Admit Step-down	25 (3.8)	25 (3.1)	35 (3.8)	45 (3.6)	36 (3.4)	29 (4.6)	5 (3.5)	2 (8.7)	202 (3.7)
Other†	41 (6.3)	48 (5.9)	38 (4.1)	41 (3.3)	14 (1.3)	6 (0.9)	1 (0.7)	--	189 (3.4)
To Operating Room	32 (4.8)	27 (3.3)	2 (0.2)	30 (2.4)	27 (2.6)	7 (1.1)	--	--	157 (2.9)
Transfer	20 (3.0)	21 (2.6)	18 (2.0)	28 (2.2)	21 (2.0)	13 (2.1)	9 (6.4)	--	130 (2.4)
Morgue	--	1 (0.1)	1 (0.1)	--	1 (0.1)	--	--	--	3 (0.1)
Total	662	810	921	1266	1044	631	141	23	5458

* Includes dispositions of "floor", "observation" and "telemetry"

† Includes dispositions of "unknown", "AMA", "n/a", "other in-hospital location", "outpatient clinic" and "other"

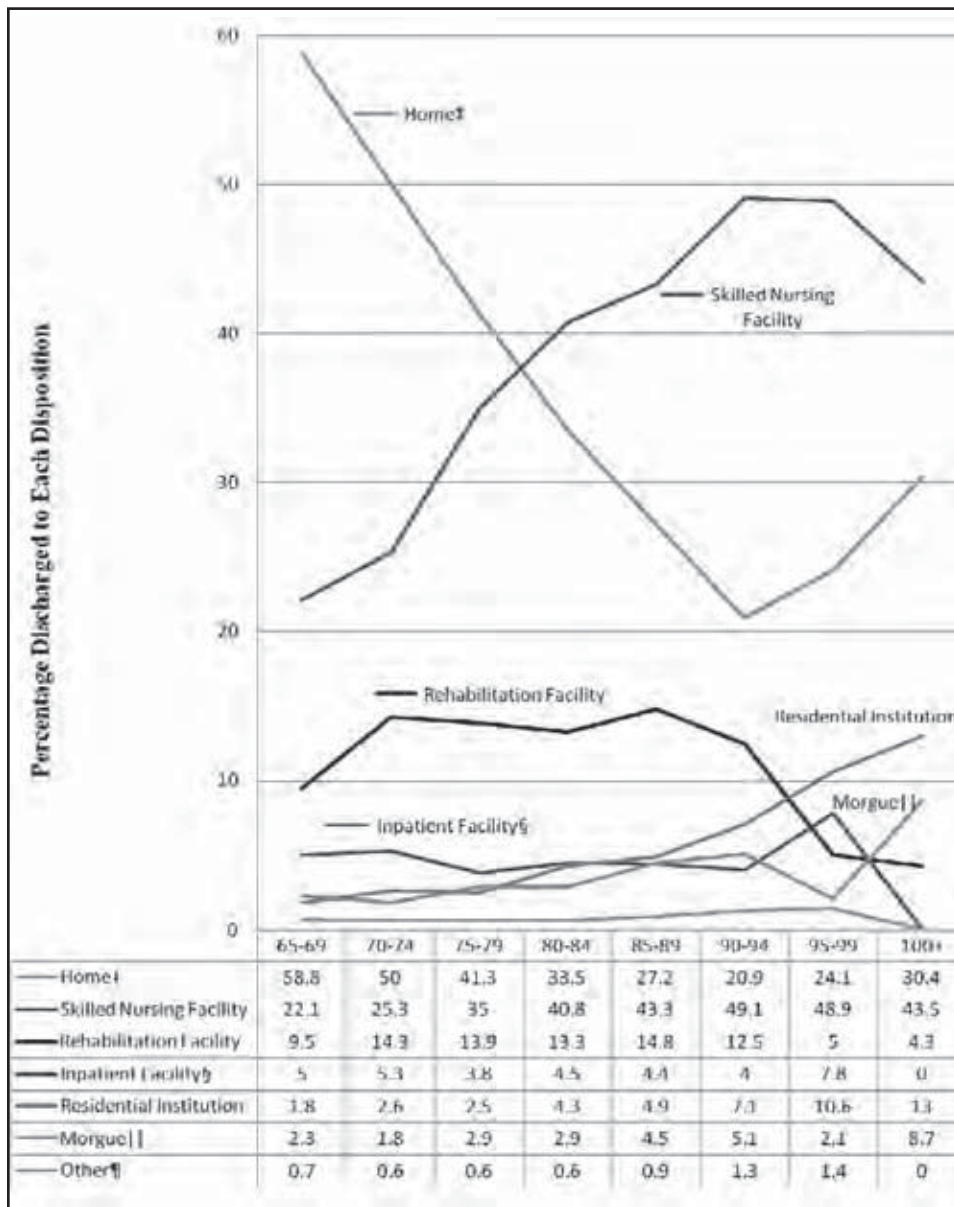
‡ Includes dispositions of "home, no assistance" and home, health care", "home, rehab outpatient" and "jail/prison"

§ Includes dispositions of "acute care hospital", "ICF" and "psych facility"

|| Includes dispositions of "morgue/funeral home" and "medical examiner"

¶ Includes dispositions of "unable to complete treatment/AMA" and "other"

Figure 1.
Hospital Discharge Disposition by Five Year Age Ranges



may not have access to assisted living housing options in the more rural communities near to where they have family and community support. This may prevent at-risk older individuals from transitioning to safer housing options when their fall risk increases. Retrofitting older homes to mitigate fall risks can be very expensive and financially out of reach for seniors on fixed incomes.

In our study, the most common injuries were femur fractures, intracranial hemorrhages, and

head and neck soft tissue injuries. Hip fractures in the elderly carry significant associated morbidity and mortality. Twenty percent of patients with a hip fracture will be dead within two years of that injury.¹¹ Limitations of subsequent ambulation and mobility are often the reason these individuals cannot return to their home after the fall. This limitation in mobility further leads to an increased risk of infection and thrombo-embolism that is

central to the increased mortality that follows a hip fracture.

ICHs likewise have significant associated morbidity and mortality. West Virginia has the highest prevalence of heart disease in the nation. With this heavy burden of heart disease, many older West Virginians are on some form of antiplatelet or anticoagulant therapy. Antithrombotic therapy increases the risk of ICH with even minor trauma, and complicates treatment of such patients with ICH. As the risk of fall is a significant concern in older patients, the decision to initiate and maintain a patient with cardiovascular disease on antithrombotic therapy clearly must involve a complicated risk-benefit analysis. For patients with known atherosclerotic disease and atrial fibrillation, antithrombotic therapy has strong evidence to support its use. The 2011 American Heart Association/ American College of Cardiology Foundation Guidelines for secondary prevention of atherosclerosis recommend aspirin therapy (75-162 mg/day) for all patients with coronary artery disease (CAD) unless contra-indicated (Class I, Level of Evidence A).¹² If a patient with CAD is allergic to aspirin, clopidogrel (75 mg/day) is recommended (Class I, Level of Evidence B). Patients who have had an ischemic stroke or TIA and atherosclerosis should be treated with aspirin alone, clopidogrel alone or aspirin and extended-release dipyridamole (Class I, Level of Evidence B). Antiplatelet therapy is preferred to anticoagulant therapy for prevention of secondary atherosclerotic disease unless there is significant reason to initiate anticoagulant therapy (i.e., atrial fibrillation, prosthetic heart valve, venous thromboembolic disease, left ventricular thrombus). In these patients, the addition of warfarin to low dose aspirin is

Table 3. Injury Distributions

Diagnosis	Number with injury	Percent with injury
Femur Fracture	1996	(36.3)
Intracranial Hemorrhage *	448	(8.2)
Head and Neck STI †	379	(6.9)
Forearm Fracture	347	(6.3)
Lower Leg Fracture	333	(6.1)
Upper Arm Fracture	332	(6.0)
Pelvis Fracture	247	(4.5)
Concussion ‡	224	(4.1)
Lower Leg STI	202	(3.7)
Rib Fracture	179	(3.3)
Lumbar Spine Fracture	120	(2.2)
Upper Leg STI	93	(1.7)
C Spine Fracture	88	(1.6)
T Spine Fracture	86	(1.6)
Upper Arm STI	67	(1.2)
Trunk STI	62	(1.1)
Facial Fracture	51	(0.9)
Forearm STI	45	(0.8)
Skull Fracture	43	(0.8)
Hand Fracture	35	(0.6)
Hand STI	25	(0.5)
Intra-abdominal Injury §	22	(0.4)
Intra-thoracic Injury	21	(0.4)
Foot Fracture	19	(0.4)
Foot STI	5	(0.1)

* Includes: subdural hemorrhage, subarachnoid hemorrhage, intra-parenchymal hemorrhage, epidural hematoma and cerebral contusion

† Soft tissue injury (STI) includes: lacerations, contusions, abrasions, hematomas and tissue avulsions to the body area. STI excludes fracture to the body area.

‡ Includes: loss of consciousness and concussion

§ Includes: liver laceration, bowel injury, aortic injury

|| Includes: pneumothorax, hemothorax, myocardial contusion

recommended (Class I, Level of Evidence A). Warfarin therapy, in combination with aspirin or clopidogrel, has an increased risk of bleeding (Level of Evidence A).¹² Evidence to support antithrombotic therapy to prevent atherosclerotic events in patients without documented disease is less clear.

Once a patient develops an unsteady gait or has a history of falls, any antithrombotic therapy should be re-evaluated for clear benefit

that outweighs the substantial risks for ICH related to falls. Patients on warfarin therapy have more intracranial hemorrhages after trauma, even relatively minor trauma and have nearly twice the chance of dying subsequent to these injuries and overall and may develop worse functional outcomes.¹³⁻¹⁵ These facts suggest there is likely a subset of patients in which the risk of fall with hemorrhage outweighs the benefit of anticoagulant therapy.

Modalities of Prevention

Identification of older individuals at risk for falling is the first step in preventing injury from falls. All older adults should be screened every year for risk of falling. Table 4 summarizes screening questions to identify persons at risk for falling as well as interventions that may help prevent falls.¹⁶

Multimodal fall prevention interventions have been shown to be most effective in reducing falls in the elderly.¹⁶ Polypharmacy and the use of psychotropic medications in the elderly are well documented as a risk factor for falls. Reducing the total number of medications and/or eliminating/reducing certain psychotropic medications have been found to reduce falls. The Beers list and the STOPP criteria are two attempts at outlining inappropriate medications for the elderly.^{17,18} Individualized exercise programs focusing on improving balance, strength, flexibility, endurance and coordination are effective in reducing falls.

Management of bradycardic and tachycardic heart rhythms, postural hypotension and podiatric concerns are all effective parts of a multifactorial approach to fall reduction. Vitamin D supplementation, even in those who are not deficient in this vitamin, has shown to be beneficial. The identification of home fall hazards with subsequent modification of the home environment has mixed support when used in isolation but has strong support when used as part of a multifactorial approach. Based on the available body of evidence, it is unclear whether correction of visual impairment reduces falls.¹⁶

Limitations

One limitation of our data set is that we do not have long-term follow-up for the patients. Thus,

Table 4. Fall Risk Screening and Prevention Interventions Summary¹⁶

<u>Screening Questions</u>
<ul style="list-style-type: none"> • Have you fallen more than twice in the last year? • Are you here for treatment of an acute fall? • Do you have problems with walking or balance? <p>Any “Yes” answer requires further evaluation and intervention.</p>
<u>Fall Prevention Interventions</u>
<ul style="list-style-type: none"> • Medication Review and Reduction • Individualized Exercise Program • Correct Visual Impairments • Management of Orthostatic Hypotension • Cardiac Rate and Rhythm Control • Supplement Vitamin D • Foot and Footwear Optimization • Eliminate Environmental Hazards • Patient and Caregiver Education

Note: Modified from Reference 16.

it is difficult to draw conclusions as to whether or not sending these patients to a rehabilitation setting has a beneficial effect on long-term outcome, especially on their ability to return to their home. Another limitation is that this data were collected from hospitals participating in the WV State Trauma Registry, which are only 33 of the 52 acute care hospitals in the state. Higher acuity patients that are initially seen at the nonparticipating hospitals were likely transferred to higher level of care facilities, which primarily do participate in the trauma registry, thus capturing these patients in the data. However, the minimally injured patients that were seen and discharged home from non-participating hospitals are not captured, so the current study may have underrepresented the number of minimally injured patients.

Conclusion

Falls can be prevented in older individuals.¹⁰ Patients who present to

the health care system for treatment of a fall or with a complaint of gait or balance disturbance should be screened for fall risk. Mitigation of fall risk factors in the patient and environment and education about the risk of falling can likely reduce the risk of subsequent injury. Correction of vision deficits, minimization of medications, management of cardiac rhythm disturbances and orthostatic hypotension and implementation of an exercise program can reduce the risk of falls in older adults.

Evaluating the home environment for fall hazards and initiating a hazard mitigation program should be part of an integrated fall prevention intervention for older individuals. Transiting to a safer, assisted living situation should be considered if fall hazards cannot be adequately remedied at home. The decision to leave one’s home for a safer living situation is a deeply personal and emotional decision. Many older individuals would prefer to be “less safe” and in “their

own home” than move away from friends and family and the home they have known for decades.

Exercise programs can decrease the risk of falling in older individuals. Exercise can improve balance, flexibility, strength and cardiovascular endurance. Exercise programs have been shown to work best when implemented with other fall prevention interventions. Older West Virginians on antiplatelet or anticoagulant medications who are at significant risk for falls present challenging treatment decisions for patients, families and care providers. The evidence for the use of antithrombotics in the treatment of various atherosclerotic diseases is compelling, but the consequences of these same medications in the face of trauma due to falls can be devastating.

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