Long-term outcomes of ground-level falls in the elderly

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BACKGROUND: For older adults, even ground-level falls (GLFs) can result in multiple injuries and are associated with significant morbidity and mortality. Previous studies have focused on in-hospital outcomes and patients with isolated injuries. Our study examined outcomes following discharge for older adults who were hospitalized following a GLF.

METHODS: A retrospective cohort study of patients older than 65 years admitted to a regional Level I trauma center, from 2005 to 2008, after a GLF was conducted. Hospital trauma registry data were linked to state hospital discharge data and the death certificate registry. Skilled nursing facilities (SNFs) were contacted to verify ultimate patient placement, with follow-up through December 2010. Kaplan-Meier and Cox proportional hazards models were used to analyze postdischarge mortality.

RESULTS: There were 1,352 consecutive admissions; 48% had an Injury Severity Score (ISS) greater than 15, and 12% died during admission. Of the patients who survived hospitalization, 51% were discharged to an SNF, 33% to home without assistance, 6% to home with assistance, and 5% to inpatient rehabilitation facilities. Within 1 year of injury, 44.6% of the patients were readmitted. The 1-year mortality for the overall cohort was 33%; for patients who were discharged alive, the 1-year mortality was 24%. After adjusting for confounders, patients discharged to an SNF had a threefold greater risk of 1-year mortality (hazard ratio, 2.82; 95% confidence interval, 1.86–4.28), compared with patients discharged home with no assistance. Of the patients discharged to an SNF, 48% died by the end of the follow-up period (mean, 28.2 months), and 61% of these patients died while residing at an SNF.

CONCLUSION: GLFs in the elderly result in severe injury, high rate of readmissions, and increased mortality, both in-hospital and after discharge. Overall, only one third of the patients were discharged home to independent living. Future efforts should examine whether improvements in the quality of posthospital care affect both mortality and functional outcomes. (*J Trauma Acute Care Surg*. 2014;76: 498–503. Copyright © 2014 by Lippincott Williams & Wilkins)

LEVEL OF EVIDENCE: Prognostic and epidemiologic study, level III.

KEY WORDS: Geriatric trauma; falls; outcomes.

In 2011, 40% of trauma admissions nationwide were caused by falls, and 50% of these falls occurred in the elderly.[1] Moreover, the elderly are the fastest growing trauma patient population and, in 2011, constituted 25% of patients admitted to hospitals for traumatic injuries. For older adults, many of these falls are only from standing height but often require hospital admission and result in significant injury.[2] Because of comorbidities and concomitant medications, including anticoagulants, a ground-level fall (GLF) in older patients may cause injury requiring multiple operations and admission to an intensive care unit (ICU) and result in inability to return to independent living.

Many studies have shown that elderly trauma patients do not fare well during hospitalization, but few data exist to examine outcomes after discharge. The few studies that have looked at long-term outcomes have shown that discharge to a skilled nursing facility (SNF) was associated with worse outcomes compared with discharge to home or inpatient rehabilitation facility (IRF).[3,4] The primary goal of the current study was to evaluate the long-term outcomes for elderly trauma patients who sustained a GLF. We were particularly interested to compare postdischarge mortality and readmission rates for patients discharged to inpatient rehabilitation, SNF, or home care. The secondary goal was to characterize the population of older adults who required skilled nursing care after discharge and track their ultimate disposition.

PATIENTS AND METHODS

We performed a retrospective cohort study of adults older than 65 years, who were admitted to the Harborview Medical Center (HMC), with a diagnosis of a GLF, from January 2005 to December 2008. HMC is the regional Level I trauma center providing care for residents of Washington and is the only higher-level trauma center in King County, Washington. Patients were identified through the trauma registry and selected based on discharge DRG International Classification of Diseases—9th Rev.—Clinical Modification codes 885.9 (fall from same level from slipping, tripping, or stumbling), 886.9 (fall on same level from collision, pushing, or shoving, by or with other person), 888.8 (accidental falls, other), and 888.9 (accidental falls, unspecified). We excluded patients who were treated in the emergency department but did not require further care.

Submitted: September 11, 2013, Revised: October 28, 2013, Accepted: October 30, 2013.
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This study was presented at the 72nd Annual Meeting of the American Association for the Surgery of Trauma and Clinical Congress of Acute Care Surgery, September 18–21, 2013, San Francisco, California.
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DOI: 10.1097/TA.0000000000000102

Patients with isolated hip fractures and those who were transferred to the HMC were included in the data set.

Data on long-term mortality and readmissions were collected by linking the Harborview Trauma Registry cohort to the Washington State Death Records and the Comprehensive Hospital Abstract Reporting System. Comprehensive Hospital Abstract Reporting System is a statewide database with coded hospital inpatient discharge information derived from billing systems. A deterministic match was made to link the Harborview Trauma Registry to the Washington State Death Records. We used the rules of exact match on name and date of birth (DOB), exact match on DOB and near match on name, or near match on both DOB and name to determine when records matched to the same patient. Personal identifiers were used to remove duplicate links. We made follow-up telephone calls to each care facility to ascertain ultimate patient disposition for those who were initially discharged to an SNF but were not identified in the death records. Mortality and telephone follow-up ended on December 31, 2010 (follow-up period ranged from 0 month to 73.0 months, with a mean of 28.2 months).

Two main analyses were performed: (1) analysis of survival 1 year after injury to examine the association between survival and discharge disposition and (2) analysis of the association between readmission 30 days following injury and patient

TABLE 1. Patient Characteristics and Outcomes

	Total Patien Population,* n = 1,352	Home, No Assistance, n = 390	Home, With Assistance, n = 70	SNF, n = 608	IRF, n = 56	Other,† n = 64	In-Hospital Death, n = 163
Sex							
Female, %	56.7	54	63	63	46	50	44
Age, mean, y	81.2	78.8	82.9	82.5	77.6	82.3	82.7
66–70, %	11.8	19.2	7.1	8.7	14.3	12.5	6.1
71–80, %	32.7	37.7	32.9	28.8	48.2	26.6	33.1
81–90, %	43.4	37.2	38.5	47.5	35.7	50.1	44.8
>90, %	12.1	5.9	21.4	15.0	1.8	10.9	16.0
Charlson comorbidity index	1.44	1.15	1.60	1.58	1.32	1.64	1.52
Organic brain syndrome,‡ %	15.2	7.2	21.4	21.2	5.4	15.6	12.3
ISS, mean	16.2	13.7	14.1	15.6	23.8	14.6	23.3
0–9, %	14.9	22.3	22.9	12.0	5.5	26.6	3.1
10–15, %	37.4	37.7	32.9	45.5	14.6	37.5	16.6
16–24, %	20.2	24.6	27.1	19.6	14.6	14.1	12.9
≥25, %	27.5	15.4	17.2	22.9	65.5	21.9	67.5
TBI,§ %	50.6	19.5	50.0	43.4	75.0	35.9	77.9
≥1 extremity fracture, %	25.7	19.1	31.2	34.3	3.9	29.2	11.4
Isolated hip fracture, %	6.9	1.8	5.7	11.2	0.0	12.5	3.7
Hospital length of stay, mean, d	7.1	3.5	5.8	9.2	13.1	7.7	6.4
ICU stay,¶ %	57.2	46.3	61.8	50.3	83.3	68.8	92.3
ICU length of stay, mean, d	2.77	1.36	1.94	2.98	5.65	6.09	3.49
Primary insurance, %							
Medicare	82.6	82.5	82.6	83.4	81.5	70.8	84.0
Commercial	9.3	8.7	8.7	9.8	7.4	14.6	7.7
Uninsured	1.4	2.8	1.5	0.7	1.9	4.2	0
Other	6.7	5.9	7.3	6.1	9.3	10.4	8.3
Race, %							
Asian/Pacific Islander	8.3	12.7	7.3	6.4	11.3	6.5	5.8
African American	0.2	0.3	0	0.2	1.9	0	0
White	89.9	85.6	92.8	92.1	83.0	87.0	92.9
Other	1.6	1.5	0	4.6	3.8	6.6	1.3
30-d mortality,‖ %	17.5	5.1	14.3	8.7	8.9	17.2	98.8
1-y mortality,‖ %	33.2	8.5	27.1	31.3	21.3	48.4	100.0
30-d readmission,‖ %	13.8	12.4	6.4	14.1	5.8	9.6	0
1-y readmission,‖ %	44.6	27.7	33.3	32.5	27.3	18.2	0

*One record missing discharge disposition.
**Includes home with outside health care assistance (e.g., visiting nurse service) and home with outpatient rehabilitation care.
†Includes transfer to another acute care facility (n = 39), psychiatric facility (n = 2), jail, and missing (n = 1).
‡Organic brain syndrome includes Alzheimer's disease and dementia.
§TBI defined as head mAIS score of 3 or greater and any of the following ICD codes 800–801, 803–804, 850–854, 950.1, 950.2, 950.3, 959.01.
¶ICU admission criteria included elderly patients with four or more rib fractures, intracranial injury requiring hourly neurovascular checks, solid-organ injury requiring serial hematocrit checks and patients who were mechanically ventilated or on vasopressor medications.
‖Readmission and mortality dates counted from date of admission.

and hospitalization characteristics. To compare mortality outcomes from our identified cohort with the generalized population, we used age- and sex-adjusted all-cause mortality rates for Washington State from 2005 to 2007 and applied them to our cohort. All-cause mortality rates were obtained from the Washington State Department of Health Vital Statistics Data. We used the Kaplan-Meier method to estimate survival and readmission rates. Cox proportional hazards models were constructed to estimate the hazard ratio (HR) of 1-year mortality and 30-day readmission after discharge. We were primarily interested in the association between discharge disposition and 30-day readmission and 1-year survival. Other variables were included in the model if they were statistically significant in both univariate and multivariate analyses. Variables not included in the final model were tested but resulted in less than 10% change in the HR estimates for discharge disposition.

This study was approved by the institutional review boards of the Washington State Department of Health and the University of Washington.

RESULTS

During the 4-year study period, there were 1,352 patients older than 65 years who required admission or transfer to the Level I trauma center after a GLF. Seventy-five percent of the patients were transferred to the HMC, consistent with the hospital's role as the regional referral center for injured patients. The mean Injury Severity Score (ISS) was 16.2, with 27.5% having a very severe injury (ISS > 24) (Table 1). The mean Charlson comorbidity index was 1.4, and 15.2% of the patients had a diagnosis of dementia. Twenty-six percent of the patients had at least one extremity fracture, and only 6.9% had an isolated hip fracture. Fifty-one percent of the patients had a traumatic brain injury (TBI), defined as maximum head Abbreviated Injury Scale (mAIS) score of 3 or greater and any of the following ICD codes 800–801 (fracture of skull), 803–804 (fracture of skull), 850–854 (concussion, contusion, intracranial hemorrhage), 950.1–950.3 (injury to optic chiasm), 959.01 (head injury).

One hundred sixty-three patients (12.1%) died in the hospital during the index admission (Table 1). Of those who survived to discharge, 51.1% were discharged to an SNF, 32.8% were discharged home without assistance, 5.9% were discharged home with assistance (home health services or outpatient rehabilitation), and 4.7% were discharged to an IRF (Table 1). On average, patients discharged to an IRF had more serious injuries, compared with patients discharged to an SNF or home with assistance (higher ISS, higher proportion of TBI, greater length of stay, and higher proportion requiring an ICU admission). Despite this finding, patients discharged to an IRF had lower 1-year mortality and readmission rates compared with patents discharged to an SNF or home with assistance.

One-Year Mortality

One-year mortality for the entire study population, including those who died during the initial admission, was significant at 33.2%. With the exception of patients discharged home, the observed mortality for patients after GLF was significantly greater than the all-cause mortality for Washington State residents, after age and sex adjustment (Fig. 1). Patients discharged to an SNF had an approximately fourfold higher 1-year mortality than expected (31.3% vs. 8.2%, $p < 0.0001$). After adjusting for age, admission to the ICU, length of hospital stay, ISS, and Charlson comorbidity index, patients discharged to an SNF were nearly three times as likely to die within 1 year of injury, compared with patients discharged home (HR, 2.82; 95% confidence interval [CI], 1.86–4.28) (Table 2). Other significant predictors of 1-year mortality were age, transfer to another acute care facility, ICU admission, length of hospital stay, and Charlson comorbidity score greater than 2.

Readmissions

For this elderly cohort, the GLF seemed to be a sentinel event that presaged a high risk of subsequent hospitalization. Nearly half of the patients who survived hospitalization (49.7%, n = 591) were readmitted during the study period; 154 were readmitted within 30 days and 403 within 1 year of injury. Patients who were readmitted within 1 year of injury were, on average, readmitted 1.7 times.

Patients who required admission to intensive care during initial hospitalization for a GLF were at higher risk of readmission. Compared with patients not admitted to the ICU, those requiring ICU admission were twice as likely to be readmitted within 30 days of injury (HR, 1.97; 95% CI, 1.39–2.78). After

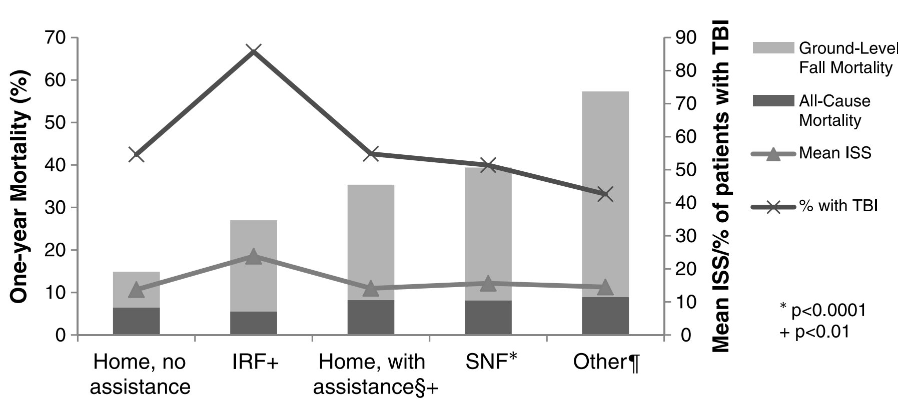

Figure 1. GLF versus all-cause 1-year mortality, age and sex adjusted, based on Washington State Population. §Includes home with outside health care assistance (e.g., visiting nurse service) and home with outpatient rehabilitation care. ¶Includes transfer to another acute care facility (n = 39), psychiatric facility (n = 2), jail, and missing (n = 1). *$p < 0.0001$. +$p < 0.01$.

TABLE 2. Factors Associated With 1-Year Mortality

	Unadjusted HR (95% CI)	Adjusted HR (95% CI)
Age, years*	1.06 (1.05–1.08)**	1.06 (1.04–1.08)**
Disposition†		
Home, no assistance	1 (reference)	1 (reference)
Home, with assistance‡	3.59 (2.03–6.33)**	1.74 (0.89–3.39)
Skilled nursing facility	4.18 (2.87–6.08)**	2.82 (1.86–4.28)**
Rehab facility	2.33 (1.15–4.74)§	1.39 (0.62–3.12)
Other¶	7.70 (4.70–12.6)**	7.00 (4.09–12.0)**
Length of stay, d‖	1.03 (1.02–1.04)§	1.02 (1.00–1.03)§
ICU stay, yes††	1.85 (1.44–2.37)**	1.47 (1.09–1.97)§
ISS‡‡	1.03 (1.02–1.04)**	1.01 (1.00–1.03)
Charlson comorbidity§§		
0	1 (reference)	1 (reference)
1	1.81 (1.29–2.53)§	1.32 (0.92–1.90)
2	1.73 (1.20–2.50)§	1.46 (1.00–2.15)
3	2.16 (1.45–3.21)§	1.56 (1.03–2.37)§
4	2.42 (1.51–3.87)§	1.92 (1.15–3.19)§
5	3.77 (2.03–7.02)**	2.57 (1.36–4.87)§
6	6.60 (2.07–21.1)§	6.19 (1.92–20.0)§

*Adjusted for disposition, length of stay, ICU stay, ISS, and Charlson comorbidity.
**$p < 0.0001$.
†Adjusted for age, length of stay, ICU stay, ISS, and Charlson comorbidity.
‡Includes home with outside health care assistance (e.g., visiting nurse service) and home with outpatient rehabilitation care.
§$p < 0.05$.
¶Includes transfer to another acute care facility (n = 39), psychiatric facility (n = 2), jail, and missing (n = 1).
‖Adjusted for age, disposition, ICU stay, ISS, and Charlson comorbidity.
††Adjusted for age, disposition, length of stay, ISS, and Charlson comorbidity.
‡‡Adjusted for age, disposition, length of stay, ICU stay, and Charlson comorbidity.
§§Adjusted for age, disposition, length of stay, ICU stay, and ISS.

adjusting for ICU admission, the only discharge disposition significantly associated with 30-day readmission was home with assistance (HR, 0.28; 95% CI, 0.09–0.9) (Table 3).

TABLE 3. Factors Associated With 30-Day Readmission

	Unadjusted HR (95% CI)	Adjusted HR (95% CI)
Age, y	1.02 (1.00–1.04)	
Disposition*		
Home, no assistance	1 (reference)	1 (reference)
Home, with assistance**	0.44 (0.16–1.21)	0.28 (0.09–0.90)†
Skilled nursing facility	1.16 (0.82–1.64)	1.03 (0.72–1.46)
Rehabilitation facility	0.55 (0.20–1.51)	0.43 (0.15–1.19)
Other‡	0.61 (0.24–1.54)	0.40 (0.13–1.29)
ICU stay, yes§	1.81 (1.28–2.55)†	1.97 (1.39–2.78)†

*Adjusted for ICU stay.
**Home with outside health care assistance (e.g., visiting nurse service), home with outpatient rehabilitation care.
†$p < 0.05$.
‡Includes transfer to another acute care facility (n = 39), psychiatric facility (n = 2), jail, and missing (n = 1).
§Adjusted for disposition.

TABLE 4. Disposition as of December 2010 for Patients Initially Discharged to an SNF (n = 608)

Disposition From SNF	Patients (n = 608), n (%)
Home, no assistance	133 (21.9)
Home, with assistance*	16 (2.6)
Assisted living facility	44 (7.2)
Remained at SNF	32 (5.3)
Readmitted to hospital	17 (2.8)
Unknown	76 (12.5)
Death (location of death)**	290 (47.7)
Home	26
SNF	178
Hospital	72
Hospice	7
Other	7

*Includes home with outside health care assistance (e.g., visiting nurse service) and home with outpatient rehabilitation care.
**Location of death determined from Washington State Death Records.

Patients Discharged to a SNF

More than half of the patients who survived to hospital discharge were discharged to an SNF (n = 608). Patients discharged to an SNF had similar demographic characteristics, injury severity, and hospital course compared with patients discharged home with assistance (Table 1). During the study period, 51.3% of the patients initially discharged to an SNF were readmitted—15.5% within 30 days and 38% within 1 year of injury (Table 1). As mentioned, the 1-year mortality rate for patients discharged to an SNF was fourfold greater than would be expected for Washington State residents of similar age and sex (Fig. 1). Forty-eight percent of the patients originally discharged to an SNF died by the end of the follow-up period (Table 4) (mean follow-up period for patients discharged to an SNF was 28.5 months).

For individuals who were originally discharged to an SNF and died during the study period, location of death was determined from the death records. Of the 608 patients discharged to an SNF, 318 were still alive at the end of the study period, and we telephoned the SNFs to determine their long-term disposition (Table 4). Two hundred nineteen patients (36.0%) were discharged home or to an assisted living facility from their SNF, while 210 patients (34.5%) remained at an SNF by the end of the follow-up period. Of the 159 patients who were discharged from SNF to home independent living, 133 (83.6%) were still alive at the end of the follow-up period. Disposition was unknown for 12.5% of the patients discharged to an SNF, owing to incomplete records when the SNFs were contacted. For those who remained or died at an SNF, we were unable to ascertain whether they were ever discharged from an SNF and readmitted. There were no patients who had a documented discharge to IRF after admission to an SNF.

DISCUSSION

Among older adults, unintentional falls are the leading cause of fatal and nonfatal injuries,[5] and there is a growing body of evidence that elderly patients experience high injury severity, morbidity, and mortality after a traumatic event.[6–8] For the patients in our trauma center cohort, even a low mechanism of injury, such as a fall from standing height, resulted in poor outcomes. Nearly half of the patients (48%) had a severe injury (ISS > 15), and 57% required admission to the ICU.

Discharge disposition was significantly associated with postdischarge mortality, with patients who were discharged to an IRF having better outcomes compared with those discharged to an SNF or home with home health care. These findings were in agreement with results from two previous studies, although these studies excluded patients with isolated hip fractures.[3,4] In our older patients who survived hospitalization, 33% were discharged home despite having a moderate injury severity and a high proportion of TBI (20%). Among these patients who returned to independent living, 1-year mortality rates were similar to those of age- and sex-matched Washington residents.

Patients who were unable to be discharged home to independent living had significantly increased 1-year mortality when compared with the all-cause mortality rates of elderly Washington residents. Other published studies have shown up to a two-thirds increased risk of postdischarge mortality for patients discharged to anywhere but home.[3] Our results show an even stronger association between discharge disposition and mortality, with patients discharged to an SNF having a nearly threefold increased risk of death within 1 year of injury, compared with patients discharged home without any assistance. The highest 30-day and 1-year mortality rates were observed in the patients discharged to "other" dispositions. The majority of these patients was discharged to a long-term acute care hospital and likely represents a sicker population, who were more likely to have preinjury comorbidities (mean Charlson, 1.64) and worse postinjury responses (69% were admitted to the ICU for an average of 6 days).

Overall, the 30-day readmission rate was 13.8%, similar to the rate for all injured Medicare patients requiring hospitalization (12.3%).[9] The only significant predictor of increased risk for 30-day readmission was admission to the ICU. While this may seem intuitive, it is contrary to studies that suggested 33% of elderly patients perceived improvement in health after requiring an ICU stay.[8,10] Discharge to home with assistance was the only disposition associated with a decreased risk of readmission within 30 days of injury. One possible explanation for this seemingly protective effect would be the disproportionately high 30-day mortality observed in these patients (14.3% vs. 5.1% for patients discharged home without assistance). It is possible that some of these patients were discharged home with hospice for end-of-life care.

Our study found that elderly patients who sustained a GLF, a relatively low-energy mechanism of injury, had poor outcomes. Previous studies have shown that these poor outcomes exist long after discharge from the hospital. However, we found that older adults who are able to return home to independent living experienced the same mortality as the rest of the population. It is unlikely that 100% of the patients would ever be able to be discharged directly home from initial hospitalization, as our study, in addition to a previous study that demonstrated that only 22% to 33% of elderly patients were functionally independent after a GLF.[11] However, eventual return to independent living seems to have the same mortality benefit, as the majority of SNF patients alive at the end of the study period had been discharged home from the SNF. For some individuals, aggressive efforts to provide rehabilitation with the goal of returning the injured elderly to home living may improve individual functionality and long-term mortality, unless rehabilitation is precluded by comorbidities or cognitive impairment. For such patients, a blend of rehabilitation and palliative care approaches may be appropriate.

Many of these patients had substantial illness burden, and geriatricians characterize such patients as having multimorbidity,[12] in which true illness burden and risk of mortality are poorly reflected in a simple list of comorbidities. For these patients, their fall with trauma, particularly if it merits admission to a Level I trauma center, may be a harbinger of their multimorbidity rather than a cause of it. Consequently, profound debility with functional and cognitive impairment, meriting admission to an SNF, may indicate that such an admission is predictive, rather than causative of subsequent mortality. Patients admitted to an IRF are often selected for admission precisely because they have the best chance of benefitting from the IRF environment based on premorbid function, cognition, and the ability to engage in more than 3 hours of active therapy per day. Patients who are unable to meet criteria for IRF are usually admitted to an SNF. Individuals who are less injured, who are more functional, and who have good social supports are those who may be able to go home without formal assistance. Therefore, patients who are discharged either to IRF or home without assistance manifest selection bias toward better outcomes, making it difficult to discern causality.

Despite this seemingly inherent bias, the economic consequences of postdischarge settings need to be considered. A cost-effectiveness analysis performed by Chen et al.[13] showed that for Medicare patients discharged from hospital after stroke, hip fracture, or exacerbations of heart and lung disease, discharge to home with in-home health services resulted in a 35.7% improvement in activities of daily living at 6 weeks, compared with 30.8% for patients discharged to an IRF and 22.3% for those discharged to an SNF. The authors reported that sending patients home with home health care was also the least costly option of the postdischarge care settings. For patients who were not able to return home, IRFs provided patients with greater functional gains than SNF care at similar or lower cost. Unfortunately, access to an IRF is severely limited, with SNF care often being the only alternative. It is also unknown whether variability across skilled nursing facilities affects outcomes, and there is no standard mechanism for assessing quality and making comparisons between SNFs. Studies regarding the optimal post–acute care setting for trauma patients have not been conducted, and future research should focus not only on returning patients to preinjury function but also on doing so in the most cost-effective manner.

Our study is limited by the use of retrospective data and the inability to measure potential confounders such as preinjury function and social support access. While there are differences in the racial composition of patients discharged to different dispositions, the differences were not statistically significant, and we cannot use race as a surrogate for available social support. This study also had a relatively small number of patients in the IRF and home-with-assistance group. However, the small proportion of patients discharged to inpatient rehabilitation highlights the reality that elderly trauma patients may not receive the assistance they need to return to preinjury activity. In addition, the patient population in this study represents the most severely injured patients who sustain a GLF, as the patients in this study, compared with national estimates,[11] were more severely injured (mean ISS, 16.2 vs. 9) and had a higher index admission mortality (12.1% vs. 4.4%).

As the health care system has moved toward decreasing hospital lengths of stay, postdischarge care has become an important challenge of treatment planning and accounts for a significant portion of health care spending in the Medicare population. Treatment of the injured elderly is complex, and return to preinjury function may not always be possible. In addition, compared with those who die during hospitalization, a higher percentage of injured patients who die after hospital discharge have a nontrauma-linked cause of death.[14] Although a GLF is a one-time event, the injuries incurred have long-term detrimental impact on the precarious balance of preexisting conditions in the elderly. A multifactorial approach will be necessary to improve functional outcomes, including greater attention to comorbidity status after injury and optimization of the post–acute care settings currently available.

AUTHORSHIP

P.A.-C., L.M., B.E.E., W.M., and R.V.M. conceived and designed the study. P.A.-C., L.M., C.D.M. acquired the data. P.A.-C., L.M., and B.E.E. analyzed and interpreted the data. P.A.-C., L.M., B.E.E., W.M., and R.V.M. drafted and critically revised the manuscript. R.V.M. supervised the study.

DISCLOSURE

The authors declare no conflicts of interest.

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DISCUSSION

Dr. Clay Cothren Burlew (Denver, Colorado): The strength of this study is in its numbers and in its long-term, post-discharge follow-up. My questions relate to each of these strengths.

First, with almost 1400 patients over a four-year period, that amounts to about one admission per day of an octogenarian that suffered a ground-level fall. This, it seems, could easily overwhelm any trauma service. Who is managing these patients? And what role did geriatricians play in the management team? Can you categorize your outcomes by inpatient management team and their eventual disposition?

Second, thanks to your diligent long-term follow-up you provide us with some very daunting numbers. With discharge disposition seemingly significantly associated with mortality and readmission rates and yet the demographics of patients sent to a SNF versus home with assist being the same, how can we effectively shift our discharge planning for these medically-complex patients?

Thank you very much.

Dr. Lisa McIntyre (Seattle, Washington): Thank you, Dr. Burlew. In terms of who is managing our patients, unfortunately I don't know the teams to which all of these patients were admitted. In general, most of these patients are admitted to our trauma service.

And we are working currently to get geriatricians very involved and to possibly round with us on a daily basis but we haven't been able to figure out the resources and availability of that to make that work as yet.

And then in terms of how to sort out the discharge planning, again, we are talking with our geriatricians to look at resource management and where patients would like to go.

Unfortunately, a lot of discharge planning is based on insurance and social support and that's very difficult to sus out from administrative databases.