HHS Public Access

Author manuscript

Am J Surg. Author manuscript; available in PMC 2017 October 01.

Published in final edited form as:

Am J Surg. 2016 October ; 212(4): 638–644. doi:10.1016/j.amjsurg.2016.06.002.

Outcomes of Trauma Admission for Falls: Influence of Race and Age on In-hospital and Post-Discharge Mortality

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Abstract

Background—Racial disparities in trauma outcomes occur but disparities in fall mortality are unknown.

Objectives—To determine in-hospital and one-year fall mortality among patients discharged from an urban trauma center.

Methods—We conducted a retrospective analysis of fall patients in our trauma registry (1997–2008) linked to the National Death Index to determine post-discharge mortality. Statistical analysis included chi-squared tests, multivariable logistic regression and Cox proportional hazards models.

Results—There were 7,541 fall admissions. There was no clinically significant difference in in-hospital mortality between blacks and whites with age stratification. One year post-discharge, Blacks younger than 65 were more likely to die of disease (HR 1.37; 95% CI 1.14–1.62).

Conclusion—While rates of in-hospital mortality are similar, Blacks under the age of 65 have a higher risk of dying following discharge due to disease when stratified by age highlighting the need for continued medical follow up and prevention efforts.

Keywords

trauma; fall; disparity; race; hip fracture; mortality

Background

In the US, over 700,000 patients are hospitalized annually dues to falls with the potential for serious debilitating injuries [1–3]. The direct medical cost of falls in the US is $34 billion annually[4]. Previous research has characterized falls in the older adult population,

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Conflicts of Interest: There are no conflicts of interest including financial, consultant or institutional.

establishing falls as one of the leading causes of death [3]. However, no studies have reported the potential racial disparities in mortality from falls among those admitted to trauma centers by age.

Racial disparities in mortality from other types of trauma have previously been documented with Blacks having higher odds of both in-hospital and post-discharge mortality [5, 6]. Using data from the Healthcare Cost and Utilization project, it was determined that Blacks had a higher odds of in-hospital mortality after mild to moderate injuries due to any mechanism than whites (OR 1.40, 95% CI 1.18–1.66)[7]. Scott and colleagues found that White males and females had a relative risk of mortality of 0.82 (95% CI, 0.80–0.85) and 0.78 (95% CI, 0.74–0.83) when compared to Blacks of the same sex at Level I trauma centers in the US controlling for other medical history, socioeconomic and injury associated factors [8]. This study attributed 5.3% of in-hospital mortality in Black patients at Level I and II trauma centers nationwide to race alone [8]. While these studies suggest racial disparities in trauma mortality, they all rely on multicenter studies that could be confounded by variance between centers in treatment practices and care.

Falls are an important cause of hospital admission with Whites having a higher incidence of falls than Blacks in the US, however there is a lack of published information regarding racial disparities in fall mortality [9–13]. While patients of older age have been shown to have an increased risk of mortality from other trauma mechanisms, the outcomes of fall-related injury across age ranges remains unknown [14]. The objectives of this study are to determine the patient characteristics that are associated with falls, as well as the incidence of in-hospital fall mortality and the likelihood of post-discharge mortality by race and age among patients admitted to a large, urban trauma center.

Methods

Study Design, Data Source and Study Population

We conducted a retrospective analysis of fall patients in the University of Maryland Shock Trauma Center (STC) registry from January 1997 to December 2008 that was linked to the National Death Index (NDI). The STC registry contains data extensive information on injuries, substance use, and pre-existing comorbid conditions. For this study we included demographic and injury information related to the last recorded trauma admission during the study period to include the most recent demographic data for each individual over 18 years of age. The study protocol was approved by the Institutional Review Board at the medical facility with which the authors are affiliated.

We included patients classified as either Black or White in the study. Other races were excluded due to small numbers in individual categories. Patients transferred from outside hospitals were also excluded as complete details on admission evaluation were not available. Fall patients were identified by E-code (E880-E888) including accidental falls from the same level, stairs, heights and unspecified. Post-discharge mortality was assessed up to 1 year after the initial fall to capture potential complications of the fall.

The NDI is regarded as the gold standard for long-term mortality data [15–18]. Identifying information (social security number, date of birth, sex and name) on all patients in the STC trauma registry was sent to the National Center for Health Statistics for linkage to the NDI. Linkage of this nature has been shown to have greater than 95% sensitivity and 99% specificity in identifying deaths [19, 20]. NDI data from 2008 was used including cause of death by ICD-9 and ICD-10 codes and date of death. Probability matches were returned to us for incorporation into our database. Patients without matches were assumed alive as validated in previous studies[21, 22].

Study Covariates

Sociodemographic factors included age, sex (male or female), median annual household income by zip code and recidivism status (previous trauma admission to our hospital). Age was stratified into less than or greater than 65 years based on variability between the two groups. Median household income was classified into four quartiles: Quartile 1 less than $48,519, Quartile 2 $48,520–65,062, Quartile 3 $65,063–85,588 and Quartile 4 greater than $85,589 based on the distribution of the study population. Injury-specific covariates included the blood alcohol content (BAC, mg/dL), urine drug screen (positive for cocaine, barbituates, opiates, or benzodiazepines), Injury Severity Score (ISS), associated hip fracture (ICD-9 820), mechanism of fall and pre-existing comorbidities. BAC was classified as not tested, negative, less than 80 mg/dL, or greater than 80 mg/dL based on the legal limit. Comorbidities abstracted from recorded medical history included myocardial infarction, congestive heart failure, diabetes, hypertension, chronic obstructive pulmonary disease (COPD), cerebrovascular attack, obesity, liver problems, chronic renal failure, and dementia and were assessed as separate conditions.

Statistical Analysis

Bivariate chi-square analysis was conducted to evaluate the potential associations of both race and mortality with covariates. Adjusted multivariable logistic regression was used to determine the relationship between race and in-hospital mortality after fall. A Cox proportional hazards model was utilized to determine the association between race and long-term mortality after fall, controlling for confounders. Censoring was done at loss to follow up and at end of study. For models addressing cause of death, additional censoring was done at time of other causes of death. Findings were considered significant at a p-value of <0.05.

Results

Sample Population

A total of 7,541 fall patients were included over the study period with 182 associated hip fractures (Table 1). The 3,711 transfers and 607 patients of other races were excluded. The study population was 5,756 (79.5%) White and 1,482 (20.5%) Black. Sixty-two percent of Black patients in the study were living in a zip code associated with the lowest quartile of median annual household income compared to 14–16% of Whites. Sex, incidence of hip fracture and ISS did not significantly differ between Black and White patients (Table 1).

Black fall patients under the age of 65 were more likely to have had a previous trauma admission (p<0.001), have both a positive BAC and a BAC above 80 mg/dL (p<0.001), have a positive urine drug screen (p<0.001) and fallen down stairs (p<0.001). Blacks in this age group had higher prevalence of pre-existing hypertension (p=0.01), diabetes mellitus (p=0.04), cerebrovascular attack (p=0.006) and chronic renal failure (p=0.02) with Whites being more likely to have COPD (p=0.04) (Table 1). Hypertension (p<0.001) and previous stroke (p=0.01) were associated with fall down stairs in those less than 65. Black fall patients 65 and older were more likely to have a BAC above 80 mg/dL (p=0.003) and fallen down stairs (p<0.001) than Whites. Older Whites had higher incidence of COPD (p=0.02) than Blacks (Table 1). There were no comorbidities significantly associated with same level fall in either age group.

In-hospital Mortality

There were 370 patients (4.9%) who died in-hospital after being admitted for a fall (Table 1). Multivariable logistic regression adjusted for sex, age, median household income, ISS, BAC, urine drug screen, previous trauma, comorbidities (cerebrovascular attack, diabetes, chronic renal failure, hypertension, COPD), mechanism of fall and incidence of hip fracture showed no significant difference in in-hospital mortality by race in patients under 65. For Black patients over 65 they were slightly more likely to die in-hospital than Whites (OR 1.02; 95% CI 1.01–1.03) although clinical significance in unclear (Table 2).

Significant covariates associated with increased odds of in-hospital mortality in the logistic regression model for those under 65 included older age, unknown BAC, elevated ISS and previous cerebrovascular event or chronic renal failure (Table 2). The highest quartile of median household income was significantly associated with decreased odds of in-hospital mortality (Table 2). Significant covariates associated with increased odds of in-hospital mortality in the logistic regression model for those over 65 included older age, previous trauma, elevated ISS and COPD. Higher median household income was significantly associated with increased odds of in-hospital mortality in this age group. Female sex (OR 0.76; 95% CI 0.66–0.68), occurrence of a hip fracture (OR 0.78; 95% CI 0.76–0.80) and elevated BAC significantly associated with decreased odds in-hospital mortality in this older age group (Table 2).

One-Year Mortality after Discharge

There were 526 patients (7%) who died during the one-year follow up period after discharge for fall. Using Cox proportional hazards models adjusted for sex, age, median income, ISS, BAC, urine drug screen, previous trauma, comorbidities, mechanism of fall and incidence of hip fracture showed Black patients under 65 were more likely to die of disease-related death (HR 1.37; 95% CI 1.13–1.61) but not injury-related death when compared to Whites (Table 3). The top three causes of disease death in this group included heart disease (27%), malignant neoplasms (18%) and chronic liver disease (5%). Additional strong predictors of disease-related long-term mortality included age, recurrent trauma, ISS, comorbidities and BAC over 80 mg/dL. Strong predictors of increased injury-related long-term mortality included initial fall down stairs or from a height, recurrent trauma, ISS, previous cerebrovascular event, COPD and BAC over 80 mg/dL. Median income within the highest

quartile by zip code was found to be protective for disease-related death. There were no significant differences in one-year mortality by race in those over 65. Female sex was protective of both injury and disease related mortality. ISS and higher median household income were strong predictors of injury-related death.

Discussion

Fall-related in-hospital mortality was 4.9% in our study population. While there was a slight increase in in-hospital mortality in Black patients over 65 compared to Whites, but the 2% increased odds of mortality is substantially lower than the previously reported 22% and 28% increased risk of death for Black males and females, respectively [8]. The lack of a large observed difference in in-hospital mortality based on race differs from several previous studies [5–7]. Our study, however, focused on a single trauma center population removing the possibility of geographic location and possible inter-center variability in outcomes such as may occur in under resourced trauma centers serving large minority populations [23, 24].

One-year post-discharge mortality after a fall was 7% with significant differences based on race. Black patients under 65 were 37% more likely to die of disease. Black patients under 65 did have a higher prevalence of several comorbidities at baseline than White patients but these were included in the multivariable model and are less likely to influence outcomes. Hypertension and cerebrovascular accident were, however, related with falls down stairs and associated one-year mortality from injury. These results and the top causes of disease death being consistent with the general population highlight the need for continued medical monitoring and treatment after traumatic injury. Black patients over 65 were found to have similar mortality outcomes to Whites consistent with previous literature and indicative of a healthier baseline Black population after age 65[25].

There were no significant differences in the incidence of hip fracture by race or in fall-related mortality after hip fracture contrary to hip fracture associations in previous studies [12, 13, 26]. Additionally, hip fracture was protective for in-patient mortality in the study population over 65. While the hip fracture population was 68% women and of an older age as expected, 62% of this population had no previously documented comorbidities suggesting a healthier patient baseline. As a major trauma center, we treat fewer isolated hip fractures than community centers potentially affecting the characteristics of our hip fracture population[27]. Female sex was protective against fall mortality which is consistent with previous studies of trauma mortality[22, 28].

Black patients were more likely to have an elevated BAC over the legal limit of 80 mg/dL which was associated with fall down stairs. BAC at this level increased risk of both injury- and disease-related mortality at one year post-discharge in those under 65. There was however a paradoxical protection in the setting of elevated BAC from in-hospital mortality in those over 65. BAC over 80 mg/dL could therefore be used as a screening metric to identify patients at high risk for mortality under 65. Black patients were also more likely than Whites to have had a previous trauma admission which was associated with an increased risk of both injury and disease mortality one year after discharge for those under 65 years. Having a trauma admission prior to the fall admission analyzed in the study

presents a potential window for prevention of injury. Due to both alcohol and previous trauma admission being associated with an increased risk of future mortality in patients who are discharged alive after fall, there is a critical need to address these modifiable risk factors to reduce preventable deaths in patients surviving the initial fall. Healthcare-based trauma recidivism and alcohol interventions have been shown to be effective encouraging the continued and expanded incorporation of these services [29, 30].

Strengths of this study included the high sensitivity and specificity of linkage with the NDI, a large sample size with extended follow up at a single trauma center with standardized treatment protocols, and high rates of alcohol testing at 92%. Limitations included lack of appropriate power to conduct a stratified analysis by specific type of fall which could allow for better understanding of the fall event. An additional limitation is the lack of information on health insurance status which could modify the associations seen with median household income explaining the paradoxical effects by age. Prevention efforts should focus on reducing fall related mortality even in younger admitted patients, as they are at a higher risk of death within the first year following injury.

Acknowledgments

Sources of Funding: This work is funded by a grant from the U.S. National Institute on Alcohol Abuse and Alcoholism (R01AA18707), National Institutes of Health.

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Summary

Racial disparities in trauma mortality have been found for many injuries. To determine disparities in mortality from falls, we linked our trauma registry to the National Death Index. We found a slight increase in odds of in-hospital mortality in Blacks compared to Whites over age 65. One year after discharge, Black patients were significantly more likely to die of disease than Whites if under 65 years old.

Table 1

Sample Characteristics – Sociodemographic and Injury-specific Covariates by Race

	Under Age 65			Over Age 65		
	White 4,161 (76.4%)	**Black 1,286 (23.6%)**	**P-value**	**White 1,845 (88.1%)**	**Black 249 (11.9%)**	**P-value**
Sex			0.40			0.68
Male	3,034 (72.9%)	953 (74.1%)		878 (47.6%)	115 (46.2%)	
Female	1,127 (27.1%)	333 (25.9%)		967 (52.4%)	134 (53.82%)	
Median Income			<.001			<.001
less than $48,519	655 (16.5%)	777 (62.5%)		252 (14.2%)	149 (62.6%)	
$48,520–$65,062	1,141 (28.7%)	211 (16.9%)		420 (23.6%)	30 (12.6%)	
$65,063–$85,588	1,068 (26.9%)	148 (11.9%)		560 (31.5%)	36 (15.1%)	
greater than $85,589	1,111 (29.9%)	108 (8.7%)		548 (30.8%)	23 (9.7%)	
Previous Trauma			<.001			0.61
No	3,818 (91.8%)	1,139 (88.6%)		1,769 (95.9%)	237 (95.2%)	
Yes	343 (8.2%)	147 (11.4%)		76 (4.1%)	12 (4.8%)	
Mechanism of Fall			<.001			<.001
Same level	453 (10.9%)	142 (11.1%)		229 (12.4%)	32 (12.9%)	
Stairs	818 (19.7%)	353 (27.5%)		564 (30.6%)	105 (42.2%)	
Height	2,267 (54.5%)	585 (45.5%)		449 (24.3%)	55 (22.1%)	
Unspecified	623 (14.9%)	205 (15.9%)		603 (32.7%)	57 (22.9%)	
Hip Fracture			0.08			0.18
No	4,086 (98.2%)	1,272 (98.9%)		1,759 (95.3%)	242 (97.2%)	
Yes	75 (1.8%)	14 (1.1%)		86 (4.7%)	7 (2.8%)	
ISS			0.53			0.07
Missing	188 (4.5%)	69 (5.4%)		30 (1.6%)	9 (3.6%)	
1–8	2,228 (53.5%)	709 (55.1%)		795 (43.9%)	117 (46.9%)	
9–15	888 (21.3%)	263 (20.5%)		447 (24.2%)	53 (21.3%)	
16–24	525 (12.62%)	144 (11.2%)		340 (18.4%)	41 (16.4%)	
25–49	316 (7.6%)	95 (7.4%)		226 (12.3%)	26 (10.4%)	
50+	16 (0.4%)	6 (0.5%)		7 (0.4%)	3 (1.2%)	

	Under Age 65			Over Age 65		
	White 4,161 (76.4%)	**Black 1,286 (23.6%)**	**P-value**	**White 1,845 (88.1%)**	**Black 249 (11.9%)**	**P-value**
BAC			<.001			0.003
Negative	2,985 (71.7%)	784 (60.9%)		1,497 (81.1%)	183 (73.5%)	
<80mg/dL	118 (2.8%)	58 (4.5%)		37 (2.1%)	2 (0.8%)	
>=80mg/dL	794 (19.1%)	335 (26.1%)		139 (7.5%)	32 (12.9%)	
Unknown	264 (6.3%)	109 (8.5%)		172 (9.3%)	32 (12.9%)	
Urine Drug Screen			<.001			0.25
Negative	1,171 (28.1%)	351 (27.9%)		626 (33.9%)	97 (38.9%)	
Positive	818 (19.7%)	303 (20.6%)		190 (10.3%)	21 (8.4%)	
Unknown	2,172 (52.2%)	632 (49.1%)		1,029 (55.8%)	131 (52.6%)	
Comorbidities *						
Cerebrovascular	48 (1.2%)	28 (2.2%)	0.006	173 (9.4%)	22 (8.8%)	0.78
Hypertension	599 (14.4%)	222 (17.26%)	0.01	940 (50.9%)	139 (55.8%)	0.15
Diabetes	219 (5.3%)	87 (6.8%)	0.04	311 (16.9%)	53 (21.3%)	0.08
Chronic Renal Failure	11 (0.3%)	9 (0.7%)	0.02	22 (1.2%)	5 (2.0%)	0.28
COPD	46 (1.1%)	6 (0.5%)	0.04	98 (5.3%)	5 (2.0%)	0.02
In-hospital Mortality			0.17			0.49
No	4,065 (97.7%)	1,248 (97.1%)		1,631 (88.5%)	224 (89.9%)	
Yes	95 (2.3%)	38 (2.9%)		212 (11.5%)	25 (10.1%)	

* The number of patients with a comorbidity is listed with p-value comparing the number without a comorbidity by race

Table 2

Multivariable Logistic Regression Odds of In-hospital Mortality

	Under Age 65		Over Age 65	
	Odds Ratio (95% CI)	**P-value**	**Odds Ratio (95% CI)**	**P-value**
Sex				
Female	Ref (1.0)		Ref (1.0)	
Male	0.94 (0.55–1.59)	0.81	**1.52 (1.51–1.53)**	**<.001**
Median Income				
less than $48,519	Ref (1.0)		Ref (1.0)	
$48,520–$65,062	0.57 (0.32–1.02)	0.06	**1.51 (1.50–1.52)**	**<.001**
$65,063–$85,588	0.55 (0.29–1.01)	0.06	**1.12 (1.11–1.13)**	**<.001**
greater than $85,589	**0.44 (0.23–0.83)**	**0.01**	**1.27 (1.26–1.28)**	**<.001**
Race				
White	Ref (1.0)		Ref (1.0)	
Black	0.94 (0.56–1.60)	0.83	**1.02 (1.01–1.03)**	**0.003**
Previous Trauma				
Single Visitor	Ref (1.0)		Ref (1.0)	
Recidivist	0.92 (0.43–1.98)	0.80	**1.15 (1.13–1.17)**	**<.001**
Mechanism of Fall				
Same Level	Ref (1.0)		Ref (1.0)	
Stairs	2.10 (0.71–6.22)	0.18	**1.01 (1.00–1.02)**	**0.05**
Height	1.60 (0.56–4.57)	0.38	**0.67 (0.66–0.68)**	**<.001**
Unspecified	1.72 (0.53–5.51)	0.37	**1.02 (1.01–1.03)**	**<.001**
Associated Hip Fracture				
No	Ref (1.0)		Ref (1.0)	
Yes	0.62 (0.15–2.54)	0.51	**0.78 (0.76–0.79)**	**<.001**
ISS				
1–8	Ref (1.0)		Ref (1.0)	
9–15	**8.68 (2.74–27.51)**	**<.001**	**2.06 (2.04–2.08)**	**<.001**
16–24	**36.09 (12.04–108.20)**	**<.001**	**6.21 (6.17–6.26)**	**<.001**
25+	**250.28 (86.27–726.13)**	**<.001**	**19.30 (19.17–19.43)**	**<.001**
Missing	3.04 (0.33–27.96)	0.33	**2.08 (2.02–2.16)**	**<.001**
BAC				
Negative	Ref (1.0)		Ref (1.0)	
<80mg/dL	2.32 (0.89–6.00)	0.08	**0.23 (0.22–0.24)**	**<.001**
>=80mg/dL	1.69 (1.00–2.89)	0.06	**0.58 (0.57–0.59)**	**<.001**
Unknown	**10.25 (5.49–19.16)**	**<.001**	**1.20 (1.19–1.22)**	**<.001**
Urine Drug Screen				
Negative	Ref (1.0)		Ref (1.0)	
Positive	0.54 (0.29–1.00)	0.06	**0.76 (0.75–0.77)**	**<.001**
Unknown	1.16 (0.72–1.87)	0.55	**0.99 (0.98–1.00)**	**<.001**
Comorbidities	Ref (1.0)		Ref (1.0)	

	Under Age 65		Over Age 65	
	Odds Ratio (95% CI)	**P-value**	**Odds Ratio (95% CI)**	**P-value**
Cerebrovascular	**3.29 (1.16–9.33)**	**0.03**	NS	
Hypertension	0.60 (0.32–1.12)	0.11	NS	
Diabetes	1.54 (0.68–3.48)	0.29	NS	
Chronic Renal Failure	**15.04 (2.81–80.54)**	**<.001**	NS	
COPD	4.45 (0.93–21.20)	0.06	**1.37 (1.35–1.39)**	**<.001**

Adjusted for age, sex, median income, race, ISS, BAC, mechanism of fall, urine drug screen, previous injury and comorbidities; Significant results in bold; NS indicates comorbidities with no significant differences by race on admission and were therefore not included in the model

Table 3

Hazard Risks of One-Year Post-Discharge Mortality Stratified by Cause of Death

	Under Age 65		Over Age 65	
	Injury Death HR (95% CI)	**Disease HR (95% CI)**	**Injury Death HR (95% CI)**	**Disease HR (95% CI**
Sex				
Female	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
Male	1.23 (0.86–2.20)	1.14 (0.89–1.57)	**1.65 (1.12–3.14)**	**1.31 (1.10–1.61)**
Median Income				
less than $48,519	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
$48,520–$65,062	0.80 (0.42–1.18)	0.85 (0.58–1.13)	2.29 (1.82–2.76)	1.02 (0.81–1.23)
$65,063–$85,588	0.83 (0.44–1.23)	**0.60 (0.28–0.92)**	**1.88 (1.42–2.35)**	0.92 (0.72–1.12)
greater than $85,589	0.61 (0.18–1.05)	**0.53 (0.19–0.86)**	**1.79 (1.34–2.25)**	1.02 (0.82–1.23)
Race				
White	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
Black	1.09 (0.75–1.43)	**1.37 (1.14–1.61)**	1.43 (0.98–1.88)	1.09 (0.86–1.32)
Previous Trauma				
Single Visitor	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
Recidivist	**1.66 (1.26–2.60)**	**1.46 (1.16–1.76)**	0.89 (0.21–1.56)	0.82 (0.45–1.19)
Mechanism of Fall				
Same Level	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
Stairs	**3.14 (2.34–3.93)**	0.91 (0.56–1.26)	1.18 (0.63–1.74)	0.97 (0.74–1.20)
Height	**2.21 (1.43–2.98)**	**0.55 (0.20–0.99)**	1.07 (0.48–1.66)	1.09 (0.86–1.33)
Unspecified	**2.19 (1.35–3.04)**	1.08 (0.71–1.44)	1.02 (0.44–1.60)	1.20 (0.98–1.43)
Associated Hip Fracture				
No	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
Yes	0.64 (0–1.79)	0.71 (0–1.60)	0.86 (0.08–1.63)	0.77 (0.40–1.13)
ISS				
1–8	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
9–15	1.28 (0.85–1.71)	**1.27 (1.01–1.51)**	**3.42 (2.68–4.18)**	1.15 (0.97–1.32)
16–24	**2.11 (1.66–2.56)**	**1.42 (1.10–1.73)**	**15.18 (14.54–15.82)**	1.02 (0.82–1.22)
25+	**10.13 (9.79–10.48)**	**1.61 (1.21–2.00)**	**45.69 (45.06–45.31)**	1.26 (0.98–1.54)
Missing	1.10 (0.26–1.94)	1.12 (0.59–1.65)	2.15 (0.10–4.20)	0.90 (0.37–1.44)
BAC				
Negative	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
<80mg/dL	1.62 (0.99–2.25)	1.29 (0.76–1.82)	0.23 (0–2.20)	0.63 (0.01–1.26)
>=80mg/dL	**1.54 (1.20–1.87)**	**1.34 (1.10–1.59)**	1.29 (0.77–1.82)	0.69 (0.39–1.00)
Unknown	**2.11 (1.62–2.60)**	**1.43 (1.03–1.84)**	1.20 (0.73–1.66)	**1.32 (1.12–1.53)**
Urine Drug Screen				
Negative	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)
Positive	1.04 (0.88–1.21)	1.02 (0.89–1.14)	1.06 (0.92–1.21)	1.02 (0.94–1.09)
Comorbidities*	Ref (1.0)	Ref (1.0)	Ref (1.0)	Ref (1.0)

	Under Age 65		Over Age 65	
	Injury Death HR (95% CI)	**Disease HR (95% CI)**	**Injury Death HR (95% CI)**	**Disease HR (95% CI**
Cerebrovascular	**2.33 (1.58–3.07)**	**2.36 (1.93–2.79)**	NS	NS
Hypertension	0.78 (0.35–1.21)	**1.27 (1.02–1.51)**	NS	NS
Diabetes	1.01 (0.40–1.61)	1.22 (0.89–1.55)	NS	NS
Chronic Renal Failure	1.32 (0–3.33)	**6.31 (5.69–6.96)**	NS	NS
COPD	**4.35 (3.51–5.19)**	**3.89 (3.38–4.42)**	0.78 (0.10–1.45)	**1.75 (1.48–2.03)**

Adjusted for age, sex, median income, race, ISS, BAC, mechanism of fall, urine drug screen, previous injury and comorbidities; Significant results in bold; NS indicates comorbidities with no significant differences by race on admission and were therefore not included in the model