Published in final edited form as:

Ann Surg. 2014 May ; 259(5): 985–992. doi:10.1097/SLA.0000000000000486.

Association Between Intentional Injury and Long Term Survival After Trauma

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Introduction

Trauma is the number one cause of death of Americans aged 1–44 years.¹ While many of these injuries are unintentional, violent trauma contributes significantly to mortality, particularly among youth. In 2005, intentional injuries claimed the lives of 51,000 individuals in the United States.² Among African-American males aged 15–24 years, homicide is the leading cause of death;³ it is the second leading killer of all American youth of the same age.¹

Intentionally injured patients are at risk of experiencing a pattern of repeated traumatic violence known as the “trauma trajectory,”⁴ in which subsequent violent injury is associated with an increased likelihood of death. Although patients may survive an initial acute injury, they generally return to the same environment in which their injury occurred and thus have a high likelihood of subsequent lethal trauma. In one single center study, 19% of intentionally injured patients seen at the Emergency Department (ED) had been treated for violent trauma in the recent past.⁵ These patients’ risk of death more than doubled for each return visit to the ED. Given the expensive and resource-intensive nature of trauma care, problems of recidivism are of serious concern and raise the question: are lives being saved only to be lost soon in the future?

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Conflicts of Interest:

None of the authors had any conflicts of interest.

Author contributions are as follows:

Conception and design of study: Drs. Haider, Young, Kisat, Villegas, Ladha, Haut, Cornwell, MacKenzie, Efron and Ms. Scott

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Critical Revisions for Intellectual Content: Drs. Ladha, Haut, Cornwell, MacKenzie and Efron

Recent evidence shows that surviving adult trauma patients experience significantly increased mortality as compared to the general population in the years following hospital discharge.⁶ However, long-term survival among intentionally injured trauma patients is unknown. The objective of this study was to determine the risk-adjusted mortality of intentionally injured patients within seven to nine years post-injury, compared to unintentionally injured patients, with an aim to investigate the long-term efficacy of saving a life after acute, violent trauma.

Methods

This study was designed to provide long-term follow-up on trauma patients admitted for at least 24 hours and discharged alive from the Johns Hopkins Hospital (JHH) between January 1st, 1998 and December 31st, 2000. The quality of data from Johns Hopkins greatly improved after 1997, leading to the restriction of the study period to after January 1, 1998. We chose a 7–9 year period for follow-up as, at the time of this study, the latest data available from the National Death Index (NDI) was 2007. The study period ended in December 31, 2000 to allow us to focus on the longest period of follow-up possible. JHH is a state designated level 1 trauma center located in an urban, inner city environment.

Creation of a Comprehensive Patient Dataset

All adult patients (> 17 years of age) included in the center's trauma registry were eligible for selection. For patients with multiple admissions for trauma during the study period, data on only the first admission was included. Trauma registry records were linked to the hospital's administrative case mix database by deterministic linkage with medical record number, birth date, and admission/discharge dates using a previously published methodology.⁷ This linkage allowed the development of a comprehensive trauma dataset including detailed data on patients' socio-demographic and clinical characteristics, as well as information on the patients' discharge disposition from the hospital.

Patient socio-demographic characteristics included age, gender, race/ethnicity (Caucasian, African-American, Latino, Other) and insurance status (Private, Public or Uninsured) and were derived from the trauma registry. Data on income level was extrapolated from patients' addresses in the administrative database. Patients' addresses were geocoded with ArcGIS 9.3 (ESRI, Redlands, CA) and linked to 2000 census block groups, the smallest publicly available unit and a common proxy for neighborhood characteristics.^{8–10} Median household income according to census block group was identified for each patient with a valid address from the 2000 US census. Median annual family income was grouped into the following categories: 1) < \$25,000 per year, 2) \$25,000–50,000 per year and 3) \$50,000 per year.

Injury characteristics were derived from the trauma registry and included Injury Severity Score (ISS), systolic blood pressure (SBP) on arrival to ED, type of injury (penetrating versus blunt) and mechanism of injury including injury intent. Intentional injury was classified using the appropriate E codes. Patients with E codes between E960 and 969.9 (“Homicide and Injury Purposely inflicted by other persons”) were considered intentionally injured (with the majority of patients classified by codes 960, 965.4, 966, or 968.2) In addition, we considered patients with Ecodes 985 (“injury by cut/pierce”) and 986 (“Injury

by Firearm with undetermined intent”) as intentionally injured, although fewer than 15 patients had this diagnosis.¹¹ Fewer than 25 patients were classified by an E code representing a self-inflicted injury. Charlson Index Scores were used to identify and adjust for co-existing medical conditions. These were calculated using ICD-9 diagnosis codes in the administrative database and a publicly available algorithm.¹² Given the association between discharge disposition and patient characteristics¹³ and outcomes, including long term mortality,⁶ this was also included in this analysis and categorized as: 1) Home, 2) Home with services, 3) Inpatient Rehabilitation Facility, 4) Skilled Nursing/Specialty Referral, 5) Transfer to Acute Care Hospital and 6) Leave Against Medical Advice.

Determination of Long-term Survival

Patient survival was determined using the National Death Index (NDI), which is designed to facilitate health-related mortality studies. Researcher-supplied submission files are matched to the NDI computerized index of death record information compiled from death certificates submitted by State Vital Statistics offices to the National Center for Health Statistics (NCHS). The NDI system selects potential death record matches based on a set of seven matching criteria. Details of the NDI application and matching process have been described elsewhere.^{14–16} The NDI dataset that includes cause of death information was procured.

All patients included in our comprehensive dataset were submitted for a potential match in the NDI using data on social security number, age and gender for matching data through 2007. Previous work has shown that social security number has the best accuracy in ascertaining death using this database.¹⁷ The NDI returned matches with data on "status code" (dead or alive) and cause of death if applicable. As the NDI matches user submission records to death records based on seven criteria, patients who were not identified were regarded as alive. The decision to believe that such patients are alive was based on strong evidence of accuracy (both sensitivity and specificity) of the NDI^{18,19} and previous studies that have supported this precedent.²⁰

Main Outcome Measure and Statistical Methodology

The primary outcome was mortality post-injury. The independent variable was intent, constructed as a binary variable (0,1) as defined by CDC mechanism coding (E-codes 960–970, assaultive, and 985–987, undetermined).

Baseline characteristics of the study population were compared by intent status using chi-squared test. Within each demographic or injury characteristic, the difference in mortality was assessed by either chi-square or Fischer’s exact test, though this only accounted for proportional differences and not any differences in time to mortality. Statistical significance was defined at $p < 0.05$. Overall difference in survival between intentional and unintentional injury was examined by comparing Kaplan-Meier survival curves,²⁵ and the rate ratios (RRs) of the survival curves were calculated using the Mantel-Cox method. These RRs represent the differences in the slopes between survival curves adjusted for age, gender, race, insurance status, ISS, injury type, comorbidity score, and final disposition. Cox proportional hazard regression model was used to investigate the association between injury intentionality and mortality. Traditionally used in cancer care outcomes, a Cox regression analysis is

similar to a logistic regression in that both reveal the relative contributions of the variables included in the model to the outcome. The difference between the two analyses is that a logistic regression measures a binary outcome, whereas a Cox regression factors in the time to when the outcome variable is met.²¹ We determined the overall hazard's ratio for mortality after intentional injury, while adjusting for baseline risk factors and potential confounders known to impact trauma outcomes, including age, gender, insurance status, race, ISS, injury type, comorbidity score and final discharge disposition.^{22–24}

In order to focus on a group known to have fewer co-morbidities, a subset analysis restricted to patients aged 44 and younger, adjusted for the factors mentioned above, was undertaken to minimize the effect of confounding by age. Additionally, a subset analysis which also adjusted for the median household income of the patient's residential zip code was performed. This subset was substantially smaller than the total cohort of patients as reliable home address information was not available for many patients. Finally, a sensitivity analysis was performed on the subset of patients who had a definite match in the NDI to ensure that our decision to treat patients not identified in the NDI as alive was not erroneous (Supplemental Digital Content 1 and 2). All analyses were performed with Stata/MP statistical software, version 11 (Stata, College Station, TX).

Results

From January 1, 1998 to December 30, 2000, 2,409 patients were admitted to the Johns Hopkins Hospital registry. Of these, 85 (3.53%) patients died in-hospital. Of the surviving patients, 2,062 met our inclusion criteria. Given the very small amount of missing data (age, gender, ISS: none; race: 0.48%; insurance status: 0.39%; injury type: 0.15%; Charlson comorbidity: 2.62%; and final disposition: 0.68%), we conducted a complete case analysis. 56.4% (n=1163) of patients were intentionally injured, while 43.6% (n=899) experienced unintentional injuries. Intentionally injured patients were more often younger (15–29 years) and male than unintentionally injured patients (Table 1). Higher proportions of intentionally injured patients were low-income, uninsured, or suffering from severe injuries than unintentionally injured patients. Seventy four percent of intentionally injured patients were admitted for penetrating injuries, as compared to just three percent of unintentionally injured patients.

There were 302 patients who had died during follow-up. Crude mortality was higher for unintentionally injured patients compared to intentionally injured patients (17.8% versus 12.2%; p value: < 0.001). Demographic and injury characteristics of those patients who had died within 7–9 years follow-up were similar to the overall study sample. Of those who had died, intentionally injured patients were more likely than unintentionally injured patients to be young, male, and low-income. More than twice as many of the unintentionally injured patients who had died during follow-up were privately insured compared to those who had been intentionally injured patients (14.9% vs. 8.2%) (Table 2).

Despite the predominance of more severe and penetrating injuries among intentionally injured patients in the study sample, Cox regression analysis controlling for age, gender, insurance status, race, ISS, injury type, comorbidity and final discharge disposition showed

that intentionality was not significantly associated with mortality rates within 7–9 years post-injury (Table 3). Factors found to be significantly associated with long-term mortality were older age at the time of injury, female sex and a higher burden of co-morbid disease.

In an additional subset analysis of 1,186 patients with median household income information available based on their residence zip code, neither race nor insurance status was significantly associated with long-term mortality. However, patients with incomes of less than \$25,000/year were significantly more likely to have died within 7–9 years follow-up than either those with annual incomes between \$25,000 and \$50,000 or greater than \$50,000. Charlson co-morbidity index scores of either 1 or 2 compared to the reference group of 0 were also significantly associated with increased mortality [HR 2.15, 95 % CI (1.37,3.37) and HR 5.29, 95% CI (3.00,9.32), respectively]. In addition, female sex was found to be significantly protective against long-term mortality, with a 31% reduced likelihood of death among women.

A subset analysis of patients under age 45, who are assumed to have fewer co-morbidities, also found no association between intention and long-term mortality (Table 4). Female sex was the only characteristic found to be significantly protective against long-term mortality in this analysis.

We proceeded to investigate the difference in survival curves by intention. No significant difference in survival was observed for patients with intentional injury as compared to patients with unintentional injury (RR = 1.15, 95% CI = 0.72–1.86, $p = 0.556$) (Figure 1). Although intentionality was not associated with long-term survival, cause of death post-injury did vary by intention. Intentionally injured patients were much more likely to die of an external cause than unintentionally injured patients (55.6% vs. 24.4%) (Figure 2a). Intentionally injured patients were more likely to later die of infection (18.3% vs. 11.3%). In sharp contrast, unintentionally injured patients more often died of circulatory problems (30.6% vs. 7.8%) and neoplasms (13.1% vs. 7.0%) compared to intentionally injured patients. Nearly one-third (31.7%) of intentionally injured patients who had died within 7–9 years follow-up were killed by gunshot wounds (GSW), compared to just 5.0% of unintentionally injured patients (Figure 2b). Unintentionally injured patients were also more likely than intentionally injured patients to later die of unintentional mechanisms, including falls (2.5% vs. 0.7%), motor vehicle collisions (MVC) (2.5% vs. 0.7%) or pedestrian hits by a motor vehicle (3.1% vs. 0.7%).

Comment

This study of trauma patients from an urban, inner city environment found that 15% of all patients discharged alive after being admitted for an injury had died at up to 7–9 years post-injury. A high proportion of this cohort of patients were injured intentionally, however, intent was not independently associated with death. This finding suggests that the overall long-term efficacy of lifesaving trauma care is similar between intentionally and unintentionally injured patients. In contrast, sex, neighborhood income, and Charlson co-morbidity scores were predictors of death. Female sex was protective against long-term

mortality. Thus, our study is consistent with several large outcomes studies suggesting that females tolerate hemorrhagic shock better than males.^{23,26–27}

Trauma is not necessarily a single acute event, but has a lasting association with higher rates of long-term mortality.⁶ A recent study by Davidson et al. found that cumulative mortality at three years post-injury among adult trauma patients in Washington State was 16% compared to the expected population cumulative mortality of 5.9%.⁶ Our study's mortality rate among adult trauma patients was also high, particularly for a relatively young population, with 14.7% of patients dying within up to 7–9 years follow-up. This may be partly due to the demographics of the patient sample, which was overwhelmingly poor and black. Patients from neighborhoods with the lowest income suffered from higher rates of mortality in this study. Furthermore, all-cause mortality in Baltimore is high relative to the state of Maryland, and within Baltimore, the all-cause mortality for blacks is much higher than whites (1102.4 per 100,000 vs. 785.9 per 100,000, respectively).²⁸

There is also a general concern that improvements in in-hospital mortality have masked worsening long-term survival. For instance, Davidson et al. demonstrated that although in-hospital mortality had decreased from 8% to 4.9% during a 14 year study period, the long-term cumulative mortality increased from 4.7% to 7.4%.⁶ There is growing recognition of the need to study long-term outcomes among trauma patients, yet to our knowledge, no study has a longer follow-up period than nine years.

While the lack of association between injury intentionality and long-term mortality outcomes may be heartening to healthcare providers who work in hospitals that care for victims of violent trauma, it must be noted that intentionally injured patients were more likely to die of a subsequent injury. Almost one-third of those who did die during the time period studied were killed by gunshot wounds. These results underscore the continued reality of trauma recidivism, which certainly does exist but which may not be so pervasive that one would question the utility of treating casualties of urban warfare. On the other hand, unintentionally injured patients were more likely to die of circulatory problems, and when they did die of external causes, it was predominantly by an unintentional mechanism of injury, such as motor vehicle collisions.

Intentional injury is often considered a “chronic” disease, as many intentionally injured trauma patients have already sustained prior injuries related to interpersonal violence.⁵ Furthermore, repeat injuries appear to occur quickly. In a study of trauma recidivists at an urban trauma center, Smith et al. found that recidivists averaged just 7.9 months between injuries and in patients with fatal repeat trauma, the mean time between initial injury and death was 18.8 months.²⁹

Recidivist, intentional injuries tend to occur in environments of significant risk, among marginalized populations. In a case-control study, Cooper et al. found multiple risk factors associated with trauma recidivism: African-American race, male sex, unemployment, lacking medical insurance, annual income less than \$10,000, current drug use, past or present drug dealing and a positive drug test at hospital admission.³⁰ Buss et al. also found that trauma recidivists were more likely to be low-income, African-American, male, lacking

health insurance, suffering from substance abuse problems and/or living in neighborhoods with pervasive violence.³¹

In this study, approximately 5% of intentionally injured patient did subsequently die of violence. This number does not include patients who may have suffered a violent injury but did not die from it, suggesting that a significant number of patients are caught in a cycle of violence that brings them back to the ED. It is clear that socioeconomic status plays a strong role, with patients living in neighborhoods characterized by annual income less than \$25,000/yr experiencing higher rates of mortality after up to 9 years post-injury than patients living in higher income neighborhoods. These findings suggest that violence can be understood as a disease of poverty – the symptoms are treated in the emergency department, but the underlying cause remains untouched in environments of deprivation.

Given the high-risk environment in which intentional injuries occur, efforts to improve long-term survival after intentional injury – and reduce incidence of subsequent violent injuries – should focus on violent injury prevention among vulnerable populations. The Ceasefire campaign in Chicago has succeeded in reducing gun violence by identifying high-risk communities for interventions that include individual and group dispute mediation and challenges to social norms that accept violence as appropriate.³² For interventions taking place in the hospital environment, Cunningham et al. suggest four key “best practices:” (1) assessment of patient psychosocial needs and risks (2) planning for treatment and services to address needs (3) identifying local partners responsible for post-discharge services and (4) coordinating a plan to ensure service delivery and mitigate gaps in care.³³

There are some important limitations to consider in this study. First, our study sample consisted solely of patients from a single urban, academic Level 1 trauma center. The majority of our patients were African-Americans and male, and 43% of patients presented with penetrating trauma. Therefore, our findings may not be easily generalizable to trauma care throughout the country. Given that 73.3% of the study sample were African-Americans and only 23.3% of patients were privately insured, it is likely that we did not have sufficient statistical power to detect race- or insurance-based disparities.

Second, the socioeconomic status analyses presented in this study relied on census-based data to measure income rather than individual level data. Neighborhood income as a proxy for socioeconomic status has been previously used in a variety of research studies, and the use and validity of this method has been evaluated by numerous epidemiological studies. Income data was only included in a subset analysis, due to a lack of reliable home address data (42.8%). Indeed, in the current study, higher neighborhood income decreased the risk of long-term mortality and was one of the key variables in this analysis. It is unclear whether neighborhood income is an important factor irrespective of individual income, and neighborhood income should not be interpreted as equivalent to individual income. However, this data highlights the importance of including neighborhood-level data when investigating epidemiological relationships involving race, insurance status, or any variable related to socioeconomic status.

In this study with up to 7–9 years of follow up, intentionally injured patients did not have higher mortality rates than unintentionally injured patients. However, intentional injuries were associated with more violent causes of death among those patients who had died during the follow-up period. Further studies are needed to develop a better understanding of the long-term impact of intentional injury and to evaluate and improve upon existing models of violence prevention interventions in the emergency department. Given that surviving intentionally injured patients are no more likely than unintentionally injured patients to die in the decade following their injury, but are disproportionately killed by violent mechanisms, interventions focused on breaking this cycle of violence could provide an effective way to prevent repeated injury and violent death.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Source of Funding:

Financial support for this work was provided by: National Institutes of Health/ NIGMS K23GM093112-01; American College of Surgeons C. James Carrico Fellowship for the study of Trauma and Critical Care (Dr. Haider).

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Figure 1.
Adjusted Cox Proportional Regression Kaplan-Meier and RR by Intent

Figure 2.
a: Cause of Death after Initial Injury

b: Mechanism of Death after Initial Injury

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Table 1**Patient Demographic and Injury Severity Characteristics**

n (%)	All Patients 2062 (100)	Unintentional Injuries 899 (43.6)	Intentional Injuries 1163 (56.4)	p value [*]
Age^d				
15–29	984 (47.7)	331 (36.8)	653 (56.2)	
30–44	682 (33.1)	284 (31.6)	398 (34.2)	0.001
45–59	250 (12.1)	157 (17.5)	93 (8.0)	<0.001
60–74	86 (4.2)	76 (8.5)	10 (0.9)	<0.001
≥ 75	60 (2.9)	51 (5.7)	9 (0.8)	<0.001
Female	420 (20.4)	295 (32.8)	125 (10.8)	<0.001
Income^f				
0–25K	418 (34.7)	123 (24.5)	295 (42.0)	
25–50K	635 (52.7)	282 (56.1)	353 (50.3)	<0.001
≥50K	152 (12.6)	98 (19.5)	54 (7.7)	<0.001
Insurance^b				
Private	479 (23.3)	296 (33.2)	183 (15.8)	
Public	1492 (72.6)	560 (62.7)	932 (80.3)	<0.001
Uninsured	83 (4.0)	37 (4.1)	46 (4.0)	0.003
Race^c				
Caucasian	484 (23.6)	366 (41)	118 (10.2)	
African American	1505 (73.3)	496 (55.6)	1009 (87)	<0.001
Latino	31 (1.5)	13 (1.5)	18 (1.6)	<0.001
Other	32 (1.6)	17 (1.9)	15 (1.3)	0.005
Injury Severity Score (ISS)^d				
<9	1137 (55.1)	528 (58.7)	609 (52.4)	
9–15	581 (28.2)	257 (28.6)	324 (27.9)	0.386
16–24	209 (10.1)	73 (8.1)	136 (11.7)	0.002
≥25	135 (6.6)	41 (4.6)	94 (8.1)	<0.001
Penetrating	877 (42.6)	24 (2.7)	853 (73.5)	<0.001

n (%)	All Patients 2062 (100)	Unintentional Injuries 899 (43.6)	Intentional Injuries 1163 (56.4)	p value [*]
Charlson Co-Morbidity^e				
0	1723 (85.8)	728 (82.7)	995 (88.2)	
1	218 (10.9)	114 (13)	104 (9.2)	0.005
2	67 (3.3)	38 (4.3)	29 (2.6)	0.019
Final Disposition^f				
Home	1,590 (77.1)	653 (73.5)	937 (80.9)	
Inpatient Rehabilitation	152 (7.4)	88 (9.9)	64 (5.5)	<0.001
Skilled Nursing/Specialty Center	34 (1.7)	25 (2.8)	9 (0.8)	<0.001
Home with Services	195 (9.5)	88 (9.9)	107 (9.2)	0.278
Acute Care Hospital	39 (1.9)	22 (2.5)	17 (1.5)	0.055
Against Medical Advice	38 (1.8)	13 (1.5)	25 (2.2)	0.395
Died	302 (14.7)	160 (17.8)	142 (12.2)	<0.001

^{*} Significant at p<.05

^f Income information available on only 660 patients

^a Reference group for age= 15–29 years

^b Reference group for Insurance= Private Insurance

^c Reference for race= Caucasians

^d Reference group for Injury Severity Score <9

^e Reference group for Charlson Index Score= 0

^f Reference group for final disposition= Home

Table 2

Percentage Mortality by Demographic and Injury Characteristics

	All patients n=2062	Unintentional deaths at 7–9 years n (%)	Intentional deaths at 7–9 years n (%)	p value
Age				
15–29	984	20 (6.0)	52 (8.0)	0.274
30–44	682	37 (13.0)	59 (14.8)	0.506
45–59	250	38 (24.2)	21 (22.6)	0.770
60–74	86	35 (46.1)	2 (20.0)	0.177
≥ 75	60	30 (58.8)	8 (88.9)	0.084
Gender				
Male	1,642	109 (18.1)	131 (12.6)	0.003*
Female	420	51 (17.3)	11 (8.8)	0.025*
Income*				
0–25K	418	29 (23.6)	40 (13.6)	0.012*
25–50K	635	33 (11.7)	37 (10.5)	0.626
≥ 50K	152	10 (10.2)	6 (11.1)	0.862
Insurance				
Private	479	44 (14.9)	15 (8.2)	0.031*
Public	1,492	113 (20.2)	119 (12.8)	<0.001*
Uninsured	83	3 (8.1)	7 (15.2)	0.500
Race				
Caucasian	484	62 (16.9)	20 (17.0)	0.998
African American	1,505	94 (19.0)	118 (11.7)	<0.001*
Latino	31	1 (7.7)	1 (5.6)	1.000
Other	32	2 (11.8)	1 (6.7)	1.000
Injury Severity Score (ISS)				
<9	1,137	78 (14.8)	71 (11.7)	0.121
9–15	581	54 (21.0)	45 (13.9)	0.023*
16–24	209	16 (21.9)	13 (9.6)	0.014*
≥ 25	135	12 (29.3)	13 (13.8)	0.034*

	All patients n=2062	Unintentional deaths at 7-9 years n (%)	Intentional deaths at 7-9 years n (%)	p value
Type of Injury				
Blunt	1,182	157 (18.0)	55 (17.9)	0.967
Penetrating	877	3 (12.5)	87 (10.2)	0.729
Charlson Co-Morbidity				
0	1,723	94 (12.9)	112 (11.2)	0.295
1	218	40 (35.1)	16 (15.4)	0.001*
2	67	24 (63.2)	11 (37.9)	0.041*
Final Disposition				
Home	1,590	91 (13.9)	113 (12.1)	0.271
Inpatient Rehabilitation	152	34 (38.6)	7 (10.9)	<0.001*
Skilled Nursing/Specialty Center	34	10 (40.0)	2 (22.2)	0.439
Home with Services	195	15 (17.1)	13 (12.2)	0.332
Acute Care Hospital	39	6 (27.3)	3 (17.7)	0.704
Against Medical Advice	38	2 (15.4)	4 (16.0)	1.000

Table 3

Adjusted Cox Proportional Hazard Ratios for Mortality at 7–9 Years Follow-Up n=1975

		Hazard Ratio	(95% CI)
Intentional		0.94	(0.68,1.31)
Age ^a			
	30–44	2.07	(1.5,2.84) *
	45–59	3.25	(2.24,4.73) *
	60–74	6.88	(4.4,10.76) *
	75	12.58	(7.79,20.31) *
Female		0.58	(0.42,0.80) *
Insurance ^b			
	Public Insurance	1.19	(0.88,1.61)
	Uninsured	1.07	(0.5,2.27)
Race ^c			
	African American	1.25	(0.93,1.68)
	Latino	1.01	(0.24,4.18)
	Other	0.61	(0.19,1.98)
Injury Severity Score ^d			
	9–15	1.1	(0.84,1.45)
	16–24	0.9	(0.58,1.39)
	>=25	1.55	(0.93,2.57)
Penetrating		0.87	(0.61,1.23)
Charlson Index Score ^e			
	1	1.76	(1.29,2.41) *
	2	3.68	(2.48,5.46) *
Final Disposition ^f			
	Inpatient Rehabilitation	1.08	(0.71,1.65)
	Skilled Nursing/Specialty Center	1.23	(0.64,2.37)
	Home with Services	0.98	(0.65,1.48)
	Acute Care Hospital	1.6	(0.78,3.29)
	Against Medical Advice	1.4	(0.57,3.41)

Model was adjusted for age, gender, insurance status, race, ISS, injury type, comorbidity score and final discharge disposition.

* Significant at p<.05

^aReference group for age= 15–29 years^bReference group for Insurance= Private Insurance^cReference for race= Caucasians^dReference group for Injury Severity Score <9^eReference group for Charlson Index Score= 0

^fReference group for final disposition= Home

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Table 4

Hazard Ratios for Mortality at 7–9 Years Follow-Up: Subset Analysis (Age <45 years) n=1,835

	Hazard Ratio	(95% CI)
Intentional	0.91	(0.62,1.31)
Age ^a		
30–44	2.11	(1.53,2.91) *
45–59	3.39	(2.32,4.96) *
Female	0.55	(0.36,0.83) *
Insurance ^b		
Public Insurance	1.33	(0.93,1.91)
Uninsured	1.29	(0.57,2.91)
Race ^c		
African American	1.35	(0.93,1.96)
Latino	1.03	(0.24,4.32)
Other	1.09	(0.33,3.55)
Injury Severity Score ^d		
9–15	1.19	(0.87,1.62)
16–24	1.04	(0.62,1.75)
≥25	1.95	(1.12,3.39) *
Penetrating	0.9	(0.62,1.29)
Charlson Index Score ^e		
1	1.81	(1.23,2.66) *
2	3.83	(2.32,6.34) *
Final Disposition ^f		
Inpatient Rehabilitation	0.89	(0.51,1.55)
Skilled Nursing/Specialty Center	0.96	(0.3,3.11)
Home with Services	0.98	(0.62,1.55)
Acute Care Hospital	1.44	(0.67,3.11)
Against Medical Advice	1.23	(0.45,3.35)

Model was adjusted for age, gender, insurance status, race, ISS, injury type, comorbidity score and final discharge disposition

* Significant at p<.05

^aReference group for age= 15–29 years^bReference group for Insurance= Private Insurance^cReference for race= Caucasians^dReference group for ISS= <9^eReference group for Charlson Index Score= 0^fReference group for final disposition= Home