Risk factors associated with death in the emergency department in Indiana, 2013-2014

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BACKGROUND

A trauma system is an organized, coordinated approach to treating individuals who have sustained severe injuries that require rapid evaluation and transport to specific hospitals with trauma care capabilities, staff and equipment to provide the comprehensive care needed. Indiana's trauma system is developing, and currently has components of a system, including 11 trauma centers around the state (Figure 1).

Figure 1. Indiana's Model Trauma System

The Indiana Patient Registry was implemented in 2007, with initial participation by the seven American College of Surgeons (ACS) trauma centers. The Trauma Registry rule, requiring all hospitals with Emergency Departments (ED), Emergency Medical Service (EMS) providers, and rehabilitation hospitals, to report trauma cases to the Indiana Patient Registry, became effective November 2013. This dynamic data registry can assess system improvement and outcomes. As Indiana continues to build its trauma system, reviewing, measuring and analyzing registry data and outcomes will be instrumental to improving patient care by ensuring highest quality of care is provided to all.

PURPOSE

The aim of the study was to identify risk factors associated with an increased risk of expiring in the ED for trauma patients, specifically examining trauma type (blunt, penetrating, or other) and trauma center status of the treating hospital. Previous studies have found strong associations between alcohol and injury, often resulting in the "Perfect Storm" of catastrophic outcomes.[1] In response, the ACS requires universal screening and brief intervention for alcohol use for all injured patients at verified trauma centers.[2] We also sought to describe the effect of alcohol consumption on the risk of dying in the ED.

METHODS

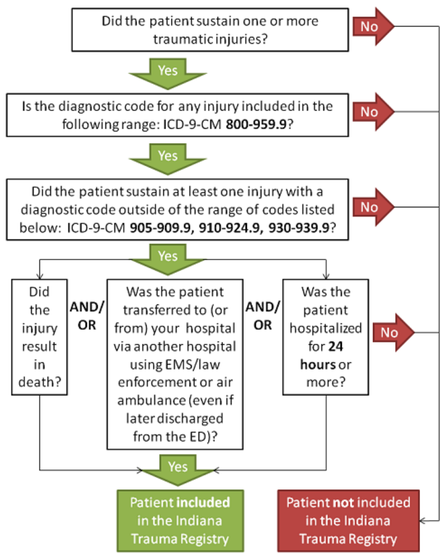
Data for all trauma cases in Indiana EDs from January 1, 2013 through June 30, 2014 were obtained from the Indiana Patient Registry and were analyzed retrospectively. Data were collected for 43,379 patients who were treated at the ED, of which 42,745 trauma incidents had available ED acute care disposition data.

Logistic regression modeling was performed with ED acute care disposition as the outcome variable. ED acute care disposition was dichotomized as expired or did not expire, and age, race, gender, alcohol use, trauma type and trauma center status were the independent variables. SAS 9.2 software was used during analysis.

Study Inclusion Criteria:

- Trauma incident occurred between January 1, 2013 and June 30, 2014
- Trauma patient treated in ED in Indiana
- Trauma incident met Indiana Patient Registry criteria and captured by registry[2] (Figure 2)
- Incident had recorded ED acute care disposition

Figure 2. Indiana Patient Registry Inclusion/ Exclusion Criteria



Indiana Patient Registry follows the strict definition of trauma defined by the American College of Surgeons – Committee on Trauma

RESULTS

Between January 1, 2013 and June 30, 2014 there were 42,745 trauma incidents with available ED acute care disposition data, of which 333 (0.78%) of these resulted in death. Gender, trauma type and alcohol were statistically significant, and age approached statistical significance (Table 1) .

Table 1. Results of Bivariate Analysis by Trauma Variables

Variable	Count/Mean (st dev)	p-value
N	42,745	
ED Acute Care Disposition		
Expired	333	
Did not expire	42412	
Age	52.8 (26.5)	0.054
Gender		0.0004*
Male	23446	
Female	19276	
Not Known/Not Recorded	23	
Alcohol Consumption		0.002*
Yes	3973	
No	32415	
NK/NR/ NA	6357	
Race		0.128
White	35586	
Black	4120	
Other	3039	
Trauma Type		<0.0001*
Blunt	35212	
Penetrating	2591	
Other	4942	
Trauma Center Status		0.119
Verified Trauma Center	21900	
Non-Trauma Center	20845	

*Indicates significance at the α=0.05 level.

Trauma incidents with 'Penetrating' trauma type have 6.73 times the odds of expiring in the ED compared to 'Blunt' trauma type (Table 2).

Trauma incidents where alcohol was consumed had 0.46 the odds of expiring in the ED compared to those with no alcohol consumption (Table 2).

Table 2. Odds from Logistic Regression Analysis

Trauma Variable	Odds
Trauma Type	
Other vs Blunt	1.60
Penetrating vs Blunt	6.73
Alcohol Consumption	
Not Known/Not Recorded/Not Applicable vs No	0.99
Yes vs No	0.46

CONCLUSIONS

Patients that experienced penetrating trauma were 6.73 times more likely to die in the ED than those with blunt trauma. Penetrating injuries may have higher morbidity and mortality, as these injuries frequently involve large-caliber, high-velocity weapons.[2] Identifying these predictors of mortality in the ED among trauma patients may help improve outcomes, especially through effective injury prevention focused on contributing factors and proximate causes of injury.

It is estimated that 30 to 50 percent of injured patients have a positive blood alcohol concentration at the time of trauma center admission, which suggests alcohol consumption contributes to severe injury requiring specialized trauma care.[3] Alcohol may affect the injury process by mediating the body's response to the traumatic injury, thereby reducing mortality.[4,5] While these findings may suggest the consumption of alcohol to be slightly protective to trauma patients against death in the ED, consumption of alcohol carries other significant health and safety risks, including increasing the risk of fatally or non-fatally injuring oneself and others.[4]

Further research with larger sample sizes could identify risk factors related to ED outcomes other than the dichotomous expired versus not expired. Limitations include ED acute care disposition was not completed on all trauma forms. There could be other factors in pre-hospital care that influence ED disposition, such as level of EMS response and procedures performed which are not included in this study.

REFERENCES

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