Severity-Adjusted Mortality in Trauma Patients Transported by Police

Roger A. Band, MD*; Rama A. Salhi, BS, MHS; Daniel N. Holena, MD; Elizabeth Powell, MD; Charles C. Branas, PhD; Brendan G. Carr, MD, MS

*Corresponding Author. E-mail: roger.band@uphs.upenn.edu.

Study objective: Two decades ago, Philadelphia began allowing police transport of patients with penetrating trauma. We conduct a large, multiyear, citywide analysis of this policy. We examine the association between mode of out-of-hospital transport (police department versus emergency medical services [EMS]) and mortality among patients with penetrating trauma in Philadelphia.

Methods: This is a retrospective cohort study of trauma registry data. Patients who sustained any proximal penetrating trauma and presented to any Level I or II trauma center in Philadelphia between January 1, 2003, and December 31, 2007, were included. Analyses were conducted with logistic regression models and were adjusted for injury severity with the Trauma and Injury Severity Score and for case mix with a modified Charlson index.

Results: Four thousand one hundred twenty-two subjects were identified. Overall mortality was 27.4%. In unadjusted analyses, patients transported by police were more likely to die than patients transported by ambulance (29.8% versus 26.5%; OR 1.18; 95% confidence interval [CI] 1.00 to 1.39). In adjusted models, no significant difference was observed in overall mortality between the police department and EMS groups (odds ratio [OR] 0.78; 95% CI 0.61 to 1.01). In subgroup analysis, patients with severe injury (Injury Severity Score >15) (OR 0.73; 95% CI 0.59 to 0.90), patients with gunshot wounds (OR 0.70; 95% CI 0.53 to 0.94), and patients with stab wounds (OR 0.19; 95% CI 0.08 to 0.45) were more likely to survive if transported by police.

Conclusion: We found no significant overall difference in adjusted mortality between patients transported by the police department compared with EMS but found increased adjusted survival among 3 key subgroups of patients transported by police. This practice may augment traditional care. [Ann Emerg Med. 2014;63:608-614.]

Please see page 609 for the Editor's Capsule Summary of this article.

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INTRODUCTION

Background

Penetrating trauma is a condition requiring early definitive care, and there is a clear time cost associated with the delivery of advanced medical care in the out-of-hospital setting.[1] The consequences of an incremental increase in out-of-hospital time in hemorrhagic shock can have lethal outcomes.[2-5] The burden of this disease is significant, especially given that there were nearly 100 aggravated assaults with a firearm or edged weapon per 100,000 persons in the United States[6] in 2007 and that there are more than 2,300 individuals transported by ambulance for acute injury per 100,000 persons in the United States each year.[7,8]

For decades, there has been debate about how to balance the competing priorities of ensuring rapid transport to definitive care with the benefits of out-of-hospital interventions for injured patients. The concept of the golden hour emphasizes the importance of rapid transport to definitive care for injured patients.[9] At the same time, a survival benefit has been demonstrated for out-of-hospital interventions in specific disease states, including myocardial infarction,[10] respiratory arrest,[11] out-of-hospital cardiac arrest,[12] and perhaps trauma.[13] In trauma, the balance between longer out-of-hospital times[14,15] and advanced out-of-hospital interventions has been extensively debated, and the tradeoff between the 2 makes the design of an efficient system challenging.[2,3,16-19]

Importance

Given the uncertain benefit of out-of-hospital care for patients with penetrating trauma, the city of Philadelphia has a policy[20] instructing police department transport of these patients in traditional police vehicles. A citywide study conducted between 1986 and 1992 suggested police department transport was

Editor's Capsule Summary

What is already known on this topic

Previous studies suggest trauma victims have similar mortality rates whether transported to the trauma center by emergency medical services or police.

What question this study addressed

This registry review of 4,122 patients with proximal penetrating trauma transported to 8 trauma centers in Philadelphia examined the mode of transport, injury type, and mortality.

What this study adds to our knowledge

The authors failed to detect an association between adjusted mortality and mode of transport. Confounders such as transport time and treatment were not examined.

How this is relevant to clinical practice

Prospective, randomized trials are required to conclusively resolve the issue of the comparative effectiveness of transport mode, but this study suggests that mortality differences are likely not large.

equivalent to EMS transport.[21] Given the substantial evolution of trauma care over time, the potential influence of out-of-hospital care on survival outcomes, and the importance of replicating important scientific findings, we recently examined the effect of police transport of penetrating trauma patients on mortality at our institution. In that study, we found no difference in adjusted mortality between patients transported by police compared with ambulance.[22] We have now broadened this analysis to include all patients with penetrating injury who were treated at any of Philadelphia's 8 Level I and II adult trauma centers between 2003 and 2007.

Goals of This Investigation

We examined the association between mode of out-of-hospital transport (police department versus emergency medical services [EMS]) and mortality among patients with proximal penetrating trauma within the city of Philadelphia.

MATERIALS AND METHODS

Study Design and Setting

More than 25 years ago, the Philadelphia Police Department began allowing police department transport of individuals with penetrating trauma to definitive care.[21] During the period of our study (January 1, 2003, to December 31, 2007), this was a well-established policy, with hundreds of subjects being delivered by police to trauma centers across the city. Under current police department directive, "Police personal will transport: Persons suffering from a serious penetrating wound, e.g., gunshot, stab wound and similar injuries of the head, neck, chest, abdomen and groin to the nearest accredited trauma center. Transportation will not be delayed to await the arrival of the Fire Department paramedics."[20] Although EMS follows citywide out-of-hospital protocols, no formal policy outlines how care should be provided to injured patients transported by police. In our experience, individuals transported by police are rendered no care, including even direct pressure on bleeding extremity wounds.

To explore differences in patient outcomes between these 2 modes of out-of-hospital transport, we performed a retrospective cohort study of trauma registry data using the Pennsylvania Trauma Outcomes Study (PTOS). All 32 trauma centers in Pennsylvania are coordinated by the Pennsylvania Trauma System Foundation and are required to prospectively collect and maintain trauma registries. The PTOS represents the state's centrally combined registry of all patients treated within the state's trauma system who meet eligibility criteria, including a diagnosis of injury (*International Classification of Diseases, Ninth Revision, Clinical Modification* codes 800-995), admission to an ICU or step-down unit, death after arrival, injury related death in the hospital, transfer, or hospital stay longer than 48 hours. Data are prospectively collected by dedicated trauma registrars within each hospital, trained in the PTOS data collection process. Collected clinical data include Trauma and Injury Severity Score (TRISS), Glasgow Coma Scale score, comorbidities, procedures performed, and patient outcomes.

Philadelphia is the nation's fifth-largest city, with a population of greater than 1.5 million.[23] There are 5 adult Level I trauma centers, 2 pediatric Level I trauma centers, and 3 Level II trauma centers within or closely proximate to Philadelphia. All EMS calls in the city are answered by the Philadelphia Fire Department EMS ambulances that are part of a multitiered service providing advanced life support. The Philadelphia Fire Department has 40 to 50 ambulances in service at any given time and receives approximately 250,000 calls for emergency service annually. Near the end of the study period (2007), a small percentage of basic life support ambulances was added to the response structure to augment existing service. The Philadelphia Police Department has more than 6,000 officers, who have no department-sponsored formal medical training and carried no department-issued medical equipment during the study period.

Selection of Participants

All PTOS subjects who were injured within the city of Philadelphia and presented to a Level I or II adult trauma center by police department or EMS during the 5-year study period (January 1, 2003, to December 31, 2007) with penetrating trauma to the thorax, abdomen, or proximal extremity (above the elbow or knee) were included in our study regardless of signs of life on arrival to the hospital. Patients included in a previously published single-center analysis were among those included in this population-based multicenter study.[22] Subjects who were transported by private vehicle or arrived to the emergency department (ED) by other means were excluded

from the analysis because they were thought to represent a diverse and distinct subset of patients.[24] Subjects transferred into or out of trauma centers were excluded because initial transport or final outcomes could not be appropriately assessed. This study was approved by the institutional review board of the University of Pennsylvania with waiver of informed consent.

Methods of Measurement

To adjust for injury severity, we used the TRISS methodology.[25,26] The TRISS score incorporates both an anatomic injury scoring system (the Injury Severity Score [ISS]) and a physiologic scoring system (the Revised Trauma Score) to generate a predicted probability of death. TRISS is a standard and comprehensive comparator used to correct for severity in outcome analysis and to predict survival in trauma patients.[25,26] TRISS coefficients appropriate for penetrating trauma were used.

Case mix adjustment was conducted with a modification of the Charlson method.[27] Traditional calculation of the Charlson index incorporates a total of 19 comorbid conditions and their associated weights. PTOS data excludes 4 of these conditions (peripheral vascular disease, any tumor, leukemia, and lymphoma). We thus used a modified index based on 15 conditions. This methodology has been used in lieu of the traditional index for this data set elsewhere.[28] Final models were also adjusted for age and sex. Stratified analyses were conducted by mechanism of injury (gunshot wound/stab wound) and severity of injury (ISS >15) (Appendix E1, available online at http://www.annemergmed.com).

Primary Data Analysis

The intent of this analysis was to explore the association between mode of transport and inhospital mortality after proximal penetrating trauma. Given our concern that we may be faced with reporting a negative study, we were careful to make sure that our sample size would be adequate to detect an effect if it existed. We used standard assumptions about α (.05); previous information from our data, including baseline police department and EMS mortality rates (21.4% and 14.8%, respectively)[22]; a sample size ratio of EMS to police department (2.7); and a target power of 90% to calculate a target sample size of 1,906 patients.

Unadjusted comparisons were performed with χ^2 test for categorical variables and the Wilcoxon rank sum test for non-normally distributed, continuous variables. Both unadjusted and adjusted analyses were performed with logistic regression models that accounted for clustering at the level of the trauma center. Final adjusted models controlled for injury severity with TRISS, case mix with the modified Charlson index, age, and sex. Subgroup analyses were conducted to explore the relationship by mechanism of injury (gunshot wound versus stab wound) and among the severely injured (ISS >15). Adjusted analyses were also stratified by trauma center. Hospitals with fewer than 10 patients transported by police were excluded from such stratified analyses because of the inability to generate point estimates (2 hospitals; n=6 police department patients; n=32 total patients). All analyses were conducted with Stata (version 12.0; StataCorp, College Station, TX).

Table 1. Demographic characteristics of injured patients by mode of transport.

Characteristic	EMS, N=2,961	Police, N=1,161
	Mean (SD)	
Age, y	30.6 (13.2)	27.7 (13.3)
ISS	17.2 (17.8)	20.1 (19.2)
Hospital LoS, days	6.5 (11.3)	8.5 (17.2)
	No. (%)	
Male	2,681 (90.6)	1,084 (93.5)
GSW	2,166 (73.2)	1,047 (90.2)
SW	795 (26.9)	114 (9.8)
ISS >15	1,193 (40.3)	592 (51.0)
Mortality		
Overall	784 (26.5)	346 (29.8)
Among patients with signs of life on arrival	328 (13.1)	155 (16.1)
	Median (interquartile range)	
Age, y	27 (21, 38)	24 (19, 32)
ISS	10 (5, 25)	16 (9, 26)
Hospital LoS, days	4 (1, 7)	4 (1, 9)

LoS, Length of stay; *GSW*, gunshot wound; *SW*, stab wound.

RESULTS

Characteristics of Study Subjects

A total of 4,122 subjects who sustained proximal penetrating injuries were identified in our 5-year citywide trauma registry (Table 1). Of these, 1,161 were transported by police department and 2,961 were transported by EMS. The overall mortality observed in our study population was 27.4%, with an overall difference in mortality between groups of 3.3% (police department 29.8% versus EMS 26.5%). The average age of subjects transported by either mode was similar and the majority of patients in each cohort were men. Just over three quarters (77.9%) of the subjects sustained gunshot wounds, and just under a quarter (22.1%) sustained stab wounds. The majority of patients in each group sustained gunshot wounds. Overall mean ISS was 18.0 (SD 18.3) and median ISS was 10 (interquartile range 9, 25). The majority of patients in both groups (84.1%) had signs of life on delivery to the hospital. A third of patients with gunshot wounds (33.0%) died compared with 7.7% of patients with stab wounds.

Main Results

Patients transported by police department were more severely injured than those patients transported by EMS (mean ISS: police department 20.1 versus EMS 17.2; mean difference –3.0; 95% confidence interval [CI] –4.19 to –1.72) (Table 2). EMS transported fewer severely injured patients with gunshot wounds (police department 21.0 versus EMS 19.4; mean difference –1.5; 95% CI –2.94 to –0.16) and fewer severely injured individuals

Table 2. Unadjusted associations between mode of transport and mortality within specified subgroups.

Population Subgroups	Mortality		OR (95% CI)
	EMS	PD	
Overall	784 (26.5)	346 (29.8)	1.18 (1.00–1.39)
GSW	721 (33.3)	339 (32.4)	0.96 (0.80–1.15)
SW	63 (7.9)	7 (6.1)	0.76 (0.51–1.14)
ISS >15	587 (49.2)	276 (46.6)	0.90 (0.74–1.10)

PD, Police department.

with stab wounds (police department 12.6 versus EMS 11.1; mean difference –1.5; 95% CI –4.24 to 1.32). Overall, in unadjusted analyses, patients transported by the police department were more likely to die compared with those transported by EMS (29.8% versus 26.5%; odds ratio [OR] 1.18; 95% CI 1.00 to 1.39). The association between police transport and increased odds of death persisted when the analysis was restricted to subjects with signs of life on arrival to the ED (16.1% versus 13.1%; OR 1.27; 95% CI 1.06 to 1.52). This relationship, however, did not persist among a subset of severely injured patients (ISS >15) (46.6% versus 49.2%; OR 0.90; 95% CI 0.74 to 1.10).

In unadjusted analyses, subjects who sustained gunshot wounds were significantly more likely to die than those who sustained stab wounds (33.0% versus 7.7%; OR 5.90; 95% CI 4.97 to 7.00). This was true independent of the mode of out-of-hospital transport (police department 32.4% versus 6.1%, OR 7.32, 95% CI 4.68 to 11.42; EMS 33.3% versus 7.9%, OR 5.80, 95% CI 4.90 to 6.86). There was no difference in mortality by transport type among patients who sustained gunshot wounds (police department 32.4% versus EMS 33.3%; OR 0.96; 95% CI 0.80 to 1.15) or among those who sustained stab wounds (police department 6.1% versus EMS 7.9%; OR 0.76; 95% CI 0.51 to 1.14).

Our final clustered logistic regression models included mechanism of out-of-hospital transport, TRISS, modified Charlson index, age, and sex as predictor variables and inhospital death as the dependent variable (Table 3). Although the adjusted odds ratio for inhospital death in patients transported by EMS versus police department was 0.78, this did not reach statistical significance (95% CI 0.61 to 1.01).

Table 3. Adjusted association between mode of transport and mortality within specified subgroups.*

Population Subgroups	OR (95% CI)	
	EMS	PD
Overall	Ref	0.78 (0.6–1.01)
ISS >15	Ref	0.73 (0.59–0.90)
ISS ≤15	Ref	0.59 (0.23–1.51)
GSW	Ref	0.70 (0.53–0.94)
ISS >15	Ref	0.67 (0.55–0.83)
SW	Ref	0.19 (0.08–0.45)
ISS >15	Ref	0.39 (0.10–1.48)

*All ORs presented are adjusted for probability of death with TRISS methodology, case mix with a modified Charlson index, age, and sex.

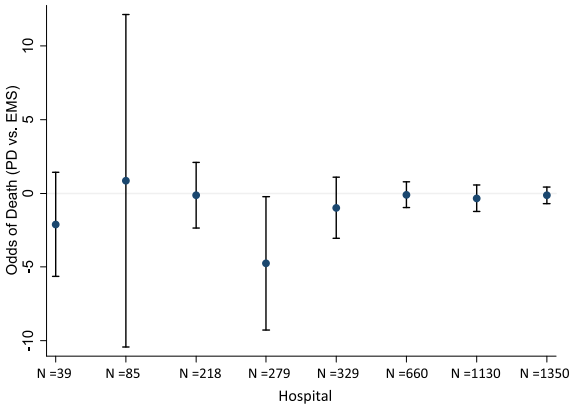
Transport by police department was associated with decreased adjusted mortality in patients with severe injury (OR 0.73; 95% CI 0.59 to 0.90), patients with gunshot wounds (OR 0.70; 95% CI 0.53 to 0.94), and patients with stab wounds (OR 0.19; 95% CI 0.08 to 0.45). When gunshot wound and stab wound analyses were restricted to severe injury only, police transport was associated with decreased mortality among patients with gunshot wounds (OR 0.67; 95% CI 0.55 to 0.83), and a nonsignificant trend toward decreased mortality among patients with stab wounds transported by police was also observed (OR 0.39; 95% CI 0.10 to 1.48). When examining adjusted mortality by center (Figure), there was no difference in 7 of 8 hospitals (87.5%), and one hospital demonstrated lower mortality rates for patients transported by police.

LIMITATIONS

The conclusions generated from this work should be interpreted within the constraints of a large, retrospective registry study. As with all retrospective registry-based research, we can identify associations but cannot comment on the causal nature of them. In addition, registry data are twice removed from actual objective patient data (first the chart and then the registry).

This study was performed across a single, large, urban area within 1 large, urban EMS system, and therefore these results may not be generalizable to other institutions and EMS systems with different geography, infrastructure, or resources. However, our single-system study has the inherent advantage of eliminating the potential confounders of merging data from multiple EMS systems and trauma centers.

A number of factors related to design and analysis warrant discussion. First, the logistic regression models presented included variables thought to be the most relevant covariates and severity adjusters, but we were limited in that our TRISS calculations were based on presenting vital signs. These scores



*All ORs presented are adjusted for probability of death using TRISS methodology, case mix using a modified Charlson index, age, and sex. The reference category is EMS transport.

Figure. Adjusted odds of death (PD versus EMS) among injured patients, stratified by deidentified hospital indicators.

therefore fail to reflect any variations in physiologic parameters that resulted directly from care (or lack of care) that occurred in the field. We believe, however, that any unaccounted-for interventions in the field would have improved vital signs only in the EMS group and thus biased our findings in the opposite direction of the adjusted result we report. Ideally, we would have captured data about out-of-hospital interventions recorded by police or EMS, but these data are unavailable. Similarly, because out-of-hospital times are unavailable for patients transported by police, we could not account for this potentially unmeasured confounder in our analysis. Therefore, we cannot draw definitive conclusions about the effect of care in the out-of-hospital environment on mortality.

Additionally, we have analyzed these data with a superiority format, one that has a null hypothesis that police department and EMS transport are equivalent and either rejects this hypothesis or does not. We would have had to use a noninferiority design with a null hypothesis that EMS transport is better than police department transport to establish (if the data had borne this out) that police department transport is noninferior to EMS transport.

Finally, our analysis may suffer from selection bias. Of the population initially identified, 4.7% were missing the exposure variable of interest (mode of transport) and thus could not be included in the analysis. We also excluded all patients who were transferred in or brought by private vehicle to a trauma center to keep our study population as homogenous as possible, and in addition to creating a selection bias, we recognize that this limits generalizability.

DISCUSSION

We identified no association between mode of transport and overall adjusted mortality for patients with proximal penetrating trauma. We did, however, identify an association between police transport and mortality in subgroup analyses restricted to patients with severe injury, patients with gunshot wounds, and patients with stab wounds. With more than 4,000 patients enrolled, to our knowledge this work represents the largest study to date examining the relationship between out-of-hospital mode of transport and mortality in penetrating trauma. We previously described the relationship between mode of transport and outcomes in a single urban trauma center in which we found no overall mortality difference between groups and identified a trend toward decreased mortality for severely injured patients and patients with gunshot wounds who were transported by police.[22] The current study focuses on the population of an entire city, and although we still found no difference in mortality overall, we found decreased adjusted mortality in key subgroups.

Given the robust, uniform, and prospective collection of data on trauma patients mandated by the state of Pennsylvania, the fact that Philadelphia has a police transport policy, and the high incidence of penetrating injury in our city, Philadelphia is one of very few cities in the United States in which this question could be answered. The population studied is a homogeneous sample of primarily male patients with proximal penetrating trauma, injured in very close proximity to a trauma center. From the outset, we planned to examine this question statewide, but the overall state data included 1,296 patients with penetrating trauma who were transported by police, 1,256 (97%) of whom were injured within Philadelphia county, so we limited our analysis to the city of Philadelphia. We believe that our findings have implications for the out-of-hospital transport of patients with penetrating trauma but recognize they may be generalizable only to cities with similarly dense populations. Our findings may have implications for other clinical settings, including underresourced regions both within and outside of the United States, but these questions are beyond the scope of our analysis.

Our results are population based and thus cannot be applied to the individual patient. For example, patients with easily compressible injuries may be more likely to exsanguinate while unattended in the back of a police vehicle compared with waiting for an ambulance, with direct pressure being applied to the wound. No policy change happens in a vacuum, and other unintended consequences (good or bad) need to be considered as well. On the one hand, police officers may have an increased risk of exposure to blood-borne pathogens when transporting penetrating trauma patients, but on the other hand, removal of patients from the scene may result in decreased tension, retaliatory events, and the potential for officers to be injured.[29] In addition, patient transport responsibilities may distract law enforcement personnel from their primary responsibilities, unintentionally compromise scene safety, and divert attention from enforcement activities. These matters were beyond the scope of our study but need to be taken into account in municipalities considering a similar policy.

Involvement of police in the delivery of out-of-hospital medical care is not novel, and success has been described in other fields, including police deployment of defibrillators for out-of-hospital cardiac arrest.[30,31] In cardiac arrest, however, the police are delivering potentially definitive therapy, whereas in trauma, the tradeoff between rapid transport and field interventions remains complicated. Although the police receive no formal training in regard to the transportation policy for penetrating injury, survival could perhaps be enhanced further if police were trained to perform basic but rapid intervention techniques, but the balance between care and speed needs to be better understood. Quick interventions such as tourniquet application, direct pressure on bleeding wounds, and use of topical hemostatic agents might further decrease mortality from penetrating proximal extremity injury without significantly increasing out-of-hospital time. Recent military combat experience has changed the conventional wisdom of using tourniquets for hemostasis,[32-34] and morbidity of tourniquet use is low and may be associated with a survival benefit.[35,36]

We examined this unique population of out-of-hospital transports because of their critical nature, their high mortality, and our desire to improve out-of-hospital care. This study is in no way intended as a critique of the care rendered by the highly trained and dedicated professionals of the Philadelphia Fire

Department or out-of-hospital providers elsewhere. Our goal is to develop an evidenced-based approach that builds on the foundation established by our nation's first fire department. Future studies should prospectively evaluate the effect that mode of transportation, provider interventions, real-time medical support, and out-of-hospital time have on the outcomes of patients with penetrating trauma and other time-sensitive conditions. The effect of these policy interventions could be prospectively and systematically measured in regions considering the inclusion of police officers as facilitators of care for the injured.

In our large urban EMS system, we failed to detect an association between adjusted mortality among patients with proximal penetrating injury and mode of transport. Although unadjusted mortality is higher in patients transported by the police department, these findings appear to be explained by the more severely injured population whom the police transport to the hospital. We did identify an association between survival and mode of transport for the most severely injured patients in our study. The use of nonmedical transport for patients with proximal penetrating trauma may be an adjunct to traditional care. Additional prospective studies in different geographic locations could validate the safety and efficacy of this policy.

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Author affiliations: From the Department of Emergency Medicine (Band, Powell, Carr), the Department of Surgery, Division of Traumatology, Surgical Critical Care, and Emergency Surgery (Holena, Carr), and the Department of Biostatistics and Epidemiology (Salhi, Branas, Carr), University of Pennsylvania, Philadelphia, PA.

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The Philadelphia Police Department has recently issued tourniquets to every police officer in the city.

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Appendix E1. Technical Summary Appendix

Study	**Severity-Adjusted Mortality in Trauma Patients Transported by Police**
IRB approved?	Yes, exempt
Description of research question	The city of Philadelphia currently allows the transport of injured patient in police vehicles without ALS or BLS care. Previous single-center studies have suggested that this practice is safe. Using a multicenter registry, we examined the relation between out-of-hospital mode of transport (PD vs ambulance [EMS]) and survival in patients with proximal penetrating trauma across the city of Philadelphia.
Data set	PTSF, January 1, 2003–December 31, 2007 PTOS: All 32 trauma centers in Pennsylvania are coordinated by the PTSF and are required to prospectively collect and maintain trauma registries. The PTOS represents the state's centrally combined registry of all patients treated within the state's trauma system who meet eligibility criteria, including the following: • a diagnosis of injury (*International Classification of Diseases, Ninth Revision, Clinical Modification* codes 800-995) • admission to an ICU or step-down unit • death after arrival, injury-related death in the hospital, transfer, OR • hospital stay longer than 48 h Data are prospectively collected by dedicated trauma registrars within each hospital who are trained in the PTOS data collection process. Collected clinical data include TRISS, Glasgow Coma Scale score, comorbidities, procedures performed, and patient outcomes.
	Patient cohort
Outcome	Inhospital mortality (0=survived to discharge; 1=died during hospital stay)
Inclusion criteria	Inclusion criteria were defined in 2 waves: **Inclusion Into PTOS Data Set** All patients admitted for treatment of a diagnosis of trauma (*ICD-9-CM* injury codes 800-995) and who meet any of the following criteria: • all ICU admissions (2:1 ratio) • all step-down unit admissions (4:1 ratio) • all DOAs, pronounced dead after arrival • all trauma deaths • all trauma admissions during 48 h, beginning from the time of arrival to the ED • all admitted transfers in • all transfers out to an accredited trauma center or burn center • cases meeting any of the above criteria but have no documented injuries • burn cases that meet one of the above criteria plus one of the following: - burned area 2 and 3 degrees (age <10 or >50 y): 10% - burned area 2 and 3 degrees (age >10 or <50 y): 20% - area 3 degrees: >5% at any age - chemical burn - electrical injury - burn of face, hands, feet or perineum - airway or inhalation injury - burn accompanied by: - significant associated injury or preexisting disease - suspected child abuse Optional: Elective admissions (patients not admitted through the ED and not transferred from another facility) with an injury date >72 h before admission and an ISS >13 may be submitted to PTOS. Elective admissions with injury >72 h before admission and ISS <13 need not be submitted. **Study Inclusion Criteria** - ED admissions meeting PTOS criteria in the study timeframe (2003–2007) - Transported to ED by EMS or police - Not a transfer patient
Size of cohort	N=4,122
	Variable definitions
Primary predictor	Mode of transport: EMS (value=0) vs 4.7% missing from initial sample
Baseline characteristics	Age: – Origin: PTSF data set – Continuous variable (range 2–106) – Missing frequency: n=30 (0.73%) Sex: – Origin: PTSF data set – Binary variable (0=male; 1=female) – Missing frequency: n=3 (0.07%)

Appendix E1. Continued.

Study	Severity-Adjusted Mortality in Trauma Patients Transported by Police
	ISS: – Origin: PTSF data set – Continuous variable (range 1–75) – Missing frequency: n=1 (0.02%) Mechanism of Injury: – Origin: PTSF data set – Binary variable (0=SW; 1=GSW) – Missing frequency: n=0 (0%) Signs of Life: – Origin: Generated (definition=pulse on ED arrival) – Binary variable (0=DOA; 1=alive on arrival) – Missing frequency: n=0 (0%) LoS: – Origin: Generated (definition=discharge date–arrival date) – Continuous variable (range 0–286) – Missing frequency: n=0 (0%)
Covariates	TRISS: – Origin: PTSF data set – Continuous variable (range 0%–99.7%) – Missing frequency: n=614 (14.9%) Charlson Index (Modified): – Origin: Generated (additive scale) – Included comorbidities: • myocardial infarction • congestive heart failure • cardiovascular disease • dementia • chronic obstructive pulmonary disease • connective tissue disease • peptic ulcer disease • mild liver disease • diabetes • hemiplegia • moderate to severe renal disease • diabetes with organ damage • moderate to severe liver disease • metastatic solid tumor • AIDS – Continuous variable (range 0–9) – Missing frequency: n=0 (0%)

Outline of analysis

Table 1
- Characteristics of injured patients transported to trauma centers in the city of Philadelphia
- All data presented as frequencies and valid percentages

Table 2
- Stratified, unadjusted odds of death among injured patients by mode of transportation to trauma center

Modeling (Table 2 only):

Method: Clustered logistic regression using logistic command and cl() option.
Dependent variable: Inhospital mortality
Primary independent variable: Mode of transport (PD vs EMS)

Table 3
- Stratified, adjusted odds of death among injured patients by mode of transportation to trauma center

Modeling (Table 3 only):

Method: Clustered logistic regression using logistic command and cl() option. Listwise deletion was used to handle missing variables.
Dependent variable: Inhospital mortality
Primary independent variable: Mode of transport (PD vs EMS)
Additional independent variables:
- Age
- Sex
- TRISS
- Charlson Index

Appendix E1. Continued.

Regression Characteristics

	Wald χ^2 (*P* Value)	AUC	Pseudo R^2	Collinearity
Overall	444.7 (<.001)	0.9737	0.7058	N/A
ISS >15	444.6 (<.001)	0.9500	0.6170	N/A
ISS ≤15	536.2 (<.001)	0.9719	0.7688	N/A
GSW	194.7 (<.001)	0.9693	0.7111	N/A
ISS >15	956.4 (<.001)	0.9609	0.6456	N/A
SW	197.6 (<.001)	0.9448	0.6401	N/A
ISS >15	51.6 (<.001)	0.9512	0.6243	N/A

PTSF, Pennsylvania Trauma System Foundation; *DOA*, dead on arrival.