Prehospital Emergency Care

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ipec20

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To cite this article: Ghassan Bou Saba, Rana Bachir & Mazen El Sayed (2022) Impact of Trauma Center Designation Level on the Survival of Trauma Patients Transported by Police in the United States, Prehospital Emergency Care, 26:4, 582-589, DOI: 10.1080/10903127.2021.1983092

To link to this article: https://doi.org/10.1080/10903127.2021.1983092

Impact of Trauma Center Designation Level on the Survival of Trauma Patients Transported by Police in the United States

Ghassan Bou Saba, Rana Bachir, and Mazen El Sayed

Abstract

Background: Police involvement in trauma management and transport is increasing in the US. Little is known about prehospital triage criteria and transport patterns used by Police Officers. In this study, we examined the impact of trauma designation level on the survival of trauma patients transported to trauma centers by police. **Methods**: We used the National Trauma Data Bank (NTDB) 2017 dataset in this retrospective observational study. Adult trauma patients transported by Police to Level I, II and III trauma centers were included. We performed a univariate analysis followed by a bivariate analysis. Finally, we carried out a multivariable logistic regression analysis adjusting for confounders to assess the impact of trauma level designation on outcomes of patients transported by Police. **Results:** A total of 2,788 patients were included. The majority of the patients were males (84.6%) between the ages of 16 and 55 with half of them being African American. Most had a mild GCS (13–15) (89.5%) and only 17.4% were recorded to have severe traumatic injuries with ISS $\geq$ 16. The most common trauma type was blunt trauma (61.4%) followed by penetrating injuries (32.2%) and burns (1.5%). Around half of injuries were the result of assault (49.4%) and 43.0% were unintentional. Head and neck injuries were most common (40.8%) followed by extremities (27.4%) and torso injuries (25.0%). Approximately half of the patients were admitted to floor bed/observation unit/step-down unit (50.7%) while 18.9% and 19.8% went to the Operating Room or Intensive Care Unit respectively. Overall survival to hospital discharge was 93.2%. Survival was 91.6% in Level I, 98.2% in level II and 98.7% in Level III centers. After adjusting for significant confounders, survival to hospital discharge was similar for patients transported by police to level II and III trauma centers in comparison to those transported to level I (OR = 0.866 95%CI (0.321–2.333); $p = 0.776$). **Conclusion:** Transport of trauma patients by police to trauma centers of different designation levels was not associated with survival in this study. Survival was also similar to other trauma studies. As such, trauma patients may be safely transported by Police to closest trauma designated center without affecting outcomes. **Key words:** Trauma center designation level; police; Emergency Department; survival; outcome

PREHOSPITAL EMERGENCY CARE 2022;26:582–589

Introduction

Police transport accounts for approximately 0.3% of annual trauma transfers to hospitals (1). Patients transported by police tend to be relatively young (16 year old to 64 year old) males with multiple comorbidities and more likely to have suffered blunt trauma rather than penetrating trauma (1).

Police are usually the first to arrive to the trauma scene and by transporting patients themselves, they can possibly reduce the critical time between time of injury and arrival to the trauma center. Despite this time related advantage, police transfers often warrant no prehospital medical interventions as Police have limited medical training (2). Previous studies have shown no difference in mortality outcomes when comparing police transport and EMS transport except in some specific cases such as patients with high injury severity scores and penetrating injuries like stab and gunshot wounds (3). Characteristics that were significantly associated with mortality in trauma victims transported by Police were male sex, African American race, high severity injuries and trauma to blood vessels or torso (1).

Around 35.8% of trauma victims transported by the police are taken to an American college of Surgeons (ACS) verified trauma center (1). The US trauma system is organized by designating trauma centers based on capabilities and resources. Designation levels (level I through V) are allocated

Received June 9, 2021 from Faculty of Medicine, American University of Beirut, Beirut, Lebanon (GBS); Department of Emergency Medicine, American University of Beirut Medical Center, Beirut, Lebanon (RB, MES); Emergency Medical Services and Pre-hospital Care Program, American University of Beirut Medical Center, Beirut, Lebanon (MES). Revision received September 14, 2021; accepted for publication September 15, 2021.

GBS and RB acquired, analyzed, and drafted the work. MES conceived, designed and substantively revised the study. GBS, RB, and MES approve the submitted version and agree to be personally accountable.

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

The authors declare that they have no competing interests.

The Institutional Review Board (IRB) at the American University of Beirut approved this study and an exemption letter for using this de-identified dataset was obtained.

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doi:10.1080/10903127.2021.1983092

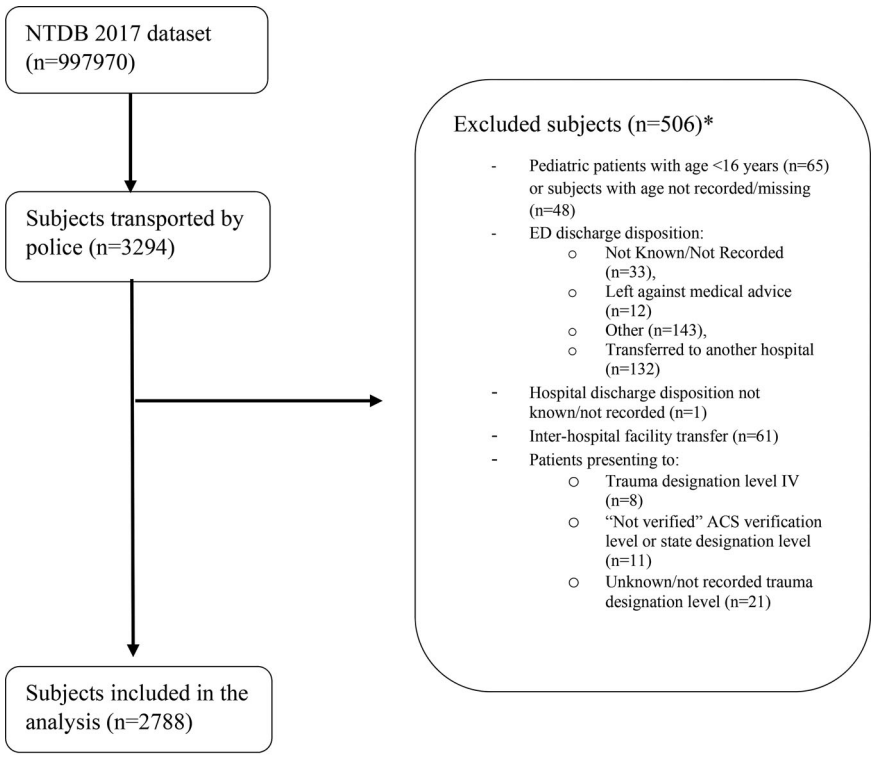

Figure 1. Study participants selection from the National Trauma Data Bank 2017. ED = Emergency Department. *There are overlaps among the categories of the excluded variables. More specifically, some patients who had an inter-hospital facility transfer had one of the excluded categories as ED disposition. Also, some patients whose age was not recorded or were 15 years or younger were transferred or had an excluded ED disposition. These overlaps explain why the final number on which the data analysis was conducted cannot be calculated just by subtracting the number of excluded patients from the selected sample.

by the ACS and/or local authority (state or the town municipality) denoting the level of care and minimum standards that the institutions can offer in trauma care as well as their degree of focus on trauma research and medical education (4).

Associations between trauma designation levels and outcomes were previously examined. Some studies showed no statistically significant difference in overall mortality between Level I and Level II (5), while other studies sub-stratifying by type of injury/disease found significant difference in mortality between trauma center levels (6, 7).

Guidelines regarding Police transport of trauma patients are usually based on internal directives specific to each police department as no national guidelines have been published (8–10). The evidence for police triaging to specific designation centers remains unclear and lacks an evidence-based approach. The objective of this study is to explore the impact of trauma designation level on the survival of trauma patients transported to the hospital by the police. This can help guide the decision-making process of Police and possibly generate evidence based recommendations especially with the increasing initiatives to expand the role of police officers in responding to trauma injuries (11).

Methods

In this retrospective cohort study, we used the 2017 dataset from the National Trauma Data Bank (NTDB; American College of Surgeons; Chicago, Illinois USA) (N = 997,970). NTDB is the largest US based trauma registry collecting data from more than 900 trauma centers and its public datasets are released annually (12). Data in the NTDB is regularly reviewed for quality control and error checks, and is validated by the NTDB's edit check program (12).

Patients transported by police were included if they were considered to have sustained a traumatic injury based on the International Classification of Diseases, tenth revision, Clinical modification (ICD-10-CM) codes excluding superficial wounds to any body part (12). Exclusion criteria consisted of patients younger than 16 years ($n = 65$) as they are considered part of the pediatric population similar to other trauma studies and to the NTDB criteria (13) and patients with unknown age ($n = 48$). We also excluded patients without full hospital course (transferred directly from ED or after admission ($n = 193$)), patients with unknown ED or hospital discharge disposition ($n = 34$), those who left AMA

TABLE 1. General characteristics.

	Total	Trauma designation level			
		I	II	III	
	$N = 2788$	($N = 2126$)	($N = 507$)	($N = 155$)	p-value
Age (years)					
16–25	647 (23.2%)	486 (22.9%)	122 (24.1%)	39 (25.2%)	0.564
26–35	816 (29.3%)	637 (30.0%)	140 (27.6%)	39 (25.2%)	
36–45	497 (17.8%)	369 (17.4%)	95 (18.7%)	33 (21.3%)	
46–55	399 (14.3%)	301 (14.2%)	78 (15.4%)	20 (12.9%)	
56–65	253 (9.1%)	197 (9.3%)	46 (9.1%)	10 (6.5%)	
≥66	176 (6.3%)	136 (6.4%)	26 (5.1%)	14 (9.0%)	
Race					
Black	1394 (50.0%)	1241 (58.4%)	124 (24.5%)	29 (18.7%)	<0.001
White	1140 (40.9%)	724 (34.1%)	329 (64.9%)	87 (56.1%)	
Other Race[a]	254 (9.1%)	161 (7.6%)	54 (10.7%)	39 (25.2%)	
Primary method of payment					
Medicaid/Medicare	1202 (43.1%)	1001 (47.9%)	152 (30.1%)	49 (35.0%)	<0.001
Self-pay	565 (20.3%)	450 (21.5%)	94 (18.6%)	21 (15.0%)	
Private/Commercial Insurance	513 (18.4%)	326 (15.6%)	140 (27.7%)	47 (33.6%)	
Not Billed (for any reason) & Other Government & Other	454 (16.3%)	312 (14.9%)	119 (23.6%)	23 (16.4%)	
Not known/Not recorded	54 (1.9%)				
Facility level: Hospital Teaching Status					
Community	645 (23.1%)	296 (13.9%)	292 (57.6%)	57 (37.0%)	<0.001
Non-teaching	204 (7.3%)	9 (0.4%)	135 (26.6%)	60 (39.0%)	
University	1938 (69.5%)	1821 (85.7%)	80 (15.8%)	37 (24.0%)	
Not KNOWN/not recorded	1 (0%)				
Comorbidity					
No	1002 (35.9%)	774 (36.4%)	162 (32.0%)	66 (42.6%)	0.036
Yes	1786 (64.1%)	1352 (63.6%)	345 (68.0%)	89 (57.4%)	
ISS					
≤15	2297 (82.4%)	1697 (80.0%)	449 (89.1%)	151 (97.4%)	<0.001
≥16	484 (17.4%)	425 (20.0%)	55 (10.9%)	4 (2.6%)	
Not known/Not recorded	7 (0.3%)				
GCS					
Severe ≤8	209 (7.5%)	200 (9.4%)	7 (1.4%)	2 (1.3%)	<0.001*
Moderate 9–12	84 (3.0%)	72 (3.4%)	9 (1.8%)	3 (1.9%)	
Mild 13–15	2495 (89.5%)	1854 (87.2%)	491 (96.8%)	150 (96.8%)	
SBP					
≤90	225 (8.1%)	210 (10.2%)	13 (2.6%)	2 (1.3%)	<0.001
≥91	2469 (88.6%)	1840 (89.8%)	481 (97.4%)	148 (98.7%)	
Not known/Not recorded	94 (3.4%)				
Transfusion blood (4 hours)					
No	2389 (85.7%)	1878 (88.9%)	473 (96.5%)	38 (97.4%)	<0.001*
Yes	253 (9.1%)	235 (11.1%)	17 (3.5%)	1 (2.6%)	
Not known/Not recorded	146 (5.2%)				
Signs of life					
Arrived with no signs of life	128 (4.6%)	122 (5.7%)	5 (1.0%)	1 (0.6%)	<0.001
Arrived with signs of life	2660 (95.4%)	2004 (94.3%)	502 (99.0%)	154 (99.4%)	

*Indicates that the Fisher's exact was used to calculate the p-value.
[a]Other race is the combination of the following categories: Asian & Pacific Islander & American Indian & Other Race

($n = 12$) and those who were transferred to a hospital or non-hospital facility such as jail, institutional care facility or mental health). Seeing that the number of patients who presented to trauma designation level IV ($n = 8$) or to a "not verified" ACS verification level or state designation ($n = 11$) was small, they were excluded from the sample. Additionally, patients that went to a destination with unknown/not recorded trauma designation level were excluded ($n = 21$). Figure 1 shows the

Table 2. Injury characteristics.

	Total	Trauma designation level			
		I	II	III	
	$N = 2788$	($N = 2126$)	($N = 507$)	($N = 155$)	p-value
Trauma type					
Blunt	1713 (61.4%)	1240 (58.8%)	367 (73.7%)	106 (70.2%)	<0.001*
Penetrating	898 (32.2%)	754 (35.7%)	109 (21.9%)	35 (23.2%)	
Burn	42 (1.5%)	39 (1.8%)	3 (0.6%)	0 (0%)	
Other/unspecified	106 (3.8%)	77 (3.6%)	19 (3.8%)	10 (6.6%)	
Not known/Not recorded	29 (1.0%)				
Injury intentionality					
Unintentional	1199 (43.0%)	870 (41.0%)	245 (48.3%)	84 (54.5%)	<0.001
Self-inflicted	123 (4.4%)	77 (3.6%)	32 (6.3%)	14 (9.1%)	
Assault	1378 (49.4%)	1130 (53.2%)	203 (40.0%)	45 (29.2%)	
Undetermined & Other	84 (3.0%)	46 (2.2%)	27 (5.3%)	11 (7.1%)	
Not known/Not recorded	4 (0.1%)				
Mechanism of injury					
Cut/pierce	291 (10.4%)	217 (10.3%)	53 (10.5%)	21 (13.7%)	<0.001
Fall	482 (17.3%)	357 (16.9%)	94 (18.7%)	31 (20.3%)	
Firearm	583 (20.9%)	521 (24.7%)	52 (10.3%)	10 (6.5%)	
MVT	496 (17.8%)	336 (15.9%)	120 (23.8%)	40 (26.1%)	
Struck by, against	659 (23.6%)	496 (23.5%)	132 (26.2%)	31 (20.3%)	
Other[a]	256 (9.2%)	183 (8.7%)	53 (10.5%)	20 (13.1%)	
Not known/Not recorded	21 (0.8%)				
Nature of injury					
Fracture	1139 (40.9%)	891 (42.2%)	198 (39.1%)	50 (32.5%)	<0.001
Internal organ injury	722 (25.9%)	567 (26.8%)	133 (26.2%)	22 (14.3%)	
Open wound	481 (17.3%)	342 (16.2%)	91 (17.9%)	48 (31.2%)	
Other[b]	432 (15.5%)	313 (14.8%)	85 (16.8%)	34 (22.1%)	
Not known/Not recorded	14 (0.5%)				
Body region					
Extremities	763 (27.4%)	575 (27.2%)	135 (26.6%)	53 (34.4%)	0.059
Head and neck	1137 (40.8%)	869 (41.1%)	219 (43.2%)	49 (31.8%)	
Spine and back	134 (4.8%)	100 (4.7%)	22 (4.3%)	12 (7.8%)	
Torso	698 (25.0%)	532 (25.2%)	129 (25.4%)	37 (24.0%)	
Unclassifiable by body region & unspecified	42 (1.5%)	37 (1.8%)	2 (0.4%)	3 (1.9%)	
Not known/Not recorded	14 (0.5%)				

*Indicates that the Fisher's exact was used to calculate the p-value.

[a]Other mechanism of injury includes: Fire/flame & Hot object/substance & Machinery & Pedal cyclist, other & Pedestrian, other & Transport, other & Natural/environmental, Bites and stings & Natural/environmental, Other & Overexertion & Poisoning & Suffocation & Other specified and classifiable & Other specified, not elsewhere classifiable & Unspecified.

[b]Other nature of injury includes: Amputation & Blood vessel & Burns and corrosions & Crushing & Dislocation & Other effects of external causes & Other specified injury & Poisoning & Superficial and contusion & Unspecified injury.

study population selection. We chose these exclusion criteria for the patients transported by police as they help tailor our sample to the study objectives and variables. Since NTDB does not include data on patients after transfer from the ED or those with unknown ED/hospital disposition, these individuals were not included in the analysis of the primary outcome (survival to hospital discharge).

The variables we collected for the patients included demographic data, injury details such as mechanism of injury and type of injury, dispositions, and payment methods. Trauma designation level for the centers was computed as the highest level given by either the ACS or the State (14). The primary outcome was considered survival to hospital discharge based on ED and hospital disposition. We obtained an exemption letter for using this de-identified dataset from the Institutional Review Board office at the American University of Beirut.

Statistical Analysis

Statistical analyses were conducted using the statistical package for social sciences (SPSS, version 24.0; Inc, IBM Corp, Chicago, IL). Age was summarized by calculating its median and interquartile range (IQR). We calculated frequencies and percentages to describe the patients' demographic and

TABLE 3. Outcomes.

	Total	Trauma designation level			
		I	II	III	
	$N = 2788$	($N = 2126$)	($N = 507$)	($N = 155$)	p-value
ED discharge disposition					
Deceased/Expired	99 (3.6%)	94 (4.4%)	4 (0.8%)	1 (0.6%)	<0.001
Admitted	2493 (89.4%)	1908 (89.7%)	462 (91.1%)	123 (79.4%)	
Discharged	196 (7.0%)	124 (5.8%)	41 (8.1%)	31 (20.0%)	
Hospital discharge disposition					
Deceased/Expired	90 (3.2%)	84 (4.0%)	5 (1.0%)	1 (0.6%)	<0.001
Left against medical advice or discontinued care	90 (3.2%)	60 (2.8%)	24 (4.7%)	6 (3.9%)	
Discharged to home or self-care (routine discharge)	1175 (42.1%)	823 (38.7%)	277 (54.6%)	75 (48.4%)	
Transferred to other destination[a]	1138 (40.8%)	941 (44.3%)	156 (30.8%)	41 (26.5%)	
Not Applicable	295 (10.6%)	218 (10.3%)	45 (8.9%)	32 (20.6%)	
Died ED/hospital					
No	2599 (93.2%)	1948 (91.6%)	498 (98.2%)	153 (98.7%)	<0.001
Yes	189 (6.8%)	178 (8.4%)	9 (1.8%)	2 (1.3%)	

[a]Transferred to other destination encompasses the following categories: Discharged/Transferred to a short-term general hospital for inpatient care & Discharged/Transferred to an Intermediate Care Facility (ICF) & Discharged/Transferred to home under care of organized home health service & Discharged/Transferred to Skilled Nursing Facility (SNF) & Discharged/Transferred to hospice care & Discharged/Transferred to inpatient rehab or designated unit & Discharged/Transferred to Long Term Care Hospital (LTCH) & Discharged/Transferred to a psychiatric hospital or psychiatric distinct part unit of a hospital & Discharged/Transferred to another type of institution not defined elsewhere.

clinical characteristics. This revealed that more than 5% of patients' race and GCS were not recorded. We therefore implemented multiple automatic imputation methods to handle missing data and to provide more accurate estimates. The Pearson's Chi-Square or the Fisher's Exact Tests were used to compare the percentages of all categorical variables by the trauma designation level. Furthermore, these two tests were carried out to assess the significance of the statistical association between all independent factors and the outcome variable "survival of patients to hospital discharge" (this analysis was not presented but it showed that only age was not significantly associated with patients' survival). Finally, we performed a multivariable analysis using a stepwise selection procedure to determine the impact of the trauma designation level on patients' survival to hospital discharge after controlling for all statistically and clinically meaningful factors. Levels II and III trauma centers were combined as one category in the multivariable analysis due to the relatively low number of patients transported by the police to each of the two levels separately in comparison to level I. p-value of ≤ 0.05 was used to denote statistical significance.

RESULTS

The total number of trauma patients in the dataset is 997,970 and after applying the inclusion and exclusion criteria, the final number of patients included in the analysis was 2,788. Patients were mostly males (84.6%) with a median age of 35 years (interquartile range 26–49) with over half being African American (Table 1). They predominantly had preexisting comorbidities (64.1%). Most had a mild GCS (13–15) (89.5%) and only 17.4% were recorded to have severe traumatic injuries with ISS $\geq$ 16 (Table 1). Few arrived with no signs of life to the hospital (4.6%). The most common trauma type was blunt trauma (61.4%) followed by penetrating injuries (32.2%) and burns (1.5%) (Table 2). Around half of the injuries were the result of assault (49.4%) and 43.0% were unintentional. Head and neck injuries were most common (40.8%) followed by extremities (27.4%) then torso injuries (25.0%) (Table 2). Approximately half of the patients were admitted to floor bed/observation unit/step-down unit (50.7%) while 18.9% and 19.8% went to the Operating room or Intensive care unit respectively (Table 3). Overall survival to hospital discharge was 93.2% (Table 3).

With regards to trauma center designation levels, most patients were taken to a level I (76.2%) and 18.2% to a level II while only 5.6% were taken to a level III center.

Survival was 91.6% in Level I, 98.2% in level II and 98.7% in Level III centers. After adjusting for significant confounders in the multivariable regression model, survival to hospital discharge was similar for patients transported by police to level II or III trauma centers in comparison to those transported to level I (OR = 0.866 95%CI (0.321–2.333); $p = 0.776$) (Table 4). The area under the Receiver Operating Characteristic (ROC) Curve (0.943

Table 4. Crude and adjusted odds ratios of survived patients transported by police.

	Crude			Adjusted*		
	OR	95% CI	*p*-value	OR	95% CI	*p*-value
Trauma designation level (I) II & III	5.408	2.923–10.006	<0.001	0.866	0.321–2.333	0.776

*Variables that were included in the model are: Trauma designation level, Age, Sex, Race, Ethnicity, Primary method of payment, Facility level: Hospital Teaching Status, Comorbidity, Injury severity score, GCS, SBP, Transfusion blood (4 hours), Trauma type, Injury Intentionality, Mechanism of Injury, Alcohol screen, Drug screen, Nature of injury, Body region, Signs of Life.

[95%CI: 0.929–0.956; $p < 0.001$]) indicated that the regression model had an outstanding discrimination between deceased and survived patients.

Discussion

This study explored the association between trauma centers designation level and survival of trauma patients transported by the police. There was no difference in survival to hospital discharge for trauma patients transported by police to level I or level II and III trauma centers. This finding is new and has not been previously reported in the literature. It has implications for police guidelines related to transporting patients to Trauma centers.

A previous study looking at outcomes of different levels trauma centers in Philadelphia city, one of the cities with the highest trauma police transport (2), showed no mortality differences between Level I and II (15). Similarly, mortality from specific injuries such as spinal trauma (16), renal trauma (17) or drowning victims (18) were not different between trauma centers of different designation levels in general.

In contrast, other studies reported improved survival in level I centers when studying MVT victims (6), patients with cardiovascular or high-grade liver injuries and those with traumatic brain injuries (7). None of these studies looked at the subpopulation of trauma patients transported by the police.

Differences between Level I, Level II and level III usually reflect structural and process elements. High designation levels have higher acuity and volume numbers, more available qualified personnel and trauma surgeons as well as medical resources. One of the main difference between Level I and II, for example, is the presence of trauma research which is not directly related to patient care and survival outcome (19). Another distinction is the presence of a continuous in-house trauma team coverage in level 1 while the constant coverage in level II is not necessarily in-house (19); This did not seem to result in difference in mortality between the two levels as long as the response is under a certain time period (20). It is difficult to examine which characteristics of the different designation levels could be affecting survival of patients as it is hard to isolate them; the final outcome is dependent on the overall interplay between these factors.

In comparison to patients transported by Police in the NTDB 2015, patients in our study had similar demographic characteristics except for a slightly higher percentage of African Americans (50% vs. 45.4% in 2015) and having less comorbidities (64.1% vs. 69.2% in 2015) (1). With regards to clinical characteristics, patients from 2017 dataset had more blunt (61.4% vs. 59.4%) and penetrating trauma (32.2% vs. 29.4%) and injuries as the result of assault (49.4% vs. 46.6%) while injury severity (ISS, GCS and SBP), frequencies were similar over the years (1). Survival rate of trauma patients transported by the police in our study using NTDB 2017 (93.2%) was approximately the same as the survival rate using the NTDB 2015 (1). Similar survival rate was also found in patients with penetrating injuries transported by EMS or private transport (3, 21, 22).

This rate was however higher than the survival rate of 90% that was reported in a recent study examining blunt trauma patients transported by EMS and using NTDB (23). Although when compared to patients transported by EMS, the ones taken by Police were significantly more likely to be younger, male, black, with gunshot wound injury and higher injury severity perhaps likely because of the perceived urgency to get the critically injured patient to a hospital without waiting for EMS (2). This can be in support of the validity of time saving police transport even without medical intervention as an alternative to EMS transport. This is especially true in areas with low trauma center density such as in Chicago's south side where longer prehospital transport times and higher mortality rates are observed in comparison with other areas of the city (2). Police transport of trauma patient is therefore a good alternative when delays in EMS arrival are expected (24).

EMS field triage uses physiology, anatomy, and mechanism of injury criteria and is based on the Centers of Disease Control and Prevention field triage guidelines (25). Field triaging for police transport varies with US geographical locations and

department-specific internal protocols. For example, according to Stockton's police regulations, the need for immediate transport "when waiting for paramedics would be impractical" is determined by Police based on the severity of the injury with no triaging directives regarding specific transport destination (10). On the other hand, in Philadelphia, Law enforcement policy details transport of trauma patient to the nearest hospital except for serious penetrating or blunt trauma that should be transferred to the nearest accredited trauma center (9). Decreasing transport time should be prioritized in policies regardless of trauma level designation level as our study did not find any difference in survival outcomes when comparing them. Moreover, these protocols can be improved through future research by more precisely detailing situations where Police transport could be more beneficial than waiting for EMS.

Potential limitations of the study are related to its retrospective nature and to the database specific characteristics. Due to the high number of different facilities included in the database, consistency between the reported data might differ. However, the quality of the database is monitored for documentation variations and regularly cleaned to make sure of the data's validity (26). Moreover, the variables with more than 5% of missing or not recorded data were corrected for in the analysis by imputation methods to provide correct estimates such as with GCS and race. The use of data from only one year (2017) reduces the ability to explore trends in variables over time. It would be interesting to monitor the extent of Police involvement in trauma transport over the years and to report on changes in the characteristics of the population they transport such as race, injury severity and other. Patients found dead on scene and who were not transported to hospital were not included in the study; This might have led to an overestimation of the observed survival rate. Important secondary outcomes in trauma patients such as disability and functional status were also not examined as these variables are not available in the NTDB. Prehospital transport time is also not available for police transports and it would be very beneficial to add it in future NTDB datasets with increasing police involvement in trauma management.

Despite these limitations, the NTDB is the largest trauma registry in the USA and the findings of this study may apply to many settings in the US and be used to improve Police involvement in trauma care.

CONCLUSION

Transport of trauma patients by police to different designation levels of trauma centers was not associated with survival in this study. Survival was also similar to other trauma studies. As such, police may transport trauma patients to closest trauma designated center without affecting outcomes. Future studies examining specific trauma subpopulations based on mechanism and nature of injury can furthermore help guide prehospital triage criteria by police for transport of trauma patients.

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References

1. Colnaric JM, Bachir RH, El Sayed MJ. Factors associated with survival in adult trauma patients transported to US trauma centers by police. Prehosp Disaster Med. 2021;36(1):58–66. doi:10.1017/S1049023X20001314.
2. Wandling MW, Nathens AB, Shapiro MB, Haut ER. Police transport versus ground EMS: a trauma system-level evaluation of prehospital care policies and their effect on clinical outcomes. J Trauma Acute Care Surg. 2016;81(5):931–5. doi: 10.1097/TA.0000000000001228.
3. Band RA, Salhi RA, Holena DN, Powell E, Branas CC, Carr BG. Severity-adjusted mortality in trauma patients transported by police. Ann Emerg Med. 2014;63(5):608–14.e3. doi: 10.1016/j.annemergmed.2013.11.008.
4. Demetriades D, Martin M, Salim A, Rhee P, Brown C, Doucet J, Chan L. Relationship between American College of Surgeons trauma center designation and mortality in patients with severe trauma (injury severity score > 15). J Am Coll Surg. 2006;202(2):212–5. doi:10.1016/j.jamcollsurg.2005.09.027.
5. Elkbuli A, Dowd B, Flores R, Boneva D, McKenney M. The impact of level of the American College of Surgeons Committee on Trauma verification and state designation status on trauma center outcomes. Medicine (Baltimore). 2019; 98(25):e16133. doi:10.1097/MD.0000000000016133.
6. Dakessian A, Bachir R, El Sayed MJ. Association between trauma center designation levels and survival of patients with motor vehicular transport injuries in the United States. J Emerg Med. 2020;58(3):398–406. doi:10.1016/j.jemermed.2019.12.029.
7. Demetriades D, Martin M, Salim A, Rhee P, Brown C, Chan L. The effect of trauma center designation and trauma volume on outcome in specific severe injuries. Ann Surg. 2005; 242(4):512–7; discussion 517–9. doi:10.1097/01.sla.0000184169.73614.09.
8. Chicago Police Department. Squadrol Operating Procedures. 2017. http://directives.chicagopolice.org/directives/data/a7a57be2-12b53b0f-33812-b53e-d78b693bdacbb396.html.
9. Philadelphia Police Department. Directive 3.14. Issued: 1996. Updated: 2001. https://www.phillypolice.com/assets/directives/D3.14-HospitalCases.pdf.
10. Stockton Police Department. General order. Escorting sick or injured persons subject. 2019. http://ww1.stocktonca.gov/-/media/Stockton-Website/Departments/Police-Homepage/About-the-Police-Department/General-Orders/Files/2019-Updates/11-27-19-Update/G-M-Files/M-04.pdf?la=en&hash=A530F6427B7ACC568D1076E05ADEF683F6544E01.

11. Jacobs LM; Joint Committee to Create a National Policy to Enhance Survivability from Intentional Mass-Casualty and Active Shooter Events. The Hartford Consensus III: implementation of bleeding control: if you see something do something. Bull Am Coll Surg. 2015;100(1 Suppl):40–6.
12. Trauma American College of Surgeons. National Trauma Database: data dictionary. As. The Committee on Trauma. 2016.
13. Hicks CW, Hashmi ZG, Velopulos C, Efron DT, Schneider EB, Haut ER, Cornwell EE, III, Haider AH. Association between race and age in survival after trauma. JAMA Surg. 2014;149(7):642–7. doi:10.1001/jamasurg.2014.166.
14. Surgeons, A.c.o. *National Trauma Database, annual report*. 2016.
15. Rogers FB, Osler T, Lee JC, Sakorafas L, Wu D, Evans T, Edavettal M, Horst M. In a mature trauma system, there is no difference in outcome (survival) between Level I and Level II trauma centers. J Trauma. 2011;70(6):1354–7. doi:10.1097/TA.0b013e3182183789.
16. Baron RB, Neifert SN, Martini ML, Maragkos GA, McNeill IT, Lamb C, Rasouli JJ, Caridi JM. A comparison of outcomes for spinal trauma patients at level I and level II centers. Clin Spine Surg. 2021;34(4):153–157.
17. Bjurlin MA, Renson A, Fantus RJ, Fantus RJ. Impact of trauma center designation and interfacility transfer on renal trauma outcomes: evidence for universal management. Eur Urol Focus. 2019;5(6):1135–42. doi:10.1016/j.euf.2018.06.006.
18. Dakessian A, Bachir R, Sayed ME. Impact of trauma designation levels on survival of drowning victims: An observational study from trauma centers in the United States. Medicine (Baltimore). 2019;98(43):e17721. doi:10.1097/MD.0000000000017721.
19. Trauma Center Levels Explained. 04/04/2021. Available from: https://www.amtrauma.org/page/traumalevels.
20. Cox JA, Bernard AC, Bottiggi AJ, Chang PK, Talley CL, Tucker B, Davenport DL, Kearney PA. Influence of in-house attending presence on trauma outcomes and hospital efficiency. J Am Coll Surg. 2014;218(4):734–8. doi:10.1016/j.jamcollsurg.2013.12.027.
21. Band RA, Pryor JP, Gaieski DF, Dickinson ET, Cummings D, Carr BG. Injury-adjusted mortality of patients transported by police following penetrating trauma. Acad Emerg Med. 2011;18(1):32–7. doi:10.1111/j.1553-2712.2010.00948.x.
22. Zafar SN, Haider AH, Stevens KA, Ray-Mazumder N, Kisat MT, Schneider EB, Chi A, Galvagno SM, Jr., Cornwell EE, III, Efron DT, et al. Increased mortality associated with EMS transport of gunshot wound victims when compared to private vehicle transport. Injury. 2014;45(9):1320–6. doi:10.1016/j.injury.2014.05.032.
23. Taylor BN, Rasnake N, McNutt K, McKnight CL, Daley BJ. Rapid ground transport of trauma patients: a moderate distance from trauma center improves survival. J Surg Res. 2018;232:318–24. doi:10.1016/j.jss.2018.06.055.
24. Cornwell EE, III, Belzberg H, Hennigan K, Maxson C, Montoya G, Rosenbluth A, Velmahos GC, Berne TC, Demetriades D. Emergency medical services (EMS) vs non-EMS transport of critically injured patients: a prospective evaluation. Arch Surg. 2000;135(3):315–9. doi:10.1001/archsurg.135.3.315.
25. Sasser SM, Hunt RC, Faul M, Sugerman D, Pearson WS, Dulski T, Wald MM, Jurkovich GJ, Newgard CD, Lerner EB. Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage, 2011. MMWR Recomm Rep. 2012;61(Rr-1):1–20.
26. Surgeons ACo. *National Trauma Data Bank (NTDB) participant use file (user manual)*. 2019.