

IMPACT OF SETTING OF INJURY AND LEVEL OF TRAUMA CENTER ON  
TRAUMA MORTALITY AFTER FIELD INTUBATION

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## ABSTRACT

**Purpose:** Pre-hospital intubation (PHI) in major trauma is associated with increased mortality. The goal of this study was to determine if PHI is protective in patients injured in rural vs. urban locations or patients transferred to level II vs. level I trauma centers.

**Methods:** The Pennsylvania Trauma Outcomes Study database from 2006 – 2011 was reviewed. Pediatric patients, burns, patients dead on arrival, and transfers were excluded. Patients receiving PHI were compared to those immediately transported.

**Results:** Of 63264 trauma patients, 2725 (4.31%) were intubated in the field. Mortality was higher among the intubated than those not intubated (28.22% vs. 4.11%,  $p < 0.0001$ ). The intubated cohort had greater mean Injury Severity Score (ISS) (27.77 vs. 13.33,  $p < 0.0001$ ). Factors associated with mortality on multivariate logistic regression included PHI (OR 6.284,  $p < 0.0001$ ), ISS > 25 (OR 35.384,  $p < 0.0001$ ), penetrating trauma (OR 5.685,  $p < 0.0001$ ), transport to level II trauma center (OR 1.151,  $p = 0.0015$ ) and urban location (OR 1.209,  $p = 0.0002$ ). Both county of injury and trauma center level both had significant interactions with PHI in their effect on mortality during multivariate analysis. With PHI, rural location of injury was associated with lower mortality risk than urban areas (OR 0.807,  $p = 0.0296$ ). However, care at level II trauma centers after PHI was associated with greater mortality risk than level I trauma centers (OR 1.141,  $p = 0.0052$ ).

**Conclusion:** Mortality risk associated with PHI was reduced in rural areas, but mortality was greater with transport to level II trauma centers. PHI could be used as a marker for prioritizing transport to level I trauma centers. PHI might be appropriate under certain conditions in rural trauma.

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## 1. INTRODUCTION

Pre-hospital Advanced Life Support changed the emphasis from rapid transport to medical centers to extension of resuscitation at the scene and during transport. However, whether this change in pre-hospital care of trauma patients reduces morbidity and mortality has not been proven. In fact, there is growing evidence that these extra actions might be harmful in certain subsets of patients.

The goal of this study was to identify conditions where prehospital resuscitative procedures might be beneficial in trauma patients, namely, rural locations of injury and transport to level II trauma centers. The specific aims of this study were to contrast the association of pre-hospital intubation and mortality in urban and rural adult trauma populations and to understand the effect that pre-hospital intubation and level of trauma center have on mortality.

## 2. BACKGROUND

Endotracheal intubation is the definitive method of securing a patient's airway in an emergency (Handley, Monsieurs, & Bossaert, 2001). Failure to maintain a patent airway is the most common preventable cause leading to the patient's demise in the setting of respiratory distress (Anderson, Woodford, Dombal, & Irving, n.d.; Gruen, Jurkovich, McIntyre, Foy, & Maier, 2006; Hussain & Redmond, 1994; Yates, 1977). Without a secure airway, the patient loses the ability to adequately ventilate and oxygenate, leading to respiratory failure and eventually, death. Intubation is the first consideration during resuscitation by the Basic Life Support (BLS) guidelines (Handley et al., 2001; Hazinski et al., 2005).

With the advent of Advanced Life Support (ALS), pre-hospital care was revolutionized with the addition of more invasive procedures like cardiac defibrillation, needle thoracostomies, and advanced intubation techniques (Hartl et al., 2006; Johnson, 1991; Stiell et al., 2007). However, it is still unclear if these interventions truly improve survival. Multiple trauma studies have shown that prehospital intravenous fluid administration, pelvic and spinal stabilization, and intubation do not provide survival benefit (Haut et al., 2010, 2011; Smith, Bodai, Hill, & Frey, 1985). Recently, intubation was removed from the guidelines for prehospital management of cardiac arrest to reflect numerous studies showing prolonged interruptions to CPR associated with reduced survival to discharge (Egly et al., 2011; Hazinski et al., 2005; Sasson, Rogers, Dahl, & Kellermann, 2010). However, intubation in the field and upon transportation by emergency medical personnel is still carried out in trauma patients.

PHI in the setting of traumatic injury has proven to be controversial for two major reasons. The first questions the rate of technical success of intubation in uncontrolled conditions. While some studies have shown that intubation in the field can be done safely and accurately (Garza, Gratton, Coontz, Noble, & Ma, 2003; Wang, Kupas, Paris, Bates, & Yealy, 2003), others have demonstrated the rates of success may be as low as 59% on the first attempt but increases to 73% after three attempts (Wang & Yealy, 2006). While failed intubation has not been associated with mortality, pneumonitis following intubation and unrecognized misplacement have caused significant morbidity among all-comer pre-hospital intubated patients (Wang, Cook, Chang, Yealy, & Lave, 2009; Wirtz, Ortiz, Newman, & Zhitomirsky, 2007).

The second argument against PHI in trauma patients questions whether intubation should take priority over transport to a trauma center for definitive care. PHI has increased scene and transport times of patients to hospitals (Aydin et al., 2010; Stockinger & McSwain, 2004). In many single institution and large database studies, PHI has not been shown to be beneficial and could, in fact, be harmful (Davis, 2008a, 2008b; Eckstein, Chan, Schneir, & Palmer, 2000; Hussmann et al., 2011; Murray et al., 2000; Shafi & Gentilello, 2005; Stiell et al., 2008; Stockinger & McSwain, 2004). In hypovolemic patients as well as those suffering penetrating trauma or major trauma in urban areas, PHI is associated with decreased survival (Seamon et al., 2007; Shafi & Gentilello, 2005). In traumatic brain injury, the relationship is less clear. While some studies indicate that early intubation and ventilation may improve survival, others have shown that there is no benefit in terms of mortality or neurological function (Davis et al.,

2005; Davis, 2008a, 2008a; von Elm, Schoettker, Henzi, Osterwalder, & Walder, 2009; Wang, Peitzman, Cassidy, Adelson, & Yealy, 2004).

Some studies advocate for immediate transportation of trauma patients in urban settings where trauma centers are always in close proximity. However, improved survival in this setting has not been clearly demonstrated. It is also speculated that in rural areas, where time of transport to hospitals is increased and there are fewer resources, PHI might be beneficial. This was not found to be the case in rural pediatric trauma, where experiences have found that PHI was not associated with increased survival. However, advanced life support, but not necessarily PHI, was indicated to be associated with greater survival in the rural adult population in one study (Reines, Bartlett, Chudy, Kiragu, & McKnew, 1988).

Trauma centers are designated by the American College of Surgeons (ACS) from level I–IV depending on the resources available, volume, and educational and research commitment (American College of Surgeons., 2006). Level I trauma centers provide comprehensive trauma care with a surgeon dedicated to trauma patients in the hospital twenty-four hours a day. In addition, other surgical specialties such as neurosurgery and orthopaedic surgery, are available. These hospitals also have training programs for residents and are active in trauma research. Level II trauma centers have trauma and specialty surgeons on call, which implies that initial trauma evaluation and resuscitation are provided by the emergency room physician. Trauma outcomes at level I and level II trauma centers have been noted to be similar except with the most severely injured patients (CT, WH, RA, & JC, 1992; Cudnik, Newgard, Sayre, & Steinberg, 2009;

Demetriades et al., 2005). No studies have been done to examine the effect pre-hospital intubation and transport to different levels of trauma center have on mortality.

This goal of this study is to examine the effect of pre-hospital intubation on mortality when comparing rural versus urban locations of injury as well as transport to level I versus level II trauma centers. Rural areas are further away from designated trauma centers, thus increasing the time that a patient might have an unprotected airway. This author hypothesized that pre-hospital intubation in rural areas might reduce the risk of death when compared to urban areas. Level II trauma centers do not have as many resources immediately available as level I trauma centers. It is hypothesized that beginning resuscitation and stabilization earlier might reduce the risk of death in those patients transported to level II trauma centers.

### 3. METHODS

#### Description of Dataset

The Pennsylvania Trauma Outcomes Study (PTOS) is a registry of all patients treated at trauma centers in the Commonwealth of Pennsylvania. It is overseen by the state-run Pennsylvania Trauma Systems Foundation (PTSF) and reporting data to PTSF is a mandatory requirement to be designated a trauma center in Pennsylvania. It collects data on an average of 10,000 patients per year from 18 level I trauma centers and 17 level II trauma centers.

Trauma, as defined by the PTSF, is any serious or critical bodily injury. (“PA Trauma,” n.d.) Patients entered in the Trauma Registry by the participating trauma centers include all trauma patients dead on arrival, all trauma deaths, all intensive care admissions, all admissions with a length of stay greater than 72 hours, and all transfers in and out. For certification by the state, registrars at each trauma center are trained to abstract data from the medical records of each eligible trauma patient, which are identified on a daily basis. These data are recorded into a customized trauma registry software package (Collector Trauma Registry; Digital Innovation, Inc., Forest Hill, MD) and transmitted electronically and merged into a centralized master data set weekly. Quality assurance procedures are performed to ensure the accuracy and integrity of reported data with customized diagnostic software (Tricode; Digital Innovation, Inc.) used to verify the consistency of all computer entries. Only data passing quality reviews are merged into the master data set. These procedures are supplemented by regular site visits and semiannual statewide trauma registrar continuing education sessions by PTSF.

PTOS data has been used previously for many studies (Harbrecht et al., 2004; Page, Spott, Krishnamurthy, Taleghani, & Chinchilli, 2004; Potoka, Schall, & Ford, 2001).

### **Participant Selection**

All blunt and penetrating trauma patients greater than 18 years of age with trauma occurring between 2006 and 2011 were included after retrospective review of the PTOS database. Patients with burns (n=8084), coded as dead on arrival (n=2317), transferred from another hospital (n=50955), transported to level III and IV trauma centers (n=1095) or had missing data (n=40,412) were excluded from this analysis.

### **Statistical Analysis**

The primary outcome was mortality following a traumatic injury. The main predictor of interest was pre-hospital intubation. Patients were classified as receiving pre-hospital intubation if they were intubated either in the field or en route to the trauma center. A descriptive analysis of all variables of interest was performed (see appendix 1 for full PTOS variable list). Mortality between patients with and without pre-hospital intubation was conducted using t-tests and chi-square tests. Injury Severity Score (ISS) was used to adjust for severity of injury. ISS is an anatomical scoring system comprised of the aggregate of severity scores for 6 regions of the body like the head and neck, each extremity, chest and abdomen. It is the most common scoring system used and has been validated in multiple discrete populations (Baker, O'Neill, Haddon, & Long, 1974;

Bolorunduro et al., 2011). PTOS generates the ISS for each patient in its dataset using the characteristics reported.

Two multiple logistic regression models predicting mortality were developed: one model with main effects only and the other model including all main effects from the first model as well as interactions between pre-hospital intubation, trauma center level, and county of injury. The first model allowed demonstration of the impact of pre-hospital intubation, county of injury, and trauma center level on mortality, independent of each other.

The second model permitted determination of role of trauma center level or county of injury by pre-hospital intubation on mortality. The statistical analysis of synergy or antagonism comprises of finding significant interaction terms when modeling the simultaneous effects of 2 variables that both act upon the same outcome. Since nearly all pre-hospital intubated patients presented at level I or level II trauma centers, trauma center level III was excluded from all multivariate analyses. All statistical analyses were completed using SAS software (SAS Institute, Cary, NC).

#### 4. RESULTS

Of the 166,207 total patients in the PTOS dataset from 2006-2011, 63,264 were included after exclusion of burns, dead on arrivals, transfers from another hospital, transport to level III trauma centers, or missing data. The patient population was an average age of  $51 \pm 22.1$  years, predominantly male (62.2%), and mostly white (80.9%) (Table 1). Injuries were most often due to blunt mechanism (92.2%) and the mean ISS score was  $13.6 \pm 10.7$ . Most patients in the sample had either Medicare or private insurance, but 16.87% were either uninsured or had Medicaid. 4.3% of trauma patients were intubated at the scene or during transport. The majority of trauma patients were injured in urban locations (79.56%) and were transported to level I trauma centers (60.28%). The overall unadjusted death rate was 5.2% or 52 per 1,000. Average hospital length of stay was  $6.93 \pm 9.1$  days. 33.54% were admitted to the Intensive Care Unit (ICU), while 15.86% were taken emergently to surgery. (Table 1)

On bivariate analysis, the intubated trauma patients were significantly more likely to be younger (mean age: 41 vs. 51 years;  $p < 0.0001$ ), male (76.2% vs. 61.6%;  $p < 0.0001$ ), white (90.8% vs. 80.4%;  $p < 0.0001$ ), and uninsured or on Medicaid (17.2% vs. 18.8%;  $p < 0.0001$ ) compared to non-intubated patients (Table 2). Interestingly, there was no difference in the distribution of mechanism of injury ( $p = .19$ ). However, the intubated trauma patients had more gunshot wounds (GSW) (6.13% vs. 4.51%,  $p < 0.0001$ ) and head injuries (64.59% vs. 3.53%;  $p < 0.0001$ ) compared to non-intubated trauma patients. Not surprisingly, the intubated trauma patients also had greater ISS scores (mean  $\pm$  SD:  $27.77 \pm 14.99$  vs.  $13.33 \pm 10.06$ ;  $p < 0.0001$ ) and were more likely to die (28.22% vs. 4.11%;  $p < 0.0001$ ) compared to non-intubated trauma patients. A greater proportion of the

prehospital intubated trauma patients had ALS personnel at the scene (92.07% vs. 86.14%;  $p<0.0001$ ) and were transported to level I trauma centers (80.22% vs. 64.61%;  $p<0.0001$ ).

Multivariate logistic regression was used to examine the independent effect prehospital intubation had on subsequent mortality among trauma patients that survived to admission. Following adjustment for patient demographics, injury severity and type, as well as transport personnel, it was found that prehospital intubation of trauma patients was associated with increased mortality compared to trauma patients who were not intubated at the scene but directly transported to a trauma center. Other factors associated with mortality among trauma patients included age, sustaining penetrating trauma, having an ISS greater than 9, having an ALS personnel at the scene, transport to trauma center level II, and urban county of injury. Additional demographic factors associated with survival, and protective of mortality, included female gender and Medicaid or uninsured. (Table 3)

The second multivariate logistic regression model, which included all of the main effects in the previous model as well as the interaction terms for prehospital intubation by county of injury, and prehospital intubation by level of trauma center, was used to describe how prehospital intubation modified the effects of county of injury and level of trauma center on mortality. Both county of injury (urban vs. rural) and trauma center level (I vs. II) had significant interactions with PHI on multivariate analysis. As shown in Table 4, rural location of injury with prehospital intubation was associated with a lower mortality than urban location with prehospital intubation (OR 0.807,  $p=0.0296$ ).

However, transport to level II trauma centers after PHI was associated with greater risk of mortality than that level I trauma centers (OR 1.141, p=0.0052). (Table 4)

## 5. DISCUSSION

Although numerous publications have examined the effect of prehospital intubation on mortality, none have compared this effect in rural or urban areas as well as transport to level I or level II trauma centers. On multivariate logistic regression analysis, this study supports the evidence that pre-hospital intubation is independently associated with mortality after adjusting for severity, mechanism, and other confounders. This study also found that transport to trauma center level II was independently associated with increased mortality, while rural county of injury was associated with reduced mortality, as shown in Table 3. Furthermore, as shown in Table 4, when considering only patients receiving pre-hospital intubation, rural injury location was associated with less mortality risk than urban location, while care given at level II trauma centers was associated with increased mortality when compared to level I trauma centers.

While pre-hospital intubation was still associated with increased risk for mortality in rural settings when compared to no intubation (OR: 6.43, 95%CI 5.27 – 7.874,  $p < 0.001$ ), intubation in the field was found to be less harmful when comparing rural areas of injury to urban counties (OR: 0.81, 95%CI 0.66 – 0.98,  $p < 0.0296$ ). Since multiple studies have demonstrated that care at rural facilities is equivalent to national standards, even if care involved stabilization at lower level trauma centers prior to transport (Norwood & Myers, 1994; Veenema & Rodewald, 1995, 1995), the reduced mortality risk after PHI might be related to the increased average response, scene and transport times in rural areas when compared to urban locations (Carr, Caplan, Pryor, & Branas, 2006; Grossman et al., 1997). However, it is unknown whether the mortality risk is increased due to intubation in urban areas causing potentially harmful delays to short

transport times or if mortality is reduced in rural areas by PHI due to longer transport times to trauma centers. This finding does, however, provide evidence that transport of trauma patients to trauma centers should be prioritized over pre-hospital resuscitative efforts in urban locations of injury.

Level I trauma centers have been previously shown to have more severely injured patients than level II trauma centers, but have similar unadjusted death rates (Cudnik et al., 2009). It has also been shown in both state level and national level trauma data that transport to level II trauma centers in certain severe injuries like cardiovascular, pelvic, and grade IV-V liver trauma results in increased mortality and worse outcomes (Cudnik et al., 2009; Demetriades et al., 2005). The reason for this discrepancy does not seem to be related solely to whether the trauma surgeon was in-hospital or not, even with difficult to treat injuries like thoracoabdominal injuries (CT et al., 1992). This study found that transport to level II trauma centers was associated with greater mortality when the patient was intubated in the field and survived to admission. This indicates that prehospital intubation could serve as a marker for severe injury during transport decision making and could be used to prioritize transport to level I trauma center over a closer level II trauma center. It has been found that transport from lower level centers delays definitive care and results in greater mortality and worse functional outcomes (Hartl et al., 2006; Sampalis et al., 1997; Veenema & Rodewald, 1995).

One notable feature of this study was its use of the PTOS dataset, which is a large scale dataset of the trauma in Pennsylvania. This dataset undergoes rigorous efforts to maintain quality during collection. The sample has a distribution of patient and injury characteristics as well as outcomes including unadjusted death and pre-hospital intubation

rates that were similar to other studies using single institution, national, other state or county wide data (Davis et al., 2003; Haut et al., 2011; Shafi & Gentilello, 2005; Stockinger & McSwain, 2004).

This study also used a narrowly defined patient sample. Patients that required transfer from lower level trauma centers to higher levels ones were excluded to reduce the effect that increased transport times to definitive care might have on mortality. Patients who were DOA were also excluded. This was because it was thought that the ISS for the DOA patients might be inaccurately calculated, since a complete assessment of all injuries either with radiographs or operative evaluation is not performed. The effect of pre-hospital intubation on mortality with the 1876 DOA patients, using the same multivariate logistic regression model adjusting for injury severity with ISS, found an increased mortality due to PHI (OR: 8.22, 95% CI 7.496 - 9.013,  $p < .0001$ ). It was unclear whether this was a true effect of increased mortality due to PHI or if the increased risk was due to inadequate adjustment for severity. Thus it was decided to include only those patients that survived to admission.

There were some limitations inherent in this study. Data on scene and transport times as well as Glasgow Coma Scale (GCS) at scene might have been useful to more accurately characterize the conditions that lead to decision to intubate in the prehospital setting. However, these variables were found to be missing in greater than 50% of the data. Another concern regarding GCS was the timing of the recording – before or after intubation, which could potentially cause a misclassification bias.

## 6. CONCLUSIONS

The results of this study may have a potential impact on public health planning related to trauma. Mortality risk appears to be reduced when intubation in the field occurs in rural injury locations as opposed to urban locations, but mortality is still elevated when compared to non-intubated patients even after adjusting for ISS. These data suggest that pre-hospital intubation should not be performed among urban trauma patients, however pre-hospital intubation might be appropriate under certain conditions among rural trauma patients. These findings need to be further studied and characterized. Pre-hospital intubation was also associated with greater mortality if the patient was transported to a level II trauma center over a level I trauma center. Pre-hospital intubation could be utilized as a marker for more serious injury during on scene decision making that prioritizes transport to level I vs. level II trauma centers.

This study raised further questions regarding differences in outcomes after advanced prehospital care in urban and rural areas as well as during transport to level I and II trauma centers. A multi-center, prospective observational study in urban and rural areas with level I and II trauma centers is needed to collect more accurate data on field times, decision making, patient status on arrival of emergency responders, and complications after admission comparing outcomes with and without advanced life support interventions. A randomized controlled trial to understand differences in mortality, complications, and functional outcomes with and without prehospital intubation in the urban setting is required to demonstrate if pre-hospital intubation should be performed.

In conclusion, we observed increased mortality among trauma patients associated with pre-hospital intubation overall and with transport to level II trauma centers, but noted that the PHI was associated with reduced mortality in rural areas when compared to urban locations. Further studies are needed to demonstrate if pre-hospital intubation of trauma patients causes increased morbidity and mortality and to determine if these patients may benefit from immediate transportation to definitive care.

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## TABLES

**Table 1. Demographics of Trauma Patients in Study  
(n=63,264)**

	Percent (%)
Prehospital intubation	4.3
Male	62.2
Race	
White	80.9
Black	16.01
Asian	0.93
Other	2.15
Age distribution (years)	
18 - 24	14.73
25 - 34	13.53
35 - 44	14.07
45 - 54	15.99
55 - 64	11.75
65 - 74	8.88
75 - 84	12.42
85 +	8.65
Injury Type	
Penetrating	7.76
Blunt	92.24
Gunshot Wound	4.58
Head Injury	6.16
Injury Severity Score (ISS) Distribution	
0 – 8	29.59
9 – 15	34.13
16 – 25	21.94
> 25	14.34
Dead on arrival	5.15
Hospital Length of Stay (Days)	6.93 ± 9.11
ICU Length of Stay (Days)	2.23 ± 6.07
Days on Ventilator	1.37 ± 5.30
Emergent OR	15.86
ICU admit	33.54
Location Type by County	

	Rural	20.44
	Urban	79.56
Trauma Center		
	Level I	65.28
	Level II	34.72
Insurance		
	Uninsured/Medicare	16.87
	Medicare	23.62
	Private	21.31
	Other	38.19
Personnel at Scene		
	Basic Life Support	13.6
	Advanced Life Support	86.4

<b>Table 2. Trauma Patient and Injury Characteristics by Pre-hospital Intubation [ n(%)]</b>			
	Prehospital intubation	No Prehospital intubation	sig
	2725 (4.31)	60539 (95.69)	
<i>Patient Characteristics</i>			
Male	2077 (76.22)	37296 (61.61)	p <0.0001
Race			p <0.0001
White	2475 (90.83)	48704 (80.45)	
Black	197 (7.23)	9934 (16.41)	
Asian	12 (0.44)	579 (0.96)	
Other	41 (1.5)	1322 (2.18)	
Age distribution (years)			p <0.0001
18 – 24	696 (25.54)	8622 (14.24)	
25 – 34	519 (19.05)	8038 (13.28)	
35 – 44	458 (16.81)	8442 (13.94)	
45 – 54	419 (15.38)	9694 (16.01)	
55 – 64	248 (9.10)	7285 (11.87)	
65 – 74	147 (5.39)	5468 (9.03)	
75 – 84	158 (5.8)	7698 (12.72)	
85 +	80 (2.94)	5392 (8.91)	
Insurance			p <0.0001
Uninsured/Medicaid	470 (17.25)	10204 (16.86)	
Medicare	270 (9.91)	14674 (24.24)	
Private	637 (23.38)	12847 (21.22)	
Other	1348 (49.47)	22814 (37.68)	
<i>Injury Characteristics</i>			
Injury Type			p =0.1977
Penetrating	229 (8.40)	4679 (7.73)	
Blunt	2496 (91.60)	55860 (92.27)	
GSW	167 (6.13)	2731 (4.51)	p <0.0001
Head Injury	1760 (64.59)	2139 (3.53)	p <0.0001
Injury Severity Score (ISS)			p <0.0001
0 – 8	295 (10.83)	18423 (30.43)	
9 – 15	275 (10.09)	21319 (35.22)	

16 – 25	595 (21.83)	13287 (21.95)	
> 25	1560 (57.25)	7510 (12.41)	
<i>Outcomes</i>			
Dead	769 (28.22)	2487 (4.11)	p <0.0001
DOA	566 (13.99)	1310 (1.52)	p <0.0001
Hospital LOS (Days)	11.51 ± 14.29	6.72 ± 8.75	p <0.0001
ICU LOS (Days)	7.27 ± 9.80	2.00 ± 5.74	p <0.0001
Days on Ventilator	6.01 ± 9.38	1.16 ± 4.94	p <0.0001
Emergent OR	695 (25.50)	9338 (15.42)	p <0.0001
<i>Location and Trauma Center Characteristics</i>			
Location Type by County			p <0.0001
Rural	1308 (48.00)	48913 (80.80)	
Urban	1417 (52.00)	48913 (97.18)	
Trauma Center			p <0.0001
Level I	2186 (80.22)	39115 (64.61)	
Level II	539 (19.78)	21424 (35.39)	
Personnel at Scene			p <0.0001
Basic Life Support	216 (7.93)	8391 (13.86)	
Advanced Life Support	2509 (92.07)	52148 (86.14)	

**Table 3. Logistic Regression Model 1: Pre-hospital Intubation of Trauma Patients on Mortality**

Predictors	OR	95% Confidence		P-value
		Limits		
Prehospital Intubation	6.28	5.59	7.07	<.0001
White	REF			
Black	1.29	1.13	1.47	0.587
Asian	2.11	1.51	2.96	0.0008
Other	1.20	0.89	1.61	0.335
Male	REF			
Female	0.70	0.64	0.76	<.0001
ISS <9	REF			
ISS 9-15	1.79	1.46	2.18	<.0001
ISS 16-25	9.20	7.71	10.99	<.0001
ISS >25	35.38	29.67	42.20	<.0001
Penetrating Injury	5.69	4.93	6.56	<.0001
Urban County of Injury	1.21	1.09	1.34	0.0002
Trauma Center Level I	REF			
Trauma Center Level II	1.15	1.06	1.26	0.0015
BLS	REF			
ALS	1.19	1.05	1.36	0.0087
Private Insurance	REF			
Medicare	1.36	1.18	1.57	<.0001
Medicaid/None	0.92	0.79	1.07	0.001
Other	1.10	0.98	1.24	0.6229

**Table 4. Logistic Regression Model 2: Main effects and Interactions Impact on Mortality**

Significant Predictors	OR	p value
Prehospital Intubation	7.055	<.0001
Male	1.375	<.0001
Other Race	REF	
White	0.844	0.2634
Black	1.084	0.6126
Asian	1.682	0.0217
ISS >25	REF	
ISS 16-25	0.258	<.0001
ISS 9-15	0.050	<.0001
ISS <9	0.028	<.0001
Penetrating Injury	0.163	<.0001
Rural County of Injury	0.807	0.0296
Age (continuous)	1.037	<.0001
Level I Trauma Center	0.775	0.0373
Other Insurance	REF	
Private Insurance	0.834	0.0028
Medicare	1.414	<.0001
Medicaid/None	0.812	0.0026
ALS	REF	
BLS	0.842	0.0099
Prehospital Intubation * Level of Trauma Center Interaction		
	Prehospital Intubated and Level I	REF
	Prehospital Intubated and Level II	1.291 0.037
Prehospital Intubation * County of Injury Interaction		
	Prehospital Intubated and Urban	REF
	Prehospital Intubated and Rural	0.806 0.0296

**APPENDIX A. PTSF DATA ELEMENT LIST**

DEMOGRAPHIC DATA

Institution Number \_\_\_\_\_

Trauma Number \_\_\_\_\_

Zip Code of Residence \_\_\_\_\_

Cause of Injury E \_\_\_\_\_. Specify \_\_\_\_\_

Place of Injury E849. Specify \_\_\_\_\_

Race \_\_\_\_ 1=white; 2=black; 3=(no longer used); 4=Asian; 5=other; U=Unknown

Sex \_\_\_\_ 1=male; 2=female

Age \_\_\_\_ in \_\_\_\_ 1=years; 2=months; 3=days; 4=estimated in years

Injury Year

Injury Time \_\_/\_\_/\_\_\_\_

Type of Injury \_\_\_\_ 1=blunt; 2=penetrating; 3=burn

Pre-existing Conditions:

A. Cardiac Disease including History of Cardiac Surgery, Coronary Artery Disease, Congestive Heart Failure, Myocardial Infarction, Hypertension

B. Diabetes

D. Hematologic Disorders including Acquired Coagulopathy, Warfarin Therapy,

Hemophilia

F. Immunosuppressed

G. Liver Disease

J. Neurologic

K. Obesity

L. Pulmonary Disease

M. Renal Disease

N. Substance Abuse including Chronic Ongoing Drug Abuse, Chronic Ongoing

Alcohol Abuse

P. Pregnancy

Q. Trauma History

PREHOSPITAL DATA

Was Patient Extricated? \_\_\_\_ 1=yes; 2=no

Were scene provider and transport provider the same? \_\_\_\_ 1=yes; 2=no; 3=No documentation of any applicable prehospital information or provider

Are any scene provider data available? \_\_\_\_ 1=yes; 2=no

Record the following for Scene, Transport, and Ref/Interhospital Transport

Provider \_\_\_\_ 1=amb; 2=heli; 3=amb/heli; 4=police; 5=fire rescue; 6=private vehicle; 7=walk-in; 9=QRS; U=unknown

Provider Dates & Times:

Dispatch \_\_/\_\_/\_\_\_\_ @ \_\_:\_\_

Arrive at Scene \_\_/\_\_/\_\_\_\_ @ \_\_:\_\_

Leave Scene \_\_/\_\_/\_\_\_\_ @ \_\_:\_\_

Life Support: Provider \_\_\_\_ Care \_\_\_\_ 1=basic; 2=advanced; 3=basic/non-professional; 4=none

Were the earliest documented vital signs documented prior to the patient leaving the scene of injury? 1=yes; 2=no; 3=no prehospital vital signs documented

Ambulance Scene Time > 20 Minutes (auto calc)

Is this a transfer patient? \_\_\_\_\_ 1=yes; 2=no

If referral...

Date/Time Admission at ref. Hospital \_\_/\_\_/\_\_\_\_ @ \_\_:\_\_

Date/Time Discharge from ref. Hospital \_\_/\_\_/\_\_\_\_ @ \_\_:\_\_

Interventions: Diagnostic:

None = 00.00;

Angiography = NEC - 88.40, Aorta (arch) (ascending) (descending) - 88.42, Basilar - 88.41, Brachial - 88.49, Carotid

(internal) - 88.41, Celiac - 88.47, Cerebral (posterior circulation) - 88.41, Coronary NEC - 88.57,

Double Catheter Technique (Judkins) (Ricketts and Abrams) - 88.56, Single Catheter Technique (Sones) - 88.55, Eye (fluorescein) - 95.12, Femoral - 88.48, Head and Neck - 88.41, Heart - 88.50, Intra-Abdominal NEC - 88.47, Intracranial - 88.41, Intrathoracic Vessels NEC - 88.44, Lower Extremity NEC - 88.48, Neck - 88.41, Placenta - 88.46, Pulmonary - 88.43, Renal - 88.45, Specified Artery NEC - 88.49, Superior Mesenteric Artery - 88.47, Transfemoral - 88.48, Upper Extremity NEC - 88.49, Vertebral - 88.41; Bronchoscopy = NEC - 33.23, Fiberoptic - 33.22, Through Tracheostomy - 33.21, With Brush Biopsy - 33.24, With Lung

Biopsy - 33.27

CAT Scan = Abdomen - 88.01, Bone, Skeletal, CT nfs - 88.38, Brain, Head - 87.03, Kidney - 87.71, Thorax - 87.41, Mineral Density Scan of Bone, Skeletal - 88.98, Other Tomography of Head - 87.04 (CTA Head and/or Neck), Other Tomography Thorax - 87.42 (CTA Thorax);

Diagnostic Laparoscopy - 54.21;

Diagnostic Peritoneal Lavage (DPL) = 54.25;

Exploratory Laparotomy - 54.11

MRI = Abdomen, MRI nfs - 88.97, Bladder (urinary) - 88.95, Bone Marrow Blood Supply - 88.94,

Brain (brain stem) - 88.91, Chest (hilar)

(mediastinal) - 88.92, Extremity (upper) (lower) - 88.94,

Eye Orbit - 88.97, Face - 88.97, Head NEC - 88.97,

Musculoskeletal - 88.94, Myocardium - 88.92,

Neck - 88.97, Prostate - 88.95, Specified Site NEC -

88.97,

Spinal Canal (cord) (spine)- 88.93, Magnetic

Resonance Angiography (MRA, any site) - 88.97;

X-ray Other and Unspecified - 88.39;

Ultrasound = Abdomen - 88.76, Aortic Arch - 88.73,

Biliary Tract - 88.74, Breast - 88.73, Deep Vein Thrombosis - 88.77,

Digestive System - 88.74, Eye - 95.13, FAST - 88.79, Head and Neck - 88.71, Heart - 88.72, Intestine - 88.74, Lung -

88.73, Midline Shift, Brain - 88.71, Multiple Sites - 88.79, Peripheral Vascular System - 88.77,  
Retroperitoneum - 88.76, Thorax NEC - 88.73, Total Body - 88.79, Urinary System - 88.75, Uterus - 88.79,  
Gravid - 88.78;

Therapeutic:

None = 00.00;

Abdominal Artery Embolization – 38.86

Abdominal Vein Embolization – 38.87

Central Lines = Systemic Arterial - 89.61, Central Venous Pressure - 89.62, Pulmonary

Artery Pressure - 89.63, Swan Ganz - 89.64,

Chest tube(s) = 34.04;

CPR = 99.60,

\*Escharotomy = 86.29 (This is a PTSF defined code),

\*Fasciotomy = 83.14 \*For burn patients only.

Intubation = 96.04;

Other Embolizations

Other surgical occlusion of vessels (clamping, division, ligation, occlusion) – 38.8 [0-9]

Endovascular occlusion of head and neck vessels (coil embolization) – 39.72

Other endovascular repair (of aneurysm) of other vessels (coil embolization) – 39.79

Transcatheter embolization for gastric or duodenal bleeding – 44.44;

Central Venous Catheterization = 38.93 (Peripheral IVs must not be recorded);

Surgery - Specify ICD-9-CM Procedure Codes,

Referral from facility # \_\_\_\_\_

Is referral facility clinical data available? \_\_\_\_\_ 1=yes; 2=no

Patient transferred to another health care facility after spending > 6 hours in the initial hospital (auto calc)

PROCESS OF ACUTE CARE

Date entered ED \_\_/\_\_/\_\_\_\_

Time entered ED \_\_: \_\_

Date Transported to Post ED Destination \_\_/\_\_/\_\_\_\_

Time Transported to Post ED Destination \_\_: \_\_

Date Administratively Discharged from ED \_\_/\_\_/\_\_\_\_

Time Administratively Discharged from ED \_\_: \_\_

Post ED Destination: \_\_\_ 1=ICU; 2=OR; 3=floor; 4=prison ward; 5=stepdown; 6=morgue; 7=transfer to other

hospital/trauma center; 8=L&D; 9=burn unit; 10=home; 11=Interventional

Angiography

Time for Referral (auto calc)

Was operating room available? \_\_\_ 1=yes; 2=no

Was there documentation that the attending surgeon was immediately available (in the OR)? \_\_\_ 1=yes; 2=no

If no, specify arrival time \_\_: \_\_

Attending surgeon specialty \_\_\_ 01=trauma/general surgery; 03=orthopaedic surgery;  
 04=cardiac surgery;  
 05=obstetric/gynecological surgery; 06=ophthalmic surgery; 07=oral/maxillofacial  
 surgery; 08=otorhinolaryngologic surgery; 09=pediatric surgery; 10=plastic surgery;  
 11=thoracic surgery; 12=urologic surgery; 13=Burn Surgery; 77=other  
 Was there documentation that the attending anesthesiologist was immediately present (in  
 the OR)? \_\_\_ 1=yes; 2=no  
 If no, specify arrival time \_\_: \_\_  
 Admitting Service \_\_\_ 0=not admitted; 1=trauma (general surgery); 2=neurosurgery;  
 3=orthopaedics; 4=thoracic surgery; 5=other (surgical) specify \_\_\_\_\_; 6=other  
 (non-surgical) specify \_\_\_\_\_; 7=oromaxillofacial; 8=OB/GYN; 9=burn  
 Trauma patient admitted to hospital under the care of admitting or attending physician  
 who is not a surgeon (auto calc)  
 Did patient receive a CT scan of the head during the resuscitative phase? \_\_\_ 1=yes; 2=no  
 Did patient require a laparotomy that was not performed within 2 hours of ED  
 arrival? \_\_\_ 1=yes; 2=no;  
 3=did not require  
 Was trauma alert called? \_\_\_ 1=yes; 2=no; 3=trauma consult  
 Initial Date/time trauma alert called \_\_/\_\_/\_\_ @ \_\_: \_\_  
 Highest Level of Alert \_\_\_ 1=highest level; 2=second level; 3=lowest level; 4=trauma  
 consult; Specify \_\_\_  
 Date and Time Called(optional) \_\_/\_\_/\_\_ \_\_: \_\_  
 Arrival dates & times: Emergency physician; Emergency medicine resident, and PGY  
 level \_\_\_; Attending trauma surgeon; Junior trauma resident, and PGY level \_\_\_  
 (optional); Senior trauma resident, and PGY level \_\_\_; Neurosurgeon; Neurosurgical  
 resident and PGY level \_\_\_; Orthopaedic surgeon; Orthopaedic resident and PGY level  
 \_\_\_; Anesthesiologist; Anesthesiology resident and PGY level \_\_\_; CRNA \_\_\_  
 Patient monitoring during radiology studies? \_\_\_ 1=yes; 2=no; 3=no radiological studies  
 performed  
 Was any CT scan performed at this hospital during resuscitative phase? \_\_\_ 1=yes; 2=no  
 24 hour in-house coverage 1=yes; 2=no (optional element for all trauma centers)  
 CT study ordered (time) \_\_: \_\_ (optional element for all trauma centers)  
 CT Tech response/arrival time \_\_: \_\_ (optional element for all trauma centers)  
 Patient monitored during CT studies 1=yes; 2=no  
 Units of Blood Hung \_\_\_

CLINICAL DATA

Total Pre-hospital Fluids Administered \_\_\_ 1=None; 2=<500 ml; 3=500-2000 ml;  
 4=>2000 ml; 5=unknown amount

	SCENE	TRANSP	REF	INTERHOS P TRANSP	ADMISSIO N
Paralyzing Drugs	___	___	___	___	___
Pulse Rate/min	___	___	___	___	___
Respiratory Rate/min	___	___	___	___	___

	SCENE	TRANSP	REF	INTERHOSP TRANSP	ADMISSION
Systolic Blood Pressure	_____	_____	_____	_____	_____
Eye Opening 4=spontaneous; 3=to voice; 2=to pain; 1=none	_____	_____	_____	_____	_____
Verbal Response 5=oriented; 4=confused; 3=inappropriate words; 2=incomprehensible sounds; 1=none	_____	_____	_____	_____	_____
Motor Response 6=obeys command; 5=localize pain; 4=withdraws; 3=flexion; 2=extension; 1=none	_____	_____	_____	_____	_____
Intubated with artificial airway 1=yes; 2=no	_____	_____	_____	_____	_____
Is patient's resp rate controlled (bagging or ventilator) 1=yes; 2=no	_____	_____	_____	_____	_____
If yes, Controlled Rate	_____	_____	_____	_____	_____
Temperature 1=Fahrenheit; 2=Celsius	_____	_____	_____	_____	_____
Route of Temperature Measurement 1=rectal; 2=oral; 3=axillary; 4=tympanic; 5=core; 6=skin	_____	_____	_____	_____	_____
Weight (required for peds and burns; optional for adults) 1=pounds; 2=kilograms	_____	_____	_____	_____	_____
ETOH/BAC	_____	_____	_____	_____	_____

	SCENE	TRANSP	REF	INTERHOSP TRANSP	ADMISSION
Drug Screen/(Clinician Administered Y/N) 0=not tested; 1=none; 2=cocaine; 3=PCP; 4=benzodiazepines; 5=barbiturates; 6=narcotics; 7=amphetamines; 8=marijuana; 9=tricyclics	_____	_____	_____	_____	_____
Is there sequential neuro documentation on the ED record of trauma patient with admission diagnosis of skull fracture, intracranial injury, or spinal cord injury? 1=yes; 2=no; 3=head or spinal cord injury not present	_____	_____	_____	_____	_____
Is there hourly documentation beginning with ED arrival? 1=yes; 2=no	_____	_____	_____	_____	_____
Did patient leave the ED with a discharge GCS $\leq$ 8? 1=yes; 2=no; 3=patient died in the ED or was a direct admit; U=no discharge GCS documented	_____	_____	_____	_____	_____

If yes, did the patient leave ED with definitive airway? 1=yes; 2=no

OUTCOME DATA

Discharge Status \_\_\_ 6=live; 7=death

Date of Death/Discharge/Transfer \_\_/\_\_/\_\_\_\_

Time of Death/Discharge \_\_:\_\_\_

Was this patient made DNR? 1=yes; 2=no

Days in ICU \_\_\_ ratio 2:1

Days in Step-down \_\_\_ ratio 4:1

Total Hospital Days \_\_\_ (auto calc)

Total Ventilator Days \_\_\_

Discharge Destination

1=home; 2=other hospital; 4=rehab; 5=skilled nursing facility; 6=burn center;  
7=psychiatric

facility; 8=legal authority; 9=drug or alcohol rehab; 10=other supervised residential  
facility; 11=AMA; 12=homeless; 13=transitional care unit; 14=Pennsylvania Trauma  
Center; 15=Out of State Trauma Center; 16=Long Term Acute Care Center

Discharge to Facility # \_\_\_\_\_

Date of Occurrence \_\_/\_\_/\_\_

Location of Occurrence \_\_\_

Occurrences:

none (01);

pulmonary; acute respiratory distress syndrome(20); acute respiratory failure(21);  
aspiration/aspiration

pneumonia (22); atelectasis (23); fat embolus syndrome (24); pleural  
effusion (44); pneumonia (26); pneumothorax (27); pulmonary  
embolus (28); cardiopulmonary arrest (48)

cardiovascular; acute arterial occlusion (30); major arrhythmia (34); extremity  
compartment syndrome (32);

deep vein thrombosis (33); myocardial infarction (35)

hematologic/coagulopathy; blood transfusion reaction (40); coagulopathy (41)

renal; acute renal failure (50);

hepatic; liver failure (63)

infection/sepsis; empyema (70); sepsis (76); septicemia (77); acute sinusitis (78);  
soft tissue infection (79);

urinary tract infection (97); wound infection (99)

airway management; esophageal intubation (80); unrecognized mainstem  
bronchus intubation (69)

gastrointestinal; GI bleeding (83); pancreatitis (84); small bowel obstruction (86)

neurologic; CNS infection (64); progression of original neurologic insult (66);

seizures (96)

procedure related; organ, nerve, vessel (91)

decubitus; dehiscence/evisceration (65); decubitus (94)

hypothermia; hypothermia (46);

post-op hemorrhage; post-operative hemorrhage (47)

pharmacology; adverse drug reaction (49)  
 burns; burn graft loss (10); burn wound infection post incision (11); burn wound  
 sepsis (12); burn wound cellulitis (13); delay in burn donor site  
 healing (14); hypovolemia (15)  
 Were there more than 10 occurrences? 1=yes; 2=no  
 Specific Complications (auto calc)  
 Discharge diagnosis of cervical spine injury with fracture, subluxation, or neuro deficit  
 not addressed on admission? \_\_\_ 1=yes; 2=no  
 Source of Final Anatomical Diagnoses: 1=yes; 2=no  
 Autopsy \_\_\_; CT \_\_\_; Surgery \_\_\_; MRI \_\_\_  
 Functional Status at Discharge: Feeding \_\_\_; Locomotion \_\_\_; Expression \_\_\_;  
 Transfer Mobility \_\_\_;  
 Social Interaction \_\_\_  
 Organ Donation \_\_\_\_\_  
 0=none; 1=heart; 2=liver; 3=kidney; 4=cornea; 5=pancreas; 6=lungs; 7=skin;  
 8=bone; 9=soft tissue;  
 10=heart valves; 11=blood vessels; 12=spleen  
 Discharge Weight and Unit of Measurement \_\_\_ in \_\_\_ 1=pounds; 2=kilograms (only  
 required for burn patients at burn centers)  
 Burn Patient Follow-up (only required for burn patients at burn centers) \_\_\_ 1=none;  
 2=burn outpatient services, specify \_\_\_\_\_; 3=other burn service,  
 specify \_\_\_\_\_; 4=other, specify \_\_\_\_\_  
 Burn Patient Readmitted \_\_\_ 1=yes; 2=no  
 If yes, reason: \_\_\_ 1=Pain Management Requiring Narcotics (IM or IV);  
 2=Wound Infection Requiring IV Antibiotics (e.g. cellulitis);  
 3=Grafting Procedures (with Integra or Autograft); 4=Temporary Wound  
 Covering Procedure (e.g. Biobrane)  
 Burn Wound Management:  
 00=No dressings or creams applied; 01=Acticoat; 02=Allograft (cadaver); 03=Amniotic  
 membrane; 04=Autograft; 05=Betadine (e.g. Providone-iodine); 06=Cultured epithelial  
 cells; 07=Elase (Fibrinolysin/Desoxyribonuclease); 08=Integra; 09=Mafenide Acetate  
 cream; 10=Mafenide Acetate solution (e.g. Sulfamylon); 11=Non-adherent wound veil  
 (e.g. Exudry, N-terface); 12=Santyl (Collagenase, Biozyme-c); 13=Santyl and Polysporin  
 (Collagenase & Polysporin); 14=Silver Nitrate; 15=Silver Sulfadiazine (e.g. Silvadene,  
 Flamazine); 16=Synthetic film (e.g. OpSite, Bioclusive, Tegaderm); 17=Synthetic gels  
 (e.g. Omiderm, Deliperm, Duoderm); 18=Synthetic laminates (e.g. Biobrane, Epigard,  
 Transcyt); 19=Travase (Sutilains); 20=Triple antibiotic cream/ointment (e.g. Nystatin +  
 1% Hydrocortisone + Bactriban); 21=Xenograft;  
 22=Other, specify \_\_\_\_\_  
 Case Reviewed in QM \_\_\_ 1=yes; 2=no  
 Autopsy Requested \_\_\_ 1=yes; 2=no  
 Autopsy Results in Medical Record \_\_\_ 1=yes; 2=no  
 Organ Donation Referral Made \_\_\_ 1=yes; 2=no  
 Consults: Trauma \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Neurosurgery \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_;  
 Orthopaedics \_\_\_/\_\_\_/\_\_\_

Provider \_\_\_; Thoracic Surgery \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Vascular Surgery  
 \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_;  
 Pediatrics \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Oromaxillo Facial Service \_\_\_/\_\_\_/\_\_\_ Provider  
 \_\_\_;  
 OB/GYN \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Burn Services \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_;  
 Cardiology \_\_\_/\_\_\_/\_\_\_  
 Provider \_\_\_; Cardiothoracic Surgery \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Drug/Alcohol  
 Counselor \_\_\_/\_\_\_/\_\_\_  
 Provider \_\_\_; ENT \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Family Medicine \_\_\_/\_\_\_/\_\_\_ Provider  
 \_\_\_;  
 Infectious Disease \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Internal Medicine \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_;  
 Nephrology \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Neurology \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Nutrition  
 \_\_\_/\_\_\_/\_\_\_  
 Provider \_\_\_; Occupational Therapy \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Ophthalmology \_\_\_/\_\_\_/\_\_\_  
 Provider \_\_\_;  
 Oral Surgery \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Physiatry \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Physical  
 Therapy \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Plastic Surgery \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Psychiatry  
 \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_;  
 Pulmonary \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Social Services \_\_\_/\_\_\_/\_\_\_ Provider; Speech Therapy  
 \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; General Surgery \_\_\_/\_\_\_/\_\_\_ Provider \_\_\_; Urology \_\_\_/\_\_\_/\_\_\_  
 Provider; Other \_\_\_/\_\_\_/\_\_\_ Specify \_\_\_\_\_ Provider \_\_\_

**FINAL ANATOMICAL DIAGNOSIS**

1. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 15.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
2. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 16.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
3. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 17.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
4. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 18.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
5. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 19.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
6. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 20.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
7. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 21.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
8. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 22.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
9. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 23.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
10. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 24.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_
11. \_\_\_\_\_ .\_\_\_ AIS\_\_\_ 25.  
\_\_\_\_\_ .\_\_\_ AIS\_\_\_

12. \_\_\_\_\_ AIS \_\_\_\_\_ 26.  
 \_\_\_\_\_ AIS \_\_\_\_\_

13. \_\_\_\_\_ AIS \_\_\_\_\_ 27.  
 \_\_\_\_\_ AIS \_\_\_\_\_

14. \_\_\_\_\_ AIS \_\_\_\_\_

Extent of Body Surface Involved 948.\_\_\_\_ (only required for burn patients at burn centers)

Initial Carboxyhemoglobin \_\_\_\_ (only required for burn patients at burn centers)

PaO<sub>2</sub>\_\_\_\_ (only required for burn patients at burn centers)

FIO<sub>2</sub>\_\_\_\_ (only required for burn patients at burn centers)

[P/F Ratio]\_\_\_\_ (auto calc)

Was a Bronchoscopy performed? (only required for burn patients at burn centers)\_\_\_\_

1=Yes; 2=No

Was there upper airway edema?\_\_ 1=Yes; 2=No

Was there soot below the cords?\_\_ 1=Yes; 2=No

Was there erythema?\_\_ 1=Yes; 2=No

Lund & Browder Chart: (only required for burn patients at burn centers)

Area	Max	%2nd	%3rd	Total	ICD Codes	
					%2nd	%3rd
Head	[_____]	_____	_____	[_____]	[_____]	[_____]
Neck	[_____]	_____	_____	[_____]	[_____]	[_____]
Ant. Trunk	[_____]	_____	_____	[_____]	[_____]	[_____]
Post. Trunk	[_____]	_____	_____	[_____]	[_____]	[_____]
R. Buttock	[_____]	_____	_____	[_____]	[_____]	[_____]
L. Buttock	[_____]	_____	_____	[_____]	[_____]	[_____]
Genitalia	[_____]	_____	_____	[_____]	[_____]	[_____]
R.U. Arm	[_____]	_____	_____	[_____]	[_____]	[_____]
L.U. Arm	[_____]	_____	_____	[_____]	[_____]	[_____]
R.L. Arm	[_____]	_____	_____	[_____]	[_____]	[_____]
L.L. Arm	[_____]	_____	_____	[_____]	[_____]	[_____]
R. Hand	[_____]	_____	_____	[_____]	[_____]	[_____]
L. Hand	[_____]	_____	_____	[_____]	[_____]	[_____]
R. Thigh	[_____]	_____	_____	[_____]	[_____]	[_____]
L. Thigh	[_____]	_____	_____	[_____]	[_____]	[_____]
R. Leg	[_____]	_____	_____	[_____]	[_____]	[_____]
L. Leg	[_____]	_____	_____	[_____]	[_____]	[_____]
R. Foot	[_____]	_____	_____	[_____]	[_____]	[_____]
L. Foot	[_____]	_____	_____	[_____]	[_____]	[_____]

Total \_\_\_\_\_ 2<sup>nd</sup> [\_\_\_\_\_] 3<sup>rd</sup> 2<sup>nd</sup> + 3<sup>rd</sup>

[Burn P(s) \_\_\_\_\_]

[Alternate P(s) \_\_\_\_\_]

PROCEDURE CODES

Record both operative and non-operative procedures performed in your facility in the combined procedure code section. Record the location in which these procedures are performed from the list below:

1 = ED (procedures listed under section B must be recorded in the procedure section for this phase of care)

- 2 = OR
- 3 = ICU
- 4 = Med/surg floor
- 5 = Step-down Unit (Step-down from ICU)
- 6 = Radiology
- 7 = Nuclear Medicine
- 8 = Burn Unit
- 9 = PMR (Physical Medical Rehabilitation)
- 10 = Minor Surgery Unit
- 11 = Special Procedure Unit/Angiography
- 12 = Pre-Hospital (Optional)
- 13 = PACU (Post Anesthesia Recovery Unit)

**Operative Procedures**

Record the ICD-9-CM procedure code, operation number, the date the procedure was performed, the time the procedure was performed, and location in which the procedure was performed.

**Non-Operative Procedures**

Record the following procedures, regardless of the location in the hospital in which they were performed, during the patient's hospital stay. Record the ICD-9-CM procedure code and the location in your facility in which the procedure was performed. Recording the date and time in which the procedures are performed is only required for those performed during the ED phase of care.

ICD-9-CM	Date	
Angiography/Vascular Imaging/Arteriography		
Aortography 88.42		
_____	_____	
Arteriography of femoral and other lower extremity arteries (88.48)		_____
_____		
Arteriography of cerebral arteries 88.41		
_____	_____	
Anoscopy 49.21		
_____	_____	
Arthroscopies (Arthroendoscopy) 80.20-80.29		
_____	_____	
Biliary Tract Endoscopy	51.10, 51.11, 51.64, 51.84 - 51.88, 51.98	_____
_____		
Bronchoscopy 33.21 - 33.24, 33.27		
_____	_____	

Cervical Stabilization (halo)(tongs) 02.94

Chest Tubes Bilateral, Unilateral 34.04

\*Circulatory Monitoring/Vascular Access

Arterial Catheterization 38.91

Central Venous Pressure monitoring 89.62

Pulmonary artery wedge monitoring (Swan-Ganz,  
Pulmonary capillary wedge monitoring) 89.64

Systemic arterial pressure monitoring 89.61

Central Venous catheterization, 38.93

(Peripheral IVs do not need recorded)

*\*Only required for resuscitative phase*

Colonoscopy 45.21 - 45.23, 45.25

Computerized Tomography (1 per body region)

abdominal 88.01

bone or skeleton 88.38

head and brain 87.03

kidney 87.71

thorax 87.41

CTA Head and/or Neck 87.04

CTA Thorax 87.42

Cystoscopy 57.31 - 57.33

Duodenoscopy 45.11 - 45.13

Embolization

Unspecified site 38.80

Intracranial vessels 38.81

Other vessels of head and neck 38.82

Upper limb vessels 38.83

Aorta, abdominal 38.84

Thoracic vessel 38.85

Abdominal arteries 38.86	_____	_____
Abdominal veins 38.87	_____	_____
Lower limb arteries 38.88	_____	_____
Lower limb veins 38.89	_____	_____
Endovascular occlusion of head and neck vessels (coil embolization) 39.72	_____	_____
Other Endovascular repair of other vessels (coil embolization) 39.79	_____	_____
Escharotomy (only required for burn patients at burn centers) 86.29	_____	_____
Esophagogastroduodenoscopy 45.11, 45.12, 45.13, 45.15, 45.16	_____	_____
Esophagoscopy 42.21 - 42.23	_____	_____
Exploratory Laparotomy 54.11	_____	_____
Fasciotomy (only required for burn patients at burn centers) 83.14	_____	_____
Gastroscopy 44.11 - 44.13	_____	_____
Intracranial Pressure Monitor 01.18	_____	_____
Intubation 96.04	_____	_____
Laparoscopy (abdom., celio.) 54.21	_____	_____
Magnetic Resonance Angiography (MRA) 88.97	_____	_____
Magnetic Resonance Imaging	_____	_____
Abdomen 88.97	_____	_____
Brain 88.91	_____	_____
Chest 88.92	_____	_____
Spine/spinal cord 88.93	_____	_____
Mediastinoscopy 34.22	_____	_____
Open Cardiac Massage 37.91	_____	_____
Pancreatic Endoscopy 52.13, 52.14, 52.21, 52.93, 52.94, 52.97, 52.98	_____	_____
Pericardiocentesis 37.0	_____	_____

Peritoneal Lavage (1x) 54.25

Peritoneoscopy 54.21

Proctosigmoidoscopy 45.24, 48.21 - 48.24

Resuscitation - Closed Cardiopulmonary 99.60

Subxiphoid Pericardial Window 37.12

Surgical Airways

    Cricothyroidotomy 31.1

    Mediastinal tracheostomy 31.21

    Percutaneous tracheostomy 31.12

    Permanent tracheostomy 31.29

Thoracoscopy 34.21

Thoracotomy (Exploratory) 34.02

Tracheoscopy/Laryngoscopy 31.41, 31.42

Transcatheter Embolization for gastric or duodenal bleeding 44.44

Ultrasounds

    Abdomen and retroperitoneum(use 88.79 for FAST) 88.76

    Digestive system 88.74

    Gravid uterus 88.78

    Head and neck 88.71

    Heart (echocardiogram) 88.72

    Other(multiple sites, nongravid uterus, total body)(includes FAST)88.79

    Peripheral vascular system 88.77

    Transesophageal echocardiogram (both codes must be used)  
and 42.23

Urinary system 88.75

Ureteroscopy 56.31, 56.33, 56.35

Urethroscopy 58.22

Ventilator: >6 hrs. post op 96.70 - 96.72

Ventriculostomy 02.2

Were there more than 84 procedures? \_\_\_ 1=yes; 2=no

Any patient sustaining a gunshot to the abdomen which is managed non-operatively  
1=yes; 2=no; 3=patient did not sustain a gunshot wound to the abdomen

Reintubation within 48 hours of extubation? 1=yes; 2=no; 3=patient not intubated, or  
only intubated for surgical procedure

Patients with epidural or subdural brain hematoma receiving craniotomy > 4 hours after  
arrival at ED, excluding those performed for intracranial pressure (ICP)  
monitoring (auto calc)

Interval of > 8 hours between arrival and initial treatment of blunt open tibial fracture  
(auto calc)

Did patient have a craniotomy for trauma? \_\_\_ 1=Yes; 2=No; 3=No craniotomy performed

Did the patient have an abdominal, intrathoracic, vascular, or cranial surgery?

Was abdominal surgery performed > 24 hours? 1=yes; 2=no; 3=surgery  
not required

\*\*Was abdominal surgery performed ≤ 24 hours? 1=yes; 2=no; 3=surgery  
not required

Was intrathoracic surgery performed > 24 hours? 1=yes; 2=no; 3=surgery  
not required

\*\*Was intrathoracic surgery performed ≤ 24 hours? 1=yes; 2=no;  
3=surgery not required

Was vascular surgery performed > 24 hours? 1=yes; 2=no; 3=surgery not  
required

\*\*Was vascular surgery performed ≤ 24 hours? 1=yes; 2=no; 3=surgery  
not required

Was cranial surgery performed > 24 hours? 1=yes; 2=no; 3=surgery not  
required

\*\*Was cranial surgery performed ≤ 24 hours? 1=yes; 2=no; 3=surgery not  
required

\*\* Optional

PAYOR CLASS

Payor Class: Primary \_\_\_\_\_ Secondary \_\_\_\_\_

1=Medicare Indemnity; 2=Medicare Managed Care; 3=Medicaid Indemnity; 4=Medicaid  
Managed Care; 5=Commercial Insurer Indemnity; 6=Commercial Insurer Managed Care;  
7=Other Third-party;

8=Self Pay

## APPENDIX B. IRB APPROVAL OF RESEARCH

To: GOLDBERG, AMY

TUSM:Surgery/Trauma (05302)

From: Institutional Review Board Coordinator

Date: 13-Sep-2011

Re: Exempt Request Status for IRB Protocol:

20005: Prehospital interventions as a Risk Factor for Mortality after Trauma: a State-Wide Analysis

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It has been determined by Expedited Review that this study qualifies for exemption status as follows:

45 CFR 46 Protection of Human Subjects

Section 101 (b): Unless otherwise required by department or agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:

Exemption 4: Collection or Study of Existing Data. Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subject.

Nothing further is required from you at this time; however, if anything in your research design should change, you must notify the Institutional Review Board immediately.

If you should have any questions, please feel free to contact IRB at 215-707-3390.

Thank you for keeping the IRB informed of your clinical research.