

Analysis of Outcomes: Post-operative management of truncal GSW at Level I versus Level II trauma centers

Tawnya M. Vernon BA;

Chet Morrison MD, FACS, FCCM;

Daniel Wu DO, FACS, FACOS; Alan Cook MD, FACS;

Brian Gross BS; Madison Morgan;

Frederick B. Rogers MD, FACS

Trauma and Acute Care Surgery

October 16, 2018



Penn Medicine
Lancaster General Health

Disclosure Statement

- ◆ **The authors have no conflicts of interest or sources of funding to disclose.**



Background

- ◆ **Implementation of ACS and state-wide trauma verification programs**
- ◆ **Level I vs Level II**
 - Severe TBI treated at LI had significantly higher rates of survival
 - PTOS 15% lower odds of mortality, 35% increased odds of complication
 - North Carolina study showed similar rates of mortality



Background

- ◆ **What about GSW victims?**
- ◆ **Objective: Determine if there is difference in outcomes of GSW management based on trauma center designation.**
- ◆ **Hypothesis: There would be a difference between Level I and II trauma centers with respect to mortality and complications following intervention for truncal GSW because of low volume of GSW managed at Level II centers.**

Methods

- ◆ **The Pennsylvania Trauma Outcome Study database was retrospectively queried from 2003-2015 and all adult (age ≥ 18) admitted with a firearm-related injury to an accredited Level I or II trauma center in Pennsylvania were included.**
- ◆ **Dead on arrival, transfer, and cases with a head Abbreviated Injury Scale (AIS) score ≥ 3 were excluded.**
- ◆ **The specific population of interest included all patients with truncal injuries (thorax AIS and/or abdomen AIS ≥ 3).**

Methods

- ◆ **The data points collected from the PTOS included:**
 - Patient demographics; injury classification; shock index; motor Glasgow Coma Scale [GCS]; accreditation level of the treating trauma center; length of stay; complications; any major surgery; and, discharge disposition
- ◆ **No changes or modifications in the criteria for classification of GSW, or other variables of interest, were noted over the period of the study.**

Methods

- ◆ **Patients were stratified based on the trauma center accreditation level: Level I and Level II.**
- ◆ **Univariate analysis using Kruskal-Wallis and Fischer's exact tests were performed on continuous and categorical variables, respectively.**
- ◆ **Multilevel mixed-effects logistic regression models assessed the adjusted impact of trauma center level (Level I) on overall mortality and complications.**



Results

- ◆ **385,689 adult patients presenting to Pennsylvania Level I or II 17,465 firearm-related injuries were identified.**
- ◆ **4,761 met inclusion criteria and were treated at a Level I (3,949) or a Level II (812) trauma centers.**
- ◆ **Of note, gunshot wounds to the abdomen that received non-operative management represented 1.29% at Level I and 0.62% at Level II centers of cases included in the study (p=0.094).**

Results

- ◆ **The age of both cohorts was similar ($p=0.004$); those treated at Level I centers had a mean age of 29.6 ± 12.1 years when compared to the mean age of 30.9 ± 12.2 years of those treated at Level II centers.**
- ◆ **Males represented a significantly ($p<0.001$) predominant portion of the population at both Level I (93.4%) and Level II (88.4%) centers.**

Results

- ◆ **Unadjusted mortality rate was not different between the two trauma center levels (Level I: 16.8%; Level II: 14.2%; $p=0.063$).**
- ◆ **Adjusted analysis did not reveal any significant differences between both center levels for mortality, AOR 1.113, $p=0.630$**

Results

- ◆ **The unadjusted complication rate was significantly higher at Level I centers (Level I: 35.6%; Level II: 29.4%; $p=0.001$).**
- ◆ **In adjusted analysis, there was a trend toward higher complications following surgical intervention at Level I centers, AOR 1.360, $p=0.060$, respectively.**

Results

- ◆ **Level I centers were associated with a 2.9 ($p < 0.001$) odds of post-surgical complications and 3.7 ($p < 0.001$) odds of mortality following major surgery.**
- ◆ **Level II centers were associated with a 4.1 ($p < 0.001$) odds ratio of post-surgical complications and a 39.8 ($p = 0.002$) odds ratio of mortality following major surgery.**

Results

◆ Adjusted odds ratios (AOR) for mortality and complications

Variable	Mortality		Complications	
	AOR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>
Level I	1.113 [0.721-1.717]	0.630	1.360 [0.987-1.873]	0.060
Major surgery	4.571 [2.942-7.100]	<0.001	3.094 [2.584-3.705]	<0.001
Age	1.024 [1.015-1.033]	0.019	1.017 [1.011-1.023]	<0.001
ISS	1.058 [1.049-1.067]	<0.001	1.026 [1.019-1.032]	<0.001
Motor GCS	0.673 [0.635-0.712]	<0.001	0.971 [0.925-1.019]	0.225
	AUROC: 0.863		AUROC: 0.692	
*Adjusted for male sex, shock index and injury year				

Conclusion

- ◆ **The effect of trauma center level on mortality is not significant.**
- ◆ **There is a trend toward higher odds of complication associated with level I centers potentially related to more severely injured patients being managed at these facilities.**

References

1. Kim YJ. Relationship of trauma center characteristics and patient outcomes: A systematic review. *Journal of Clinical Nursing*. 2013 Feb;23:301-314
2. DuBose JJ, Browder T, Inaba K. Effect of trauma center designation on outcome in patients with severe traumatic brain injury. *Arch Surg*. 2008 Dec;143(12):1213-1217
3. Gance LG, Osler TM, Mukamel DB, Dick AW. Impact of trauma center designation on outcomes: Is there a difference between level I and level II trauma centers? *Journal of the American College of Surgeons*. 2012 Sept;215(3):372-378.
4. Demetriades D, Martin M, Salim A, Rhee P, Brown C, Chan L. The effect of trauma center designation and trauma volume on outcome in severe specific injuries. *Ann Surg*. 2005 Oct;242(4):512-519.
5. 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). *Journal of the American College of Surgeons*. 2006 Feb;202(2):212-215.
6. Cudnik MT, Newgard CD, Sayre MR, Steinberg SM. Level I versus level II trauma centers: An outcomes-based assessment. *J Trauma Acute Care Surg*. 2009 May;66(5):1321-1326.
7. Clancy TV, Maxwell GJ, Covington DL, Brinker CC, Blackman D. A statewide analysis of level I and II trauma centers for patients with major injuries. *J Trauma Acute Care Surg*. 2001 Aug;51(2):346-351.
8. Harbrecht BG, Zenati MS, Ochoa JB, Townsend RN, Puyana JC, Wilson MA, Peitzman AB. Management of adult blunt splenic injuries: Comparison between level I and level II trauma centers. *Journal of the American College of Surgeons*. 2004 Feb;198(2):232-239
9. Feliciano DV, Burch JM, Spjut-Patrinely V, Mattox KL, Jordan GL. Abdominal gunshot wounds. An urban trauma center's experience with 300 consecutive patients. *Ann Surg*. 1988 Sept;208(3):362-370.
10. Dodge GG, Cogbill TH, Miller GJ, Landercasper J, Strutt PJ. Gunshot wounds: 10-year experience of a rural, referral trauma center. *The American Surgeon*. 1994 Jun;60(6):401-404.

