ABSTRACTS

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Paper #1
January 15, 2025
8:30 am

DOES HYPERTONIC SALINE AFTER DAMAGE CONTROL LAPAROTOMY IMPROVE PRIMARY FASCIAL CLOSURE? A MULTI-CENTER RANDOMIZED CONTROL TRIAL

Mayar A. Osman, MD, MS, Tesserae Komarek, MD, Patrick M. McCarthy, MD*, Julie Rizzo, MD, James Aden, PhD, Martin A. Schreiber, MD, FACS*, Reagan Bollig, MD*, Mark Muir, MD, Edgardo S. Salcedo, MD*, Stephen Cohn, MD*, Valerie G Sams, MD*
Brooke Army Medical Center

Presenter: Mayar A. Osman, MD, MS

Discussant: Jason W. Smith, MD, PhD, MBA – University of Louisville

Objectives: The inability to close the abdominal wall following initial damage control laparotomy (DCL) and the resultant open abdomen has led to new therapeutic challenges. Hypertonic saline (HTS) use after DCL may reduce bowel edema and resuscitation volumes, leading to improved fascial closure. Our primary objective was to determine if there was a higher rate of primary fascial closure (PFC) in DCL patients when using HTS versus normal saline resuscitation.

Methods: All consenting trauma patients requiring a DCL were randomized to receive 30 ml/hr of either 3% HTS or 0.9% normal saline for 72 hours in a multi-center, double-blinded, prospective study. Demographics, vital signs, laboratory values, surgical procedures, blood transfusions, PFC, and outcomes were compared.

Results: We enrolled 163 patients. HTS group (n=81) were similar to the normal saline group (n=82) concerning patient demographics and injury characteristics. There was no statistical difference between HTS and NS groups in mean values of Lactate (2.1 vs 2.5, p=0.134), INR (1.3 vs 1.3, p=0.424), and thromboelastography component mean values. There was no difference in crystalloid fluid administration between the two groups (6530+3700 vs 7855+4148, p=0.9804). The HTS group had a lower incidence of intra-abdominal abscesses (1.2% vs 9.8% p=0.018). Primary fascial closure was 8% and was not different between groups (7.4%HTS vs. 8.6%NS). The HTS cohort had statistically significantly more patients with hypernatremia (16% vs 4.9%, p=0.018) and hyperchloremia (8.6% vs 1.2%, p=0.027), but this did not result in a greater incidence of acute kidney injury (11.1% vs 14.6%, p=0.52).

Conclusions: We demonstrated hypertonic saline use was safe and feasible after damage control laparotomy. However, there appeared to be no benefit in this resuscitation strategy in the rate of primary fascial closure when compared to normal saline.

	Hypertonic (N=81)	Normal Saline (N=82)	p-value
Mean age in years (range)	41.2 (18-82)	39.7 (18-91)	0.8
Male Gender (n, %)	54 (67%)	58 (71%)	0.5
Median GCS (range)	12 (3-15)	11 (3-15)	0.1
Mean BMI kg/m^2 (range)	28.9 (15.03-51.16)	30.8 (18.99-52.8)	0.17
Mean ISS (range)	24 (1-57)	25 (4-57)	0.46
Mean TRISS (range)	0.799 (0.109-0.993)	0.795 (0.031-0.993)	0.84
Mean RTS (range)	6.739 (2.198-7.841)	6.32 (2.628-7.841)	0.34
Moderate - Severe TBI (%)	8 (9.9%)	5 (6.1%)	0.36
Mechanism of Injury Penetrating (%) Blunt (%)	 34 (42.0%) 46 (56.8%)	 27 (32.9%) 53 (64.6%)	0.23

GCS: Glascow Coma Scale, BMI: Body Mass Index, ISS: Injury Severity Score, TRISS: Trauma Score and Injury Severity Score, RTS: Revised Trauma Score, TBI: Traumatic Brain Injury

Table 1: Demographics by fluid type

	Hypertonic (n = 81)	Normal Saline (n = 82)	p-value
Primary Fascial Closure Achieved (n, %)	75 (92.6%)	75 (91.5%)	0.9
Mean hours to PFC (range)	37.47 (6-323)	34.8 (8-120)	0.61
Number of OR trips	2.38 (2-6)	2.88 (2-13)	0.048
Median Hospital Days	12 [8,23]	17 [9,26]	0.1
Hyperchloremia (n, %)	7 (8.6%)	1 (1.2%)	0.027
Hypernatremia (n, %)	13 (16%)	4 (4.9%)	0.018
VAP (n, %)	5 (6.2%)	6 (7.3%)	0.78
Fascial Dehiscence (n, %)	2 (2.5%)	7 (8.5%)	0.09
Surgical Site Infection (n, %)	3 (3.7%)	6 (7.3%)	0.32
Intra-abdominal abscess (n, %)	1 (1.2%)	8 (9.8%)	0.018
Enterocutaneous Fistula (n, %)	1 (1.2%)	3 (3.7%)	0.32
AKI (n, %)	9 (11.1%)	12 (14.6%)	0.52
Abdominal Compartment Syndrome (n, %)	4 (4.9%)	4 (4.9%)	0.97
Acute Respiratory Distress Syndrome (Moderate-Severe, P:F<200) (n, %)	27 (34.6%)	34 (43%)	0.28
Mortality	7 (8.6%)	13 (15.9%)	0.16

PFC: Primary Fascial Closure, VAP: Ventilator-associated pneumonia, AKI: Acute Kidney Injury

Table 2: Outcomes by fluid type

Paper #2
January 15, 2025
8:50 am

HEALTHCARE UTILIZATION AFTER OPERATIVE VS. NON-OPERATIVE APPENDICITIS MANAGEMENT

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Presenter: Pawan Mathew, MD

Discussant: Oliver Gunter, Jr., MD – Vanderbilt University Medical Center

Objectives: Use of non-operative management for uncomplicated appendicitis is increasing. Recurrent appendicitis is only one measure of successful non-operative management. We examined healthcare utilization and exposure to medical imaging between patients post-appendectomy and those with an in-situ appendix over the year after initial diagnosis.

Methods: Using MarketScan, an all-payers claims database, we extracted patients presenting to the emergency department (ED) with acute appendicitis and without perforation from 2017-2021, and either underwent appendectomy during index presentation or non-operative treatment. We examined differences in abdominal pain related healthcare utilization within one-year including ED visits, hospitalizations, and abdominal CT scans associated with the most common causes of ED presentation for abdominal pain.

Results: Of 26,588 patients presenting with uncomplicated appendicitis, 50.4% female, mean age 37.9 (SD=15.3), mean Elixhauser comorbidity index (ECI) 0.8 (SD=1.2), 24,102 (90.6%) underwent appendectomy (Table 1). At one year, 2,544 (9.6%) re-presented to the ED with an abdominal pain and/or appendicitis related diagnosis. Of non-operatively managed patients, 78 (3.1%) underwent appendectomy for recurrent appendicitis at a median of 70 days and 396 (15.9%) re-presented to the ED but did not undergo appendectomy. ED visits, subsequent hospitalization, and abdominal CT scans were more common in the non-operative group (Table 1). After adjusting for patient sex, age, and ECI, patients managed non-operatively were approximately twice as likely (RR=2.10 [1.90-2.31]) to re-present to the ED, be hospitalized (RR=2.32 [1.94-2.76]) or undergo a CT scan (RR=1.87 [1.68-2.08]) within one-year (Table 2).

Conclusions: After adjusting for baseline characteristics, non-operative management of uncomplicated appendicitis was associated with re-presentation to the ED, rehospitalization and repeat CT imaging.

	Non-operative management	Operative management	Total
All patients n (%)	2,486 (9.4)	24,102 (90.6)	26,588 (100)
Female	1,467 (59)*	11,940 (49.5)	13,407 (50.4)
Mean age (SD)	38.3 (16.6)	37.9 (15.2)	37.9 (15.3)
Mean ECI (SD)	1.0 (1.5)*	0.8 (1.2)	0.8 (1.2)
One year follow up:			
ED visit	474 (19.1)*	2,070 (8.6)	2,544 (9.6)
Hospitalization	170 (6.8)*	693 (2.9)	863 (3.2)
Abdominal CT scan	388 (15.6)*	1,926 (8.0)	2,314 (8.7)
Appendectomy	78 (3.1)		

Table 1: Patient characteristics and one-year healthcare utilization among patients with first diagnosis of appendicitis, by initial operative management. *p<0.001

Risk factors	**Follow-up ED Visit Relative Risk [95% CI]**	**Follow-up Hospitalization Relative Risk [95% CI]**	**Follow-up CT scan Relative Risk [95% CI]**
Non-operative Management	2.10 [1.90, 2.31]*	2.32 [1.94, 2.76]*	1.87 [1.68, 2.08]*
Sex (Female)	1.45 [1.34, 1.58]*	1.14 [0.98, 1.32]	1.40 [1.28, 1.53]*
Age at index appendicitis diagnosis			
16-24	Reference	Reference	Reference
25-39	0.81 [0.73, 0.90]*	1.03 [0.83, 1.29]	1.10 [0.97, 1.24]
40-64	0.61 [0.56, 0.68]*	1.19 [0.97, 1.44]	1.11 [0.99, 1.24]
65+	0.52 [0.40, 0.67]*	1.44 [1.01, 2.05]*	1.06 [0.84, 1.34]
Elixhauser Comorbidity Index			
0	Reference	Reference	Reference
1	1.26 [1.14, 1.39]*	1.18 [0.98, 1.42]	1.32 [1.19, 1.47]*
2	1.52 [1.34, 1.73]*	1.43 [1.13, 1.81]*	1.64 [1.45, 1.87]*
3+	1.91 [1.67, 2.18]*	2.19 [1.76, 2.72]*	1.81 [1.58, 2.07]*

Table 2: Risk of one-year follow-up ED visits, hospitalizations, and CT scans for appendicitis/abdominal pain after incident appendicitis, comparing operative and non-operative management and adjusting for age, sex and comorbidity. CI – confidence interval, * p<0.05

Paper #3
January 15, 2025
9:10 am

SOCIAL VULNERABILITY AFFECTS THE BIOLOGIC RESPONSE TO INJURY

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Benjamin J Ramser, MD, Otto N. Thielen, MD, William Hallas, MD,
Sanchayita Sen, MS, Denise Garofalo, MD*, Quintin Myers, PhD,
Catherine G. Velopulos, MD, MHS, FACS*, Mitchell Cohen, MD, FACS*
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Presenter: Lauren T. Gallagher, MD

Discussant: Carrie Sims, MD

Objectives: Social determinants of health including individual characteristics and environment, contribute to trauma morbidity. The Centers for Disease Control and Prevention's Social Vulnerability Index (SVI) consists of 16 variables that examine the intersection of social and economic factors. While SVI is linked to increased trauma mortality, its effect on post-trauma biology and injury-related metabolic changes is unknown. We explored the influence of SVI on the metabolic response to trauma in severely injured patients.

Methods: Prospectively enrolled patients meeting criteria for highest level activation at a Level 1 trauma center were assigned SVI based on residential address and grouped into low SVI(<75 %ile) and high SVI(>75 %ile) cohorts. Multiple regression adjusted omics data for injury severity and base excess between high and low SVI. Metabolomic analyses were performed using liquid chromatography-mass spectrometry. MetaboAnalyst was used for analyses of omics data using univariate non-parametric comparisons.

Results: 74 patients classified as High Injury/High Shock were included (44 [59%] low SVI, 30 [41%] high SVI). High SVI was associated with a metabolomic signature of chronic stress response including amino acid metabolism and aberrant mitochondrial function (Figure 1) compared to those with low SVI**.** Pathway analyses revealed altered metabolomic expression in high SVI patients; particularly, in the utilization of amino acids, oxidative stress, and catecholamine synthesis (Figure 2).

Conclusions: Social vulnerability primes multiple regulatory systems in response to chronic social and environmental stress which in turn are affected by trauma. This pre-existing stress exposure leads to cellular reprogramming influencing the maladaptive response in trauma patients. Our data highlight the role of SVI on the biologic response to injury and reveal a previously undescribed interplay between social factors and biologic response to trauma.

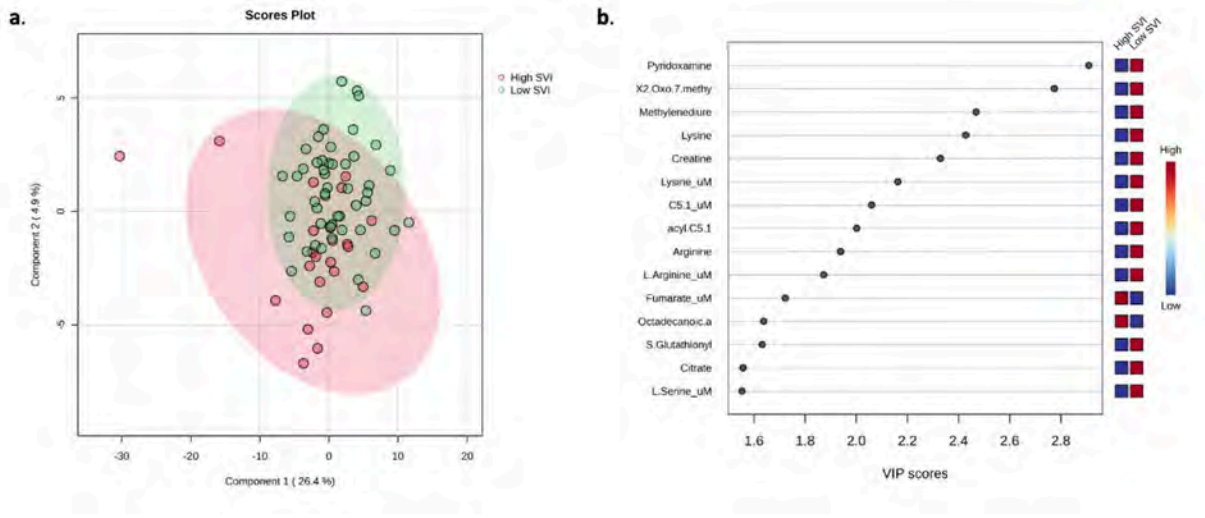

Figure 1: PLS-DA and VIP plots demonstrating a unique omic signature of High SVI in trauma, independent of injury severity, shock, sex, and ethnicity. PLDS-DA (a) and corresponding VIP plots (b) are displayed. VIP plots display the top differentiators, as indicated by VIP scores, with relative abundances for low SVI and high SVI patients indicated by the colored boxes on the right of the plots.

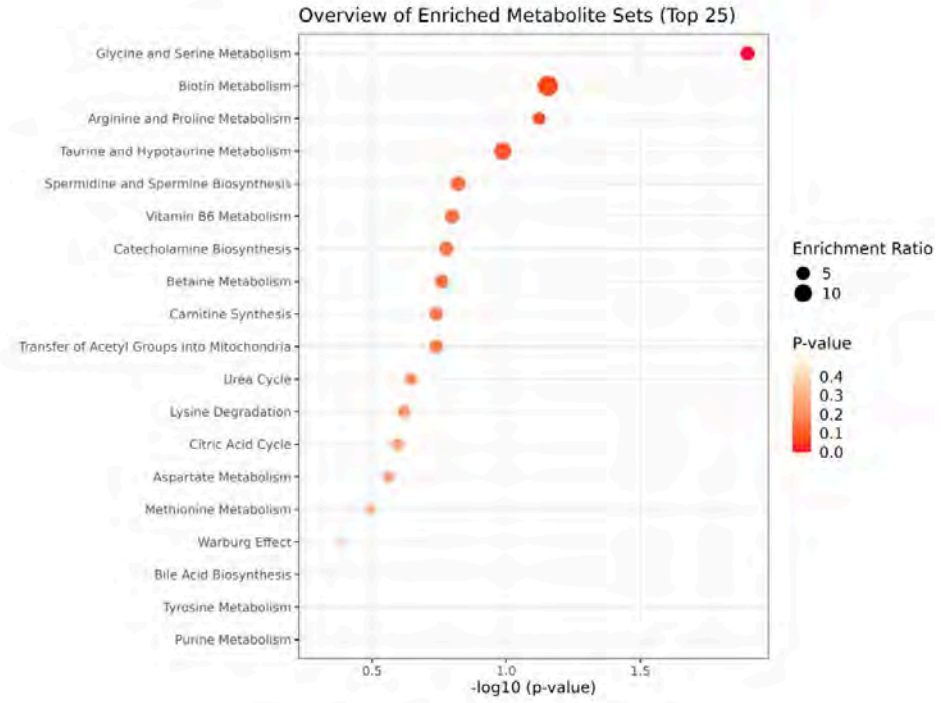

Figure 2: High injury and high shock group summary of metabolic pathways enrichment analysis performed in MetaboAnalyst (Version 3.0, URL: http://www.metaboanalyst.ca) using top 25 metabolites found to be significantly altered in high SVI patients compared to low SVI patients.

Paper #4
January 15, 2025
9:30 am

TBI-ASSOCIATED ACUTE LUNG INJURY IS DRIVEN BY MIRNA-362

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Presenter: William Johnston, MD

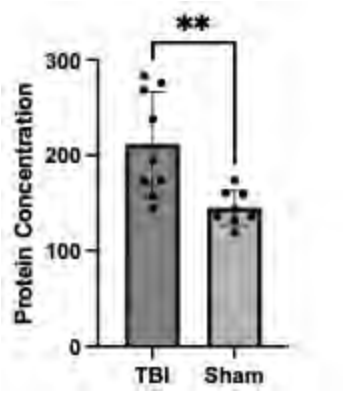
Discussant: Yann-Leei Lee, MD – University of South Alabama School of Medicine

Objectives: Traumatic Brain Injuries (TBI) are a common cause of morbidity and mortality after major trauma. In addition to local injury effects, TBI is associated with a systemic inflammatory response and acute lung injury (ALI), which increases mortality and worsens neurologic outcomes. The exact mechanism of this acute lung injury is not known. Extracellular vesicles (EV's) are small cell-derived particles involved in cell-cell communication that carry a wide variety of payloads, including proteins and microRNAs (miRNAs), which can mediate inflammation. We sought to characterize EV-derived miRNAs associated with TBI-induced ALI.

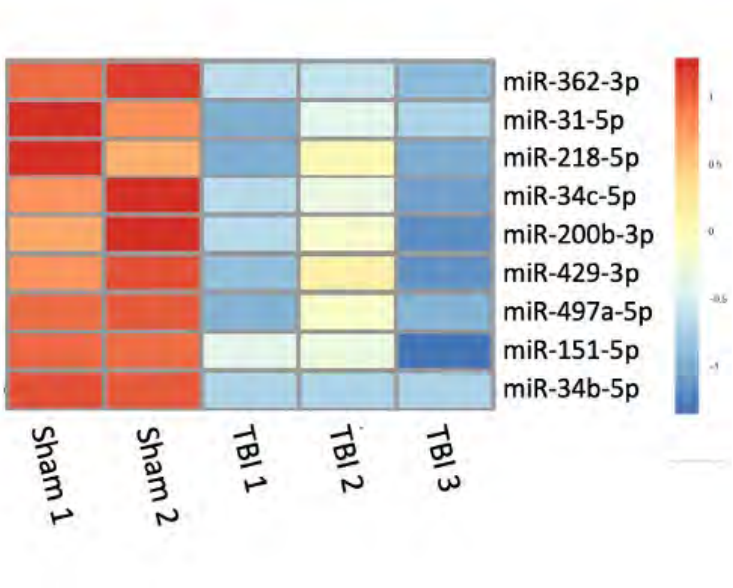
Methods: C57 mice underwent controlled cortical impact as a TBI injury model or sham procedure (anesthesia only). Bronchoalveolar lavage fluid (BALF) was then collected 4 hours post injury. BALF protein concentration was used as a marker of acute lung injury and measured using Pierce BCA assay. Results were compared using a Student's T-test. BALF EV's were isolated using size exclusion chromatography (SEC), and EV concentration confirmed via vesicle flow cytometry. EV miRNA sequencing was performed, comparing sham and injured mice.

Results: Total protein concentration was increased in BALF in injured mice ($p=0.006$, see figure 1), confirming lung injury after TBI. EV's were isolated using SEC and verified with vesicle flow cytometry. miRNA sequencing of BALF EV's demonstrated downregulation of 17 different miRNA's, most notably miRNA-362 (see figure 2).

Conclusions: We successfully identified multiple downregulated miRNA's from BALF in an in vivo model of TBI-induced ALI. Of these, downregulation of miRNA-362 has previously been associated with a pro-inflammatory phenotype, and was the most strongly affected by TBI, suggesting that miRNA-362 plays a critical role in the pathophysiology of TBI-induced ALI.



C57 mice have increased protein concentration in BALF after TBI compared to sham animals, p=0.06.



MiRNA heat map data comparing BALF from sham animals and injured animals. Numerous miRNA's are down regulated after TBI.

Paper #5
January 15, 2025
10:30 am

TOO QUICK TO CUT? CRITICAL OUTCOMES, RESOURCE UTILIZATION, AND ETHICAL PERSPECTIVES WITH A LIBERAL APPROACH TO EMERGENCY DEPARTMENT THORACOTOMY

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Presenter: Danielle Brabender, MD

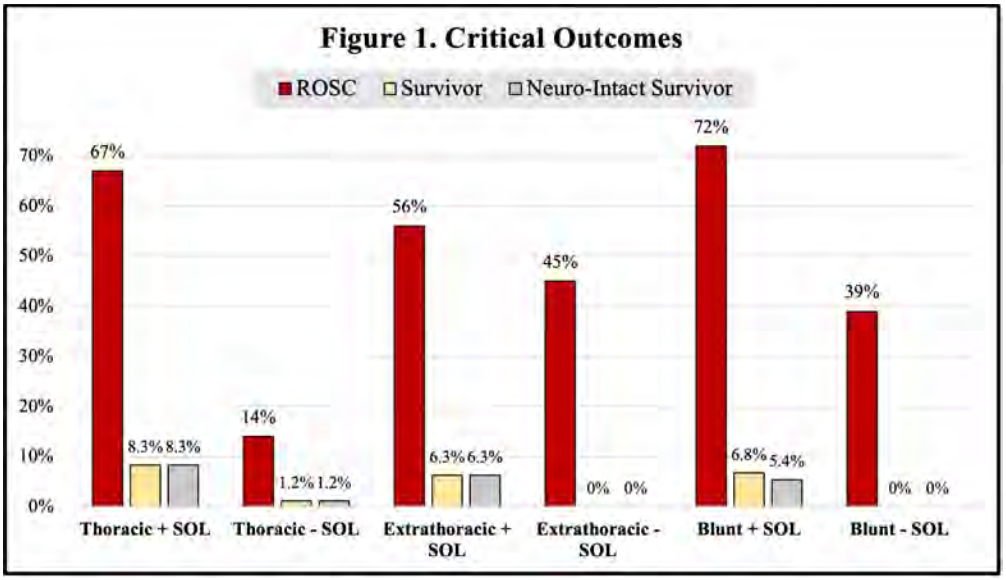
Discussant: Elliott Haut, MD, PhD – The Johns Hopkins Hospital

Objectives: Recent guidelines for Emergency Department Thoracotomy (EDT) recommend against liberal utilization based on survival rates and resource utilization. Proponents of liberal EDT cite other considerations including training, moral necessity, and organ donation. We aimed to analyze these factors at a center under a liberal EDT policy.

Methods: Mixed-methods study including an 8 year retrospective review and a provider survey evaluating ethical opinions and adverse events. Outcomes included survival, return of spontaneous circulation (ROSC), neurologically-intact survival (NIS), blood product use, and organ referral and donation. Patients were categorized into six groups by injury mechanism, location and signs of life (SOL), as in the EAST guidelines.

Results: 428 patients underwent EDT, with 39% suffering penetrating injuries (PEN). Analysis was performed based on the six groups (Figure 1). 79% of patients had an organ referral, with only 4 (1%) going on to donation. All donors sustained blunt injury, of which 3 were without SOL (Figure 2). Blood product usage across the groups varied significantly ($p<0.01$), with PEN thoracic and blunt with SOL having the highest utilization. Survey results showed that 46% of providers agreed with EDT to facilitate donation, 29% agreed for teaching, and 67% disagreed for blunt without SOL. 17% reported at least one occupational exposure, with 50% requiring post-exposure prophylaxis.

Conclusions: A liberal EDT policy results in significant resource utilization, but high rates of ROSC. NIS rate is low, particularly when no SOL are present, but salvage for organ donation was seen even in blunt mechanism without SOL. Providers had low support for EDT for teaching and blunt trauma without SOL, but nearly half support it for donor salvage. Future guidance is needed to clarify the ethics and cost/benefit considering these indications.



Analysis of the critical outcomes was performed based on the six EAST groups: PEN thoracic with SOL (ROSC 67%, survival/NIS 8.3%) and without (ROSC 14%, survival/NIS 1.2%), PEN extra-thoracic with SOL (ROSC 56%, survival/NIS 6.3%) and without (ROSC 45%, survival/NIS 0%), and blunt with SOL (ROSC 72%, survival 6.8%, NIS 5.4%) and without (ROSC 39%, survival/NIS 0%).

Figure 2: Organ Donation

EAST CATEGORY	BLUNT		PENETRATING THORAX		PENETRATING EXTRA-THORACIC	
	+ SOL	- SOL	+ SOL	- SOL	+ SOL	- SOL
Organ Referral	57 (77%)	147 (79%)	10 (83.3%)	66 (75.9%)	13 (81.3%)	43 (81.1%)
Organ Donor	1 (1.1%)	3 (2.7%)	0 (0%)	0 (0%)	0 (0%)	0 (%)
Organs Donated	2	11				
Kidneys	1	3				
Heart		2				
Liver	1	3				
Lung		2				
Pancreas		1				

Organ referral occurred for 79% of patients, with only 4 (1%) going on to organ donation (13 organs total). All donors sustained blunt injury, of which 3 were without signs of life.

Paper #6
January 15, 2025
10:50 am

PLATFORM ASSESSMENT OF THROMBIN GENERATION TO PREDICT VENOUS THROMBOEMBOLISM EARLY AFTER TRAUMATIC INJURY

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Presenter: Sergio M. Navarro, MD, MBA

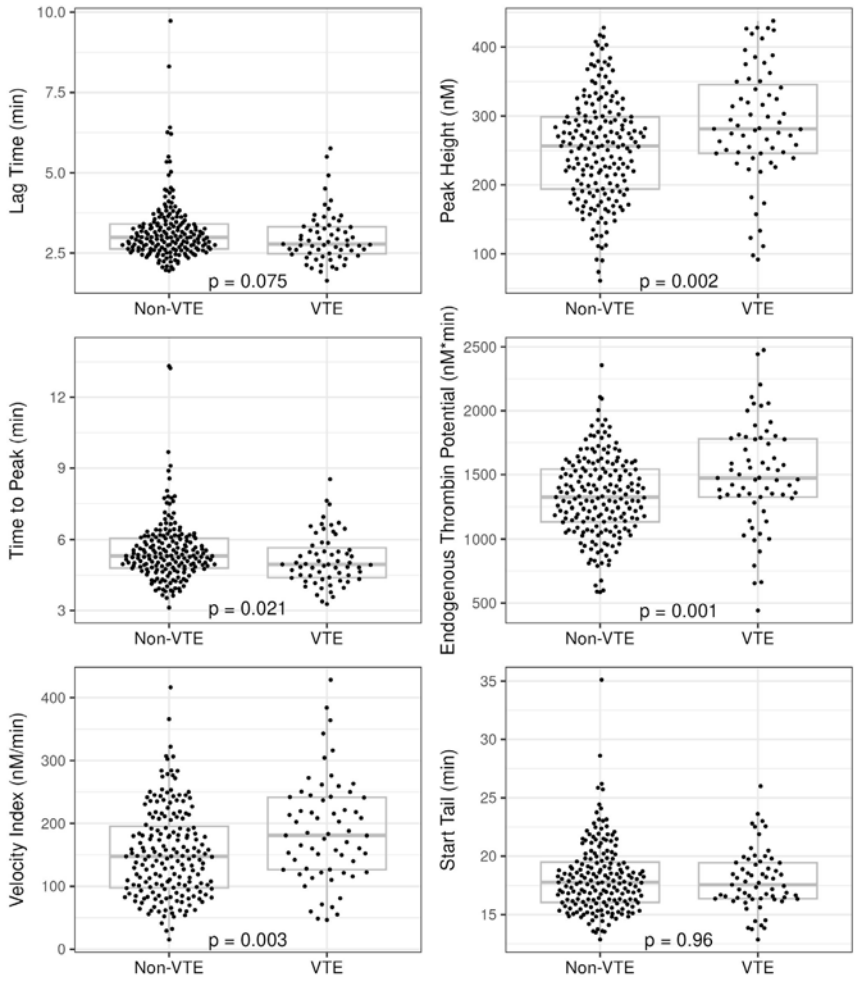
Discussant: Mitchell Cohen, MD – University of Colorado School of Medicine

Objectives: Calibrated automated thrombography (CAT) assay parameters can independently predict symptomatic venous thromboembolism (VTE) up to 90 days post-injury. Yet, CAT lacks high throughput and standardization, limiting diagnostic potential. This study analyzed thrombin generation profiles in trauma patients using ST Genesia (Diagnostica STAGO SAS), processing up to 10 samples at once. We hypothesized that trauma patients (pts) who developed VTE would show accelerated thrombin generation profiles compared to those who did not.

Methods: Trauma pts presenting to a Level I Trauma Center (2019-23) had samples collected within 12 hours of time of injury prospectively. Follow up was conducted to 90 days, time to symptomatic VTE diagnosis or death, confirmed via autopsy or imaging. Thrombin generation profiles were measured from the ST Genesia assay. Data presented as median [IQR] or n (%), with Wilcoxon Rank-Sum or chi-squared test performed between trauma pts who developed sympomatic VTE vs those who did not.

Results: A total of 258 trauma pts were analyzed (48.5 years [31.0, 62.0], 72.0% male): 63 pts with VTE (24.4%) to 191 with non-VTE. VTE pts had a median time to VTE of 8 days, with 28 developing deep venous thrombosis (DVT), 24 with pulmonary embolism (PE), and 11 with DVT/PEs. No significant differences were found in age, sex, or Body Mass Index (BMI); significantly more VTE pts underwent surgery within 24 hours. Thrombin generation profiles were accelerated in pts developing VTE compared to non-VTE, with significant differences in Peak Height (p=0.002), Time to Peak (p=0.021), Endogenous Thrombin Potential (p=0.001) and Velocity Index (p=0.003). However, LagTime and StartTail were not significantly different (Figure 1).

Conclusions: Thrombin generation profiles using ST Genesia can differentiate trauma pts at high risk of developing VTE. The platform suits clinical labs needing high throughput.



Characteristics of thrombin generation profiles in VTE patients compared to non-VTE patients

Paper #7
January 15, 2025
11:10 am

RURAL FACIAL TRAUMA: OPPORTUNITIES FOR TELECONSULTATION TRIAGE

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Gregory P. Schaefer, DO, FACS*, James M. Bardes, MD*
West Virginia University

Presenter: Connor P. Mamikunian, MD

Discussant: Alexandra Briggs, MD – Dartmouth Hitchcock Medical Center

Objectives: Maxillofacial trauma encompasses a spectrum of injuries, from minor facial fractures to severe craniofacial defects, some requiring urgent surgical intervention while others are managed non-operatively. Telehealth evaluation of patients by facial trauma specialists before transfer provides an opportunity to identify cases suitable for outpatient management, potentially reducing the number of non-emergent transfers and costs.

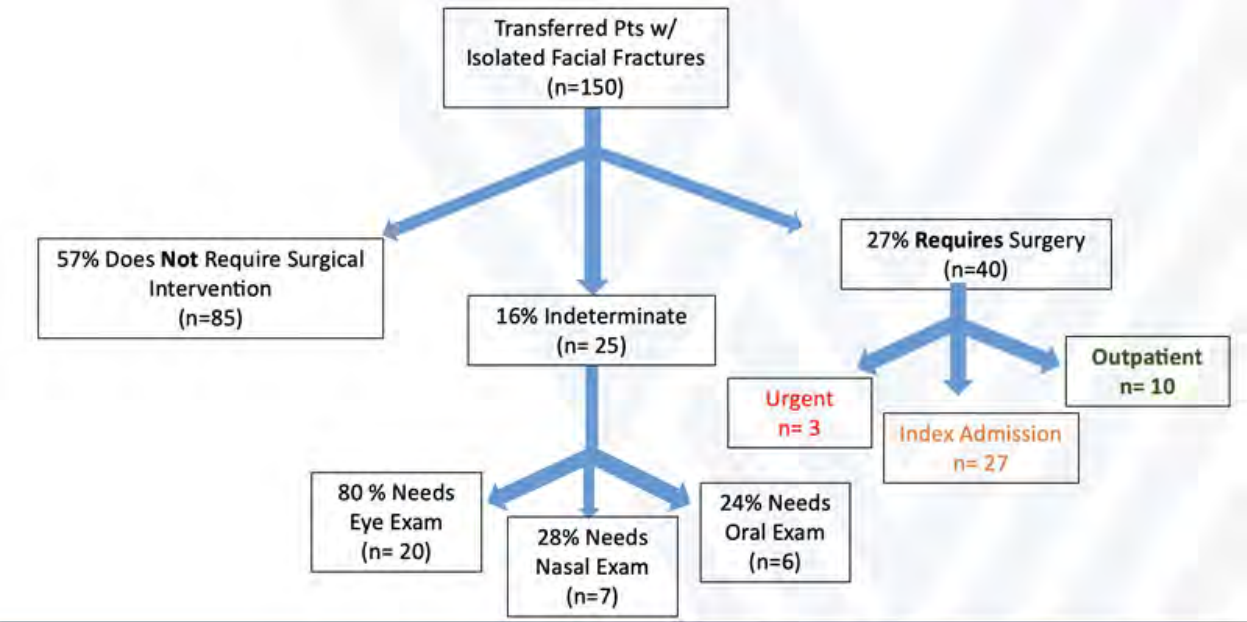
Methods: Our institution's trauma registry was queried for adult patients transferred from a system hospital with facial injuries. A random selection of 150 patients with imaging available for review from the transferring facility was selected. ENT facial trauma surgeons then reviewed charts and CT images to determine the need for surgery, the timing of surgery, and additional clinical information needed to make this determination.

Results: The mean age was 50, with a median AIS of 2. Based on CT imaging, 27% would require surgery, 57% did not require surgery, and 16% were indeterminate and required additional clinical information. Of those who were indeterminant, 80% required an eye exam, 24% required an oral exam, and 28% required a nasal exam.

Of those requiring surgery, only 7% had urgent indications in less than 24 hours. Surgery during the same admission was appropriate for 68% of patients, and 25% of patients would have been suitable for outpatient surgery.

Our ENT surgery reviewers proved to have 100% accuracy in determining whether the patient was nonoperative based on CT imaging alone (n=85).

Conclusions: This study demonstrates that most transfers for facial fractures are low-grade and non-operative. Reliable exams and remote telehealth evaluation of patients with facial fractures could significantly decrease the burden of unindicated transfers. Future aims would be to initiate a pilot study with a partner institution further to understand such a program's applications and limitations.


Transferred Pts w/ Isolated Facial Fractures (n=150)
57% Does **Not** Require Surgical Intervention (n=85)
16% Indeterminate (n= 25)
27% **Requires** Surgery (n=40)
Outpatient n= 10
Urgent n= 3
Index Admission n= 27
80 % Needs Eye Exam (n= 20)
28% Needs Nasal Exam (n=7)
24% Needs Oral Exam (n=6)

Paper #8
January 15, 2025
11:30 am

SEMIAUTONOMOUS VENTILATION IN A PORCINE HEMORRHAGE AND LUNG INJURY MODEL PROVIDES LUNG PROTECTIVE VENTILATION

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University of Cincinnati

Presenter: Ellen R. Becker, MD

Discussant: Alison Wilson, MD – West Virginia University

Objectives: Mechanical ventilation requires frequent reassessment from providers to ensure delivery of lung protective ventilation (LPV). However, in resource limited settings, the time and attention LPV requires is not always feasible. This study aimed to compare a physiologic closed-loop control (PCLC) ventilator capable of self-adjusting based on patient parameters against standard of care (SOC) ventilatory management in a porcine model.

Methods: The study compared SOC (n=15) to PCLC (n=15) for three porcine injury models: hemorrhage (HEM), lung injury (LI), and hemorrhage plus lung injury (HEM+LI). HEM animals were progressively bled to three mean arterial pressures (MAP=60, 50, then 40 mmHg) for 60 minutes each. LI used saline surfactant washout to a targeted PO_2:FiO_2 ratio <200. HEM+LI combined surfactant washout followed by hemorrhage. LPV success was defined by the percent of time spent within target values: oxygenation (SpO_2>92% or FIO_2=100%), tidal volume (6<Vt/kg<12 ml/kg), and plateau pressure (Pplat<30 cmH_2O).

Results: PCLC animals spent a greater percentage of time within targeted SpO_2 (98+2%) compared to SOC (94+4%, p<0.001) across all injury models (Figure 1). PCLC and SOC had similar tidal volumes (9.2±1.8 vs 9.9±0.1 ml/kg, p=0.12), minute volumes (228±63 vs 218±33 ml/min/kg, p=0.47), $EtCO_2$ (45.4±8.4 vs 40.7±6.8 mmHg, p=0.09), and Pplat (98±1 vs 93±20 % of time in target, p=0.26) in all injury models. In both PCLC and SOC, HEM required a lower FiO_2 (29±4%) compared to LI and HEM+LI (75±17%, 62±17%, p<0.001), while PEEP was higher in LI (9.3±2.9 cmH_2O) compared to HEM and HEM+LI (5.0±0.0, 5.5±1.0 cmH_2O, p<0.001) (Figure 2).

Conclusions: PCLC successfully delivered semiautonomous LPV to a similar degree as SOC during both LI and HEM. PCLC has potential to provide ICU-level ventilator management in resource limited circumstances, both in civilian and military operations.

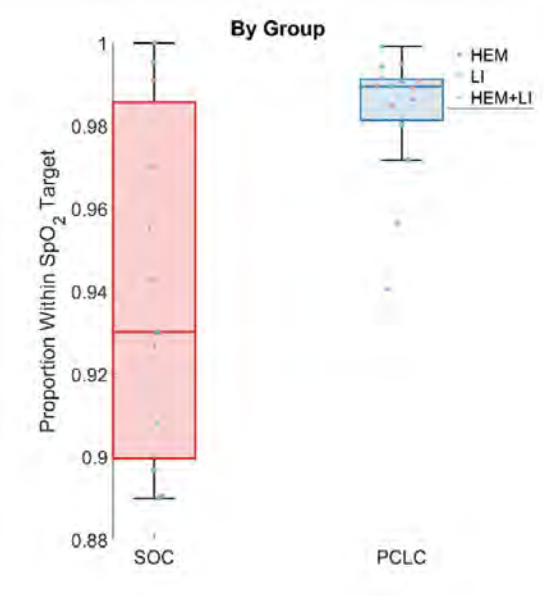


Figure 1. Proportion of time within targeted oxygen saturation by standard of care (SOC) and physiologic closed-loop control (PCLC). Markers represent means for each animal. Box plots show median, 25th and 75th percentile, and data extremes.

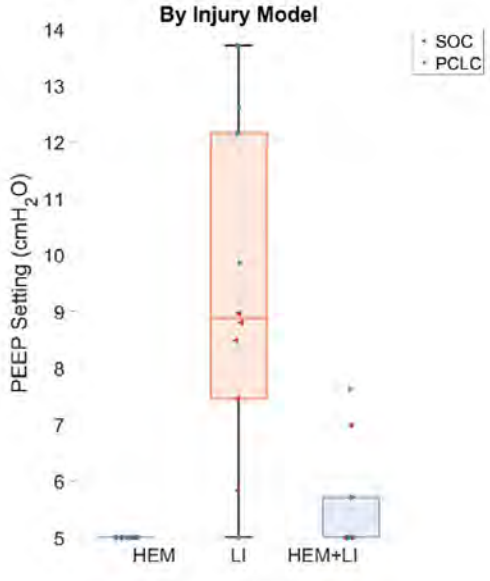


Figure 2. Mean positive end-expiratory pressure (PEEP) by hemorrhage (HEM), lung injury (LI) and hemorrhage with lung injury (HEM+LI) models. Markers represent means for each animal. Box plots show median, 25th and 75th percentile, and data extremes.

Paper #9
January 16, 2025
11:15 am

THE INTERSECTION BETWEEN FIREARM INJURY PREVENTION AND SURGICAL PRACTICE: A QUALITATIVE STUDY

Shelbie D Waddle, DO, MS, Arielle Thomas, MD, MPH, MS, Marian E. Betz, MD, MPH, Julie K. Johnson, PhD, MSPH, Regina Royan, MD, MPH, Alexander Ellyin, MPH, Ana M Reyes, MD, MPH*, Angie Jang, BS, Marie L. Crandall, MD, MPH, FACS*, Anne Stey, MD, MSc*, Brendan T. Campbell, MD, MPH*
Northwestern University

Presenter: Shelbie D Waddle, DO, MS

Discussant: Sigrid Burruss, MD – University of California Irvine

Objectives: Previous work has demonstrated that counseling trauma patients on firearm safety is reportedly difficult for US surgeons to effectively incorporate into clinical practice. The objective of this study was to understand firearm-owning surgeons' perceptions of barriers to incorporating firearm injury prevention in their clinical practice.

Methods: We conducted semi-structured interviews with firearm-owning surgeons who are fellows of the American College of Surgeons (ACS) and treat patients with firearm injuries. Participants were recruited through the ACS Committee on Trauma email listserv with subsequent snowball sampling of additional participants. Inductive and deductive reasoning, based on the Theory of Planned Behavior, was applied to the transcript data to code and identify dominant themes and subthemes.

Results: Thirty-two surgeons were virtually interviewed from April to August 2022. Most interviewees believed surgeons had a role in preventing firearm injuries. Many expressed concerns that these discussions may adversely affect the doctor-patient relationship. Dominant barriers to firearm safety discussions included; 1) surgeon concerns over patient receptivity (including timing and content of discussions) 2) the influence of the patient's injury intent (e.g., assault, unintentional, self-inflicted) on the surgeon's likelihood of discussion, and 3) limited resources (e.g., perceived lack of training, and few patient resources).

Conclusions: We identified that most surgeons believed that they should have a role in firearm injury prevention, but many expressed concerns that direct discussions may adversely impact the doctor-patient relationship.

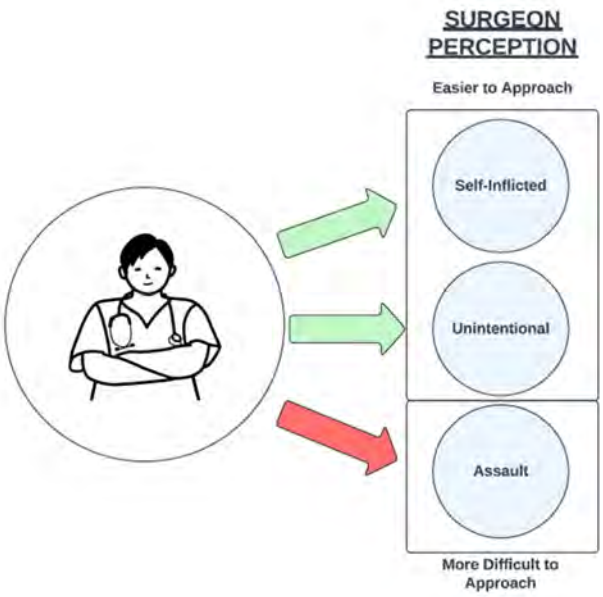


Figure 1. Relationship of Injury Intent and Surgeon Perception of Patient Receptivity to Firearm Safety Discussions

Paper #10
January 16, 2025
11:30 am

PREPARING HEALTHCARE STUDENTS AS COMMUNITY TRAUMA ADVOCATES THROUGH A NOVEL INTERPROFESSIONAL COURSE IN INJURY PREVENTION AND EMERGENCY PREPAREDNESS

Michael S. Rallo, PhD, Rachel Cary, BS, Jennifer Geller, MD*,
Rachel L. Choron, MD, FACS*, Clifton Lacy, MD, Amanda Teichman, MD, FACS*
Rutgers Robert Wood Johnson Medical School

Presenter: Michael S. Rallo, PhD

Discussant: Danby Kang, MD – Boston Medical Center

Objectives: Prevention and rapid intervention are critical links in the trauma chain of survival. Healthcare Students (HCSs) are a unique population who can augment community safety and preparedness with appropriate training. To prepare students as community trauma advocates, we piloted an interprofessional course introducing key concepts in injury prevention (IP), and trauma care and response.

Methods: This extracurricular course consisted of (5) 90-minute sessions which familiarized students with strategies for community engagement, IP, interprofessional trauma care, and STOP THE BLEED (STB). Students' knowledge, attitudes, and perceptions regarding these roles were compared via matched pre- and post-course surveys.

Results: Fifty-six HCSs completed the course and surveys. The majority of students were willing to assist their community in response to an emergency (N=50; 89.3%), but few felt prepared with the knowledge and skills to meaningfully do so (N=8; 14.3%). Following the course, HSCs felt increasingly prepared (N=48; 85.7%; $p<0.001$) and willing (N=55; 98.2%; $p=0.008$) to be called upon by their community. Moreover, there was a significant increase in the number interested in pursuing a career related to trauma, emergency, and/or disaster medicine (71.4% vs. 57.1%; $p=0.018$). As newly trained STB instructors, HCSs have taught over 20 courses in the community.

Conclusions: While HCSs are interested and willing to act as community advocates or responders during an emergency, the standard educational curriculum generally fails to prepare them to effectively contribute in these roles. This study demonstrates the effectiveness of a novel extracurricular elective in teaching interested students' foundational knowledge and skills, thus increasing their confidence in meaningfully preparing for and assisting in community injury prevention, preparedness and response.

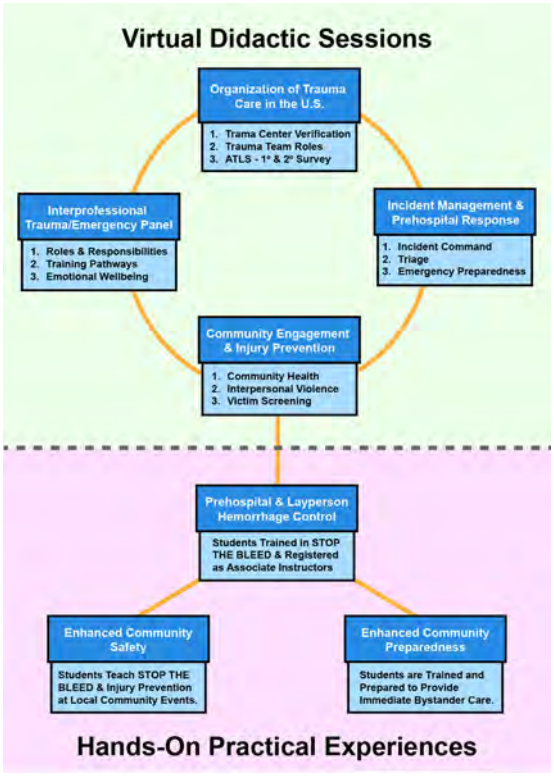


Figure 1: Structure of the Trauma, Emergency and Disaster Response Extracurricular Elective and Impact of Students as Community Trauma Advocates.

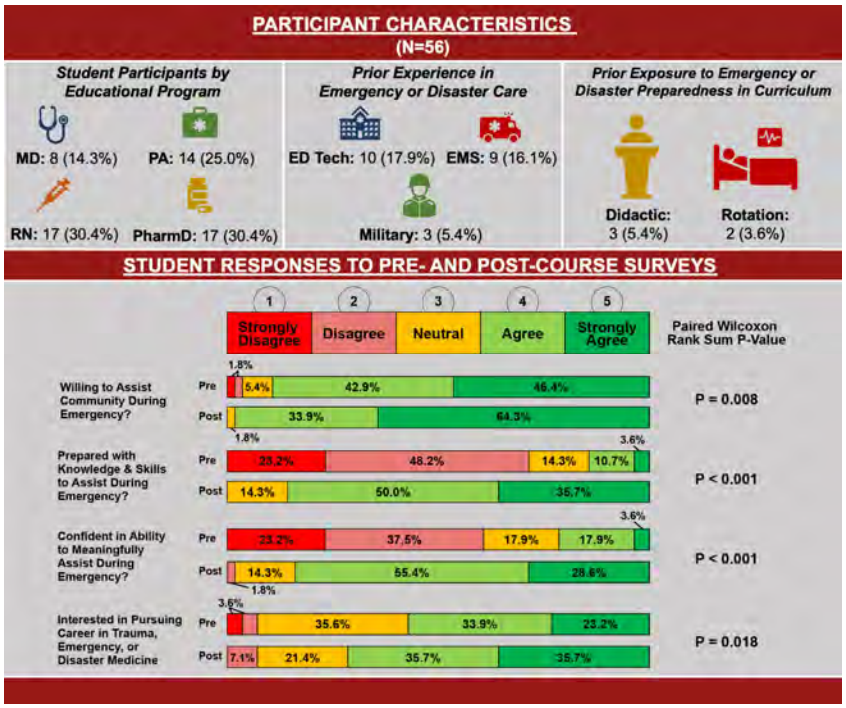


Figure 2: Summary of Key Results Including Participant Characteristics and Comparison of Student Knowledge and Perceptions Prior to and Following the Course.

Paper #11
January 16, 2025
11:45 am

ILLINOIS COMMUNITY HEALTH NEEDS ASSESSMENTS: DISPARITIES IN PRIORITIZING FIREARM VIOLENCE PREVENTION

Rolando J. Casas Fuentes, Shelbie D Waddle, DO, MS, Rochelle Dicker, MD, FACS, Brendan T. Campbell, MD, MPH*, Leah C. Tatebe, MD, FACS*
Northwestern University

Presenter: Rolando J. Casas Fuentes

Discussant: Dane Scantling, DO, MPH – Boston University School of Medicine

Objectives: We sought to determine if hospitals in counties with high rates of firearm-related violence identified violence prevention in their Community Health Needs Assessments (CHNA) and if trauma center designation influenced this prioritization.

Methods: We performed a cross-sectional review of all publicly available CHNAs for hospitals within 13 Illinois counties from 2021-2023. These counties represented the top quartile ratio of age-adjusted firearm-to-all-mechanism homicide rates. Five-year homicide rates were obtained from CDC WISQARS' Health Equity Data for Illinois from 2017-2021. Descriptive statistics were used to compare violence prevention priorities of CHNA hospitals and by whether the hospital was a designated trauma center.

Results: Of 67 hospitals identified, 27 (40%) were trauma centers. Trauma centers were not more likely to identify violence as a community problem as compared to non-trauma centers (70.3% vs. 57.5%, p=0.29). The majority of hospitals identified violence as a hospital priority using a combination of epidemiologic data, community feedback, and stakeholder priorities (n=60, 94%). Among those hospitals that obtained community feedback, all used a combination of focus groups, surveys, and interviews to gather these data. Despite this, only 12 hospitals (18%) outlined a CHNA plan to address community violence through social determinants of health-based interventions and only 8 hospitals (11.9%) outlined a CHNA plan specific to community violence prevention.

Conclusions: While nearly all hospitals examined listed community violence as a problem in their CHNAs, precious few had a written plan to address community violence. There is a significant gap between recognizing the scope of firearm-related violence and identifying specific interventions. There remains the opportunity to enhance the utilization of CHNAs to develop community-based prevention initiatives.

	Total (N=67, 100%)	Trauma hospital (N=27, 40.3%)	Non-trauma hospital (N=40, 59.7%)	p-value
Hospital Trauma Level	67 (100)			-
Level I		15 (55.6)	-	
Level II		12 (44.4)	-	
Non-trauma center		-	40 (100)	
Is violence identified as a community issue?				0.29
Yes	42 (62.7)	19 (70.4)	23 (57.5)	
No	25 (37.3)	8 (29.6)	17 (42.5)	
How was violence identified as a priority?				0.21
Epidemiologic data	1 (1.6)	0 (0)	1 (2.7)	
Community feedback	3 (4.7)	0 (0)	3 (8.1)	
Stakeholder priorities	0 (0)	0 (0)	0 (0)	
Multiple	60 (93.8)	27 (100)	33 (89.2)	
Is it a primary or secondary hospital priority?				0.56
Listed under SDOH priorities	20 (48.8)	10 (52.6)	10 (45.5)	
Primary	14 (34.2)	5 (26.3)	9 (40.9)	
Secondary	7 (17.1)	4 (21.1)	3 (13.6)	
Does the hospital outline a plan to address community violence in the CHNA?				0.89
No plan	20 (50.0)	10 (47.6)	10 (52.6)	
Broad SDOH plan	12 (30.0)	5 (26.3)	7 (33.3)	
Specific violence prevention plan	8 (20.0)	4 (19.1)	4 (21.1)	
Was violence prevention listed in the CHNA as a previous year's priority?				0.13
Yes	3 (4.5)	0 (0)	3 (7.5)	
No	4 (6.0)	3 (11.1)	1 (2.5)	
Missing	60 (89.6)	24 (88.9)	36 (90.0)	

Violence Prevention as identified in 67 Community Health Needs Assessments (CHNA) from 13 Illinois counties from 2021-2023, by trauma center designation.

Top quartile of counties with the highest ratio of age-adjusted firearm-to-all-mechanism homicide rates from 2017-2021.

Paper #12
January 16, 2025
12:00 pm

DEDICATED DELAYED INTIMATE PARTNER VIOLENCE (IPV) SCREENING IMPROVES IPV SURVIVOR IDENTIFICATION

Jennifer Geller, MD*, Khushi Patel, BS, Andres Alba Vega, BS,
Stephanie Ji, MD, Rachel L. Choron, MD, FACS*,
Mayur Narayan, MD, MPH, MBA, MHPE, FACS, FCCM, FICS*
Amanda Teichman, MD, FACS
Rutgers Robert Wood Johnson Medical School

Presenter: Jennifer Geller, MD

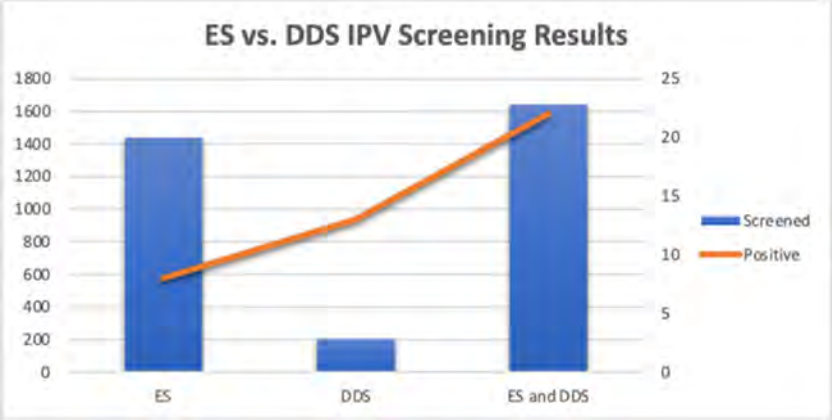
Discussant: Carlos Palacio, MD – McAllen Medical Center

Objectives: Intimate Partner Violence (IPV) is a global health crisis with long-term physical and mental health consequences. All IPV survivors who present to the hospital, for related or unrelated causes, are at risk for future IPV-related hospitalizations. Thus, universal screening is advised to ensure IPV identification to better deliver necessary resources. Unfortunately, there are many barriers to consistent patient centered IPV screening. We hypothesized that dedicated delayed IPV screening (DDS) identifies more patients at risk for IPV than early screening (ES).

Methods: This is a retrospective study at a level 1 trauma center of all trauma patients admitted July 2022-October 2023. Standard practice was ES, a nursing based IPV assessment administered on hospital arrival as part of a broader determinants of healthcare screen. DDS was a clinician-based dedicated screen, implemented in July 2022, administered during tertiary survey after initial workup and disposition. Fisher's Exact Test and Mann Whitney U test were used for data analysis.

Results: 4,527 patients were included. Although, less patients were screened by DDS than ES [205 (4.5%) vs. 1,436 (31.7%), p< 0.001], DDS detected IPV more frequently than ES [13 (6.3%) vs 9 (0.6%), p< 0.001]. Patients screened by DDS were younger and had longer length of stay than ES (p<0.05). In total, 22 patients screened positive, none by both DDS and ES, therefore DDS resulted in increased IPV identification.

Conclusions: DDS IPV screening identified more survivors when compared to ES. Improvement of DDS and ES compliance is needed to safeguard IPV detection. Based on this study, we suggest a two-phase screening approach using ES followed by DDS to better ensure IPV identification.



ES vs. DS IPV Screening Results

Paper #13
January 16, 2025
1:40 pm

ASSOCIATION BETWEEN COAGULATION BIOMARKERS, ICH TYPES, AND TXA TREATMENTS IN EARLY TBI

Karen Minoza, MD, Alexandra MP Brito, MD*, Lindsey J Loss, MD, Luis Tinoco-Garcia, MD, Scott McLoud, MS, Jack McLean, BS, Linda Papa, MD, Susan E. Rowell, MD, MBA, MCR*, Martin A. Schreiber, MD, FACS*
Oregon Health and Science University

Presenter: Karen Minoza, MD

Discussant: Kristen Carter, MD, MS – University of Michigan

Objectives: Although a prehospital 2g bolus of Tranexamic acid (TXA) has been shown to decrease mortality in patients with traumatic intracranial hemorrhage (ICH), the underlying mechanism remains controversial. We investigated whether early coagulation biomarkers are associated with ICH type, prehospital TXA, and outcomes in patients with moderate or severe TBI.

Methods: We conducted a secondary analysis of the Prehospital TXA for TBI Trial (GCS<13 and SBP>90 to either a 2g prehospital TXA bolus, a 1g prehospital TXA bolus + 1g infusion, or placebo) in the subset of patients with coagulation biomarkers drawn within 2 hours of injury. ICH types were categorized as extradural (EDH), subdural (SDH), subarachnoid (SAH), intraventricular (IVH), intraparenchymal (IPH), mixed, any ICH, and no ICH. Outcomes including Glasgow Outcome Score Extended (GOSE), Disability Rating Score (DRS), and mortality were examined at discharge and 6 months. Associations between biomarker levels, ICH type, TXA treatment group and outcomes were examined.

Results: Of 822 patients, 492 had ICH (6 EDH, 41 SDH, 87 SAH, 9 IVH, 29 IPH, 320 mixed, 492 any ICH, and 330 no ICH). Three markers of fibrinolytic activity [D-dimer, Plasmin-2-antiplasmin complex (PAP), and Thrombin antithrombin complex (TAT)] were significantly increased in the presence of any ICH and mixed ICH (Fig 1). Higher D-dimer was associated with increased mortality while higher PAP was associated with worse GOSE and DRS at discharge and 6 months. PAP was associated with TXA treatment group, with lower PAP levels associated with higher initial TXA bolus dose (Fig 2).

Conclusions: In patients with moderate or severe TBI, D-dimer, PAP, and TAT are associated with the presence of any ICH and mixed ICH, while D-dimer and PAP are associated with neurologic outcomes. Only PAP is affected by TXA treatment. Future studies should examine the utility of PAP as a potential marker for TXA responsiveness.

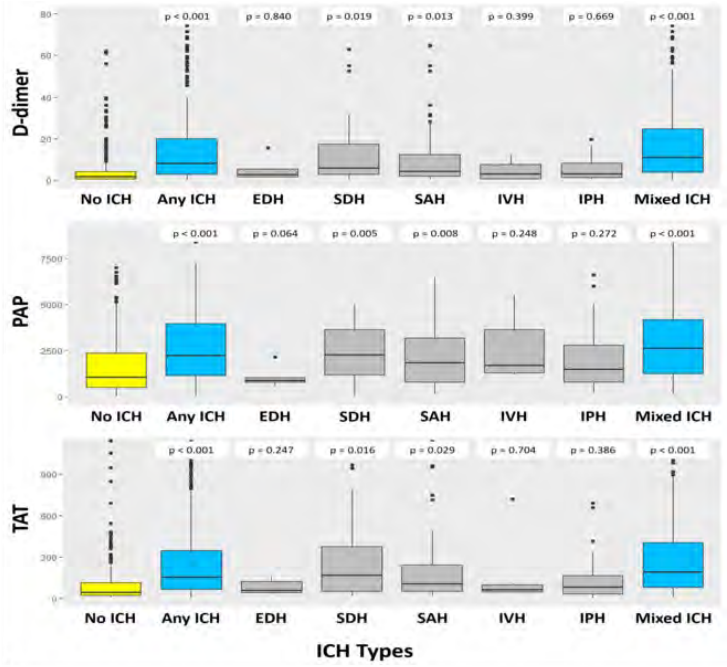


Figure 1: Coagulation Biomarkers significantly associated with ICH are D-dimer, PAP and TAT ($p < 0.003$, after the Bonferroni correction). The control group (no ICH) is demarcated in yellow, and ICH types with significant difference from control are demarcated in blue.

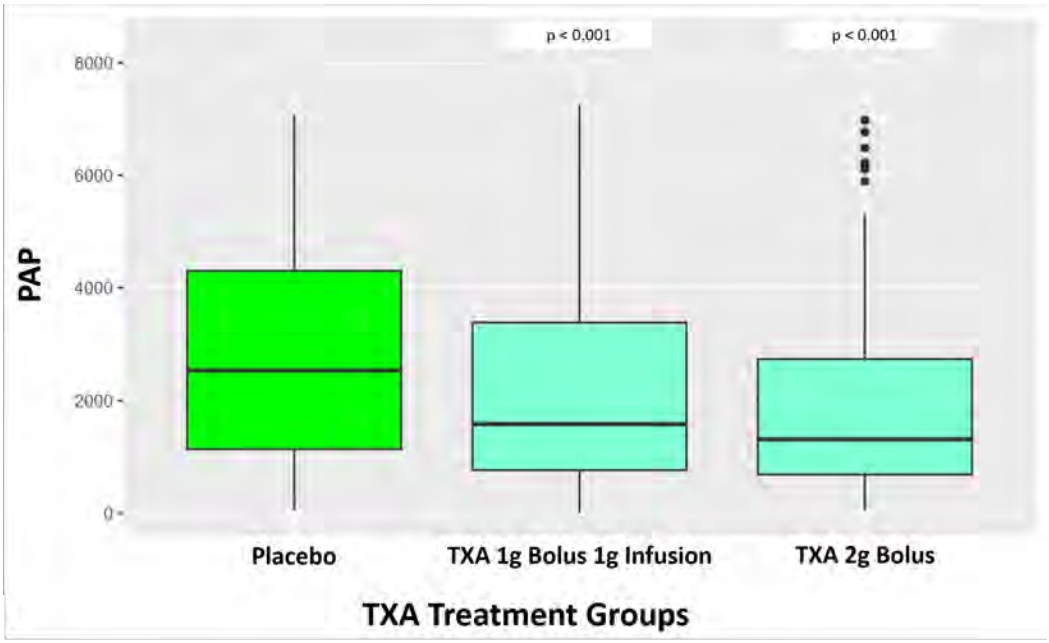


Figure 2: Effect of prehospital TXA treatment on PAP levels**.** When compared to placebo (Treatment group 0), the levels of the biomarker PAP were significantly different than when prehospital TXA was administered ($p<0.003$, after the Bonferroni correction); Treatment Group 1 (1g TXA bolus, followed by 1g TXA infusion over 8 hours, $p=0.00023$) and Treatment Group 2 (2g TXA bolus, $p=0.00000000075$).

Paper #14
January 16, 2025
2:00 pm

MALE AND FEMALE MICE DEMONSTRATE DISTINCT PATTERNS OF NEUROCOGNITIVE RECOVERY AFTER IDENTICAL SEVERE TRAUMATIC BRAIN INJURY

Patricia Santos Carlin, MD, Michael Coons, BA, Priyanka Bele, MD, Matthew Culkin, BS, Anastasia Georges, MS, Christina Jacovides, MD*, Patricia Martinez Quinones, MD, PhD*, David Meaney, PhD, Lewis J. Kaplan, MD, FACS, FCCM, FCCP*, Alexandra Kauffman, BS, Douglas Smith, MD, Gary Alan Bass, MD, MBA, PhD, FEBS (EmSurg)*, Jose L. Pascual, MD, PhD, FRCS(C), FACS, FCCM*
Department of Surgery, Perelman School of Medicine, University of Pennsylvania

Presenter: Patricia Santos Carlin, MD

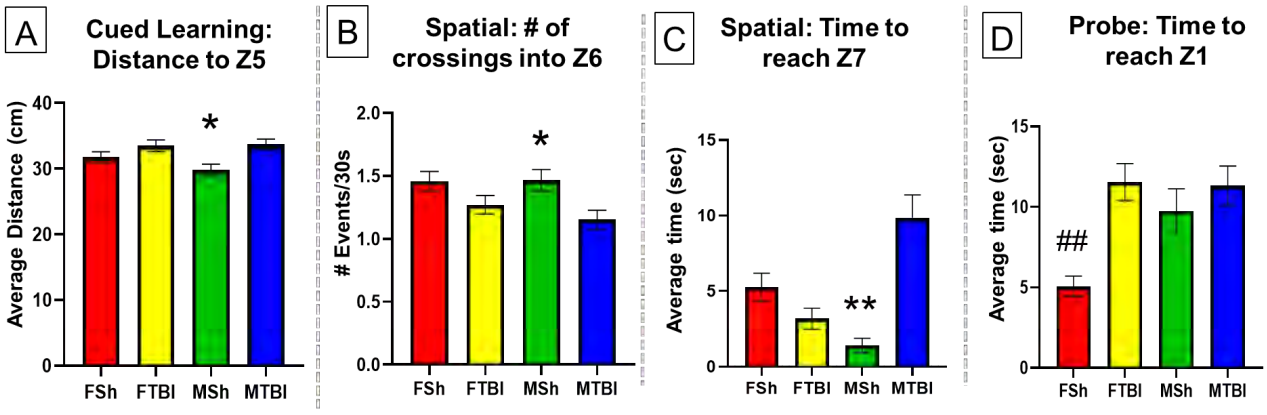
Discussant: Rachel Russo, MD, MAS – University of California Davis

Objectives: Sex-related outcomes following severe traumatic brain injury (TBI) appear to principally favor females. However, sex-related dimorphism in post-TBI learning and memory remain unexplored. We hypothesized that females realize greater cognitive recovery than males following severe TBI.

Methods: CD1 male (M) (n=12) and female (F) (n=12) mice were randomized to controlled cortical impact (severe TBI: 3mm-diameter impactor, 6m/s impact velocity, 1mm depth, 100ms dwell time) or sham craniotomy (Sh) and followed for 14 days. As a surrogate of neuroclinical recovery, body weight (bw) loss recovery was measured daily. From days 6-14, mice underwent Morris water maze exercises to gauge learning and recall. Better task completion was indicated by mice reaching the platform quadrant (Zone1), the platform itself (Zone 5), or concentric zones around the platform (Zone 6, 7) in a shorter time interval, covering a shorter distance, and crossing target zones with increased frequency.

Results: Compared to Sham M, MTBI failed to recover lost weight for the first 7 days after injury (i.e. day 5: MTBI: -3.7+/-1.5% v. MSh: +4.1 +/-1.4% bw, $p<0.01$) while FTBI recovered the same lost weight and at the same rate as FSh (FTBI: -1.6+/-1.0% v. FSh: -1.8+/-0.9% bw, $p=1.0$). Learning (cued: figure A; spatial: figure B, C) after TBI was significantly worse in males but not in females. In probe (memory) trials, impaired memory post-TBI was only observed in females (figure D).

Conclusions: Severe TBI worsens cued and spatial learning and impairs weight loss recovery in male but not female mice. Female - but not male - mice sustain memory impairment after identical severe TBI. While the mechanism(s) that underpin these observations remain unclear, sex-related neurocognitive outcome differences should be incorporated in study strategies directed at TBI management.



* p< 0.05 v. MTBI, ** p< 0.01 v. MTBI, ## p< 0.01 v. FTBI

Scientific Session IV

Paper #15
January 16, 2025
2:20 pm

PLASMA RESUSCITATION RESTORES GLOMERULAR HYALURONIC ACID AND MITIGATES HEMORRHAGE-INDUCED GLOMERULAR DYSFUNCTION

William Risinger, MD, MS*, Paul Matheson, PhD,
Jason W. Smith, MD, PhD, MBA, FACS*
University of Louisville

Presenter: William Risinger, MD, MS

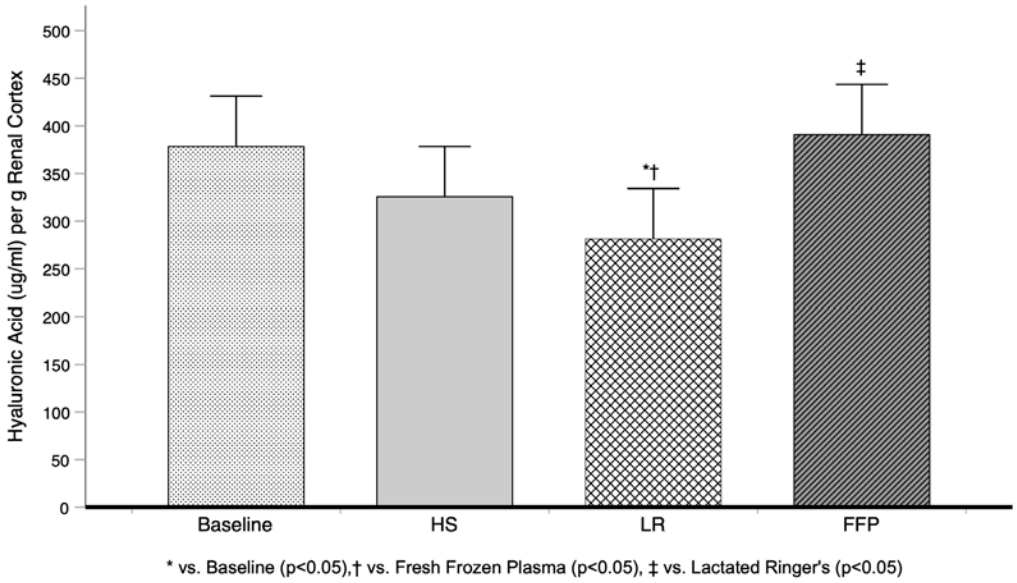
Discussant: Sawyer Smith, MD, MBA – University of California Davis

Objectives: Acute renal dysfunction following hemorrhagic shock and resuscitation carries significant morbidity and mortality. Despite an extensive understanding of renal tubule damage after injury, less is known regarding early alterations to the glomerulus, particularly its glycocalyx. We sought to evaluate the impact of hemorrhagic shock and resuscitation modalities on glomerular composition/function and hypothesized that fresh frozen plasma resuscitation would attenuate glomerular glycocalyx damage and reduce glomerular dysfunction.

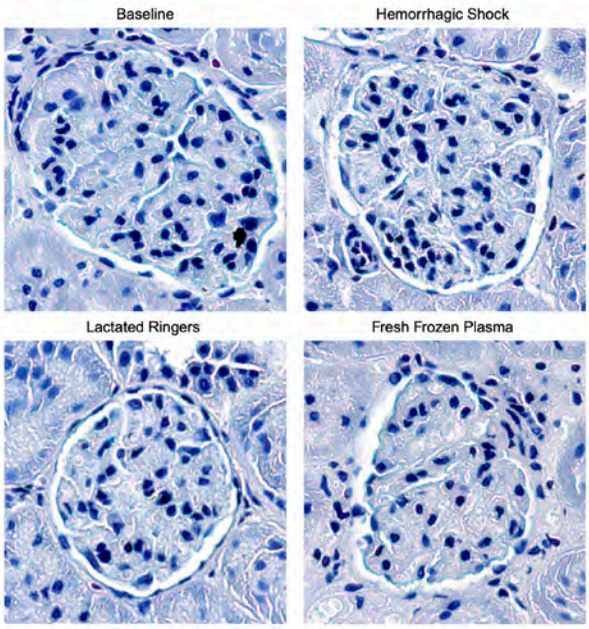
Methods: Sprague-Dawley rats underwent hemorrhagic shock to 40% of baseline mean arterial pressure for 60 minutes followed by resuscitation with shed whole blood and either crystalloid or plasma. Experimental groups included: A) Baseline, B) Post-hemorrhagic shock, C) Post-crystalloid resuscitation, and D) Post-plasma resuscitation. Urinary proteomics was used to identify markers of glomerular damage, followed by confirmatory evaluation using glomerular histologic evaluation and renal lysate enzyme-linked immunosorbent assays. Urine protein levels were measured as a surrogate for glomerular function.

Results: Urinary proteomics identified elevated levels of hyaluronidase-1 following hemorrhagic shock, suggesting shedding of hyaluronic acid, a key constituent of the glomerular glycocalyx. Renal levels of hyaluronic acid dropped significantly following hemorrhage and crystalloid resuscitation. By contrast, plasma restored levels back to baseline (Figure 1). Alcian blue staining of glomerular hyaluronic acid demonstrated a similar trend (Figure 2). Proteinuria was observed following crystalloid resuscitation, while plasma administration reduced urine protein levels to baseline.

Conclusions: Resuscitation with fresh frozen plasma restores hemorrhage induced shedding of hyaluronic acid from the glomerular glycocalyx and attenuates glomerular dysfunction.



Levels of hyaluronic acid in the renal cortex following hemorrhagic shock and resuscitation determined via ELISA.



Alcian blue (pH 2.5) staining of glomerular hyaluronic acid (light blue) following hemorrhagic shock and resuscitation. Plasma resuscitation restores glomerular hyaluronic acid when compared to lactated ringers.

Paper #16
January 16, 2025
2:40 pm

INTERLEUKIN-22 AS A NOVEL THERAPY FOR TRAUMA RELEVANT ACUTE KIDNEY INJURY

Sharven Taghavi, MD, MPH, MS, FACS*, Farhana Shaheen, David Engelhardt, Allison Newell, John Dasinger, Jay Kolls, Heddwen Brooks, Olan Jackson-Weaver, PhD
Tulane University School of Medicine

Presenter: Sharven Taghavi, MD, MPH, MS, FACS

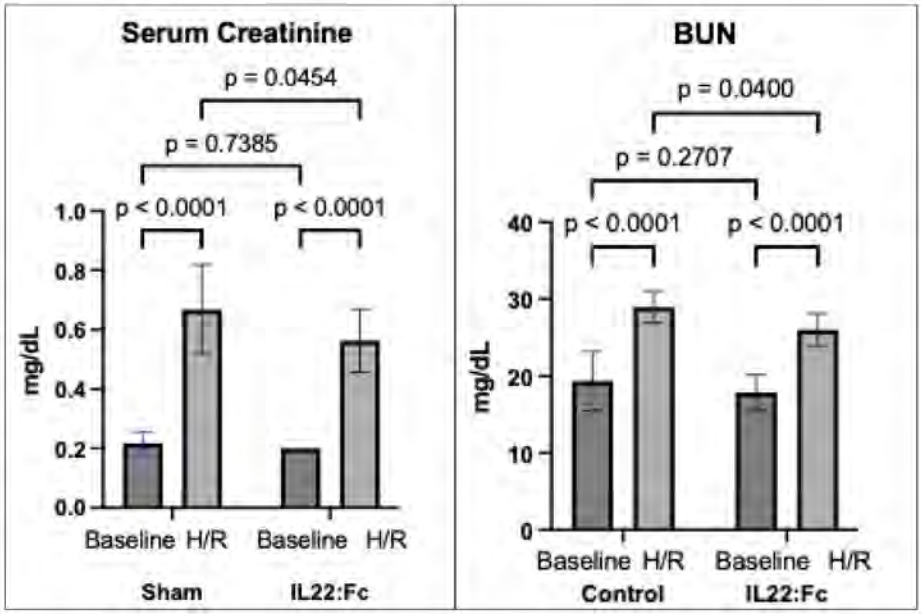
Discussant: Allan Stolarski, MD, MS – Boston Medical Center

Objectives: Treatment for acute kidney injury (AKI) after trauma and resuscitation remains primarily supportive. While Interleukin-22 (IL-22) is known to decrease cell death and stimulate regeneration in the kidney, its potential as a therapeutic in trauma-relevant AKI is unknown. IL-22:Fc is a recombinant human IL-22 protein combined with a human Fc immunoglobulin to increase serum half-life. We hypothesized that IL-22:Fc would mitigate AKI in a trauma-relevant rat model of hemorrhagic shock and resuscitation (H/R).

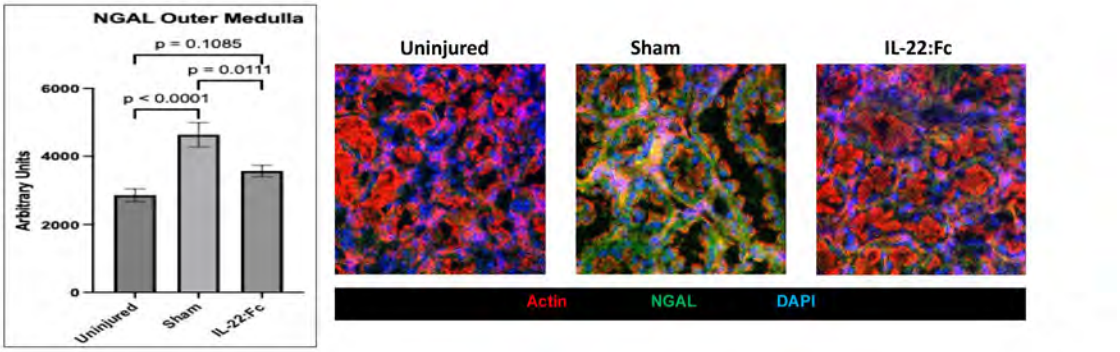
Methods: Sprague-Dawley rats were anesthetized and femoral arteries were cannulated. Mean arterial pressure (MAP) was reduced to 40 mmHG by withdrawing blood and kept there for 30 minutes. Animals were then resuscitated with IV lactated ringer's to a MAP of 60 for an additional 30 minutes. Treated animals (n=8) received 150 ug/kg of IL-22:Fc at the start of resuscitation and compared to sham injected. Labs were drawn at baseline and end of resuscitation.

Results: Both groups demonstrated AKI as measured by BUN and serum creatinine, while treated animals had lower BUN and creatinine at the end of H/R (Fig 1). In addition, IL-22:Fc treated animals had lower urinary albumin concentration (0.39 vs. 0.12 ug/mL, p=0.02). Furthermore, neutrophil gelatinase-associated lipocalin (NGAL) levels, a marker of AKI, measured in the outer medulla were lower in treated animals (Fig 2). NGAL levels measured in the cortex glomeruli (1005 vs. 1457 AU, p=0.41) and inner medulla (5670 vs. 5885 AU, p=0.16) were not different. NGAL levels were higher in the tubular cortex for treated rats (2420 vs. 3541 AU, p=0.02). Phosphorylated STAT-3 levels were not higher in the kidney of treated rats.

Conclusions: IL-22:Fc protects the kidneys after H/R and appears to act selectively on the outer medulla. This beneficial effect does not appear to be mediated by STAT-3, as shown in other organ systems. IL-22:Fc may be a novel therapy for AKI in trauma patients.



Hemorrhagic shock followed by resuscitation results in acute kidney injury as measured by blood urea nitrogen (BUN) and serum creatinine. Animals treated with IL-22:Fc had decreased kidney injury as measured by BUN and creatinine.



Treatment with IL-22Fc results in less injury in the outer medulla of the kidney as measured by neutrophil gelatinase-associated lipocalin (NGAL) staining.

Paper #17
January 16, 2025
3:00 pm

IS YOUR WHOLE BLOOD HEMOSTATIC? IN VITRO EVALUATION OF COLD-STORED WHOLE BLOOD WITH TEG 6S AT A LEVEL 1 TRAUMA CENTER

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Presenter: Brian Czarkowski, MD

Discussant: Morgan Schellenberg, MD, MPH – LAC+USC Medical Center

Objectives: The use of cold-stored whole blood has increased in use in the civilian trauma setting. Nonetheless, the effect of storage on hemostatic efficacy remains a concern, particularly with respect to platelet function. We sought to evaluate the thromboelastogram (TEG) profiles of typical emergency-release whole blood units on hand in the blood bank at our level 1 trauma center. We hypothesized that whole blood would demonstrate a storage age dependent decline in platelet function.

Methods: TEG 6S tracings were obtained from samples of 10 whole blood units (WB) and 10 samples of reconstituted whole blood (RWB) provided by our blood bank (RWB = 1:1:1 red blood cells, fresh frozen plasma thawed on day of testing, and seven-day old platelets). TEG 6s parameters (R time, functional fibrinogen (FF), maximum amplitude (MA)) were compared between groups and analyzed according to storage age (days; RWB age per red blood cell storage age).

Results: For both WB and RWB, R times were within the normal range for all samples. Concerning FF, 2 of 10 WB samples were below the normal range compared with zero below-normal RWB samples ($P= 0.146$). Concerning MA, 7 of 10 WB samples were below the normal range compared with zero below-normal RWB samples ($P<0.001$). All RWB MA values were greater than all WB MA values. WB MA values were not correlated to storage age of the WB samples (Figure).

Conclusions: In vitro platelet function as measured by TEG 6S was below normal in 70% of WB units tested in our blood bank, but was found to be in the normal range in all of the RWB samples. Although platelet function degradation has been previously attributed to WB storage age, marked dysfunction was observed as early as storage day 8 and did not correlate with increasing age.

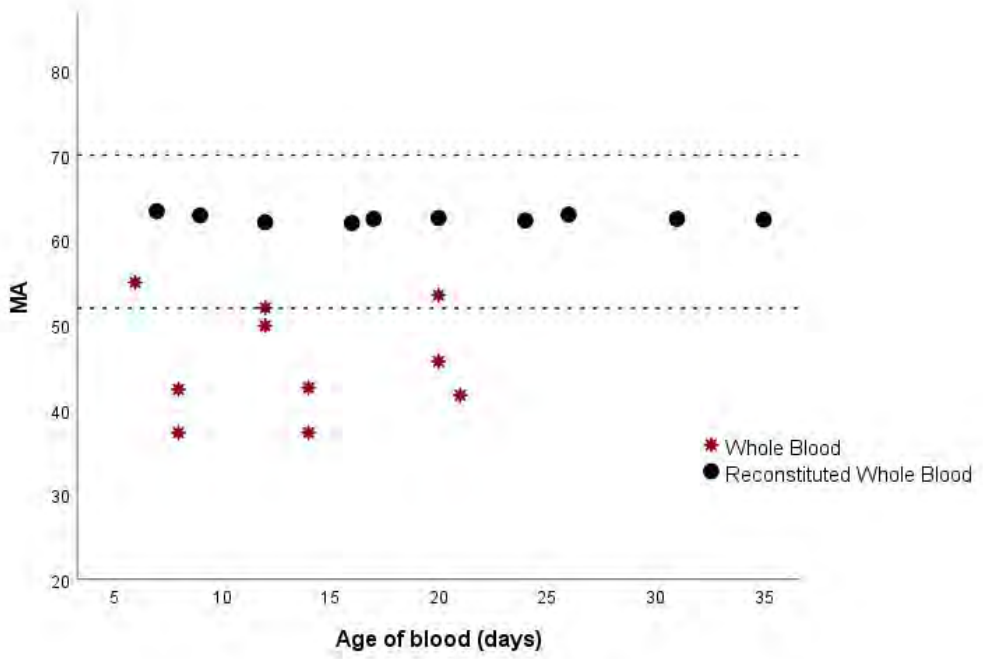

Figure: Storage age of whole blood and reconstituted whole blood units with corresponding MA values. Dashed lines represent upper and lower limits of the normal range for TEG 6S MA.

Paper #18
January 16, 2025
1:40 pm

PUBLIC VS PRIVATE EMS: RESPONSE TIME DISPARITIES AND MORTALITY IN TRAUMA

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Washington University in Saint Louis

Presenter: Ricardo A. Fonseca, MD

Discussant: Shyam Murali, MD – Grandview Health

Objectives: Literature on "Trauma Deserts" has shown a correlation between distance/time to the hospital and mortality, but emerging data suggests Emergency Medical Services (EMS) optimization may mitigate this impact. This study aims to compare private and public ambulance services, focusing on response times and their impact on Emergency Department (ED) mortality in severely-injured patients.

Methods: This study was conducted using a level 1 trauma registry, querying all patients from 2017-2023. Only patients transported by ground EMS directly from the injury scene within 80 miles, with an Injury Severity Score (ISS) >15 were included. Injury locations and EMS data were geocoded utilizing ArcGIS Pro to calculate distances and times. Logistic regression models were used to analyze the impact of EMS type, initial response time, scene time, and on-scene procedures on ED mortality when controlling for ISS, mechanism, and distance.

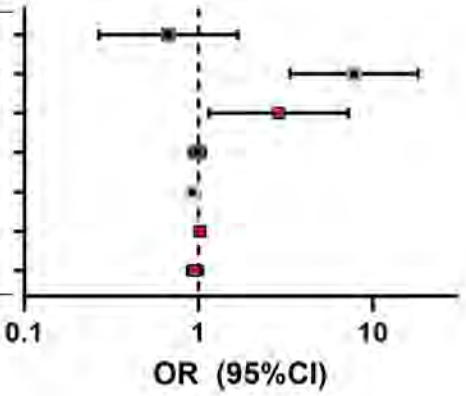
Results: 1,057 of 11,104 patients with known injury locations met our inclusion/exclusion criteria. Patients transported by Private EMS had a higher ED Mortality (5.4% vs 2.0%, p=0.008) despite equivalent injury severity (ISS: Public 24.9 vs Private 25.3, p=0.228). While initial response times from call dispatch were similar, Private EMS demonstrated longer scene times (14.6 vs 13.9 min, p=0.05) and a greater number of advanced procedures performed on-scene. Logistic regression revealed that Private EMS (OR 2.88, p=0.025), EMS advanced procedures (OR 7.80, p<0.001), and scene time (OR 0.92, p=0.025) were significant predictors of increased ED mortality.

Conclusions: This analysis shows that the higher ED mortality with Private EMS is due to longer on-scene times and more procedures, not ISS, or distance/time from injury. Public EMS had better response times and lower ED mortality, suggesting a benefit to enhanced public oversight and funding to enhance EMS response and patient outcomes.

Figure 1. Logistic Regression with ED Mortality as outcome

	OR	p-value	95% C.I. Lower	95% C.I. Upper
Mechanism of Injury	0.672	0.245	0.269	1.678
Advanced Procedures at Scene	7.801	0.001	3.341	18.217
Private Vs Public EMS	2.882	0.025	1.144	7.258
Distance from Injury to Hospital	0.985	0.771	0.888	1.092
Length at Scene	0.919	0.025	0.854	0.989
ISS	1.020	0.183	0.991	1.050
Time from Dispatch to Arrival at Scene	0.954	0.354	0.864	1.054

EMS: Emergency Medical Services; ISS: Injury Severity Score.



Logistic Regression with ED Mortality as Outcome

Table 1. Demographics

	TOTAL (n = 1,057)	Private EMS (n = 391; 37%)	Public EMS (n = 666; 63%)	p-value
Age yr, median (IQR)	39.6 (28.1-58.7)	36.3 (26.7-57.2)	41.4 (29.3-59.1)	***0.004 ****
Gender n (%)				
Male	752 (71.1)	281 (71.9)	471 (70.7)	*0.691*
Female	305 (28.9)	110 (28.1)	195 (29.3)	
Race n (%)				
Black	719 (68)	271 (69.3)	448 (67.3)	*0.118*
White	277 (26.2)	107 (27.4)	170 (25.5)	

Table 2. Injury Characteristics

	TOTAL (n = 1,057)	Private EMS (n = 391; 37%)	Public EMS (n = 666; 63%)	p-value
MOI n (%)				
MVC	414 (45.9)	161 (46.9)	253 (45.3)	*0.890*
GSW	306 (34)	115 (33.5)	191 (34.2)	
Fall	181 (20.1)	67 (19.5)	114 (20.4)	
ISS median (IQR)	22 (17-29)	22 (17-29)	22 (17-29)	*0.228*
Mean (±SD)	25 (9.9)	25.3 (10.2)	24.9 (9.8)	
GCS on Arrival median (IQR)	15 (12-15)	15 (11-15)	15 (13-15)	*0.135*
Mean (±SD)	12.3 (4.5)	12.5 (4.3)	12.1 (4.5)	

Table 3. EMS Response Details

	TOTAL (n = 1,057)	Private EMS (n = 391; 37%)	Public EMS (n = 666; 63%)	p-value
EMS Procedures On-Scene n (%)	291 (27.5)	179 (45.8)	112 (16.8)	***0.005 ****
EMS CPR On-Scene n (%)	48 (4.5)	12 (3.1)	36 (5.4)	*0.078*
Time from Dispatch to Scene Arrival, *minutes,* median (IQR)	7 (4-10)	6 (4 - 10)	7 (4 - 9)	*0.404*
Time to Hospital from Call Dispatch, *minutes,* median (IQR)	34 (27-44)	39.5 (31.2-47.7)	31 (24-40)	***<0.001 ****
Length at Scene, *minutes,* median (IQR)	12 (8-18)	13 (9-19)	12 (8-17.7)	***0.008 ****
Time to Hospital from Scene Departure, *minutes,* median (IQR)	14 (9-19)	18 (15-23)	11 (7-15)	***<0.001 ****
Distance from Injury to Hospital, *miles,* median (IQR)	4 (2.6-7-6)	7.8 (5.6-9.6)	3.2 (2.2-4.4)	***<0.001 ****

Table 4. Clinical Outcomes

	TOTAL (n = 1,057)	Private EMS (n = 391; 37%)	Public EMS (n = 666; 63%)	p-value
LOS median (IQR)	8 (7-15)	8 (4-14.5)	8 (4-15)	*0.068*
ICU Admission n (%)	771 (72.9)	287 (73.4)	*484* (72.7)	*0.797*
ICU Days median (IQR)	4 (3-10)	7.8 (8.8)	8.3 (9.4)	*0.240*
Use of MTP n (%)	224 (21.2)	86 (22)	*138* (20.7)	*0.625*
ED Mortality n (%)	44 (4.2)	21 (5.4)	13 (2)	***0.008 ****
Hospital Mortality n (%)	160 (15.1)	54 (13.8)	106 (15.9)	*0.357*
Discharge Disposition n (%)				
Home	491 (54.7)	183 (54.3)	308 (55)	
Skilled Nursing Facility	128 (14.3)	44 (13.1)	84 (15)	*0.070*
Rehab	225 (25.1)	96 (28.5)	129 (23)	
AMA	30 (3.3)	4 (1.2)	26 (4.6)	

Paper #19
January 16, 2025
2:00 pm

PROLONGED EMERGENCY MEDICAL SERVICES (EMS) RESPONSE TIMES AND NEIGHBORHOOD RACIAL/ETHNIC SEGREGATION: DISPARITIES AND INEQUITIES AMONG CRITICALLY INJURED PATIENTS IN PRE-HOSPITAL EMS CARE

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Supraja Krovvidi, Laurent Hasson, BS, MS, Charles DiMaggio, Ph.D., MPH,
Dustin Duncan, ScD, Natalie Escobar, MD, Spiros Frangos, MD, MPH,
Ashley C. Pfaff, MD*, Olubenga Ogedegbe, MD, MPH, Ran Wei, Ph.D.
NYU School of Medicine

Presenter: Cherisse Berry, MD, FACS

Discussant: Gregory Schaefer, DO – West Virginia University

Objectives: The National Fire Protection Association (NFPA) has established a 9 minute "response time" (RT) benchmark goal for the arrival of an Emergency Medical Service (EMS) unit to the incident scene. Among injured patients, extended prehospital times are associated with increased mortality; however, disparities in EMS RTs times are unknown. This study sought to evaluate EMS RTs within racial/ethnic segregated neighborhoods among critically injured patients.

Methods: We identified all critically injured patients in the National EMS Information System (NEMSIS) database (2020-2022). EMS RTs were then stratified by the total population (urban and rural), segregation tertiles (low, medium, high). We measured racial/ethnic segregation of each census block group using the Multigroup Entropy Index. Racial/ethnic groups including Asian, Black, White, and Hispanic/Latino were considered when calculating block group diversity scores, stratified by segregation tertiles & urbanicity, and then compared using the Welch's t-test.

Results: 38,770,528 critically injured patients were identified. The mean RT was 12.5min. 37% of patients were in rural areas with a mean RT of 14.6min and 63% of patients were in urban areas with a mean RT of 11.3min. Highly segregated neighborhoods had a significantly longer RT when compared to less segregated neighborhoods (21.1min vs.11.1min, $p<0.001$). Highly segregated rural and urban neighborhoods had significantly longer RTs when compared to less segregated rural and urban neighborhoods (23.2min and 20.6min vs 11.9min and 10.7min, $p<0.001$) which was consistent across racial/ethnic groups.

Conclusions: Among critically injured patients, EMS RTs are significantly longer in highly segregated rural and urban neighborhoods. Inequities in EMS RTs on outcomes deserves further study.

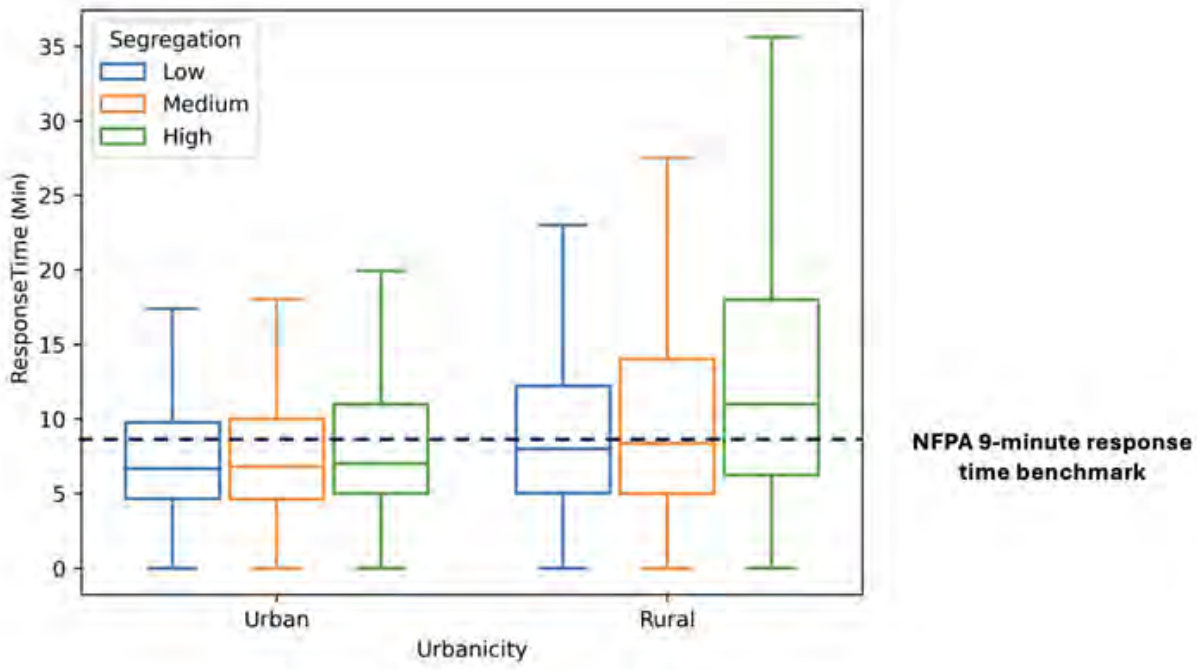

Figure 1: EMS Response Times (minutes) stratified by urbanicity and segregation tertiles

Scientific Session V

Paper #20
January 16, 2025
2:20 pm

LEAD THE ROOM: IMPACT OF LEADERSHIP STYLE ON TEAM RESILIENCE AMONG TRAINEES IN THE TRAUMA BAY

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Ashley Holroyd, BIE, MEd, Ryan P. Dumas, MD*
University of Texas Southwestern Medical Center

Presenter: Bahaa Succar, MD

Discussant: Alaina Lasinski, MD – MetroHealth Medical Center

Objectives: Leadership is a crucial component to successful team function in high-acuity trauma resuscitations. Literature addressing the impact of leadership style on team members during trauma resuscitations is scarce. We aim to assess the relationship between leadership type and team resilience among trainees in the trauma bay using trauma video review.

Methods: A prospective observational study of adult patients presenting at our level 1 trauma center was performed. Trainee performance was evaluated with Behavior Anchored Rating Scales through audio-visual review of captured trauma resuscitations. Statistical analysis was performed to explore possible correlations between leadership style (transformational, transactional, and passive) and 3 team behavior indicators (speaking up, knowledge sharing, and cooperation).

Results: A total of 66 trauma activations were analyzed. The median age was 33.5 [IQR:25-46] years, with 29%(n=19) penetrating injuries, and a median Injury Severity Score of 14 [IQR:5-22]. Trauma leads were more likely to exhibit passive leadership (*mean (M)*=2.96, standard deviation (*SD)*=1.17), followed by transactional(*M*=2.91, *SD*=1.29) and transformational (*M*=2.46, *SD*=1.20). Teams scored highest on knowledge sharing(*M*=3.61, *SD*=0.78), whereas speaking up was the lowest*(M*=2.96, *SD*=1.17*)*. Transformational and transactional leaderships were both positively correlated to the capacity in which team members cooperate(r =0.49, p<0.001 and r =0.49, p<0.001, respectively) and share knowledge(r =0.50, p<0.001 and r =0.52, p<0.001, respectively). Passive leadership was strongly correlated to speaking up in trauma teams(r =1.00, p<0.001).

Conclusions: When trauma leaders exhibit passive behavior, team members speak up more frequently, showcasing resilience. Educational opportunities among trainees should promote transformational or transactional leadership styles to improve team performance.

Paper #21
January 16, 2025
2:40 pm

IMPROVING TRAUMA INFORMED CARE PRACTICES IN THE RESUSCITATION BAY: A MIXED-METHODS ANALYSIS

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Yara Hamadeh, BS, Sehr Khan, MD, Kathleen Williams, MD,
Terri deRoon-Cassini, MS, PhD, Libby Schroeder, MD, FACS*
Medical College of Wisconsin

Presenter: Amber Brandolino, MS

Discussant: John Bliton, MD – Jamaica Hospital Medical Center

Objectives: To evaluate patients' perceptions of the trauma resuscitation process before and after implementing an Assurance of Safety (AOS) to provide patients with the clinical context of their care and comfort.

Methods: This was a prospective, mixed method, pre/post analysis of the implementation of the AOS at our urban, Midwest Level 1 Trauma Center. Inpatients who underwent trauma resuscitation were surveyed regarding their perceptions of and emotions during the resuscitation process (Feb '23 - July '23). The trauma team was then educated on trauma informed care practices and to provide the AOS for 4 months. Post-intervention surveys were then performed Nov '23 - Jun '24. Descriptive statistics and independent samples t-tests ($p<0.05$) for closed-ended responses and free responses were qualitatively analyzed to characterize patient perceptions.

Results: There were 197 pre-AOS and 189 post-AOS patients. Most patients were males (63.7%) involved in a motor vehicle collision (34.2%) and identified as White (45.3%) or Black (45.3%). On average, AOS patients were younger (48.1 vs 43.5 years, $p=0.03$). There were no other demographic or clinical differences between the cohorts. AOS patients less often reported being "quite a bit" or "severely" worried they would lose their life (39.2% vs 50.3% in pre-AOS, $p=0.03$). Major qualitative themes from both groups included patients being unable to remember what happened and "waking up" later, clothes being cut off, fear for loss of life or being paralyzed, and reassurance from medical staff. More AOS than pre-AOS patients (12% vs 1%) mentioned doctors explaining the resuscitation process to them.

Conclusions: A quick assurance that the patient is safe and will be taken care of improved the number of patients who were "quite a bit" or "severely" worried that they would lose their life and was recalled by patients when describing their resuscitation experience.

Paper #22
January 16, 2025
3:00 pm

IT'S JUST A BROKEN BONE! DO GERIATRIC ORTHOPEDIC PATIENTS BENEFIT FROM TRAUMA SERVICE ADMISSION?

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The Ohio State University

Presenter: Angela M. Duff, BS

Discussant: Stefan W. Leichtle, MD, MBA – Inova Health System

Objectives: The population of ≥65years old is growing faster than any other age range. Geriatric trauma accounts for 23% of trauma-related hospital admissions. The altered physiology/comorbidities of older patients leads to under-triaging & more complications. Geriatric patients with isolated orthopedic injuries(IOIs) are traditionally admitted to orthopedics or medicine. We hypothesized the trauma service would have better outcomes.

Methods: We retrospectively reviewed our Level 1 trauma center's registry. Patients included were ≥65years old admitted with an IOI from 1/1/2017-6/31/2023. Patients were admitted to trauma, orthopedics, or medicine. We investigated inpatient complications/discharge destination. Multivariable analyses adjusted for age, sex, race, insurance, ISS, & CCI. Data were analyzed using appropriate statistical tests.

Results: 42% of geriatric trauma patients were admitted to trauma, 27% to medicine, and 31% to orthopedics. Univariate analysis revealed patients admitted to trauma were mostly male (36.3 v 32.7 v 27.8%,p=0.029) and had 2 comorbidities (33.7 v 32.1 v 28.1%,p=0.0001) compared to those admitted to medicine/ortho. Those admitted to trauma had shorter lengths of stay (5 IQR[3,8] v 6 IQR[4,9] v 5 IQR[3,6],p=0.0001), fewer complications (9.4 v 25.2 v 13.9%,p=0.0001), lower mortality (1.2 v 4.2 v 1.6%, p=0.008), and higher odds of being discharged home (36.6 v 28.4 v 30.1%, p=0.02). When adjusted, medicine no longer had significantly higher mortality, but they had 3.2x the odds of having a complication in comparison to trauma. Both medicine and ortho had 1.4x the odds of discharging their patients to a facility.

Conclusions: Geriatric trauma patients had shorter lengths of stay, less complications and lower mortality on the trauma service. Trauma patients had higher odds of discharge home and lower odds of complications. Trauma service adds value to geriatric patients admitted for IOI.

Paper #23
January 16, 2025
3:20 pm

EVALUATING THE PREVALENCE OF POST-TRAUMATIC STRESS DISORDER IN PROFESSIONAL TRAUMA PATIENT CAREGIVERS

Kaitlyn Shelley, BS, Amy Stewart, MD, FACS*, Luke Willand, MD,
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Advocate Lutheran General Hospital

Presenter: Kaitlyn Shelley, BS

Discussant: Keelin Roche, MD, MPH – East Tennessee State University

Objectives: Trauma Patient Caregivers: First responders, nurses, and physicians are chronically exposed to patient-related trauma, frequently with insufficient institutional support. Research on the prevalence of PTSD in this population is limited. This study examines the prevalence of PTSD in this population, how trauma exposure may contribute to PTSD development, and coping methods utilized after exposure.

Methods: In August 2020, an anonymous electronic survey was administered to Trauma Patient Caregivers of a level 1 trauma center. Respondents were screened for PTSD via PCL-5 and for presence of PTSD risk factors. Bivariate associations between the type of exposure and PTSD prevalence were assessed using Chi-square tests with statistical significance set at $p < 0.05$.

Results: Of 116 respondents, 19 (16.4%) demonstrated a positive PTSD screen with all 19 reporting exposure to trauma. PTSD was significantly associated with being unmarried, preexisting mental illness, exposure to domestic violence, or exposure to sexual assault. A total of 14 PTSD positive respondents (73.7%) reported using substances to cope and 11 (57.9%) reported abusing them.

Conclusions: In our study, 16.4% of Trauma Patient Caregivers screened positive for PTSD, substantially higher than the general population rate of 6-9%, with factors of unmarried, pre-existing mental illness, domestic violence, or sexual assault exposure associated with the highest risk. Only 52.6% of those with a positive PTSD screen have received mental health care with 73.7% admitting the use of alcohol as a coping mechanism. This leaves 47.4% of PTSD positive Trauma Patient Caregivers without professional treatment. PTSD negatively impacts cognitive performance, memory, and risk assessment; improvement of mental health services for trauma caregivers is crucial for the safety and well-being of both the Trauma Patient Caregiving team and patient.

	PTSD (%, mean)	No PTSD (%, mean)	P value
Demographic variables			
Female sex	57.9	38.1	0.11
Younger than 50	84.2	78.4	0.066
Not married	63.2	34.0	0.003
Early in their job (<10yrs)	57.9	37.1	0.32
Military	10.5	12.4	0.82
Types of exposure			
Trauma Exposure	100.0	86.6	0.09
Multiple trauma exposures	94.7	66.0	0.43
Single trauma exposure	5.3	11.3	0.43
Pre-existing Mental Illness	42.1	13.4	0.003
Domestic Violence Victim	36.8	15.5	0.03
Sexual Assault Victim	36.8	9.3	0.001
Coping strategies			
Alcohol Use	73.7	53.6	0.003
Mental care received	52.6	38.1	0.24
Reaching out now	10.5	9.3	-

Table 1 Factors associated with the development of PTSD in exposed subjects (N = 116)

Paper #24
January 17, 2025
7:30 am

PRIMARY REPAIR VERSUS RESECTION FOR AAST GRADE I AND II COLON INJURIES: DOES THE TYPE OF REPAIR REALLY MATTER? AN EAST MULTICENTER TRIAL

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Brody School of Medicine- East Carolina University

Presenter: Caitlin A. Fitzgerald, MD

Discussant: Michael Derickson, MD – Vanderbilt University Medical Center

Objectives: The management of traumatic low-grade (AAST grades I and II) colon injuries has evolved. Recent data suggests primary repair or resection over colostomy decreases morbidity and mortality. However, data comparing patients undergoing primary repair (PR) versus resection with anastomosis (RWA) are lacking. We hypothesized that patients presenting with low-grade colon injuries undergoing PR would have fewer post-operative complications than patients undergoing RWA.

Methods: This was a retrospective, multicenter analysis of all patients presenting with AAST grades I and II colon injuries to 32 Level 1 trauma centers from 2011 to 2021. Based on operative documentation, patients were dichotomized into two groups, those that underwent PR or RWA. Outcomes included length of stay (LOS), infectious complications, and mortality. Multivariate logistic regression was performed to determine the independent effect of operative technique on outcomes.

Results: A total of 2,022 patients met inclusion criteria for this study. Most were young (36 [24-44]), male (79.6%), and presented after penetrating trauma (58.2%). 1013 patients presented with a grade I injury while 1009 patients presented with a grade II injury. 1314 patients underwent PR and 708 underwent RWA. While there was no difference in ISS between PR and RWA, RWA was associated with more adverse outcomes (Table 1) including surgical site infections, suture line failure, and fascial dehiscence (all $p < 0.001$). When controlling for mechanism of injury, AAST grade, ISS, and number of intra-abdominal injuries RWA was independently associated with more infectious complications (Table 2).

Conclusions: RWA was independently associated with more adverse outcomes including multiple infectious complications and longer hospital length of stay compared to PR suggesting that low grade colon injuries can be safely managed with PR alone.

Table 1. Clinical variables and outcomes of entire study population (univariate analysis).				
	All Patients (n=2022)	**Primary Repair (PR) (n=1314)**	**Resection with Anastomosis (RWA) (n=708)**	**p-value**
Age (mean ± SD)	35.6 ± 14.8	36.4 ± 15.0	34.3 ± 14.3	0.002
Male	1602 (79.6)	1041 (79.5)	561 (79.8)	0.9
Penetrating Mechanism	1172 (58.2)	682 (52.1)	491 (69.7)	< 0.001
Systolic Blood Pressure (mmHg)	123 [105-141]	124 [107-142]	120 [102-140]	0.002
Heart Rate	102 [83-114]	99 [83-115]	109 [82-113]	0.2
Injury Severity Score	19 [9-26]	19 [9-27]	18 [9-25]	0.7
Massive Transfusion Protocol	449 (22.2)	283 (21.5)	174 (24.6)	0.1
Other Intra-Abdominal Injuries (solid organ and other hollow viscus)				
1	407 (20.1)	282 (21.5)	125 (17.7)	0.04
2-3	1334 (66.0)	863 (65.7)	483 (68.2)	0.2
>4	281 (13.9)	169 (12.9)	100 (14.1)	0.4
AAST Grade				
I	1013 (50.1)	854 (65)	159 (22.5)	< 0.001
II	1009 (49.9)	460 (35)	549 (77.5)	< 0.001
Sepsis	130 (6.4)	67 (5.1)	63 (8.9)	< 0.001
Superficial Surgical Site Infection	102 (5.2)	46 (3.6)	56 (8.3)	< 0.001
Deep Surgical Site Infection	87 (4.5)	38 (3)	49 (7.3)	< 0.001
Organ Space Infection	132 (6.8)	49 (3.8)	83 (12.3)	< 0.001
Suture Line Failure	67 (3.3)	23 (1.8)	44 (6.2)	< 0.001
Fascial Dehiscence	87 (4.3)	41 (3.1)	46 (6.5)	< 0.001
Enterocutaneous Fistula Development	30 (1.5)	11 (0.8)	19 (2.7)	0.001
Hospital Length of Stay (days)	16 [6-19]	16 [6-18]	18 [7-21]	< 0.001
Mortality	108 (5.3)	66 (5)	42 (5.9)	0.4

Table 1. Clinical variables and outcomes of entire study population (univariate analysis).

Table 2. Infectious complications compared by repair method (multivariate analysis).			
	Adjusted Odds Ratio (PR vs RWA)	**95% Confidence Interval**	**p-value**
Surgical Site Infection (composite)	0.51	[0.38-0.68]	< 0.001
Superficial Surgical Site Infection	0.61	[0.39-0.95]	<0.03
Deep Surgical Site Infection	0.51	[0.31-0.83]	0.006
Organ Space Infection	0.49	[0.33-0.73]	<0.001
Unplanned Return to the OR	0.74	[0.53-1.02]	0.06
Unplanned Return to the ICU	0.73	[0.47-1.15]	0.17

Table 2. Infectious complications compared by repair method (multivariate analysis).

Paper #25
January 17, 2025
7:50 am

WHERE DOES CRYOPRECIPITATE FIT INTO BALANCED RESUSCITATION? AN EVALUATION OF 2,117 HEMORRHAGING PATIENTS UTILIZING VISCOELASTIC-BASED RESUSCITATION

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University of Texas Health Science Center at Houston

Presenter: Jan-Michael Van Gent, DO

Discussant: Mary Stuever, DO – Landstuhl Regional Medical Center

Objectives: Empiric cryoprecipitate (Cryo) administration has recently failed to show survival benefit in hemorrhaging trauma patients. However, a recent TQIP query suggested a survival benefit in massive transfusions (MT) when administering one unit of Cryo to every 7-8 units of red blood cells (RBC). We describe transfusion ratios when Cryo was indicated by viscoelastic testing (VET) and evaluated whole blood's (WB) impact on this ratio.

Methods: Adult trauma patients admitted from 07/2017-12/2021 who received emergency-release blood products prehospital or in the ED were included. Patients who died within 60 minutes were excluded. MT patients received arrival VET, which was repeated serially while on MT protocol. Cryo transfusion was based on VET results. Blood component ratios were calculated for RBC, plasma, platelets, and Cryo in the first four hours of resuscitation. Each WB unit was counted as 1 RBC, 1 plasma, and 0.17 units of platelets. Outcomes were evaluated based on blood component ratios. Patients receiving WB were compared to patients who only received blood components (COMP). 30-day survival was evaluated for included patients.

Results: 2,117 patients were included. Overall, the median age was 37 years (25, 55), 74% were male, 37% were white, and 67% sustained blunt trauma. Overall survival was 77%. The median 4-hour RBC:plasma:platelet:cryo ratio was 9: 9.5: 1.3: 1. Patients who received WB did not require Cryo until later in their resuscitation (TABLE).

Conclusions: When using VET to guide resuscitation for hemorrhage, Cryo transfusion occurred after 9 units of RBC:plasma. Survivors received Cryo at lower ratios and those who received WB did not require Cryo until later. For centers that don't use VET, Cryo transfusion after 7 units of RBC:plasma and after 10 units of a WB based resuscitation should be considered.

	All patients (n=2117)	WB (n=1228)	COMP (n=889)	p-value
4-hr RBC: plasma: platelets: cryo	9: 9.5: 1.3: 1	10: 9.5: 1.7: 1	7: 6: 1: 1	0.008
	All patients (n=2117)	Survivors (n=1630)	Non-survivors (n=487)	p-value
4-hr RBC: plasma: platelets: cryo	9: 9.5: 1.3: 1	6.5: 6.5: 1.7: 1	11.5: 11.5: 1.1: 1	<0.001

Observed cryoprecipitate ratios based on resuscitation type and outcome

Paper #26
January 17, 2025
8:10 am

A MORE TARGETED EMBOLIZATION STRATEGY IN BLUNT SPLENIC TRAUMA REDUCES PROCEDURAL VOLUME WITHOUT INCREASING RATES OF DELAYED SPLENECTOMY

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Joseph J. DuBose, MD*, Yvonne Chung, MD, MPH*, Rishi Kundi, MD*,
Thomas M. Scalea, MD, FACS, FCCM*, Melike N. Harfouche, MD*
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Presenter: Amanda Marsh, MD

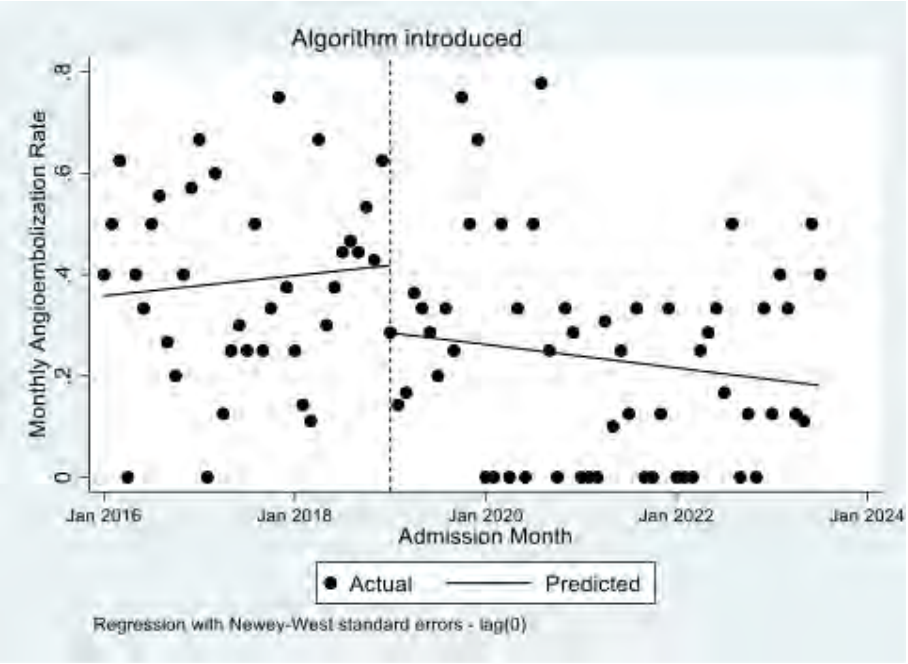
Discussant: Rishi Rattan, MD – Legacy Emanuel Medical Center

Objectives: The role of splenic angioembolization (SAE) in blunt splenic injury (BSI) has evolved. Revision of the AAST BSI classification scheme and increased quality of CT scan may now identify injuries that no longer benefit from SAE. We revised our BSI algorithm to use SAE only for high-risk findings (pseudoaneurysms <10 mm, moderate to large hemoperitoneum, parenchymal injury > 3 cm). We hypothesized this would reduce the use of SAE without increasing failure rates of non-operative management.

Methods: We reviewed hemodynamically stable patients with AAST Grade II-V BSI on initial contrast CT scan. We excluded patients who had urgent splenectomy. An interrupted time-series analysis was performed with a cutoff of 1/2019 (when the algorithm was introduced) spanning 3 years before and 5.5 years after (PRE vs POST). The primary outcomes of interest were rates of SAE and splenectomy >24 hours after admission.

Results: A total of 274 individuals were in the PRE group versus 333 in the POST group. The overall rate of SAE decreased from 38% to 23% (p=0.002) after algorithm implementation without a significant change in rates of delayed splenectomy (PRE 5.7% vs POST 6.7% p=0.66). Controlling for mean AAST Grade and rate of CT-proven pseudoaneurysm per month, fitted time trends in SAE in the PRE and POST periods (Figure) demonstrate a sharp decline in the SAE rate (p <0.001).

Conclusions: A conservative approach to the use of selective angioembolization for BSI leads to a reduction in SAE without increasing failure rates. Future research should evaluate even more conservative use of SAE while better defining which high-risk features are mitigated by SAE.



Trends in splenic angioembolization for blunt splenic trauma after introduction of algorithm for high-risk features.

Scientific Session VI

Paper #27
January 17, 2025
8:30 am

PERCUTANEOUS PIGTAIL CATHETER VERSUS CHEST TUBE FOR THE TREATMENT OF PEDIATRIC TRAUMATIC HEMOTHORAX: AN EAST MULTICENTER STUDY

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Children's Hospital Orange County

Presenter: Alice Martino, MD

Discussant: LeAnne S. Young, MSN, RN, TCRN – Texas Children's Hospital

Objectives: Small percutaneously placed pigtail catheters (PC) for traumatic hemothorax (HTX) are safe and effective in adults but have yet to be evaluated in children. We hypothesized PC would have similar efficacy and complication rates compared to chest tubes (CT).

Methods: A retrospective study of hemodynamically stable pediatric trauma patients (<18 years) with HTX or hemopneumothorax (HPTX) was conducted at 41 trauma centers (01/2010-12/2022). Catheter failure was defined as a requirement for surgery or second procedure, additional tube placement, or use of thrombolytics. Multivariable logistic regression analysis adjusting for age, sex, mechanism of injury, and injury severity score (ISS) was used to evaluate the associated risk of failure for PC vs CT.

Results: Of 548 patients, 477 had CT and 71 PC. Median age (CT: 15.7 vs PC: 15.6, p=0.49) and ISS (CT: 17 vs PC: 16, p=0.17) were similar between cohorts. Penetrating trauma patients more often received CTs (62.6 vs 35.2%, p<0.0001). Failure rate was similar between CT vs PC (16.1 vs 12.6%, p=0.56). Catheter-related complication (CRC) rate (acute respiratory distress, effusion, empyema, pneumonia) was similar between groups (n=32, 6.7%, vs n=7, 9.8%, p=0.32). Odds of CRCs were not increased in the PC group (OR 1.03, 95% CI 0.96-1.09, p=0.34) on multivariable analysis. Catheter dwell time, length of stay (LOS), and intensive care LOS were similar between cohorts (all p>0.05). Logistic regression analysis revealed use of PC was not associated with the risk of failure (OR 0.96, CI 1.01-1.21, p=0.48). There was an increased risk of failure with ISS>15 (OR 1.07, CI 1.0-1.14, p=0.02).

Conclusions: There was no difference in the risk of failure between PC and CT for pediatric HTX/HPTX, and no difference in associated risk of complications after adjustment for confounders. PC has similar safety and efficacy compared to larger bore CT.

Table 1: Logistic Regression Model Predicting Catheter Failure in Hemothorax Patients				
	Odds Ratio	95% Confidence Interval		p-value
Age < 15 years	0.94	0.88	1.00	0.07
Male sex	0.96	0.89	1.03	0.31
Penetrating injury	1.03	0.96	1.10	0.30
ISS > 15	1.07	1.00	1.14	0.02
Percutaneous catheter placement	0.97	0.89	1.06	0.55

Table 2: Logistic Regression Model Predicting Catheter Related Complication in Hemothorax Patients				
	Odds Ratio	95% Confidence Interval		p-value
Age < 15 years	0.96	0.92	1.01	0.16
Male sex	0.97	0.92	1.02	0.36
Penetrating injury	0.91	0.87	0.96	0.0002
ISS > 15	1.07	1.02	1.11	0.001
Percutaneous catheter placement	1.03	0.96	1.09	0.34

Logistic regression models predicting catheter failure and catheter-related complications in hemothorax patients

ISS: injury severity score

Paper #28
January 17, 2025
8:50 am

ALL ABOUT THE ASIA A'S: A SUB ANALYSIS OF THE EAST MAP MULTICENTER TRIAL

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Presenter: Aimee LaRiccia, DO

Discussant: Rondi Gelbard, MD – University of Alabama at Birmingham

Objectives: Treatment of blunt traumatic spinal cord injuries (SCI) focuses on post injury mean arterial pressure augmentation (MAP) regardless of the severity of neurologic deficits. A complete SCI is characterized as ASIA A. We compared SCI patients with an ASIA A on hospital day (HOD) 1 to other injury severities to better understand outcomes.

Methods: Twenty level I and II institutions participated in a prospective observational multicenter trial with data collection from 10/2021-3/2024 including patients > 18 years old with blunt SCI. HOD 1 ASIA A was compared to HOD 1 ASIA B-E for injury specifics and demographics. Subgroup analysis of ASIA A patients was also completed between two cohorts: improvement vs no improvement.

Results: 256 patients had both HOD 1 ASIA and discharge ASIA scores; of those 68 (26.6%) had an ASIA score of A on HOD 1. Compared to HOD 1 ASIA B-E, HOD 1 ASIA A's were significantly younger (45.8 vs 58.1 $p < 0.001$) and had increased mortality (18.5% vs 4.9% $p<0.001$). ASIA A SCI patients had longer median duration of MAP treatment (96.3 vs 94.7 hours, $p= 0.023$) but spent less percentage of their treatment time at a goal MAP of 85 mmHg (66.1% vs 73.9% $p= 0.003$). However, there was no observed difference is improvement based on HOD 1 ASIA score (23.5% HOD 1 ASIA A vs 25.1% HOD 1 ASIA B-E, $p =0.79$) (Table1). The ASIA A patient's that improved had significantly lower ISS (24.3 vs 33.6, $p =0.035$) and a higher percentage of Neurosurgical operative intervention (100% vs 75%, 0.026). ASIA A patients that improved spent an increased percentage of time at goal MAP of 85 mmHg during treatment but that difference failed to reach significance (70.6% vs 64.8%, $p =0.78$) (Table 2).

Conclusions: HOD 1 ASIA A patients were younger and had increased mortality compared to all others. ASIA A improvement was associated with a lower ISS and Neurological intervention not MAP treatment specifics.

	All Combined N = 256	HOD 1 ASIA A. N = 68	HOD 1 ASIA B-E N = 188	P-value
Demographics				
Age mean (SD)	54.9 (19.1)	45.8 (19.8)	58.1 (17.8)	<0.001*
Male Sex N, (%)	186 (72.7%)	45 (66.2%)	141 (75%)	0.16
Hospital Transfer N,(%)	64 (25.6%)	12 (18.2%)	52 (28.3%)	0.11
Hospital Length of Stay mean (SD)	22.6 (72.8)	21.7 (16)	22.9 (84.3)	0.001*
Ventilator days mean (SD)	5.3 (13.2)	9.2 (13.5)	3.8 (12.8)	<0.001*
Mortality N, (%)	21 (8.4%)	12 (18.5%)	9 (4.9%)	<0.001*
Mechanism of injury N, (%)				
Fall	122 (48%)	24 (35.3%)	98 (52.75)	0.08
Motor Vehicle Accident	75 (29.5%)	25 (36.8%)	50 (26.9%)	
Motor Cycle Accident	12 (4.7%)	6 (8.8%)	6 (3.2%)	
Pedestrian Struck	8 (3.1%)	3 (4.4%)	5 (2.7%)	
Assault	4 (1.6%)	2 (2.9%)	2 (1.1%)	
Other	33 (13%)	8 (11.8%)	25 (13.4%)	
Injury Specifics mean (SD)				
Injury Severity Score	24.1 (13.7)	31.6 (14.8)	21.3 (12.2)	<0.001*
AIS head	2.5 (1.3)	2.7 (1.4)	2.4 (1.3)	0.38
AIS C-spine	4.2 (5)	5.5 (9.7)	3.7 (0.80)	<0.001*
AIS T-spine	3.4 (1.5)	4.1 (1.4)	3.0 (1.5)	0.002
AIS L-spine	2.5 (1.4)	2.8 (1.5)	2.4 (1.3)	0.3
Treatment Specifics				
MAP treatment duration in Hours (median)	96	96.3	94.7	0.023*
% Time at Goal MAP > 85 mmHg mean (SD)	71.9 (24.3)	66.1 (23.6)	73.9 (24.3)	0.003*
Neurosurgical Intervention N, (%)	203 (79.3%)	55 (80.9%)	148 (78.7%)	0.71
ASIA Improvement at Discharge N, (%)	63 (24.7%)	16 (23.5%)	47 (25.1%)	0.79
Discharge Disposition N, (%)				
Home	42 (16.9%)	5 (7.8%)	37 (20%)	0.008*
Inpatient Rehabilitation	142 (57%)	35 (54.7%)	107 (57.8%)	
Long Term Care Facility	22 (8.8%)	7 (10.9%)	15 (8.1%)	
Skilled Nursing Facility	23 (9.2%)	6 (9.4%)	17 (9.2%)	

Table 1: Demographics, injury specifics and outcomes of HOD 1 ASIA A vs all others

	Improvement N = 16	No Improvement N = 52	P- value
Injury Severity Score mean (SD)	24.3 (7)	33.6 (15.7)	0.035*
% Time at Goal MAP > 85 mmHg mean (SD)	70.6 (14.3)	64.8 (25.6)	0.78
Neurosurgical intervention N, (%)	16 (100%)	39 (75%)	0.026*
Duration Treatment Time in Hours median [IQR]	102 [679, 2191]	96 [106, 60]	0.55
Arrival Lactate mean (SD)	2 (1.4)	2.4 (1.4)	0.49
Arrival pH mean (SD)	7.4 (0.07)	7.3 (0.12)	0.26
Mortality N, (%)	0 (-)	12 (24.5%)	0.028*

Table 2: HOD 1 ASIA A patients compared in 2 cohorts: improvement vs no improvement

Paper #29
January 17, 2025
9:10 am

IMPROVING THE READABILITY OF PATIENT EDUCATION MATERIALS ON TRAUMATIC INJURIES USING CHATGPT

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University of Texas Southwestern Medical Center

Presenter: Bahaa Succar, MD

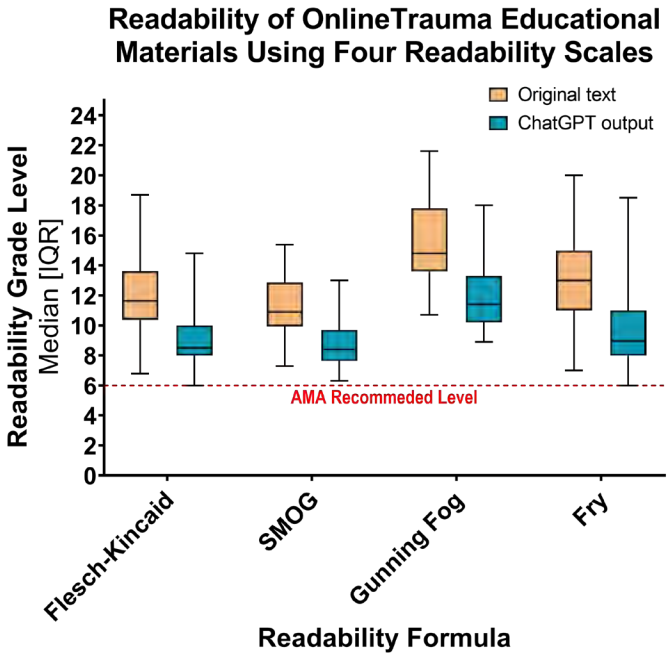
Discussant: Laura Brown, MD, PhD – University of Illinois College of Medicine Peoria

Objectives: Online health information is increasingly vital for patient education. However, the readability of online material often exceeds the recommended reading level set by the American Medical Association(AMA), limiting accessibility. In this study, we investigate the use of a large language model(LLM) to improve the readability of public-facing content on traumatic injuries.

Methods: Text from all patient education webpages across national trauma organizations' websites was collected. Each webpage provided information regarding common types of traumatic injuries and measures for injury prevention. ChatGPT 3.5 was tasked to improve the readability of the original texts. Four readability measures (SMOG, Gunning Fog, Flesch-Kincaid, and Fry) were used to assess the readability level of the original texts and ChatGPT outputs. Mean and median readability scores were calculated for each measure across webpages to compare the ChatGPT outputs with the original texts.

Results: A total of 51 webpages underwent readability analysis. The mean readability score of original texts across the four measures was 13, corresponding to a grade-level of a college freshman. Zero out of 51 webpages adhered to the AMA recommendation of presenting patient education materials at a grade 6 reading level. Upon rewriting the webpage content, ChatGPT significantly improved the mean readability to a grade level of 9 ($p<0.001$), the equivalent to a high school freshman. The figure illustrates the medians and ranges for original texts and ChatGPT outputs across the four scales. Moreover, after ChatGPT revision, 4/51 webpages (8%) met the AMA recommended grade level on at least one of the readability scales.

Conclusions: Our study demonstrates the potential of ChatGPT in improving the readability of trauma-related patient education materials. Future endeavors should further explore the capacity of LLMs to ensure equitable access to such resources.



Box and Whiskers plot illustrating the medians and ranges for both original texts and ChatGPT outputs across the four scales.

P<0.001 on the Wilcoxon signed-rank test

Paper #30
January 17, 2025
7:30 am

UNDERSTAFFED AND OVERWORKED: THE STARK REALITY OF ACUTE CARE SURGEON STAFFING IN THE UNITED STATES: AN EAST MULTI-CENTER STUDY

Patrick B. Murphy, MD, MPH, MSc*, Jamie J. Coleman, MD, FACS*, Danielle J Wilson, MD, Jaclyn Gellings, MD*, Elise Biesboer, MD*, Morgan Maring, BS, MS, Kaushik Mukherjee, MD, MSCI, FACS*, Stephanie Bonne, MD, FACS*, Melissa M. Boltz, DO, MBA, FACS*, Robert D. Winfield, MD, FACS*, Ryan P. Dumas, MD*, Jason Kurle, DO*, Roseanna Guzman-Curtis, MD, MPH*, S. Rob Todd, MD, FACS*, Baila Maqbool, MD*, Bryan C. Morse, MS, MD*, Michael W. Cripps, MD, FACS*, Stephen Gondek, MD, MPH*, Galinos Barmparas, MD, Jordan Lilienstein, MD*, Jeffry Nahmias, MD, MHPE, FACS, FCCM*, Lee Faucher, MD, Charles V. Bayouth, MD, FACS*, Tanya Egodage, MD, FACS*, Kristan Staudenmayer, MD, MS*, John D. Berne, MD*, Charles Fasanya , MD, FRCS, FACS*, Meredith Shaddix, DO*, Lewis E. Jacobson, MD, FACS*, Michael S Farrell, MD, MS*, Luis G. Fernandez, MD, KHS, KCOEG,FACS, FASAS, FCCP, FCCM, FICS*, Benjamin M. Manning, MD*, Robert Shayn Martin, MD*, Tovy H Kamine, MD*, Jordan M. Kirsch, DO*, Ilya Rakitin, MD, FACS*, Michael S Englehart, MD*, Stephanie Montgomery, MD, FACS*, Benoit Blondeau, MD, MBA, FACS*, Brent Emigh, MD, MSc, Katherine McKenzie, DO*, Sharven Taghavi, MD, MPH, MS, FACS*, Leah C. Tatebe, MD, FACS*, Kyle W. Cunningham, MD, MPH, FACS*, Marc A. de Moya, MD*
ACS Staffing Study Group
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Presenter: Patrick B. Murphy, MD, MPH, MSc

Discussant: Alicia R. Privette, MD – Medical University of South Carolina

Objectives: Right-sizing the workforce to clinical demand requires a balance of work intensity, productivity and a definition of clinical full-time equivalent (cFTE). We hypothesized a shortage of acute care surgeons based on a 204 shift/year (avg 17/month) definition of a 1.0 cFTE established in our prior mixed-methods study (2 service weeks + 5 call / month).

Methods: This multicenter study used mixed-methods, integrating clinical schedules (01/01/22-12/31/22), work relative value units (wRVU), and qualitative insights from semi-structured interviews (7/23–6/24). Schedules were converted to shifts (8-14hrs). Hospitals were short-staffed when shift demand exceeded supply based on each surgeon's cFTE. Interviews explored clinical demand and staffing challenges. Descriptive analysis and a deductive-inductive thematic analysis were performed.

Results: Forty Level I/II hospitals representing 373 acute care surgeons (258 cFTEs) from 25 states were included. 78% of hospitals were short-staffed (Figure 1). Compared to well-staffed hospitals, short-staffed hospitals had fewer cFTEs (6.6±2 v. 9.2±3, $p<0.006$), a higher demand for clinical work (1958±545 v. 1654±570 shifts, $p=0.16$) and a higher wRVU/cFTE (8902 v. 7488, $p=0.12$). The aggregate clinical demand exceeded available surgeon capacity by 20% overall. Based on volume, a 1.0 cFTE is needed for every 289 (IQR 152, $R^2=0.66$) trauma admissions. There was a deficit of 74 cFTEs across the centers. Key themes are outlined in Table 1.

Conclusions: There appears to be a shortage of acute care surgeons in the USA when a definition of 204 shifts/year clinical FTE is applied. Hospitals face significant financial and administrative barriers to workforce expansion despite the overabundance of clinical volume. Future research is needed to ascertain the effects of expanding the existing workforce on both clinical outcomes and surgeon wellbeing.

Figure 1: Bar graph of clinical shift deficit (red) or surplus (green) per hospital (01/01/2022-12/31/2022) and line graph of clinical full-time equivalents (1.0 cFTE = 204 shifts/year) compared to needed cFTEs. There is a shortage of 420 shifts (red line) or 2.1 cFTE per hospital on average.

Key Theme	Supporting Quote(s)
Balancing intensity / efficiency	*"Yeah, we don't [balance intensity]. We don't weigh it in any way. It is basically a shift as a shift, as a shift."* *"Just try to do the accounting and make everyone equal at the end of the year. Everyone did kind of the same amount of weeks, because that's a natural way"*
Staffing for unpredictable clinical demand	*"Other industries budget 80%, so that they can have a 20% flex capability. You have to look at the clinical workload then you ramp up the clinical workload by 20% and see what you need for that."* *"I think we'll reach a point where the nights are busy enough that we need a second person in house. The backup from home seems to be working for us and you have nights where you don't get called. You have other nights where you end up there all night, but not frequently enough where we feel like we need a second person for those things. We're trying to really gauge it by the volume trends"*
Value and Financial Challenges	*"I think the biggest challenge is understanding our roles and responsibilities, and the value that we bring to the institution. "* *"Acute care surgery are like firefighters. You don't pay firefighters to show up when there's a fire. You pay firefighters to stay in shape, stay proficient, stay competent to be able to do the things they need."* *"And see, part of the problem is that a lot of people are still reporting to their department chairman, and the department chairman is an RVU person. I don't report to Department Chairman."*

Table 1: Qualitative themes from 40 semi-structured interviews with surgeon leadership

Paper #31
January 17, 2025
7:50 am

THE MISSING PERSPECTIVE IN THE REGIONALIZATION DEBATE: EVALUATING PATIENT PREFERENCES FOR LOCAL VERSUS REGIONAL EMERGENCY GENERAL SURGERY CARE

Patrick K. McGillen, MSc, MD, Eddie Rodriguez, BS, Shea Gallagher, MD,
Anaar Siletz, MD, PhD*, Kazuhide Matsushima, MD*,
Kenji Inaba, MD, Matthew J. Martin, MD, FACS, FASMBS*
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Presenter: Patrick K. McGillen, MSc, MD

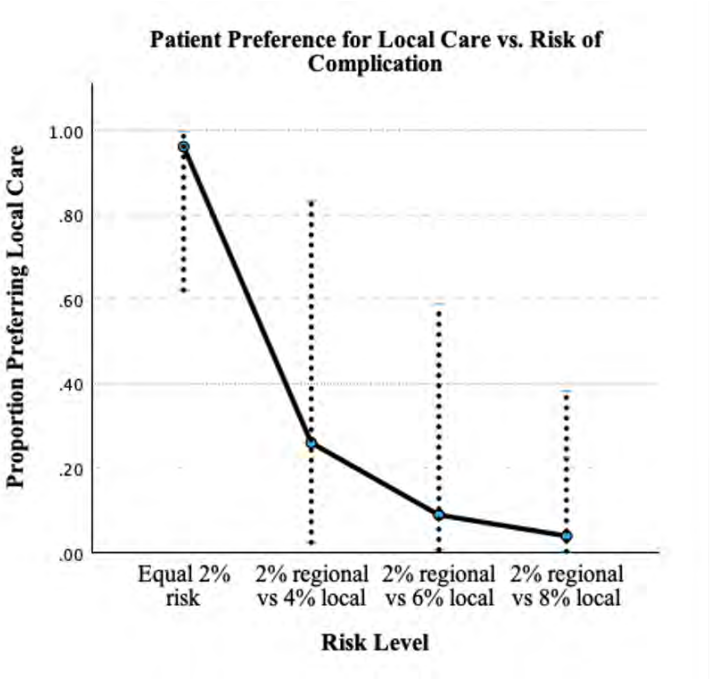
Discussant: Joseph Posluszny, MD – University Hospitals Cleveland/Case Western Reserve University SOM

Objectives: Regionalization of emergency general surgery (EGS) care is thought to enhance outcomes for certain populations and diseases but may not align with patient preferences and risk tolerances for adverse outcomes. We aimed to evaluate EGS patient preferences for local vs. regional EGS care across varying levels of risk.

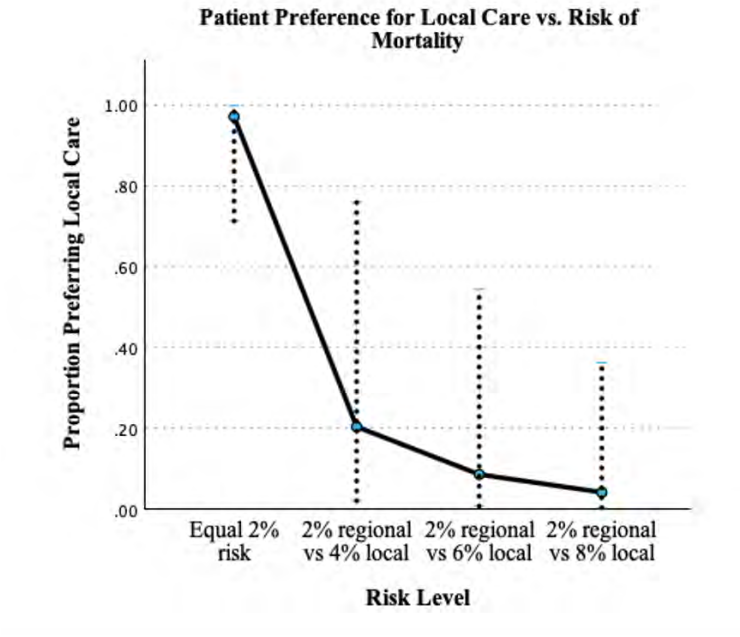
Methods: Structured surveys and risk assessments of EGS patients were performed. Preferences for local vs. regional care were quantified using a modified standard gamble utility assessment to determine the additional adverse outcome risks acceptable to patients. A mixed model regression identified predictors influencing willingness to accept increased risks with local care.

Results: Out of 121 gamble utility assessments, the majority preferred local care over regional transfer when operative complication (93%) and mortality risks (94%) were equivalent. When complication and mortality risk was 2% higher, 36% and 28% still preferred local care. At 6% increased risk, 14% and 12% still favored local care. Regression modeling demonstrated that higher local complication and morality risks decreased patient preference for local care ($F = 22.4$, $p < .001$; $F = 22.6$, $p < .001$), while factors like age and surgery during hospital stay showed no significant effects. Patients weighed mortality risks more heavily than complication risks when deciding between local or regional care. Variability in preferences suggested these differences were not captured by demographic, socioeconomic, and clinical variables.

Conclusions: Patients preferred local care over distant transfer at equivalent morbidity and mortality risks, and a significant proportion preferred local care even with increased risk of morbidity and mortality. These findings underscore the importance of incorporating individual patient preference and risk tolerance in discussions of regionalizing EGS care.



Modeled estimated marginal means of patient preferences for local care as operative complication risk increases, with each point representing preferences at risk increments of 0%, 2%, 4%, and 6% relative to the distant regional center.



Modeled estimated marginal means of patient preferences for local care as operative mortality risk increases, with each point representing preferences at risk increments of 0%, 2%, 4%, and 6% relative to the distant regional center.

Paper #32
January 17, 2025
8:10 am

AIR MEDICAL TRANSPORT FOR EMERGENCY GENERAL SURGERY TRANSFERS: WHEN IS THE HELICOPTER FASTER?

David Silver, MD, MPH, David Silver, MD, MPH, Liling Lu, MS,
Vanessa P. Ho, MD, MPH, PhD, FACS*, Arnav Mahajan, MB BCh BAO*, Sebastian Boland, MD,
Tamara Byrd, MD, Kevin Li, BS, Jamie Beiriger, BS, Francis X. Guyette, MD, MPH,
Andrew B. Peitzman, MD*, Matthew Neal, MD, Joshua B. Brown, MD, MSc, FACS*
University of Pittsburgh Medical Center

Presenter: David Silver, MD, MPH

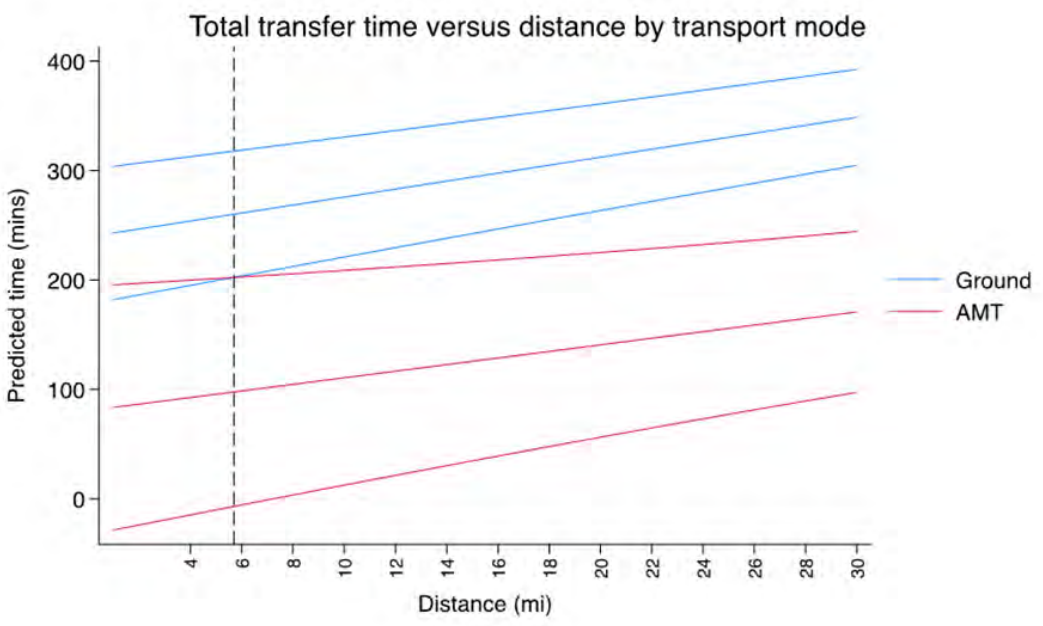
Discussant: Michael McGonigal, MD – Regions Hospital

Objectives: Delayed interfacility transport for emergency general surgery (EGS) is detrimental. Use of air medical transport (AMT) in EGS is not well described. We aimed to characterize EGS patients undergoing AMT and identify when AMT is faster than ground transport.

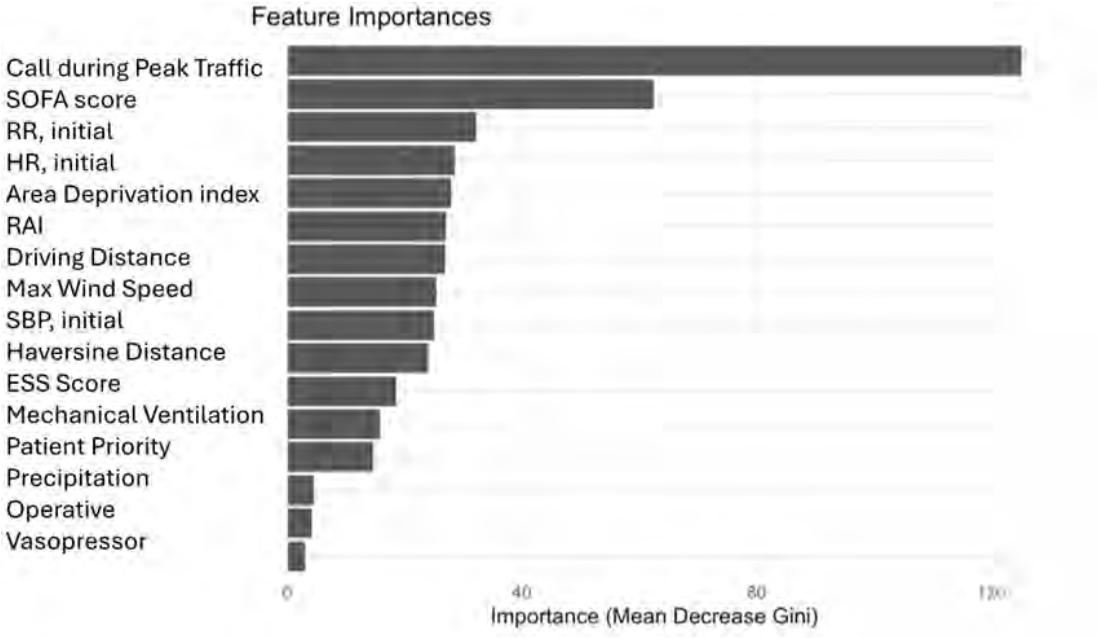
Methods: We retrospectively analyzed EGS patients transferred to our quaternary center Jan 2021-Dec 2023. GIS calculated transport distance. Linear regression determined the association between total transfer time and transport distance. We identified the distance threshold where the 95%CI of AMT did not overlap with ground transport. We stratified our analysis by weather (clear vs. adverse) and peak traffic times. Random forest models were used to assess variable importance in AMT utilization. We also tested the interaction of transfer center assigned priority.

Results: 1,713 patients were included, with 452 (26%) undergoing AMT. AMT patients were older, frailer, with higher unadjusted mortality (28% vs. 7%). AMT patients traveled 14 miles further with a total transfer time nearly 1 hour shorter than ground transport (195 vs 137 min, p=0.001). AMT became faster than ground transport at 5.7 miles (Fig 1). This threshold increased to 7.2 miles during adverse weather and 9.1 miles during peak traffic. During both adverse weather and peak traffic, the threshold extended to 14.8 miles. Predictors of AMT utilization included peak traffic and SOFA score (Fig 2). Accounting for transfer center assigned priority increased the threshold to 17.4 miles.

Conclusions: AMT offers significant time-saving benefits over ground transport at specific distance thresholds, which vary across different conditions. These findings highlight the importance of considering environmental factors and patient acuity in planning interfacility transfers for EGS patients. Improved guidelines for AMT utilization in EGS patients can optimize resource allocation and enhance patient outcomes.



Total prehospital time versus distance by transport mode. Middle color line represents effect estimate bounded by 95% confidence interval for ground transport (blue) and air transport (red). Vertical dashed line represents point where the 95%CI no longer overlap.



Mixed-effects random forest feature Importance for prediction of AMT utilization

Paper #33
January 17, 2025
8:30 am

SAFETY OF EARLY DIVERTING LOOP ILEOSTOMY REVERSAL AFTER SIGMOIDECTOMY WITH PRIMARY ANASTOMOSIS FOR PERFORATED DIVERTICULITIS

Rebecca Empey, MD, Joshua John Horns, PhD, Rupam Das, MS,
Sarah R. Lombardo, MD, MSc*, Marta McCrum, MD, MPH*
University of Utah

Presenter: Rebecca Empey, MD

Discussant: Jacinta Robenstine, MD – Oregon Health and Science University

Objectives: Increasing evidence supports sigmoidectomy with primary anastomosis (SPA) and diverting loop ileostomy (DLI) over Hartmann's procedure for perforated diverticulitis in stable patients. Prompt DLI reversal (DLIR) is often preferred by patients, however, optimal timing remains unclear. The objective of this study is to examine the association of DLIR timing with clinical outcomes and costs.

Methods: Retrospective analysis using National Readmissions Database (2010-2020) of all adults who underwent emergent SPA and DLI for perforated diverticulitis and subsequent elective DLIR. Timing of DLIR in days from discharge after SPA/DLI was categorized as early (< 25 percentile), middle (25-75 percentile), or late (>75 percentile). Multivariable regression was used to evaluate association of DLIR timing with post-operative complications, length of stay (LOS), and inpatient costs controlling for relevant patient and hospital characteristics.

Results: 5,757 patients were analyzed: 24% early DLIR (<61 days), 51.5% middle (61-115 days), and 24.5% late (>115 days). Late reversal patients had a higher proportion of public insurance, comorbidities, and incidence of complications after index SPA. After adjusting for competing patient and hospital characteristics, including comorbidities and complication after index SPA/DLI, odds of complication following DLIR was higher for middle (aOR 1.85, 95% CI 1.25-2.73) and late (aOR 3.59, 95% CI 2.4-5.38) groups compared to the early reversal. LOS and cost of DLIR admission was also increased in middle and late groups (Table 1).

Conclusions: Early DLIR after SPA for perforated diverticulitis is safe and associated with fewer post-operative complications, shorter LOS, and lower costs. Consideration should be given to early DLIR (6-8 weeks) after index SPA for appropriate patients.

Table 1: Association of diverting loop ileostomy reversal timing with outcomes and inpatient cost in multivariable analysis±

	Early Reversal (<60 days) N= 1,381	Middle Reversal (61-115 days) N= 2,963	Late Reversal (>115 days) N= 1,413
Complication* aOR (95% CI)	*reference*	1.85 (1.25-2.73) p<0.001	3.59 (2.4-5.38) p<0.001
Length of Stay for DLIR aIRR (95% CI)	*reference*	1.06 (0.99-1.33) p = 0.12	1.40 (1.26-1.56) p<0.001
Cost at DLIR $USD (95% CI)	*reference*	+1,507.5 (726-2,289) p<0.001	+6,492 (4,550 – 8,434) p<0.001

±All models adjusted for age, sex, primary payer, comorbidities (history of myocardial infarction, congestive heart failure, chronic pulmonary disease, renal disease, peripheral vascular disease, diabetes, liver disease, cancer), hospital teaching status and bed size, and presence of complication following index sigmoidectomy.
**Composite of: intra-abdominal abscess, anastomotic leak, bowel obstruction, ileus, dehydration, stoma prolapse*

Paper #34
January 17, 2025
8:50 am

BALANCING SAFETY AND EFFICACY: ASSESSMENT OF A WEIGHT-BASED, ANTI-XA GUIDED ENOXAPARIN VENOUS THROMBOEMBOLISM PROPHYLAXIS DOSING STRATEGY FOR TRAUMATIC BRAIN INJURY PATIENTS

Steven Atallah, PharmD, Benjamin Lee, PharmD, Andy Lo, PharmD, Christopher Limbo, PharmD, Jefferson W Chen, MD, Jeffry Nahmias, MD, MHPE, FACS, FCCM*
University of California Irvine

Presenter: Steven Atallah, PharmD

Discussant: Nimitt J. Patel, MD – MetroHealth Medical Center

Objectives: Patients with traumatic intracranial hemorrhage (ICH) are at high risk for venous thromboembolism (VTE) but are also prone to hemorrhagic progression. The efficacy and safety of weight-based, anti-Xa guided enoxaparin dosing for patients with ICH is unknown. We hypothesized that a weight-based, anti-Xa guided enoxaparin dosing will reduce VTE incidence without increasing ICH progression in traumatic brain injury (TBI) patients.

Methods: This was a retrospective pre-post, quasi-experimental study conducted at a single, academic, Level-I trauma center. Adult TBI patients admitted from December 2017 to May 2023 with ICH identified on computed tomography (CT) imaging who received at least 24 hours of chemoprophylaxis were included. A weight-based, anti-Xa guided enoxaparin arm was compared to fixed doses of enoxaparin 40 mg daily or unfractionated heparin 5000 units two-three times daily. Treatment groups were compared using a 1:1 propensity-score model (PSM), which matched for demographics, and injury profile (Table 1).

Results: Of 831 included patients, 281 PSM matched cohorts were compared. A significantly lower incidence of VTE was observed in the anti-Xa guided cohort (2.1% vs 6.1%; p=0.019) while radiographic ICH progression was equivalent between the two cohorts (3.9% vs 3.9%; p=0.99). A subgroup PSM analysis comparing 215 patients each from the anti-Xa guided vs enoxaparin-only control cohort also demonstrated a significantly lower incidence of VTE with the anti-Xa guided treatment (0.9% vs 5.6%; p=0.012) with no difference in radiographic ICH progression (4.2% vs 3.3%; p=0.61).

Conclusions: Weight-based, anti-Xa guided enoxaparin dosing was associated with reduced VTE incidence without increased ICH progression in TBI patients with existing ICH.

Characteristics [a]	Fixed-dose chemoprophylaxis n = 281	Anti-Xa guided chemoprophylaxis n = 281	*P* Value	Fixed-dose enoxaparin n = 215	Anti-Xa guided chemoprophylaxis n = 215	*P* Value
Demographics						
Male, n (%)	212 (75.4)	205 (73)	0.50	156 (72.6)	159 (74)	0.74
Race, n (%)						
White	218 (77.6)	208 (74)	0.17	161 (74.9)	154 (71.6)	0.06
Non-Hispanic White, n/N (%)	164/218 (75.2)	130/208 (62.5)		123/161 (76.4)	95/154 (61.7)	
Hispanic or Latino, n/N (%)	54/218 (24.8)	78/208 (37.5)		38/161 (23.6)	59/154 (38.3)	
African American	4 (1.4)	9 (3.2)		1 (0.5)	7 (3.3)	
Asian/Pacific Islander	34 (12.1)	46 (16.4)		31 (14.4)	40 (18.6)	
Other	25 (8.9)	18 (6.4)		22 (10.2)	14 (6.5)	
Age (years)	51 [31-67]	50 [32-64]	0.76	53 [32-71]	54 [37-69]	0.68
Body mass index (kg/m^2)	25.2 [22.4-29.0]	25.8 [22.7-29.3]	0.36	25.1 [22.5-28.4]	25.1 [22.3-28.1]	0.71
Obese (≥ 30 kg/m^2), n (%)	56 (19.9)	59 (21)	0.75	36 (16.7)	32 (14.9)	0.60
Prior history of VTE, n (%)	2 (0.7)	2 (0.7)	> 0.99	2 (0.9)	2 (0.9)	> 0.99
Anticoagulant prior to arrival, n (%)	7 (2.5)	4 (1.4)	0.55	3 (1.4)	4 (1.9)	> 0.99
Antiplatelet prior to arrival, n (%)	29 (10.3)	20 (7.1)	0.18	20 (9.3)	14 (6.5)	0.28
Glasgow Coma Scale on arrival	14 [10-15]	14 [11-15]	0.83	14 [12-15]	14 [12-15]	0.42
Injury Severity Score	21 [13-29]	19 [14-29]	0.70	21 [13-29]	19 [14-27]	0.96
Head AIS, n (%)			0.34			0.38
4-5	114 (40.6)	103 (36.7)		93 (43.3)	84 (39.1)	
2-3	167 (59.4)	178 (63.3)		122 (56.7)	131 (60.9)	
Spinal cord injury, n (%)	7 (2.5)	9 (3.2)	0.61	2 (0.9)	1 (0.5)	> 0.99
Pelvic or femoral fracture, n (%)	54 (19.2)	65 (23.1)	0.26	49 (22.8)	42 (19.5)	0.41
Isolated TBI, n (%)	2 (0.7)	4 (1.4)	0.69	2 (0.9)	4 (1.9)	0.69
Craniotomy performed, n (%)	21 (7.5)	18 (6.4)	0.62	16 (7.4)	15 (7)	0.85
Cerebral monitor, n (%)	43 (15.3)	39 (13.9)	0.63	30 (14)	31 (14.4)	0.89
COVID (+)	10 (3.6)	11 (3.9)	0.82	6 (2.8)	5 (2.3)	0.76
Intubated, n (%)	89 (31.7)	85 (30.3)	0.72	56 (26.1)	60 (27.9)	0.66
Ventilation days	6 [2-10]	5 [2-14]	0.64	6 [2-12]	6 [3-14]	0.62
Delayed prophylaxis initiation (> 48 hours from arrival)	62 (22.1)	57 (20.3)	0.61	48 (22.3)	54 (25.1)	0.50

Table 1. Baseline Demographics, Injury Profile, and Outcomes for TBI Patients Included within Propensity Score Matching Analyses

Characteristics [a]	Fixed-Dose	Anti-Xa	*P* Value
Heparin and Enoxaparin Treated Patients in Fixed-Dose	n = 281	n = 281	
Any VTE, n (%) [b]	17 (6.1)	6 (2.1)	***0.019***
Pulmonary embolism, n (%)	7 (2.5)	2 (0.7)	0.18
Deep vein thrombosis, n (%)	12 (4.3)	4 (1.3)	0.07
Radiographic ICH progression, n (%)	11 (3.9)	11 (3.9)	> 0.99
Clinically significant ICH progression, n (%)	4 (1.4)	4 (1.4)	> 0.99
Hospital LOS (days)	8 [5-15]	8 [5-16]	0.48
Enoxaparin-Only Treated Patients in Fixed-Dose	n = 215	n = 215	
Any VTE, n (%) [b]	12 (5.6)	2 (0.9)	***0.012***
Pulmonary embolism, n (%)	4 (1.9)	1 (0.5)	0.37
Deep vein thrombosis, n (%)	9 (4.2)	1 (0.5)	***0.020***
Radiographic ICH progression, n (%)	7 (3.3)	9 (4.2)	0.61
Clinically significant ICH progression, n (%)	3 (1.4)	4 (1.9)	> 0.99
Hospital LOS (days)	7 [5-12]	8 [5-15]	0.27

Abbreviations: VTE, venous thromboembolism; ICH, intracranial hemorrhage; LOS, length of stay

[a] All values reported as median [IQR] unless otherwise stated

[b] Inclusive of patients with both DVT and PE

Table 2. Efficacy and Safety Outcomes after Propensity Score Matching

Paper #35
January 17, 2025
9:10 am

OPTIMIZING TIME TO VTE PROPHYLAXIS DEVELOPMENT OF AN ENOXAPARIN DOSING CALCULATOR

Allison E Berndtson, MD, FACS*, Kevin Box, PharmD, Laura N. Haines (Godat), MD, FACS *, Jay Doucet, MD MSc*, Alan Smith, PhD MPH, Todd Costantini, MD
University of California San Diego

Presenter: Allison E Berndtson, MD, FACS

Discussant: Andrew Medvecz, MD, MPH – Vanderbilt University Medical Center

Objectives: Optimal pharmacologic prophylaxis is critical for preventing VTE in trauma patients, with delays in goal anti-Xa levels associated with increased VTE risk. While current protocols recommend a "one-size fits all" approach to enoxaparin, this may be inadequate as optimal dosing can be altered by weight, sex and creatinine clearance (CrCl). We hypothesized that a dosing calculator incorporating these factors could improve initial enoxaparin dosing and reduce time to goal anti-Xa level.

Methods: We performed a retrospective review of trauma patients admitted 2015-21, age >14 years, LOS>4 days, on enoxaparin per weight-based protocol. Exclusion criteria were incorrect dosing, CrCl <30mL/min, renal replacement therapy, or no valid peak anti-Xa level. A training dataset consisting of 80% of total patients (n=1536) was used to build a linear regression model for anti-Xa level. Weight, sex, and CrCl were included based on prior studies, and remained significantly associated with anti-Xa on univariate analysis. Results were incorporated into a dosing calculator which was applied to the remaining 20% of patients (n=354).

Results: Of the 354 test patients, 31.4% (n=111) had an initial anti-Xa outside goal range. For the 68 patients with a low anti-Xa, the calculator predicted a higher starting dose in 91.2%. For the 43 patients with an initial high anti-Xa, a lower starting dose was predicted in 76.7%. 52 patients had dose adjustment to achieve an in-range anti-Xa. The initial enoxaparin dose predicted by the calculator would have been correct in 80.7% of cases.

Conclusions: An enoxaparin dosing calculator combining weight, sex, and CrCl may improve accuracy of initial dosing and reduce delays to appropriate VTE prophylaxis. This calculator can be incorporated into a web-based app or integrated into the electronic health record for ease of use. Prospective implementation in a trial setting is required for model validation.

Quick Shots Session I

Paper #1
January 16, 2025
10:00 am

ANTIBIOTICS FOR FACIAL FRACTURES: HOW MUCH IS ENOUGH?

Taryn Dee, DO, Andrew Desio, PharmD BCPS BCCP BCCCP BCIDP, Margot Knight, DO, Michelle Mendiola, MD, Chad Purnell, MD, Pravin Patel, MD, Grace Chang, MD
Mount Sinai Hospital Chicago

Presenter: Taryn Dee, DO

Objectives: Surgical Infection Society guidelines limit prophylactic antibiotic use in patients with facial fractures to the perioperative period only. This contrasts with the extended duration of antibiotic use commonly seen in practice. The objective of this study was to determine whether limiting antibiotic usage to a perioperative course is associated with head and neck infection (HNI).

Methods: This retrospective cohort study included 258 patients initially treated with ampicillin-sulbactam for traumatic facial fractures in a community level 1 trauma center from October 2018 - December 2021. Patients either received a short course (SC, 0-1 days, n = 37) or a long course (LC, >2 days n = 221) of antibiotics. The primary outcome was HNI within 90 days. A Kaplan Meier survival analysis was performed to compare HNI risk over time followed by Cox proportional hazard regression analysis to determine univariate and multivariate hazard ratios (HR).

Results: Baseline demographics between SC and LC groups were well-balanced. A majority of patients were managed operatively (53.5%, n = 138). At 90 days, 5.4% of patients in both SC and LC groups experienced HNI. Receipt of a SC of antibiotics was not associated with a higher risk of HNI (HR 0.69, 95% CI 0.15-3.07, p = 0.62). On multivariate analysis, these results remained similar (HR 0.61, 95% CI 0.13–2.81, p = 0.52). Univariate analysis revealed mandibular fractures were associated with a higher risk of HNI (HR 17.92, CI 2.34-137.1, p = 0.005).

Conclusions: Receipt of SC antibiotics for prophylaxis in patients with facial fractures was not associated with a higher rate of HNI. Prospective randomized data is needed to clarify the role of antibiotics in this patient population.

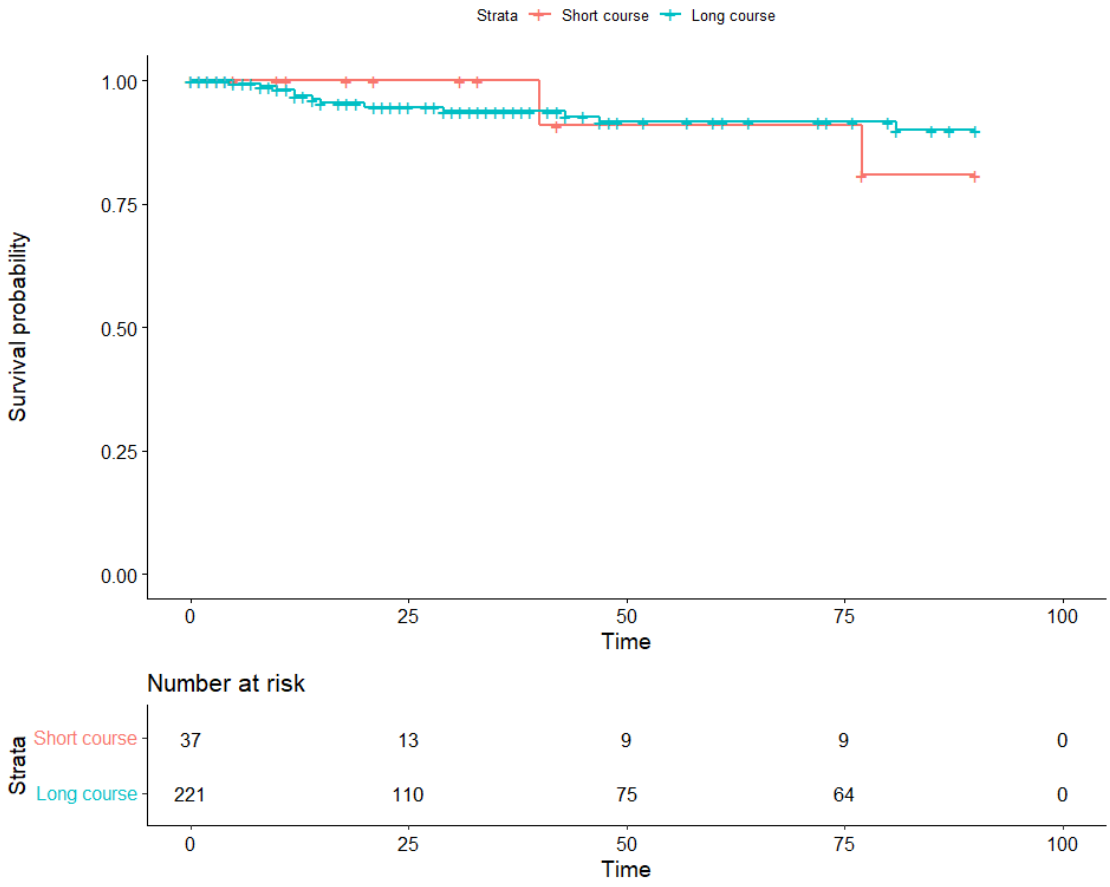


Figure 1. Kaplan-Meier Survival Curve – Short vs Long Courses of Antibiotics to 90 Days

Characteristic	Short Course (n = 37, 14%)	Long Course (n = 221, 86%)	p-value
Raw Infection Rate (90 days)	2 (5.4%)	12 (5.4%)	>0.9
Length of Stay	3.2 days (2.8)[1]	5.9 days (5.3)[1]	<0.001
Operative Management	9 (24%)	129 (58%)	<0.001
Medical Management	28 (76%)	92 (42%)	
Mechanisms of Injury			
Stab	0	4 (1.8%)	0.4
GSW	2 (5.4%)	40 (18%)	
MVC	6 (16%)	31 (14%)	
Assault	22 (59%)	96 (43%)	
Fall	5 (14%)	33 (15%)	
Peds vs Auto	2 (5.4%)	12 (5.4%)	
Unknown	0	5 (2.3%)	

Figure 2. Key Characteristics in Short Course vs Long Course Groups [1]Mean (SD)

Paper #2
January 16, 2025
10:06 am

TRUST, BUT VERIFY: THE IMPORTANCE OF CONFIRMATORY TESTING AFTER BCVI SCREENING

Jessica L Masch, MD, MS, Jarrett Santorelli, MD*,
Louis A Perkins, MD, Jessica L. Weaver, MD, PhD*
University of California San Diego

Presenter: Jessica L Masch, MD, MS

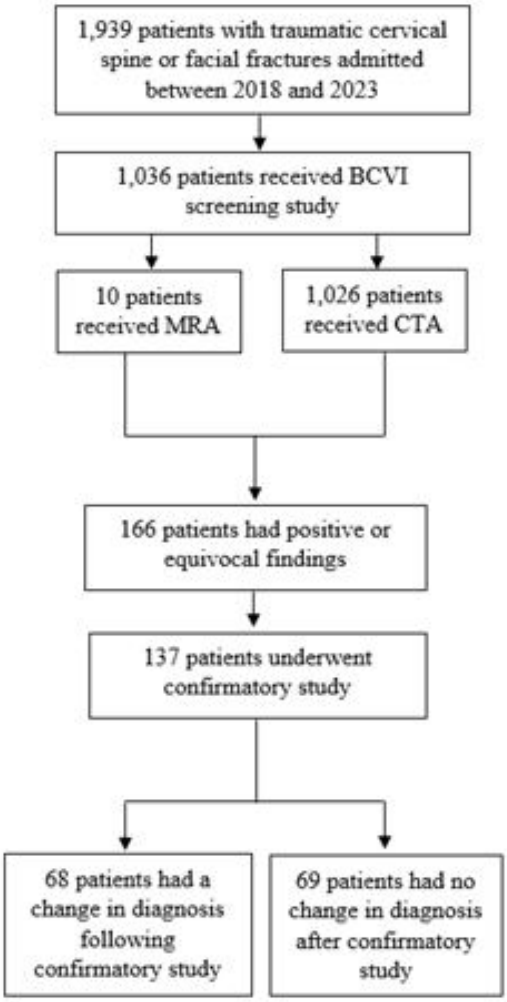
Objectives: Clinical practice guidelines recommend screening for blunt cerebrovascular injury (BCVI) based on the Denver Criteria. BCVI is typically treated with antithrombotic therapy, which may be high-risk in patients with concomitant brain or spine injuries. At our center, we often perform confirmatory imaging in high-risk patients after positive initial screening for BCVI. Our study investigates how frequently confirmatory studies change diagnosis and management of patients screening positive for BCVI.

Methods: A cross-sectional study of all trauma patients admitted to a level 1 trauma center with cervical spine or facial fractures between 2018 and 2023 was performed. Chart review was conducted to identify all patients who had a positive screening study for BCVI. Individual charts were reviewed for BCVI screening and confirmatory test modality and results, as well as timing and specifics of treatment recommendations.

Results: A total of 1,939 patients met inclusion criteria (Figure 1). 1,036 of these patients received BCVI screening, 10 with Magnetic Resonance Angiography (MRA) and 1,026 with Computed Tomography Angiography (CTA). Of those screened, 166 (16%) had with positive or equivocal findings, of which 137 (82.5%) patients received a confirmatory study, including 2 patients who received multiple studies (Figure 2). Confirmatory studies resulted in a change in the diagnosis in 68 patients (49.6%), including 49 studies (35.8%) that found no injury or chronic findings. 8 patients (5.8%) had studies that were non-diagnostic or aborted.

Conclusions: In our study, confirmatory BCVI imaging frequently identified false positive BCVIs in a third of patients. This suggests we should re-evaluate guidelines that would recommend antiplatelet or anticoagulation treatment in many high-risk patients based on screening studies alone.

Figure 1



Study cohort

Screening Study	Confirmatory Study	N	Diagnosis changed (N, %)
CTA	MRA	127	65 (51.2%)
CTA	Angiography	7	4 (57.1%)
CTA	Repeat CTA	2	1 (50%)
CTA	Ultrasound	1	1 (100%)
MRA	Ultrasound	1	1 (100%)
MRA	Angiography	1	1 (100%)

Diagnosis change based on imaging modality

Paper #3
January 16, 2025
10:12 am

PRE-HOSPITAL NEEDLE DECOMPRESSION: DOES LOCATION MATTER?

Sydney R. Willhite, MD, Tanner Wright, MD,
Shaun Rowe, PharmD, Catherine L. McKnight, MD*
University of Tennessee Medical Center-Knoxville

Presenter: Sydney R. Willhite, MD

Objectives: In 2018, Advanced Trauma Life Support guidelines changed their recommendation on the location at which needle thoracostomy for tension pneumothorax should be performed. We aimed to evaluate the success and injury rates when comparing the previously recommended 2nd intercostal space at the midclavicular line to the newly recommended 4th/5th intercostal space at the anterior axillary line.

Methods: A retrospective study was performed at a level 1 trauma center between January 1, 2018 and March 11, 2024. Patients 18 years and older who were involved in blunt or penetrating trauma with at least one attempt at needle decompression in the prehospital setting were included. Computed tomography was then reviewed to assess success and injury rates.

Results: After exclusion criteria, 157 attempts were reviewed on a total of 147 patients with mean age of 46 and with an 84.4% male population. When comparing success of entry into the chest cavity, the 4th/5th intercostal space at the anterior axillary line was more successful than the 2nd intercostal space at the midclavicular line, at 88.5% versus 46.1% respectively ($p<0.001$). The 4th/5th intercostal space at the anterior axillary line was also associated with a lower rate of injury to underlying organs, with 11.5% of attempts causing injury in comparison to 37.7% ($p<0.001$) when utilizing the 2nd intercostal space at the midclavicular line.

Conclusions: In patients with tension pneumothorax necessitating prehospital needle decompression, the 4th/5th intercostal space at the anterior axillary line has higher success rates and decreased injury rates, which is in concordance with new Advanced Trauma Life Support guidelines.

	ICS2-MCL (n=70)	ICS4/5-AAL (n=77)	p-value
Age, median (IQR)	46 (30, 59)	47 (33, 61)	0.67
Gender (female)	13 (18.6%)	10 (13.0%)	0.3755
ISS, median (IQR)	22 (14, 34)	22 (17, 29)	0.64
Mechanism of Injury			0.03
Blunt	70 (94.3%)	65 (84.4%)	
Penetrating	4 (5.7%)	12 (15.6%)	

Table 1. Comparison of demographics.

	ICS2-MCL (n=77)	ICS4/5-AAL (n=80)	p-value
Successful Chest Entry	35 (46.1%)	69 (88.5%)	**<0.001**
Organ Injury (all attempts)	29 (37.7%)	9 (11.5%)	**<0.001**

Table 2. Results comparing success and injury rates between ICS2-MCL and ICS4/5-AAL.

Paper #4
January 16, 2025
10:18 am

THE IMPACT OF VISION THERAPY ON POST-CONCUSSION SYMPTOM RESOLUTION

Francesca Andronic, BA, MD, Francesca Andronic, BA, MD, Eden K Hunt, MD,
David Clark, BS, Mitch Daniel, BS, Aaron Banwer, BS,
Megan Hammer, BS Candidate, Daniele Shollenberger, BS, NP,
Alison Sutter, MPH, Hope Kincaid, MPH, CPH, Mark D Cipolle, MD, PhD*
Lehigh Valley Health Network

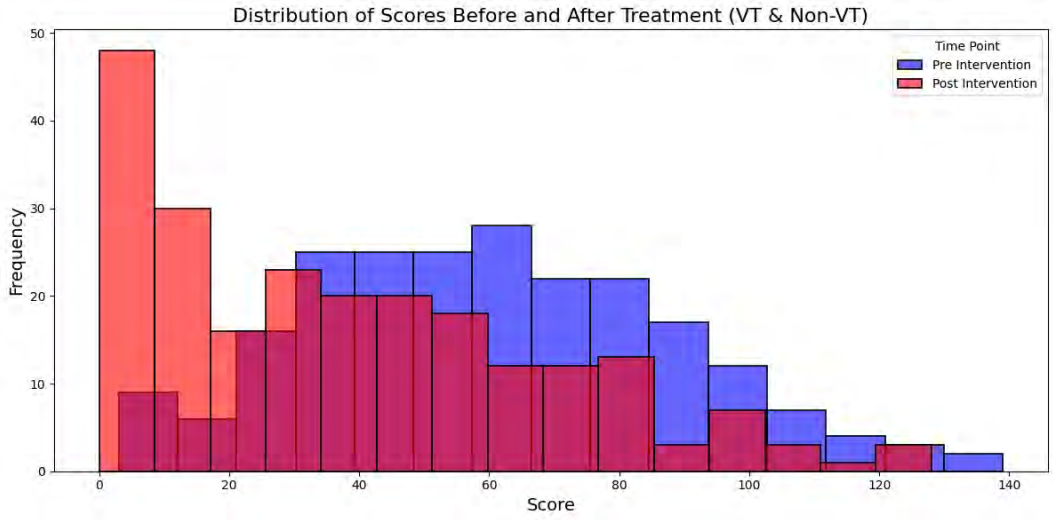
Presenter: Francesca Andronic, BA, MD

Objectives: Vision therapy has been identified as a treatment avenue for post-concussion symptoms, especially those associated with visual impairments. The correlation between concussive injury and visual symptoms has been demonstrated as a potential metric to quantify recovery. Current evidence exploring the efficacy of vision therapy suggests that it improves outcomes when used concurrently with other rehabilitation methods. The aim of this study is to evaluate the impact of vision therapy on post-concussive symptomatic recovery in comparison to standard treatment modalities.

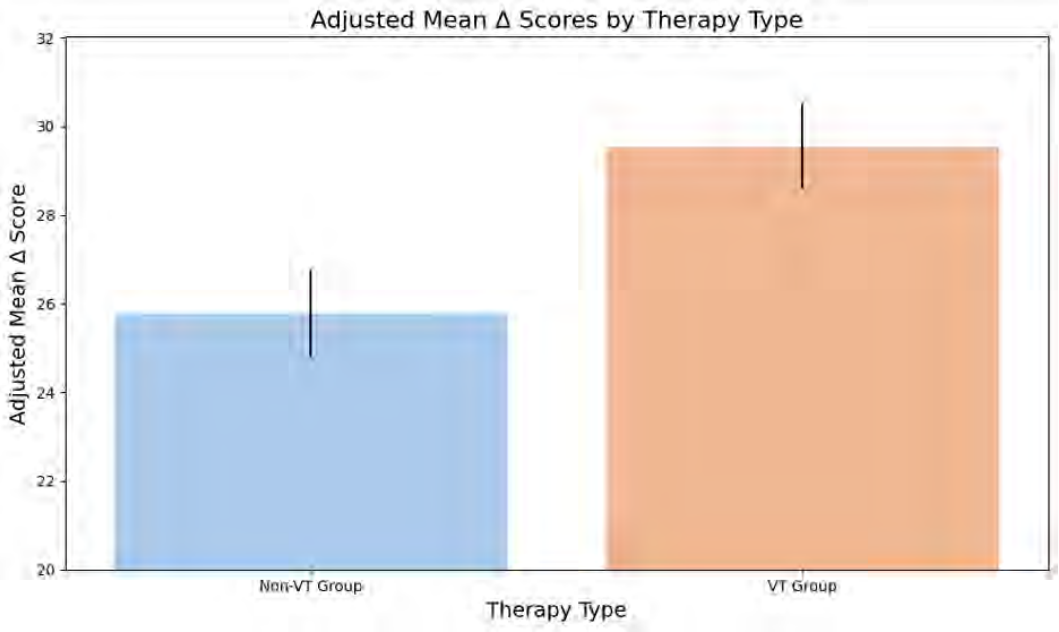
Methods: A retrospective chart review encompassing all patients who were evaluated in the concussion clinic from 1/1/2019-12/31/2021 was conducted. Patients were then stratified into two groups based on the treatment modality received: PT and OT (non-VT group) vs. PT, OT, and VT (VT group). Post-concussion syndrome symptoms were tracked utilizing a 24 item post-concussion checklist which was completed at each patient encounter. A preliminary ANCOVA analysis was performed comparing the magnitude of change in symptom scores between two therapy types, while adjusting for initial symptom severity.

Results: In our preliminary analysis, the ANCOVA model demonstrated that the mean and variance scores between the non-VT and VT groups are statistically significant ($p<0.05$). Individuals with higher initial scores had a larger decrease over time when therapy type remained constant. When controlling for the variance in index checklist score, the VT group had an average final symptom checklist score of 10 points lower when compared with the non-VT group.

Conclusions: The addition of vision therapy as an adjunct to OT & PT in the treatment of PCS demonstrates a decrease in post-concussive checklist score in our preliminary analysis, suggesting that including vision therapy in PCS treatment regimen can improve clinical outcomes.



Distribution of Symptom Checklist Scores Before and After Treatment in All Treatment Groups



Adjusted Mean Change Scores by Treatment Group

Paper #5
January 16, 2025
10:24 am

EMERGENCY DEPARTMENT INTUBATION IS ASSOCIATED WITH HIGHER EARLY MORTALITY IN SEVERELY INJURED PATIENTS REQUIRING HEMORRHAGE CONTROL SURGERY

Jonathan P. Meizoso, MD, MSPH*, Michael Cobler-Lichter, MD,
Nicholas Namias, MBA, MD*, Bryan A. Cotton, MD, MPH,
Jeremy W. Cannon, MD, SM, FACS*, Martin A. Schreiber, MD, FACS*,
Ernest Eugene Moore, MD*, Joseph P. Minei, MD, MBA, FACS*,
Stephen R. Wisniewski, PhD, Francis X. Guyette, MD, MPH, Jason L. Sperry, MD, MPH*
University of Miami Miller School of Medicine

Presenter: Jonathan P. Meizoso, MD, MSPH

Objectives: Traditional priorities in the management of trauma patients emphasize securing the airway prior to considering need for hemorrhage control. This airway-first approach may result in postintubation hypotension and cardiac arrest. We hypothesize that emergency department (ED) intubation is associated with lower survival than OR intubation in trauma patients at risk for massive transfusion (MT) undergoing hemorrhage control surgery.

Methods: Secondary analysis of a prospective, multicenter observational cohort study. Adults at risk of MT (ABC score > 2) requiring blood products and hemorrhage control surgery within 60min of arrival were included. Exclusion criteria: age<15, penetrating brain injury, >5 min CPR, death before OR, prisoners, pregnancy, transfers, and prehospital intubations. Primary outcome was early mortality. Multivariate analysis was performed to control for potential confounders.

Results: 566 patients were included; 110 (19%) underwent ED intubation. ED intubation patients were more commonly blunt trauma with shock and TBI, required more transfusions, and had longer delays from arrival to OR. Mortality was higher in the ED intubation group at all time points (Table **1**). On multivariate analysis after adjusting confounders, ED intubation was an independent predictor of mortality at 4-hours (aOR 3.26, 95% CI 1.23-8.64), 12-hours (aOR 3.73, 95% CI 1.33-10.49), and 24-hours (aOR 4.20, 95% CI 1.60-11.03) (Table 2).

Conclusions: ED intubation is independently associated with higher early mortality in trauma patients at risk of MT who require hemorrhage control surgery, suggesting a critical window where intubation may be more safely performed in the OR. Shifting the focus from airway to circulation first, with an emphasis on expedient hemorrhage control and simultaneous airway management, may improve outcomes in these patients.

Table 1. Study Population Stratified by ED Intubation.

	No ED Intubation (n = 456)	ED Intubation (n = 110)	p-value
Age, years	35 (27-49)	35 (25-47)	0.706
Female sex	82 (18.0%)	25 (22.7%)	0.254
Time to OR, min	16 (11-25)	25 (17-38)	**<0.001**
Penetrating trauma	325 (71.3%)	60 (54.5%)	**<0.001**
ISS	20 (10-29)	26 (13-33)	0.056
AIS Head	0 (0)	0 (0-3)	**<0.001**
AIS Chest	2 (0-3)	3 (0-3)	**0.003**
AIS Abdomen	3 (0-4)	2 (0-4)	0.165
Lowest SBP, mmHg	90 (76-110)	76 (60-93)	**<0.001**
Highest HR, bpm	110 (97-130)	134 (117-155)	**<0.001**
Lowest GCS	15 (14-15)	3 (3-12)	**<0.001**
4-hour total blood products, units	7 (3-17)	17 (7-30)	**<0.001**
24-hour total blood products, units	9 (4-21)	20 (8-43)	**<0.001**
4-hour mortality	19 (4.2%)	19 (17.4%)	**<0.001**
12-hour mortality	29 (6.4%)	25 (22.9%)	**<0.001**
24-hour mortality	30 (6.6%)	26 (23.9%)	**<0.001**
28-day mortality	37 (8.2%)	34 (31.2%)	**<0.001**

ED: emergency department; OR: operating room; ISS: Injury Severity Score; AIS: Abbreviated Injury Scale; SBP: systolic blood pressure; HR: heart rate; bpm: beats per minute; GCS: Glasgow Coma Scale. Categorical variables are expressed as frequency (percentage); continuous variables are expressed as median (interquartile range).

Table 2. Multiple Logistic Regression Results by Mortality Time-Point.

	4-Hour Mortality		12-Hour Mortality		24-Hour Mortality	
	aOR	**95% CI**	**aOR**	**95% CI**	**aOR**	**95% CI**
Penetrating trauma	2.590	0.988-6.787	3.466*	1.292-9.300	2.664*	1.058-6.704
Lowest SBP	0.979*	0.965-0.993	0.992	0.977-1.007	0.992	0.978-1.007
Highest HR	1.002	0.987-1.017	0.993	0.978-1.008	0.998	0.983-1.012
AIS Head	0.815	0.568-1.171	0.680	0.443-1.046	0.695	0.475-1.018
AIS Chest	0.998	0.764-1.302	0.906	0.690-1.188	1.009	0.782-1.303
AIS Abdomen	1.234	0.955-1.594	1.219	0.931-1.594	1.351*	1.045-1.745
Time to OR	0.982	0.949-1.016	0.997	0.864-1.031	0.993	0.963-1.024
4-hour WB	1.170*	1.045-1.311	1.315*	1.141-1.515	---	---
4-hour RBC	1.064*	1.014-1.117	1.156*	1.082-1.236	---	---
4-hour plasma	0.979	0.905-1.059	1.008	0.921-1.103	---	---
4-hour platelets	0.842	0.563-1.261	0.581*	0.380-0.889	---	---
24-hour WB	---	---	---	---	1.248*	1.093-1.426
24-hour RBC	---	---	---	---	1.149*	1.086-1.215
24-hour plasma	---	---	---	---	0.948	0.885-1.015
24-hour platelets	---	---	---	---	0.660*	0.490-0.888
ED intubation	3.256*	1.227-8.641	3.733*	1.329-10.487	4.201*	1.601-11.028
AUROC	0.890		0.917		0.908	

aOR: adjusted odds ratio; CI: confidence interval; SBP: systolic blood pressure; HR: heart rate; AIS: Abbreviated Injury Scale; OR: operating room; WB: whole blood; RBC: red blood cells; ED: emergency department; AUROC: area under the receiver-operator characteristic curve; * indicates statistical significance

Paper #6
January 16, 2025
10:30 am

SERUM TROPONIN HAS LIMITED UTILITY IN STABLE PATIENTS AT RISK FOR BLUNT CARDIAC INJURY

Hannah L. Cleary, Matthew Bernard, BS*, Andrew C. Bernard, MD, FACS*
University of Kentucky

Presenter: Hannah L. Cleary

Objectives: There are no gold standard criteria for diagnosing Blunt Cardiac Injury (BCI). Admission electrocardiogram (ECG) is standard. While the combination of serum troponin (cTnI) and ECG is considered the most sensitive screening method for those being considered for discharge, little evidence exists regarding the diagnostic value and clinical utility of initial and serial serum troponin levels in stable patients who are being admitted with a possible BCI. Therefore, this study seeks to determine if troponin level is an independent predictor of adverse cardiac events in stable, admitted patients at risk for BCI.

Methods: This was a 5-year retrospective study using the trauma database at a University Level I Trauma Center. The study population included adult trauma patients presenting with a physician diagnosis of BCI or a sternal fracture who met prespecified stability criteria (SBP>90mmHg, HR<110bpm, shock index<1, GCS>14). The main data points collected were troponin value and ECG interpretation. A patient had an adverse cardiac event if they were diagnosed with a new arrhythmia requiring treatment, had cardiac surgery, or suffered cardiac-related mortality. Comparison in the incidence of adverse cardiac events between patients with normal and abnormal ECG was analyzed using the independent samples z-test for proportions.

Results: 350 patients met inclusion criteria, and there were 12 adverse cardiac events (Table); each were new arrhythmias requiring treatment with 1 patient also requiring synchronized cardioversion. Patients with an abnormal ECG were more likely to have an adverse cardiac event (p=1.47E-6). No patients with a normal ECG and abnormal troponin had an adverse cardiac event.

Conclusions: In stable patients in this cohort, troponin level did not predict adverse cardiac events. Admitted patients at risk for BCI who meet stability criteria might be safely observed without measurement of serum troponin.

ECG	Troponin	Adverse Cardiac Events
Normal (n=243)	Normal (n=160)	1
	Abnormal (n=83)	0
Abnormal (n=107)	Normal (n=55)	6
	Abnormal (n=52)	5

Table. The incidence of adverse cardiac events in patients presenting with either a physician diagnosis of Blunt Cardiac Injury (BCI) or a sternal fracture categorized by electrocardiogram (ECG) interpretation and troponin value.

Paper #7
January 16, 2025
10:36 am

DIFFERENTIAL GENE EXPRESSION IN PATIENTS WITH MODERATE OR SEVERE TRAUMATIC BRAIN INJURY TREATED WITH TRANEXAMIC ACID

Ian McKinley, MD*, Matt Dapas, PhD., Andrew J. Benjamin, MD, MS*,
Tzintzuni Garcia, Ph.D., Lea Hoefer, MD*, Ann M. Polcari, MD, MPH, MSGH*,
Martin A. Schreiber, MD, FACS*, Susan E. Rowell, MD, MBA, MCR*
University of Chicago

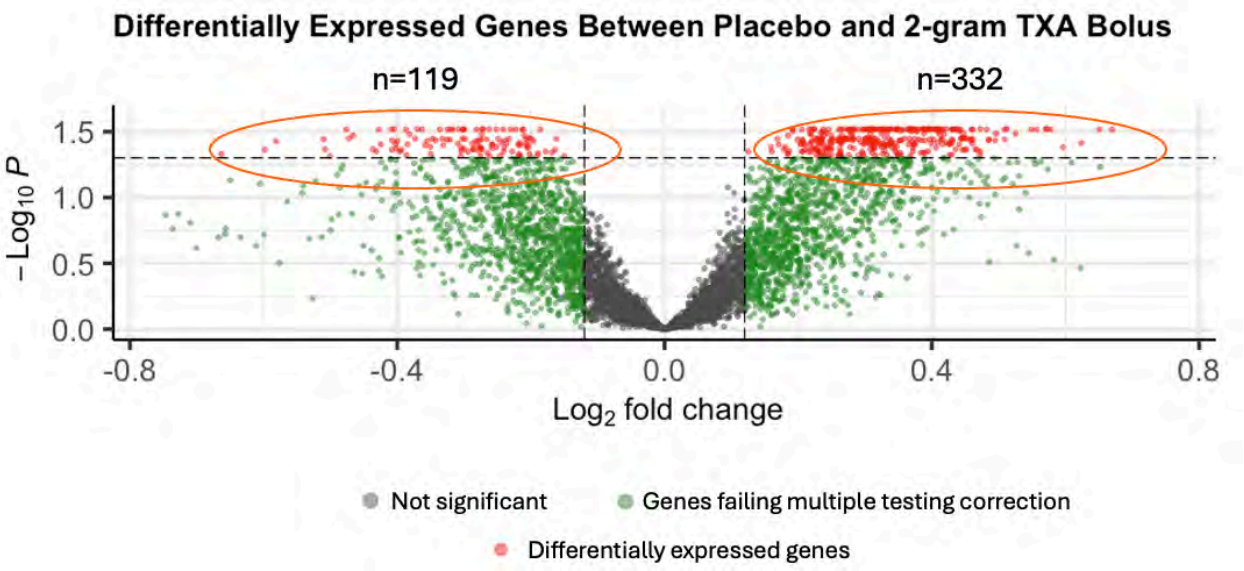
Presenter: Ian McKinley, MD

Objectives: A 2-gram bolus of tranexamic acid (TXA) decreases mortality in patients with traumatic brain injury (TBI) and intracranial hemorrhage (ICH), but the underlying mechanism remains unclear. We performed the first differential gene expression analysis in humans receiving TXA using peripheral blood samples to identify differences in gene expression between TXA-treated and untreated patients to direct future investigation into the mechanism by which TXA improves mortality.

Methods: Patients enrolled in the Prehospital TXA for TBI trial (GCS 3-12 and SPB > 90) with ICH who received either a 2-gm prehospital TXA bolus or placebo within 2 hours of injury with high-quality RNA samples available at baseline and 24-hours were included. Whole-transcriptome RNA-seq and gene set enrichment analysis were performed to identify relevant biological pathways. The primary comparison was the difference in gene counts between groups, accounting for individual baseline gene expression. Secondary analyses included differences between groups at baseline and 24 hours. A p-value < 0.05 was used for significance after correcting for multiple testing.

Results: Of 92 subjects who met inclusion criteria (placebo n=38, 2-gm TXA bolus n=54), no differences in baseline demographic/physiologic variables or gene counts were observed. When accounting for individual baseline expression, 451 genes were significantly differentially expressed between groups (332 increased, 119 decreased), primarily related to alternate RNA splicing, inflammatory cascade modulation, and transcriptional and cell-cycle control mechanisms.

Conclusions: Differentially expressed genes in patients with moderate or severe TBI and ICH treated with TXA are identifiable 24 hours after treatment using peripheral sampling. Pathways identified suggest TXA may be involved in inflammation, alternate RNA splicing, and cell cycle regulation.


Differentially Expressed Genes Between Placebo and 2-gram TXA Bolus
n=119
n=332
1.5
1.0
0.5
0.0
−Log10 P
-0.8
-0.4
0.0
0.4
0.8
Log2 fold change
Not significant
Genes failing multiple testing correction
Differentially expressed genes

Paper #8
January 16, 2025
10:42 am

TAKING THE LONG VIEW IN TRAUMATIC PERIPHERAL VASCULAR INJURY REPAIRS: AN ANALYSIS OF THE PROOVIT POST-DISCHARGE REGISTRY

Negar Nekooei, MD*, Justin Wang, M.S., Ajay Prasad, BS, Danielle Brabender, MD, Anaar Siletz, MD, PhD*, Kazuhide Matsushima, MD*, Kenji Inaba, MD, Joseph J. DuBose, MD*, Matthew J. Martin, MD, FACS, FASMBS*
LAC+USC Medical Center

Presenter: Negar Nekooei, MD

Objectives: Outcomes of peripheral arterial repairs (PAR) in trauma are well-studied but primarily limited to inpatient or 30-day complications. This study analyzes outcomes with extended post-discharge follow-up data after PAR.

Methods: A recently added post-discharge follow-up module to the PROspective Observational Vascular Injury Treatment (PROOVIT) registry (2012-2023) was queried for all PAR surviving to discharge. Demographics, injury severity, repair type, and PAR-related complications were collected. Rates of in-hospital and post-discharge vascular complications (VC) were analyzed and compared in subgroups including vascular repair type and those with and without an in-hospital VC.

Results: Of the total 1117 PAR identified, 483 (41%) had post-discharge follow-up data. 83% were male, and 70% sustained penetrating trauma. The median injury severity and mangled extremity severity score were 10 and 4, respectively. PAR included primary repairs, autologous grafts, and synthetic grafts. During the hospital stay, 16% experienced PAR-related complications (10% primary repair, 20% autologous, 27% synthetic, $p<0.01$). An additional 8% experienced post-discharge PAR-related complications (6% primary repairs, 9% autologous, 14% synthetic, $p=NS$, Table 1). Among those with an in-hospital VC, 12% developed additional post-discharge VCs while those without an in-hospital VC had a 7% incidence of post-discharge VC (p=NS). Post-discharge VC (Table 2) in the latter cohort consisted of 1.2% reinterventions, 1.2% infections, 0.2% each of technical repair issues, stenosis, occlusion, thrombosis, and ischemia.

Conclusions: There is a significant incidence of peripheral arterial repair-related VC after trauma, with about one-third manifesting post-discharge and with the highest rates after synthetic repairs. Focused efforts to improve routine follow-up and data capture/analysis in this cohort are warranted.

	Primary repair N =195	Autologous N =266	Synthetic N=22	P value
In-hospital complication	19 **(9.7%)**	52 **(19.5%)**	6 **(27.3%)**	**0.008**
Post-discharge complication	11 (5.6%)	24 (9%)	3 (13.6%)	0.254

Table 1-Rates of in-hospital and post-discharge complications within each repair group.

Follow-up vascular complication types	Total N=483	In-hospital VC N=77	No in-hospital VC N=406	P-value
Follow-up time months *Median (IQR)*	2 (1-3)	2 (1-4)	2 (1-3)	0.338
Any complication	38 (7.9%)	9 (11.7%)	29 (7.1%)	0.174
Re-intervention	11 (2.3%)	6 **(7.8%)**	5 **(1.2%)**	**0.003**
Infection	5 (1.0%)	0 (0.0%)	5 (1.2%)	1.000
Ischemia	4 (0.8%)	3 **(3.9%)**	1 **(0.2%)**	**0.014**
Technical repair problem	3 (0.6%)	2 (2.6%)	1 (0.2%)	0.068
Stenosis	3 (0.6%)	2 (2.6%)	1 (0.2%)	0.068
Occlusion	2 (0.4%)	1 (1.3%)	1 (0.2%)	0.294
Thrombosis	2 (0.4%)	1 (1.3%)	1 (0.2%)	0.294
Amputation	1 (0.2%)	1 (1.3%)	0 (0.0%)	0.159
Aneurysm	1 (0.2%)	1 (1.3%)	0 (0.0%)	0.159
Stroke	0	0	0	N/A
Bleeding/ hematoma	0	0	0	N/A

Table 2- Rates of post-discharge complications in two cohorts: those with an in-hospital vascular complication versus no in-hospital vascular complication.

Paper #9
January 16, 2025
10:48 am

MORTALITY AFTER REPEAT ASSAULTIVE INJURY: A LONGITUDINAL STUDY OF POST-DISCHARGE OUTCOMES

Sarah JH Melin, Pranjal Srivastava, Sydney Timmer-Murillo, PhD, Jacey Kant,
Terri deRoon-Cassini, MS, PhD, Andrew Schramm, PhD
Medical College of Wisconsin

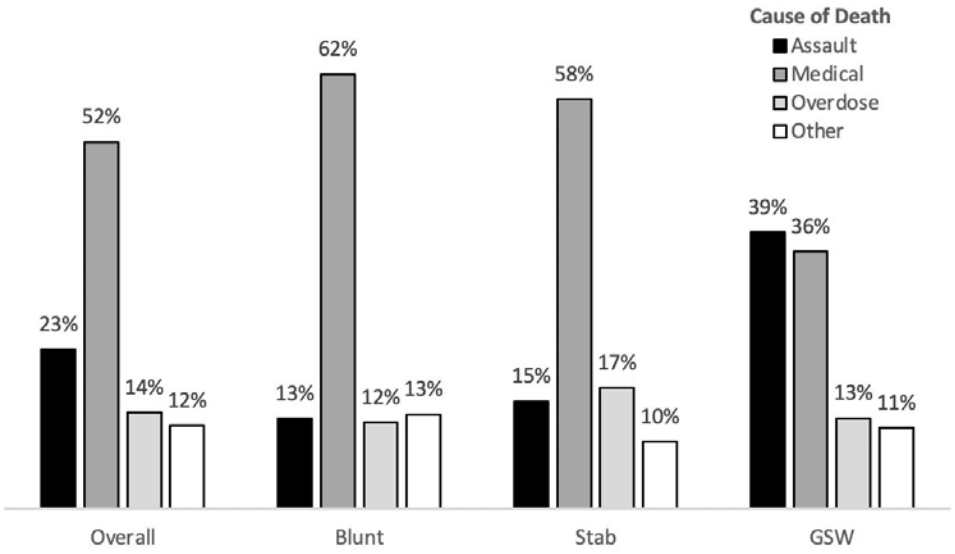
Presenter: Sarah JH Melin

Objectives: Assaultive injuries often repeat and tend to escalate. Prior studies have considered the risk factors and hospital outcomes of repeat assaultive injury, but no study has investigated post-discharge outcomes such as long-term mortality. This study considered the rates and manner of post-discharge mortality in patients presenting for assaultive injury, hypothesizing that patients with multiple assaultive injury encounters face an elevated risk of post-discharge mortality compared to a single encounter.

Methods: A retrospective review was conducted of patients included in the trauma registry for an assaultive injury at a Level I Trauma Center between 1/1/2004-12/31/2020. Patients were identified using ICD codes. The primary outcome was post-discharge mortality, which was obtained from the CDC National Death Index. Cox models and survival curves were constructed to compare the outcome across groups.

Results: There were 5797 patients who presented to the hospital for an assaultive injury during the study period, of which 5437 (94%) survived their initial encounter and 194 (3%) experienced multiple encounters. Overall, the primary cause of post-discharge mortality was medical disease; however, patients surviving a gunshot wound were more commonly deceased due to homicide when compared to blunt injury (HR=1.74, $p<0.001$) (Figure 1). Multiple assaultive injury encounters were associated with increased risk of post-discharge mortality (HR=1.91, $p<0.001$).

Conclusions: Patients that survive multiple assaultive injury encounters have significantly greater post-discharge mortality compared to a single encounter. Overall, patients suffering an assaultive injury are most commonly deceased by unrelated natural disease processes. However, gunshot wounds are associated with increased risk of future homicide. This information can be incorporated into hospital-based violence intervention programs to break the cycle of violence.



Cause of death in patients surviving an assaultive injury encounter by mechanism of initial injury.

Paper #10
January 16, 2025
10:54 am

LOW ENERGY, HIGH IMPACT: DOES MECHANISM OF INJURY CORRELATE WITH SEVERITY IN ISOLATED RIB FRACTURES IN ELDERLY PATIENTS?

Gabriela Dincheva , DO, Veronica Layrisse-Landaeta, MD, Victoria Yuan, MD,
Christopher Wong, Miroslav Kopp, DO*, Konstantin Khariton, DO*
New York Presbyterian Queens

Presenter: Veronica Layrisse-Landaeta, MD

Objectives: We hypothesized that elderly patients with isolated rib fractures due to high-energy transfer trauma (HETT) would have a higher rate of pulmonary complications and mortality than low-energy transfer trauma (LETT).

Methods: A retrospective study at a Level 1 trauma center between 1/2018-1/2023 categorized patients aged ≥ 65 years by mechanism of injury: LETT (falls from standing height or lower) and HETT (motor vehicle accidents, pedestrian strikes, falls from height). We compared the presence of at least one pulmonary complication: pneumonia, ARDS, intubation, pleural effusion, empyema. Multivariate logistic regression assessed risk factors for pulmonary complications.

Results: Out of 567 patients, 458 were LETT and 109 were HETT. LETT were older (83 vs 78 years, $p<0.001$), with higher Charlson Comorbidity Index (4.6 vs 3.76, $p<0.001$). HETT had higher Injury Severity Scores (7.3 vs 8.3, $p=0.048$). Rib fracture characteristics were similar except for frequency of sternal and first rib fractures (Table 1). LETT had lower incentive spirometer volumes (931 vs 1,122 cc, $p=0.003$), longer ICU (4.06 vs 2.65 days, $p=0.021$) and hospital lengths of stay (4 vs 2.9 days, $p=0.005$). HETT was associated with higher incidence of functional decline at discharge (39% vs. 19%, $p<0.001$). Pneumonia (2.4 vs 1.8%, $p>0.9$) and intubation (2 vs 3.7%, $p=0.3$) rates were similar. Composite pulmonary complication score was similar (10 vs 7.3%, $p=0.4$). Mechanism of injury was not a predictor (OR 0.97, 95% CI 0.30-2.66). RibScore predicted pulmonary complications in both groups, while CCI and age were predictors in HETT and LETT, respectively (Figure 1).

Conclusions: Mechanism of injury did not correlate with pulmonary complication risk in elderly patients with isolated rib fractures. LETT patients were older, functionally dependent and co-morbid, while HETT patients had higher ISS resulting in comparable outcomes. RibScore was a significant predictor of pulmonary complications in both groups, validating its applicability in elderly patients.

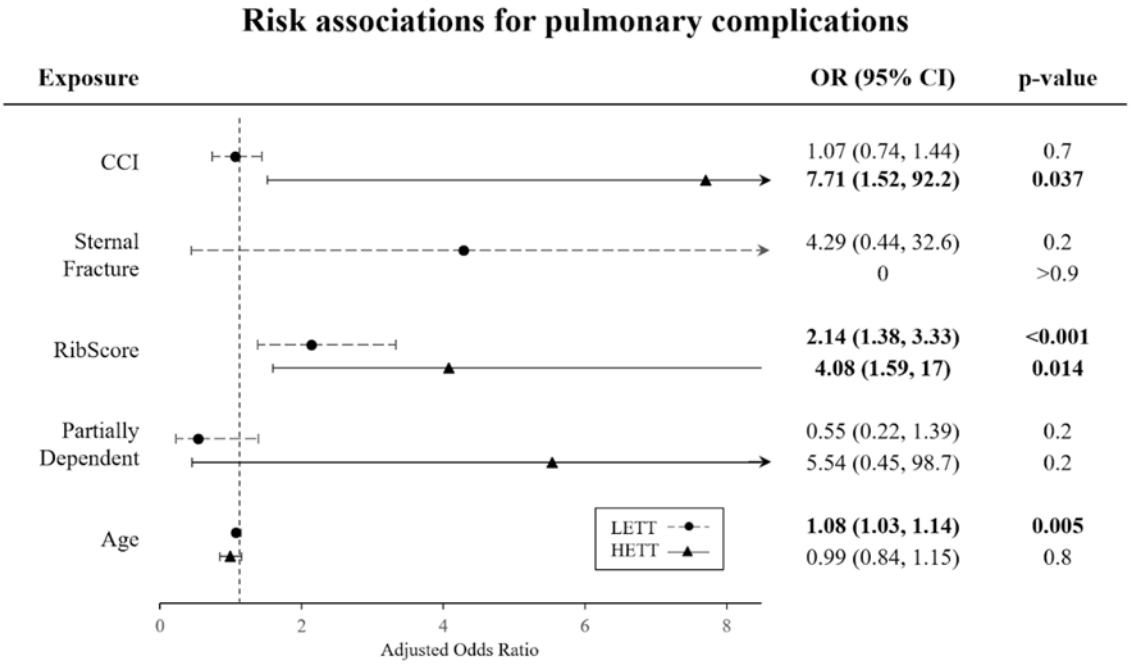
Table 1: Rib fracture characteristics of patients with low and high energy transfer traumas

	High Energy, N = 109[1]	**Low Energy**, N = 458[1]	**p-value**[2]
# Rib Fractures	3.94 (2.39)	3.47 (2.00)	0.10
# Displaced Rib Ractures	2.11 (2.40)	1.98 (1.91)	0.7
Sternal Fracture	11 (10%)	5 (1.1%)	<0.001
1st Rib Fracture	7 (6.4%)	7 (1.5%)	0.008
Flail Chest	4 (3.7%)	16 (3.5%)	>0.9
Pneumothorax	12 (11%)	42 (9.2%)	0.6
Hemothorax	16 (15%)	66 (15%)	>0.9
Pulmonary Contusions	8 (7.4%)	18 (4.0%)	0.13
RibScore			0.092
0	62 (57%)	260 (57%)	
1	30 (28%)	142 (31%)	
2	11 (10%)	47 (10%)	
3	4 (3.7%)	9 (2.0%)	
4	2 (1.8%)	0 (0%)	

[1] Mean (SD), Frequency (%)

[2] Wilcoxon rank sum test; Fisher's exact test; Pearson's Chi-squared test

Table 2: Risk factors for pulmonary complications after low and high energy transfer traumas in elderly patients



Paper #11
January 16, 2025
10:00 am

USING HUMAN FACTORS ENGINEERING TO ENHANCE NEW TRAUMA BAY EFFECTIVENESS

Don B. Scarboro, MD, Nate Jones, MBA, Laurie Wolf, PhD,
Bryan R. Collier, DO, FACS*, Daniel I. Lollar, MD*
Carilion Roanoke Memorial Hospital

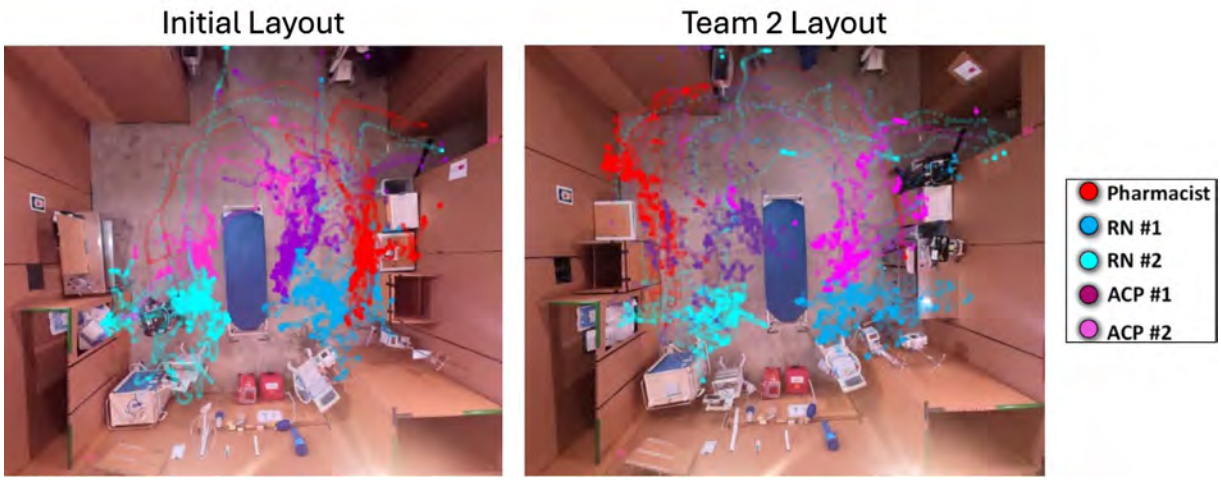
Presenter: Don B. Scarboro, MD

Objectives: Spatial design can contribute to patient harm and healthcare inefficiencies if the design process does not consider how workers interact with each other and their environments. Human factors engineering (HFE) applies human-centered design assessment to the built environment to evaluate implications for patients and staff. HFE assessment was applied to a proposed trauma bay design prior to construction. We hypothesized that HFE evaluation would produce significant changes to a new trauma bay layout that would improve provider safety and decrease errors and costs.

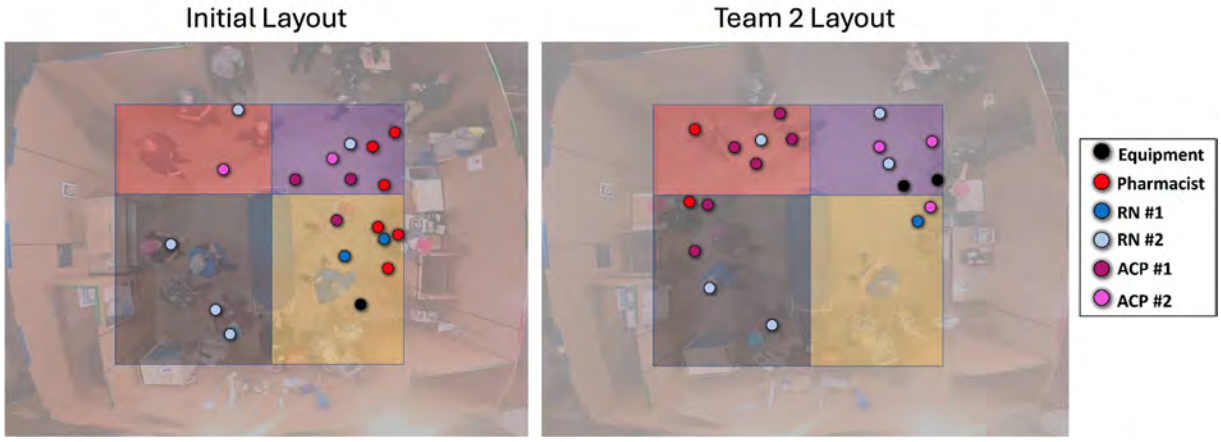
Methods: Cardboard mockup of the proposed trauma bay were created. Mock scenarios were performed with two interdisciplinary teams. An iterative process whereby the architectural plans were adapted by the trauma medical director and then each subsequent team was performed with changes made in real time. We utilized a mixed-methods analysis including pre/post surveys as well as video analyses including link analysis, bump analysis, and crossover analysis. Our results were integrated into layout design recommendations provided to the architects.

Results: Mockup cost was $2986 and required 10 hours of labor. Two teams completed six scenarios. Staff simulation time was 70 hours while analysis took 36 hours. Survey data indicated improvements in "ability to do your job" from 3.85 to 4.25. Link analysis demonstrated areas in certain layouts that created work inefficiencies. Bump analysis demonstrated a decrease in bumps from 47 to 33. Crossover analysis showed a decrease in patient crossovers from 7 to 0. Estimated cost savings were estimated at $333,200.

Conclusions: The opportunity for HFE assessment integration into the construction of new healthcare facilities is rare. We present a structured and iterative approach to testing new physical design changes prior to construction. We identified improvements in staff satisfaction, staff safety, and estimated cost.



Comparison of worker flow via link analysis (red = pharmacist, blue = RN 1, teal = RN 2, purple = ACP 1, pink = ACP 2) from initial layout to final/Team 2 layout.



Comparison of bumps via bump analysis (black = equipment, red = pharmacist, blue = RN 1, teal = RN 2, purple = ACP 1, pink = ACP 2) from initial layout to final/Team 2 layout.

Paper #12
January 16, 2025
10:06 am

SURROGATE DECISION MAKING IN OLDER ADULT PATIENTS WITH TRAUMATIC BRAIN INJURY: A PROSPECTIVE LONGITUDINAL TRIAL

Abdul Hafiz Al Tannir, MD, Rodney Sparapani, PhD, Patrick B. Murphy, MD, MPH, MSc*, Ann Nattinger, MD, Edmund Duthie, MD, Krista Haines, DO*, Marc A. de Moya, MD*, Christopher J Tignanelli, MD*, Nicole von Steinbuchel, Rachel S. Morris, MD, FACS*
Medical College of Wisconsin

Presenter: Abdul Hafiz Al Tannir, MD

Objectives: Surrogates are often required to make treatment decisions for older adults with traumatic brain injury (TBI). Assessing the accuracy of surrogates' predicted health-related quality of life (HRQoL) for older adults with TBI is paramount. One highly utilized previously validated HRQoL outcome measure is the Quality of Life After Brain Injury Overall Scale (QOLIBRI-OS). The aim of the present study is to evaluate the construct validity of the Patient-QOLIBRI-OS measure and Proxy-QOLIBRI-OS to evaluate concordance.

Methods: This is a single-center prospective longitudinal pilot study (09/2022-05/2024) of older adults with TBI (age≥65 years) admitted to a level I trauma center. The primary outcome measure for HRQoL utilized in the present study was QOLIBRI-OS (score ranges from 0 through 100 representing the lowest and highest HRQoL). Both patients and proxies were surveyed at index hospital admission and followed up at 3-months after injury. The internal consistency and construct validity of the Pt-QOLIBRI-OS and Proxy-QOLIBRI-OS was assessed with a Pearson correlation coefficient (Pcorr).

Results: A total of 117 patients and 117 proxies (52% spouse, 32% daughter, 9% son, 8% other) were surveyed. Most patients were of female sex (58%), the median age was 78 years, and the majority suffered a TBI due to a ground level fall (85%). The mean Pt-QOLIBRI-OS and proxy-QOLIBRI-OS at index hospitalization were 58 and 50, respectively, with a Pcorr of 0.77. A total of 73 patients and 73 proxies were followed up at 3-months. The mean Pt-QOLIBRI-OS and Proxy-QOLIBR-OS at 3-months were 61 and 54, respectively, with a Pcorr of 0.71.

Conclusions: The overall HRQoL experiences after TBI in older adults are accurately reported by proxy caregivers at baseline and 3-months after injury. Accordingly, the results of the present study can aid in providing goal concordant care in older adults with TBI.

Paper #13
January 16, 2025
10:12 am

FROM A WINTER OF DESPAIR TO A SPRING OF HOPE - A TALE OF TWO TRAUMA CENTERS: A COMPARISON OF ADOLESCENT PATIENTS TRIAGED TO A PEDIATRIC VS. ADULT LEVEL 1 TRAUMA CENTER

Kevin J. Lang, MD, Rachel Landisch, MD, Saskya E. Byerly, MD, MS*,
Regan Williams, MD, MSE*, Dina M. Filiberto, MD*,
University of Tennessee Health Science Center - Memphis

Presenter: Kevin J. Lang, MD

Objectives: Adolescent firearm injury (AFI) victims are variably treated at pediatric (PTC) and adult trauma centers (ATC). Triage criteria guide emergency medical services to direct care towards the most appropriate hospital. We hypothesize that AFI patients triaged to the ATC are more severely injured, however access to post-trauma aftercare is superior at the PTC.

Methods: A post-hoc analysis of a prospective observational study was conducted for patients 12-18 years at two large, urban level 1 trauma centers. Patient and injury characteristics, outcomes, and social services provided were compared.

Results: Of 163 patients included, 105 (64%) were treated at the PTC and 58 (36%) treated at the ATC. Disparate resources and increased volume resulted in less capture of patients at the ATC. Patients managed at the ATC were older (17 vs 15, p=.029) and had a higher ISS (9 vs 2, p=.0003) compared to the PTC. The ATC cohort was more likely to go to the operating room (43% vs 19%) and intensive care unit (12% vs 3%), and less likely to be discharged home (64% vs 90%). ATC patients had a higher mortality (17% vs 3%, p=.002). Identification of adverse childhood events (ACEs) (10% vs 35%) and prior traumatic events (PTEs) (3% vs 45%) was more common at the PTC, however patients at the ATC had a higher rate of mental illness (16% vs 10%). Receipt of psychosocial ancillary services (p<.0001) was more common at the PTC, including social work/case management (2% vs 10%) and child protective services (0% vs 29%).

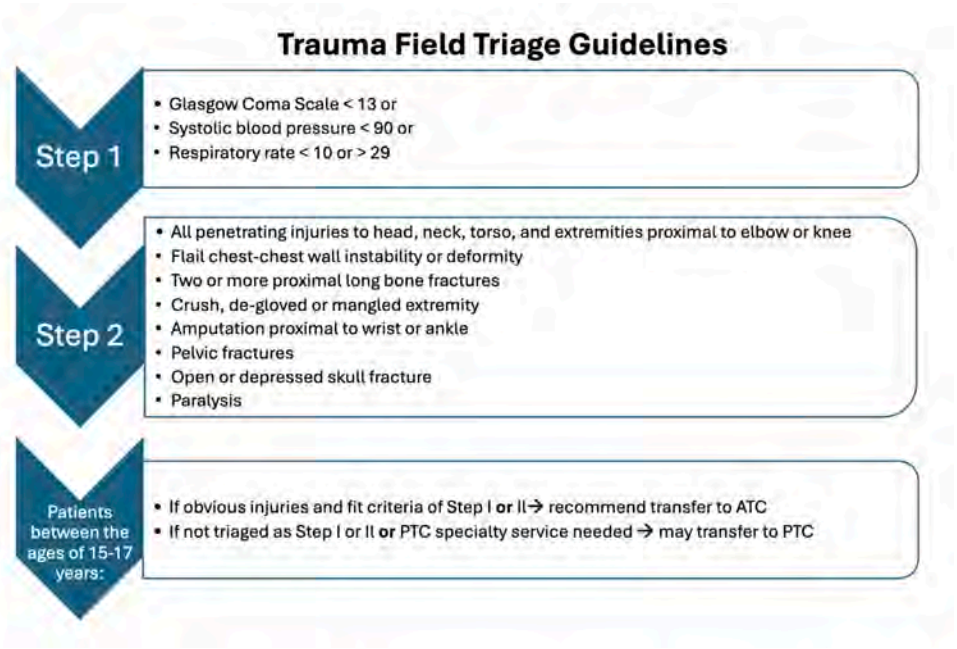
Conclusions: AFI victims managed at the ATC are more severely injured compared to the PTC. However, recognition of ACEs, PTEs and access to psychosocial ancillary services was greater at the PTC. A future prospective study evaluating AFI victims is needed to develop a pathway that optimizes immediate resuscitation and post-trauma social support.

Patient characteristics and outcomes of adolescent firearm injury victims treated at an adult trauma center and pediatric trauma center

Variable	Adult Trauma Center	Pediatric Trauma Center	P-value
N	58	105	
Age	17 (SD 1.1)	15 (SD 1.5)	0.029
Male	53 (91%)	85 (81%)	0.077
Black	53 (91%)	88 (84%)	0.341
Systolic Blood Pressure	132 (IQR 115, 144)	140 (125, 154)	0.010
Injury Severity Score	9 (IQR 1, 18)	2 (IQR 1, 9)	0.0003
Length of Stay	2 (IQR 1, 7)	3 (IQR 2, 5)	0.485
Mortality	10 (17%)	3 (3%)	0.002

SD: Standard deviation
IQR: Inter-quartile range

Patient characteristics and outcomes of adolescent firearm injury victims treated at an adult trauma center and pediatric trauma center



Trauma Field Triage Guidelines

Paper #14
January 16, 2025
10:18 am

MACHINE LEARNING ACCURATELY PREDICTS MORTALITY AND RESPIRATORY FAILURE IN PATIENTS ADMITTED WITH RIB FRACTURES

Travis J. Miles, MD, Jose Mendez-Reyes, MD MPH,
Chad T. Wilson, MD, MPH*, Ravi Ghanta, MD
Baylor College of Medicine

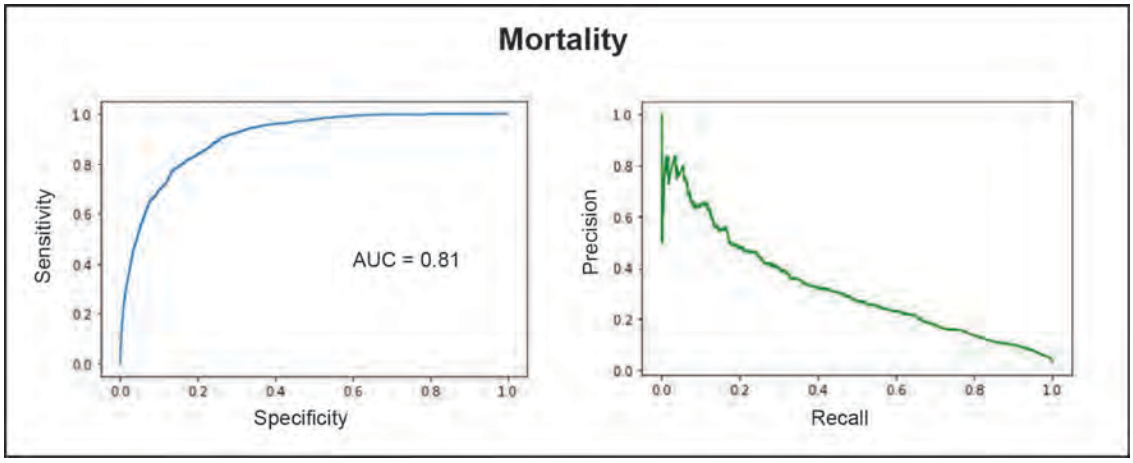
Presenter: Travis J. Miles, MD

Objectives: Accurate risk stratification is crucial in the management of rib fractures given early implementation of standardized clinical protocols based on risk have been shown to improve outcomes. However, identifying rib fracture patients at increased risk of clinical decompensation remains challenging as existing risk scores perform poorly on external validation. We hypothesize that machine learning methods can accurately prognosticate outcomes for patients with rib fractures.

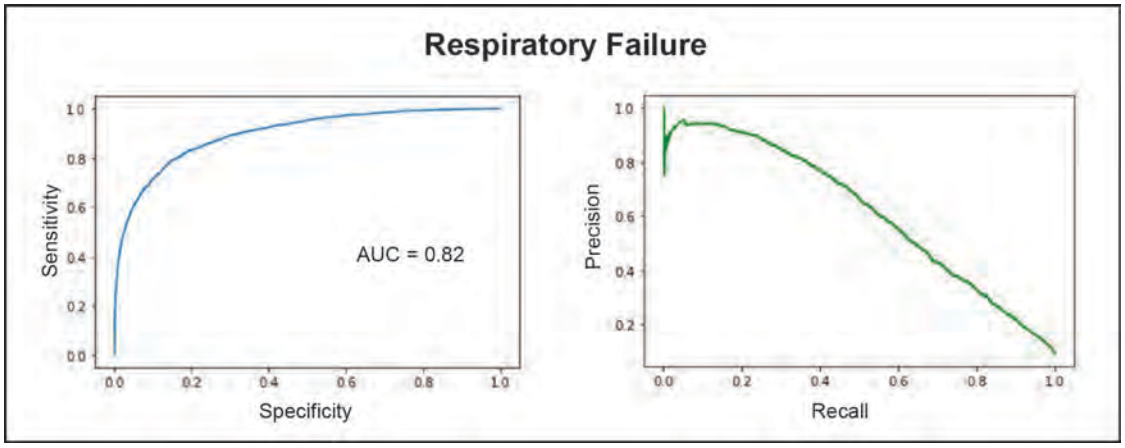
Methods: The National Trauma Data Bank (2021-2022) was queried for patients admitted to the hospital with rib fractures. The primary and secondary outcomes were mortality and respiratory failure. Random Forest (RF) and Extreme gradient boosting (XGB) models were developed and evaluated using 10-fold cross-validation with 1000-replication bootstrapping. Model performance was evaluated by the area under the receiver-operative characteristic curve (AUROC).

Results: Overall, 260,771 patients were admitted with at least one rib fracture over the study period (median [IQR] age: 60[43-73] years; 66.8% male). The majority (95.8%) sustained blunt trauma with 77.6% presenting with multiple rib fractures and 4.9% presenting with flail chest. The incidence of mortality and respiratory failure was 3.4% and 10.1% respectively. The classification accuracy in predicting mortality was 0.80 and 0.83 for RF and XGB respectively. Model performance was similar in predicting respiratory failure (RF: 0.85, XGB: 0.84). Models demonstrated good discriminatory performance in predicting mortality (AUCROC: 0.82 (RF), 0.81 (XGB)) and respiratory failure (0.80 (RF), 0.82 (XGB)).

Conclusions: Machine learning techniques can accurately predict mortality and respiratory failure in patients requiring admission with rib fractures. Machine learning enabled risk models may allow for early identification of trauma patients at risk for clinical decompensation.



Receiver operating characteristic curve and precision-recall curve for XGBoost model predicting mortality in patients admitted with rib fractures.



Receiver operating characteristic curve and precision-recall curve for XGBoost model predicting respiratory failure in patients admitted with rib fractures.

Paper #15
January 16, 2025
10:24 am

IMPACT OF A DEDICATED EMERGENCY OPERATING ROOM ON TRANSFERS FOR ACUTE APPENDICITIS AND CHOLECYSTITIS

Jill Kanney, Kevin Collopy, MHL FP-C NRP CMTE2,
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New Hanover Regional Medical Center

Presenter: Jill Kanney

Objectives: The purpose of this study was to analyze the resource utilization, time, and cost of EGS transfers before and after the creation of a dedicated EGS OR.

Methods: This was an IRB approved retrospective study of adult patients with appendicitis and gallbladder (GB) disease transferred from network hospitals to a single tertiary center, one year prior to the creation of an EGS OR and one year afterwards. A standardized T-test was used to compare transfers pre-EGS OR to transfers post-EGS OR. We hypothesized the advent of an EGS OR would decrease time to incision.

Results: 183 patient transfers with appendicitis and 101 with GB disease were included in the study. When the EGS OR was available, there was a substantial increase (29.7%) of patients with appendicitis who were taken directly to the OR and a substantial decrease (23.9%) transferred to the ED. There was also a substantial decrease in median time from arrival at the tertiary center to incision. A similar trend was identified for GB patients.

Approximately 10% of transfers with appendicitis chose to travel via private vehicle (PV). This cohort of patients had a 49 minute median decrease in length of stay, and a $1923 decrease in median total charges. For patients with GB disease who traveled via PV, there was a 200 minute decrease in median time from arrival to incision in the OR, and an 894 minute decrease in median length of stay; this lead to a $3143 decrease in median total charge.

Conclusions: This study suggests that there is value in creating a dedicated EGS OR by optimizing transport resources, improving throughput, and decreasing transfer cost. This study also suggest added value in having cohorts of patients travel via PV. We plan to utilize this study to create a standardized algorithm that will guide decisions regarding EGS transfers.

		EGS Operating Room **NOT** available	EGS Operating Room available
Appendectomy	n	148	28
Arrival at 17th St to Incision (median [IQR])		177.50 [86.50, 347.00]	150.50 [92.75, 281.75]
Transport destination (%)	ED	45.3	21.4
	Floor	8.8	3.6
	OR	45.3	75.0
Cholecystectomy	n	89	23
Arrival at 17th St to Incision (median [IQR])		937.00 [511.00, 1268.00]	1117.00 [337.00, 1413.00]
Transport destination (%)	ED	33.0	65.2
	Floor	55.7	21.7
	OR	9.1	13.0

Impact of a Dedicated Emergency General Surgery Operating Room

Paper #16
January 16, 2025
10:30 am

PLATELET COUNT RECOVERY: A HIDDEN PROGNOSTIC SIGN

Revathy Pillai, BS, MS, Jack K Donohue, Emily Mihalko, PhD, Susan M. Shea, PhD,
Philip C. Spinella, MD, FCCM*, Christine M. Leeper, MD, MS*,
Joshua B. Brown, MD, MSc, FACS*, Lucy Z. Kornblith, MD, FACS*,
Jason L. Sperry, MD, MPH*, Matthew Neal, MD
University of Pittsburgh Medical Center

Presenter: Revathy Pillai, BS, MS

Objectives: Data are sparse regarding the impact of platelet count trajectory following injury. We sought to characterize platelet count trends following injury and hypothesized that platelet count recovery would be associated with improved outcomes.

Methods: A secondary analysis was performed using harmonized data from two prehospital trauma trials that enrolled patients at risk of hemorrhagic shock. Patients with a platelet count decrease between day 0-3 and who survived until at least day 5 were included in the current analysis. The primary outcome, 30-day mortality was compared between patients with platelet recovery (platelet count change > 0 between day 3-5) and those with platelet decline (platelet count change ≤ 0 between day 3-5). The secondary outcome was Denver Multiple Organ Failure (MOF) Score. Regression analyses were utilized adjusting for variables with $p<0.15$ on univariate analysis.

Results: A total of 343 patients were included in the analysis. In the overall cohort, a median platelet count nadir was observed at day 3 and the first significant increase was at day 5 (Figure 1). The platelet recovery cohort (n=300) was significantly younger with lower rates of prehospital intubation relative to the platelet decline cohort. Demographics, injury characteristics, and trial interventions were similar between groups. The platelet recovery cohort had a marked reduced risk of 30-day mortality (HR: 0.23, 95% CI 0.10, 0.58, $p<0.01$; Figure 2) and was associated with lower Denver MOF Scores (β: -1.69, 95% CI -2.37, -1.01, $p<0.01$) after adjusting for prehospital vital signs, prehospital intubation, and age.

Conclusions: In this secondary analysis, platelet recovery was associated with increased 30-day survival and lower Denver MOF Scores compared to those with platelet decline. Platelet count trends may aid in identifying patients at risk of mortality allowing for increased timeliness of interventions, while simultaneously predicting those likely to survive.

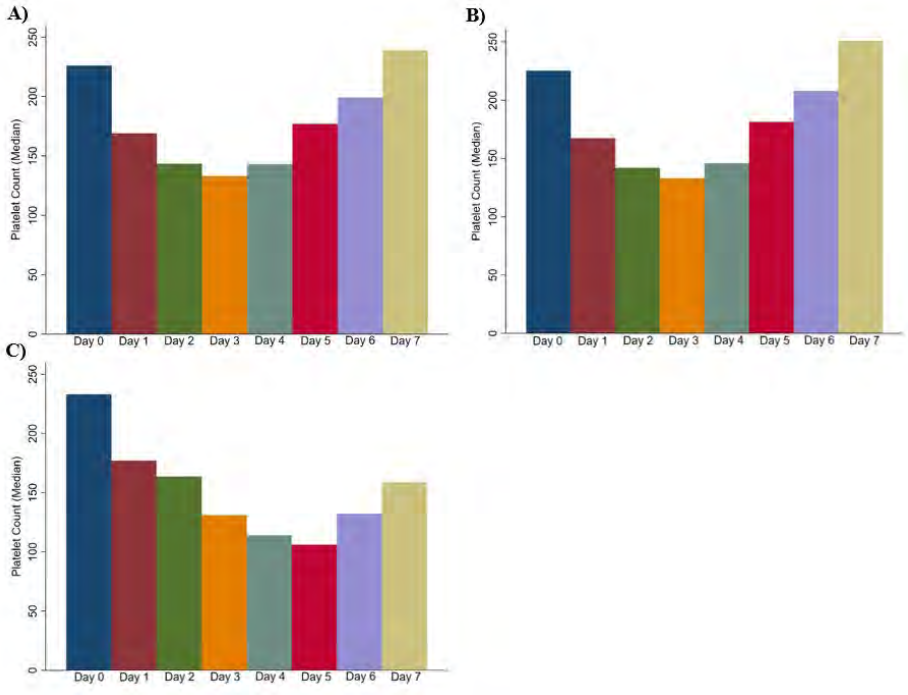

Figure 1. A: Median platelet count across 7 days in the overall cohort. B: Median platelet count across 7 days in the platelet recovery cohort. C: Median platelet count across 7 days in the platelet decline cohort.

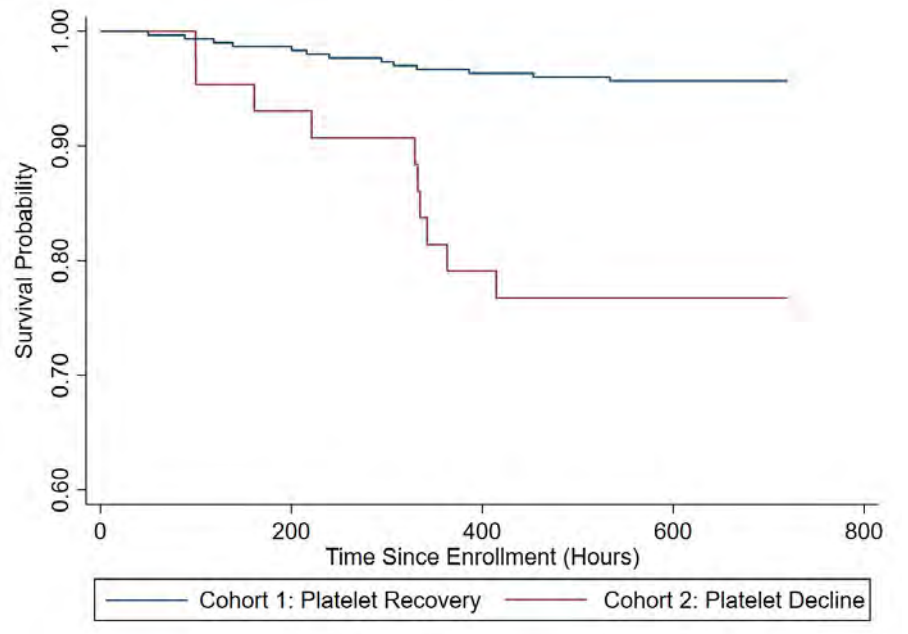

Figure 2. Kaplan-Meier survival analysis comparing platelet recovery and platelet decline cohorts at 30 days.

Paper #17
January 16, 2025
10:36 am

TENSION CHANGES OF THE ABDOMINAL WALL IN OPEN ABDOMENS: A PROSPECTIVE COHORT TRIAL

Sara M. Maskal, MD, Ryan Ellis, MD, Daphne Remulla, MD, Kimberly Woo, MD, Robert Simon, MD, Ricard Corcelles Codina, MD, Lucas Beffa, MD, Clayton Petro, MD, Ajita Prabhu, MD, Chao Tu, MS, Michael Rosen, MD, Benjamin T Miller, MD*
Cleveland Clinic

Presenter: Sara M. Maskal, MD

Objectives: Open abdomen management is frequently used to treat patients presenting in extremis from intraabdominal etiologies. Primary fascial closure can be difficult in these scenarios, but the relationship of open abdomen duration and tension on the abdominal wall is unknown. We sought to serially measure the tension needed to re-establish the linea alba over time in patients with open abdomens.

Methods: Adult patients without ventral hernias or prior component separation who were being managed with damage control laparotomy and open abdomen at a single institution were enrolled from October 2022 to March 2024. At subsequent reoperations, a proprietary, sterilizable tensiometer measured the tension (in pounds) needed to approximate the fascial edge to the midline. The primary outcome was the fascial tension over time, which was analyzed using multivariable regression, adjusting for body mass index, age, comorbidities, volume of crystalloid administered, volume of colloid administered, blood transfusion, cumulative fluid status, and vasopressor use. Baseline tension was assumed to be 1.94lbs based on data from primary laparotomies at our institution.

Results: A total of 45 patients were included. Mean patient BMI was 29.6 (SD 7.71) kg/m^2, and mean incision length was 23.54 cm (SD 5.54). Mean tension needed to bring both myofascial edges to the midline was 11.73 lbs (SD 8.80). Mixed-effect multivariable regression modeling found that increasing age and crystalloid fluid volume were associated with higher abdominal wall tension (coefficient 0.18, 95% CI [0.02,0.33]; p = 0.028, coefficient 0.00, 95% CI [0.00,0.00]; p = 0.044, respectively).

Conclusions: Fascial closure tension is supraphysiologic for patients with open abdomens, but time is not independently associated with closing tension. Further study is needed to elucidate if this high tension is a result underlying pathology versus the decision to leave the abdomen open.

Paper #18
January 16, 2025
10:42 am

RELATIONSHIP OF PROPHYLACTIC ENDOVASCULAR THERAPY AND STROKE IN THE MANAGEMENT OF BLUNT CEREBROVASCULAR INJURY: SUB-ANALYSIS OF AN EAST MULTICENTER TRIAL

Anthony J. DeSantis, MD*, William Kelley, BS, Emily Esposito, DO,
Thomas M. Scalea, MD, FACS, FCCM*, Margaret H. Lauerman, MD*,
Deborah M. Stein, MD, MPH, FACS, FCCM*
R Adams Cowley Shock Trauma Center, University of Maryland School of Medicine

Presenter: Anthony J. DeSantis, MD

Objectives: There are no clear guidelines for the use of prophylactic endovascular therapy (PET) in the management of blunt cerebrovascular injury (BCVI). We hypothesized that PET would be associated with fewer subsequent strokes in select patients with BCVI and high-risk lesions.

Methods: We performed a sub-analysis of a prospective, observational, 16 center trial of BCVI from 2018-2020. Internal carotid artery (ICA) BCVI were included. PET was defined as endovascular therapy prior to stroke. Endovascular therapy after stroke was excluded. Only strokes ≥6 hours after admission were included. We evaluated the relative rates of subsequent stroke in patients who had PET compared with patients who did not.

Results: 332 patients with ICA BCVI were included, of which 15 patients (4.5%) underwent PET. In patients with grade 2 ICA BCVI, stroke occurred in none of the 3 patients who underwent PET, and 10 of the 98 patients who did not (10.2%). In patients with grade 3 ICA BCVI, stroke occurred in none of the 11 patients who underwent PET (0%), and 8 of the 40 patients who did not (20%). Of the grade 3 patients who suffered a stroke, the stroke rate increased from 3/10 (30.0%) in those with >5mm pseudoaneurysm to 2/3 (66.7%) in >10mm pseudoaneurysm. Stroke rate also increased from 3/12 (25.0%) in those with >25% luminal stenosis to 1/2 (50.0%) in patients with >75% luminal stenosis.

Conclusions: The relative rarity of use of PET for carotid BCVI limits our ability to demonstrate statistical significance, but in select patients, use of PET was associated with no subsequent strokes compared to a 10-20% stroke rate in patients with Grade 2/3 BCVI not treated with PET. This should prompt further investigation of the use and safety of PET for BCVI.

BCVI Grade	Stroke (No PET)	Stroke (PET)	p-value
1	8/145 (5.5%)	0/0 (0%)	--
2	10/98 (10.2%)	0/3 (0%)	1.00
3	8/40 (20.0%)	0/11 (0%)	0.18
4	1/19 (5.3%)	0/1 (0%)	1.00

Table 1: Stroke rate > 6hours after admission with and without prophylactic endovascular intervention in multiple subgroups of BCVI

Paper #19
January 16, 2025
10:48 am

ASSESSING THE IMPACT OF ACA MEDICAID EXPANSION ON TRAUMA OUTCOMES: AN INTERRUPTED TIME SERIES ANALYSIS OF NATIONAL YEARLY TRENDS

Adham Makarem, MD, MPH, Zhiqian Song, MPH,
Fangyong Li, MS, MPH, Hani Mowafi, MD, MPH
Yale University School of Medicine

Presenter: Adham Makarem, MD, MPH

Objectives: Trauma-related mortality is a major public health issue. The Affordable Care Act (ACA) aimed to reduce disparities in healthcare coverage through Medicaid expansion, launched in 2014. This study evaluates the ACA's impact on trauma outcomes using an interrupted time series analysis.

Methods: This retrospective study used ACS-TQP-PUFs from 2010-2021. Adult trauma patients aged 18 or older were included, excluding those deceased on arrival, non-trauma cases, and records with missing data. The primary outcome was in-hospital mortality. Secondary outcomes were length of stay (LOS), time to first surgery, payment method, Abbreviated Injury Scale (AIS), and complications. Logistic regression & interrupted time series analysis assessed changes pre- and post-ACA Medicaid expansion.

Results: Patients post-ACA Medicaid expansion had lower odds of in-hospital death compared to pre-expansion [OR=0.97, 95% CI (0.96, 0.98), $p<0.001$]. The mean LOS & time to first surgery post-ACA increased by 5.7% & 0.8%, with other variables held constant ($p<0.001$). Patients post-ACA were less likely to pay via private insurance & self-pay[OR=0.85, 95% CI (0.84, 0.85) & OR=0.64, 95% CI (0.64, 0.65) respectively, $p<0.001$], and more likely to use Medicaid & Medicare(OR=1.33 & 1.44, $p<0.001$). The mean AIS post-ACA was 9% less than pre-expansion. After ACA, kidney & respiratory complications decreased by 0.06% & 0.97% each year ($p=0.011$ & 0.025) respectively, while accounting for covariates.

Conclusions: ACA Medicaid expansion improved trauma outcomes, reducing mortality & complications, shortening hospital stays, and increasing timely surgeries. Payment methods shifted towards Medicaid & Medicare, highlighting healthcare policy's role in enhancing trauma care & reducing disparities. Our findings underscore the importance of policy interventions in improving trauma care & access among vulnerable populations.

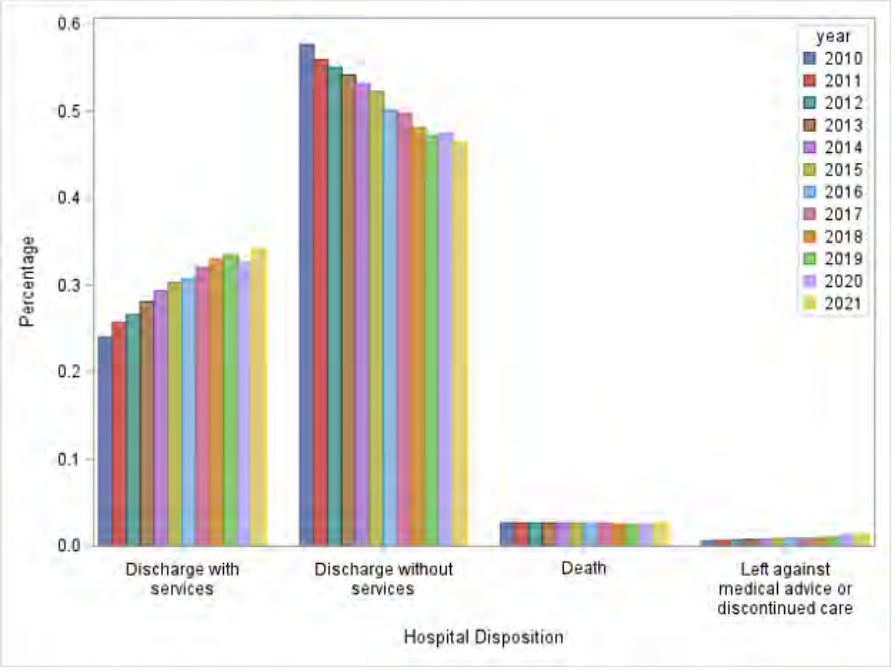

Figure 1 shows the percentage variation of hospital disposition from 2010 to 2021. The percentage of patients discharged with services significantly increased post-ACA, while the percentage of those discharged without services or who died in the hospital significantly decreased post-ACA compared to pre-ACA Medicaid expansion.

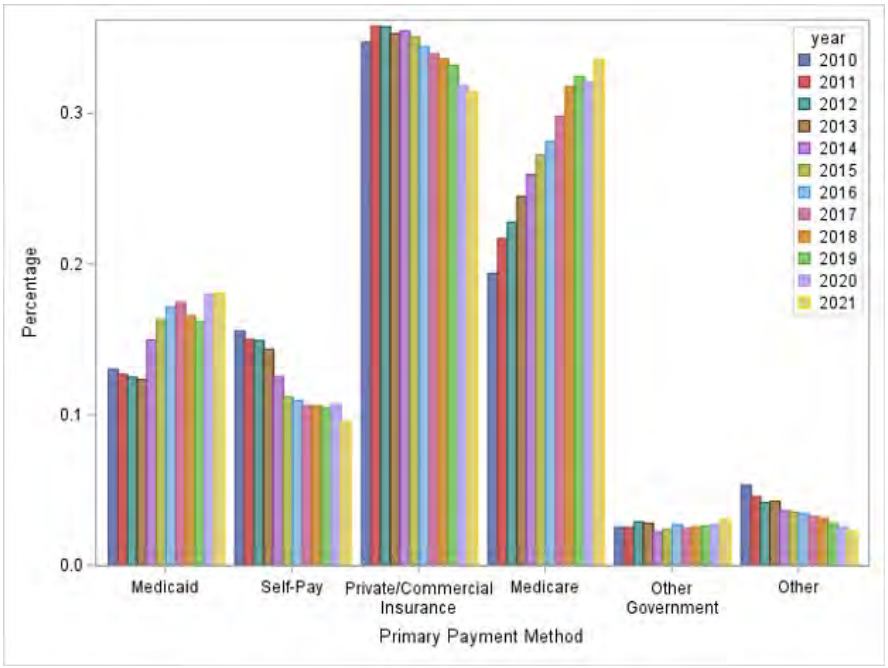

Figure 2 shows the percentage variation of each primary payment method from 2010 to 2021. Patients post-ACA were less likely to pay via private insurance and self-pay, and more likely to use Medicaid and Medicare.