

TRAUMA CENTERS AS HEALTH EQUITY BEACONS: MITIGATING THE EFFECTS OF SOCIAL VULNERABILITY

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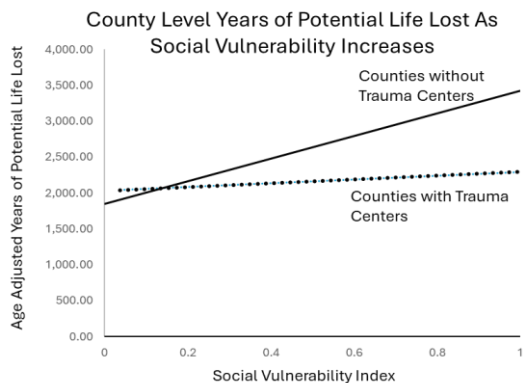
Invited Discussant: Cherisse Berry, MD

Introduction: Trauma Centers (TC) are key to reduction of injury mortality, but little is known about TC contribution to health equity. Social Vulnerability Index (SVI) is a county-level coefficient derived from 18 census metrics. Increasing SVI correlates to increasing injury rate, specifically from firearms. We hypothesized that the presence of a trauma center (TC) in a county would be protective against the deleterious effects of high county level SVI on injury mortality.

Methods: CDC WISQARS was queried by county from 2017-2020 for population, SVI, Age Adjusted Injury Mortality in total and by mechanism (AAIM), and Crude and Age Adjusted Years of Potential Life Lost (YPLL). A leveled listing of all US trauma centers was obtained from ACS-COT and state health departments. A novel county-level trauma center score was calculated by assigning weighted value to Level 1 and Level 2 TCs, accounting for population. Spearman's linear regression was performed relating SVI to Mortality across injury types and Regression Slope Variance was performed to identify statistical differences in slope relationships between SVI and AAIM and YPLL across injury types.

Results: 3,135 US counties were included, 335 of which have at least 1 TC. Increasing SVI predicted higher mortality for all injuries except suicide. Mortality decreased by 14/100,000 in counties with TCs. Controlling for SVI, TCs decreased mortality further to 17/100,000. TCs saved 10,000 Americans annually who would have died as a result of living in socially vulnerable areas. TCs accounted for a decrease of 478/100,000 years of life lost per county, or a total national increase of 1,673,000 years and economic contribution of \$83.6 billion. TCs were most protective for MVC (11/100,000) and Firearm Injury (5/100,000) mortality. As county trauma center score increased, there was an observed increase in protective effect.

Conclusion: There is a linear relationship between social vulnerability and injury mortality, but the presence of a trauma center flattens that line. Effects are more marked for YPLL, indicating TCs are saving the lives of younger people in high SVI areas. Trauma centers effectively decouple the relationship of social vulnerability to injury mortality, making trauma center access not only lifesaving, but a key component of health equity.



THE ECONOMIC IMPACT OF DECREASING STATE TRAUMA MORTALITY ON LIFETIME PERSONAL INCOME AND STATE TAX REVENUE

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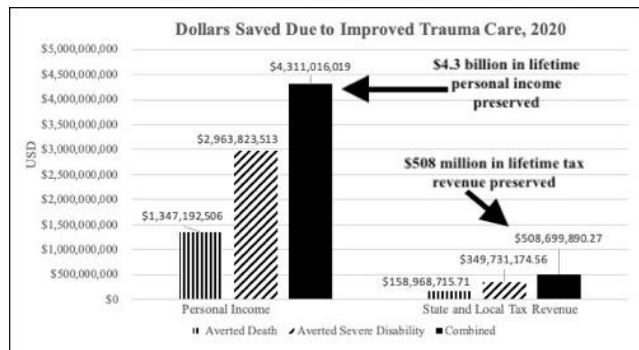
Invited Discussant: Joseph Minei, MD, MBA

Introduction: In 2003, the state's trauma mortality rate was 16% above the national average. To combat this high mortality, a state Trauma Commission was legislatively established in 2007 to develop, maintain, and administer a trauma care network. Through system development, mortality has decreased to 6% below the national average in 2020 (1,803 lives saved in 2020). The purpose of this study is to assess the statewide economic impact of decreasing mortality and disability measured in the amount of lifetime personal income and state tax revenue preserved.

Methods: Using the CDC's WISQARS database, state/national trauma mortality rates for 2020 were compared to 2003 (pre-Commission). Years of Potential Life Lost (YPLL) for trauma victims up to 65 were calculated for the same time period. Rates of severe disability were calculated based on the average results of 6 studies (1992-2022) and used to estimate additional YPLL. The per-capita personal income for the state and average percent of personal income paid in state taxes were calculated using federal and state data. These numbers were then multiplied by state YPLL rates in order to calculate lifetime personal income and state tax revenue lost due to trauma.

Results: \$4.3 billion in lifetime personal income preserved (averted death \$1.3 billion and averted disability \$2.9 billion). \$508 million in lifetime tax revenue preserved (averted death \$158 million and averted disability \$349 million). This resulted in a return on investment of \$22.60 for every \$1 spent on the Commission in 2020.

Conclusion: Decreasing state trauma mortality and disability substantially benefitted lifetime personal income and state tax revenue. This resulted in a positive return on investment for dollars spent on the state trauma system. State trauma system funding should be considered an investment, not a cost.



ASSOCIATION OF PRE- AND POST-INJURY MENTAL HEALTH WITH LONG TERM CLINICAL AND FINANCIAL OUTCOMES

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Invited Discussant: David Livingston, MD

Introduction: As increased attention is placed on optimizing long-term outcomes of trauma patients by addressing mental health, little is known regarding the interplay of both preinjury mental health conditions and post-injury mental health and the subsequent impact on long-term outcomes.

Methods: Patients from 19 Level 1-2 trauma centers took part in serial surveys 1-24m post-discharge. Pre-injury mental health diagnoses (MH dx) using trauma registry data and post-injury mental health symptoms (MH sx) from survey data. Outcomes included (i) health-related quality of life (hrQoL) from the EuroQol-5D-5L and (ii) elements of financial toxicity (FT) (e.g. medical debt, job/income loss, non-medical bills, unaffordable care). Multivariable models adjusted for patient, injury, and treatment factors to evaluate the association of MH dx and MH sx on hrQoL and FT.

Results: 646 patients completed 833 surveys from Jul 2021-Dec 2023, at a median 6m post-injury. 47% were female, median age was 67.5y, and 89% had blunt injuries. 31% of patients had a pre-injury MH dx, 45% had self-reported MH sx post-discharge, and 44% had neither. Patients with a pre-injury MH dx had higher odds of post-injury MH sx (aOR 3.6 [2.4-5.3]); however, 56% of those with post-injury MH sx had no pre-injury MH dx. When stratified by pre- and post-injury MH dx/sx, post-injury MH sx were more strongly associated with hr-QoL than pre-injury MH dx (**Table**). Compared to patients without MH dx/sx, those with post-injury MH sx had worse FT across all domains (data not shown). Notably, patients with new post-injury MH sx (no pre-injury MH dx) had the highest rate of foregone post-injury care due to costs (26% vs 14% if no MH dx/sx, $p<0.01$).

Conclusions: More than 1-in-2 patients had peri-injury mental health concerns, and most patients with post-injury MH sx did not have a known pre-injury MH dx. Addressing post-injury HM sx may potentially improve long-term hrQoL of trauma survivors; however, efforts are needed to ensure patients can afford the care they need to achieve optimal health.

Table. Association Between MH and Self-Reported Health

Pre-Injury MH dx	Post-Injury MH sx	Cohort Size, N (%)	Mean Self-reported Health (Scale Range: 0-100)	Adjusted P-value
No	No	282 (44%)	77.8	<i>Reference</i>
Yes	No	71 (11%)	76.2	0.486
No	Yes	163 (25%)	62.6	<0.001
Yes	Yes	130 (20%)	59.5	<0.001

IS ASPIRIN AN EFFECTIVE THROMBOPROPHYLAXIS IN HIGH-RISK PATIENTS? A COMPREHENSIVE SUBPOPULATION ANALYSIS OF THE PREVENT CLOT STUDY

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Invited Discussant: Rishi Kundi, MD

Introduction: A recent clinical trial concluded that thromboprophylaxis with aspirin was similar in efficacy and safety to low-molecular-weight heparin in orthopaedic trauma patients. Some clinicians remain skeptical that aspirin's benefits persist in high-risk subpopulations. We have replicated the primary analysis in 11 clinically important subpopulations.

Methods: We performed a secondary analysis of a multicenter trial in which fracture patients were randomly assigned to 81mg of aspirin or 30mg of low-molecular-weight heparin, twice daily. From the 12,211-patient sample, we derived 11 subpopulations according to evidence-based thromboembolic risk factors. The primary outcome was 90-day all-cause mortality.

Secondary outcomes included non-fatal pulmonary embolism, proximal and distal deep vein thrombosis, and bleeding events. We assessed all outcomes with treatment-specific Kaplan–Meier estimators. Due to the increased risk of false positive findings with multiple comparisons, our threshold for statistical significance was a Bonferroni-corrected alpha of 0.0001.

Results: Among the 11 subpopulations, the 3 largest were isolated lower extremity fractures (n=6289), Obesity (n=4234), and ICU admission (n=1596). None of the 55 statistical comparisons reached our threshold for significance. Two of 55 statistical comparisons were less than the conventional $p < 0.05$ threshold, favoring low-molecular-weight heparin over aspirin in protecting against distal deep vein thrombosis for patients with head injuries (difference, 4.4%; 95% CI, 0.8% to 8.1; $p = 0.03$) and ICU admission (difference, 1.7%; 95% CI, 0.2% to 3.3; $p = 0.03$).

Conclusions: Across 11 clinically important subpopulations, we found no evidence of differential treatment effects of aspirin versus low-molecular-weight heparin on 90-day mortality, pulmonary embolism, proximal deep vein thrombosis, or bleeding rates. Low-molecular-weight heparin may offer better protection against clinically less important distal deep vein thrombosis in patients with head injuries or admitted to the ICU; however, this difference was not statistically significant. These findings increase the likelihood that the main findings of noninferiority of aspirin apply to high-risk subpopulations as well.

**JUST BECAUSE WE CAN DOESN'T MEAN WE SHOULD: ONE
YEAR MORTALITY FOLLOWING TRACHEOSTOMY IN
TRAUMATICALLY INJURED OLDER ADULTS**

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Invited Discussant: Lisa Kodadek, MD

Introduction: Outcomes in older trauma patients undergoing tracheostomy are unclear, limiting informed decision making. We aimed to evaluate long-term outcomes following tracheostomy in older trauma patients and hypothesized that one-year survival decreases with older age.

Methods: This was a retrospective descriptive analysis of ICU patients ≥ 65 years old that underwent tracheostomy from 1/1/2015–12/31/2020. Groups were categorized by age: 65-74, 75-84, and ≥ 85 yo. The primary outcome was 1 year mortality using the National Death Index. Secondary outcomes were inpatient ventilator days, hospital length of stay (LOS), inpatient mortality, and 6-month mortality. Univariate analyses were performed. Survival by age strata was analyzed using the Kaplan-Meier method.

Results: Of 205 eligible patients, 125 (61%) were 65-74yo, 68 (33%) 75-84, and 12 (6%) ≥ 85 . Median injury severity scores (ISS) (24 vs 22 vs 21, $p=0.2$) and Charlson Comorbidity index (1 vs 2 vs 2, $p=0.99$) were similar between groups. Ventilator days (12 vs 11 vs 11, $p=0.51$) and hospital LOS (23 vs 21 vs 20 days, $p=0.49$) were similar between groups. Overall, 29 patients (14%) died prior to discharge from the hospital, 95 patients (46%) died within 6 months of tracheostomy, and 118 (58%) died within 1 year. One year mortality increased by decade of life: 51% vs 65% vs 83%. Median survival decreased by decade: 350 days for age 65-74, 164 days for age 75-84, and 58 days for those 85+.

Conclusions: In this cohort of severely injured older adults who underwent tracheostomy following trauma, 58% died within 1 year of tracheostomy, and increasing age was associated with shorter survival. While tracheostomy may facilitate transfer out of the ICU and hospital, overall survival is poor. This study offers valuable insights to patients and their families during the decision-making process. Clear goals and expectations are needed when advising these patients and their families regarding tracheostomy.

NOT ALL CALL IS CREATED EQUALLY: THE IMPACT OF CULTURE AND GENDER ON BURNOUT RELATED TO IN-HOUSE CALL

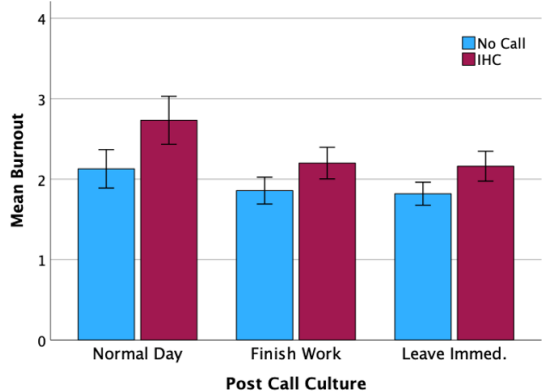
Jamie Coleman, MD; William von Hippel, PhD;
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Invited Discussant: M. Margaret Knudson, MD

Introduction: In-house call (IHC) has previously been shown to result in increased burnout in acute care surgeons (ACS). There is wide variation, however, in the implementation and culture of work surrounding IHC across trauma centers as well as within the demographics of practicing ACS. We hypothesized that local work practices and culture surrounding IHC as well as gender of ACS would impact burnout.

Methods: Continuous physiologic data were collected over six months from 224 ACS who wore a fitness wearable. ACS were sent daily surveys to record work and personal activities. The Maslach Burnout Inventory was completed by ACS at the beginning and end of the study period.

Results: 48 (21.5%) of ACS reported being expected to complete a usual workday after IHC, 94 (42.2%) were expected to finish work from IHC, and 81 (36.3%) were expected to leave immediately after IHC was over. ACS expected to complete a usual workday post-call were more likely to be burned out and IHC resulted in a greater increase in their burnout than among ACS who reported working in other work cultures (figure). Females showed higher burnout than males but no difference in the degree to which IHC led to burnout.

Conclusion: IHC results in increased burnout in all ACS, however, there were higher levels of burnout in ACS expected to work without adjustments to their work schedule post call. Although female ACS reported higher levels of burnout than male ACS, IHC increased burnout levels equally between the two genders. Taken together these findings necessitate caution about work expectations surrounding IHC and suggest a need for the deliberate creation of a post-call culture for ACS.



NATIONAL ESTIMATES OF FINANCIAL TOXICITY BEFORE AND AFTER TRAUMATIC INJURY

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 Lisa M. Knowlton, MD, MPH; Barclay Stewart, MD, PhD;
 Eileen M. Bulger, MD, FACS; Douglas Zatzick, MD;
 Joseph Dieleman, PhD; John W. Scott, MD, MPH
 Harborview Medical Center
 Invited Discussant: Patrick Murphy, MD, MPH, MS

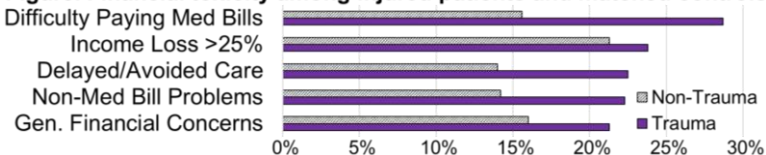
Introduction: Despite growing attention toward financial toxicity after injury, national estimates are lacking and the absence of pre-injury data limit our understanding of the association between injury and financial outcomes.

Methods: We analyzed 2011-2021 data from two nationally representative surveys: the National Health Interview Survey (NHIS) and the Medical Expenditure Panel Survey (MEPS). Injured adults who required inpatient (IP) or emergency department (ED) care were matched to uninjured controls without ED or IP encounters using 1:5 coarsened-exact matching on age, sex, income, payor, marital status, region, and survey panel. Outcomes included 5 domains of financial toxicity described by the AAST Healthcare Economics Committee (Figure). We used difference-in-difference models to estimate the temporal association between injury and self-reported health, difficulty paying medical bills, and cost-related delays in care compared to matched controls. Secondary analyses evaluated for associations between financial outcomes and self-reported fair or poor overall health.

Results: Among 22,445,434 trauma patients in NHIS and 143,887,341 in MEPS, all 5 financial toxicity domains were more common among injured adults (Figure, $p < 0.05$ for all). Injuries were temporally associated with a 22% increase in difficulty paying medical bills, 17% increase in cost-related delays in care, and 22% increase in poor self-reported health ($p < 0.05$ for all). Injured adults who reported difficulty paying medical bills were more likely to report delaying care due to costs (OR 5.2 [4.2-6.6]), and those who delayed care were more likely to report poor health (OR 2.2 [1.8-2.7]).

Conclusions: In this first-ever national estimation of financial toxicity after injury, 1 in 2 adults reported ≥ 1 domain of financial toxicity, and injury was temporally associated with worsening financial and physical health. Programs aimed at mitigating the financial impacts of injury may improve long-term health, but systems monitoring these outcomes are needed.

Figure. Financial toxicity among injured patients and matched controls



INTEGRATED VASCULAR TRAINING MAY NOT PREPARE GRADUATES TO CARE FOR VASCULAR TRAUMA PATIENTS

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Invited Discussant: Leah Tatebe, MD

Introduction: Vascular surgery board eligibility may be secured through 5-year integrated programs (IV) as well as the traditional 2-year fellowship following general surgery residency (VF). We hypothesized that IV graduates accrue less experience in areas relevant to vascular trauma than VF graduates or general surgery graduates (GS). We assessed the first decade of IV graduates and compared it to GS and VF during the same period.

Methods: ACGME case log data was collected for IV, GS, and VF from 2013-2022. GS data was added to VF to assess total experience for VF graduates. Open vascular cases were classed as cerebrovascular, upper extremity, thoracic, abdominopelvic, infrainguinal, and infrapopliteal. Non-vascular general surgery cases were categorized as neck, thoracic, and abdominopelvic. Non-operative trauma and critical care data was recorded.

Results: There were 12,225 GS, 1224 VF, and 397 IV graduates. In 2012, IV accounted for 10% of all graduating vascular surgeons. By 2022, this proportion was 44%. Open vascular experience, regardless of body region, did not differ between IV and VF; both were significantly higher than GS ($p<0.05$). Non-vascular operative numbers did not differ between GS and VF in any category, but IV experience was significantly less than GS or VF in every category. IV logged 5% of the abdominopelvic cases that GS and VF did, 18% of the thoracic cases, and 3% of the neck cases ($p<0.05$). Critical care and nonoperative trauma experience were each higher in both GS and VF than IV ($p<0.05$). While open vascular trauma cases were not significantly different between VF and IV, integrated vascular graduates logged five vascular repairs for every vascular exposure.

Conclusion: The proportion of vascular surgeons trained through IV programs has quadrupled. IV graduates have a fraction of the experience in critical care, trauma, and non-vascular surgery than VF and GS graduates. This combined with their inexperience performing vascular trauma exposure may limit their ability to provide complete care of vascular injuries.

PROPHYLACTIC ANTIBIOTICS IN NON-OPERATIVE FACIAL FRACTURES: AN AAST MULTICENTER TRIAL

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Rosemary Kozar, MD; Andrew Doben, MD, FACS;
Tjiska Conrotto, DDS; Ernest E. Moore, MD; Claudia Alvarez, MD;
Jason Murry, MD; Tatiana CP Cardenas, MD;
Richard H. Lewis, MD, MA, MS; James Zebley, MD;
Caitlin M Blades, MS; Gail T. Tominago, MD;
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Invited Discussant: Christopher Dente, MD

Introduction: Craniofacial trauma affects approximately 3 million individuals in the United States annually. Historically, low overall data quality and inadequate sample size have limited the development of clinical practice guidelines for prophylactic antibiotic use in facial fractures. We aimed to determine the current use patterns and effects of prophylactic antibiotics in non-operative facial fractures.

Methods: A prospective analysis was conducted of adult patients with non-operative facial fractures across 19 centers from January 2022 to December 2023. Antibiotic duration was grouped as no antibiotics, ≤ 72 hours (hrs), and > 72 hrs. Data were assessed with chi-square testing and a logistic regression model. Chi-squared tests evaluated the associations between antibiotic duration, infectious complications, and adverse drug events (ADEs).

Results: Among 2,311 patients, 766 (33.1%) received antibiotics (None, $n=1,545$; ≤ 72 hrs, $n=365$; > 72 hrs, $n=401$). A total of 24 (1.0%) patients developed facial fracture-associated infections, 0.9% of no antibiotic group vs 1.3% with antibiotics, and eight (0.4%) patients developed ADEs. Most patients (99.0%) did not develop an infection despite the majority (66.8%) of the population receiving no antibiotics. Injuries were predominately closed fractures (87.1%), without mucosal disruption (84.1%) or foreign bodies (97.1%). Antibiotic administration correlated with higher rates of infection ($p=0.008$). Higher infection rates were maintained in the ≤ 72 hrs group following multivariable logistic regression, adjusting for confounders ($OR=3.22$ [95% CI: 1.56 - 8.98]; $p=0.025$).

Conclusion: Data suggest prophylactic antibiotics may be unnecessary for non-operative facial fractures. Avoiding antibiotics did not correlate with an increased risk of infection for most injury patterns. While a randomized trial is optimal to validate these data, at this time, there is no evidence to support presumptive antibiotics for closed facial fractures.

ENHANCING TRAUMA OUTCOMES IN INDIA: THE IMPACT OF THE GOOD SAMARITAN LAW ON BYSTANDER ENGAGEMENT AND TRAUMA CARE

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Amanda L. Teichman, MD, FACS; Karuna Raina, BS; Gautam Singh, BS;

Charoo Piplani, MBBS; Gregory Peck, MD; Zachary Englert, MD;

Philip S. Barie, MD, MBA, MCCM; Joseph Hanna, MD, PhD;

Sahil Mattoo, BS; Piyush Tewari, BS

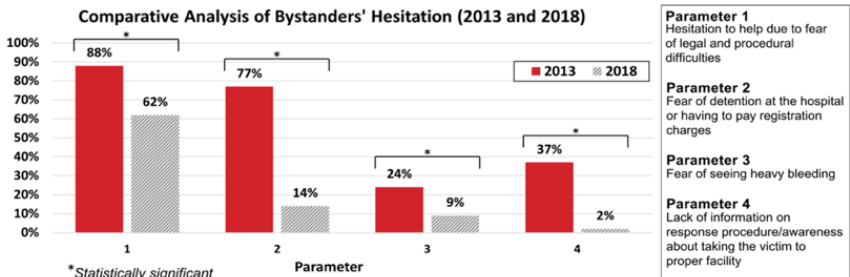
Invited Discussant: Christopher Dodgion, MD, MSPH, MBA

Introduction: India's motor vehicle collision (MVC) fatalities constitute 13% of the global MVC mortality burden. As India currently lacks a systematized prehospital trauma system, bystander engagement (BE) is crucial to the trauma “chain of survival” but limited in particular due to fear of criminal liability (Figure). The 2016 Good Samaritan Law (GSL) championed by SaveLIFE Foundation versus Union of India, provided legal protection to Good Samaritans (GS) who aid MVC victims (MVCV) at the scene. Our aim is to assess the impact of GSL on BE before and after GSL became a law.

Methods: We performed two knowledge, attitude, behavior, and practice surveys across 7 cities among 1,027 road-users before (2013) and 3,667 road-users and physicians after (2018) GSL was enacted. Barriers to BE and willingness to aid MVCV were assessed. Statistical analysis: χ^2 test; $p < 0.05$.

Results: GS surveyed were mostly male (93.1%) and young (57% aged 19-30 years). Compared with pre-GSL, willingness to assist MVCV increased post-GSL (26% vs. 88%, $p < 0.001$). Fear of liability (88% vs. 62%, $p < 0.001$) and concern about paying medical costs (77% vs 14%, $p < 0.001$) decreased. Additionally, 90% of surveyed physicians reported more trauma patients being brought by GS to hospitals.

Conclusion: GSL catalyzed cultural and behavioral shifts in India, enhancing BE by indemnifying and supporting more informed, less fearful GS. This prompted international adoption (i.e. Bangladesh) showing GSL to be a model for global trauma care reform in low- and middle-income countries.



OUTCOMES AMONG PATIENTS WITH ISOLATED TRAUMATIC BRAIN INJURY BEFORE & AFTER MEDICAID EXPANSION

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Invited Discussant: Amelia Maiga, MD, MPH

Introduction: Insurance coverage is a critical determinant of access to care. Uninsured patients suffer poorer outcomes including increased risk of morbidity/mortality. To reduce uninsurance among adults, the Affordable Care Act provisioned states the option to expand Medicaid eligibility. We hypothesized patients with isolated TBI (iTBI) had more insurance coverage and better outcomes after Medicaid expansion (ME) as compared to before.

Methods: National data on trauma admissions was obtained from the ACS TQP PUF for three years preceding and following the implementation of ME in 2014. iTBI admissions were identified by an AIS-Head ≥ 2 without significant bodily injury. Only patients between the ages 18-64 years were included as that was the ME target demographic. Univariate and multivariate analyses controlling for injury severity were used to detect changes in insurance coverage (Medicaid, private/other insurance, uninsured), outcomes, and discharge disposition before and after ME.

Results: There were 267,716 and 313,664 admissions for iTBI in pre- and post-expansion years. The proportion of patients insured by Medicaid rose significantly from 13.8% to 22.6% (+8.8%, $p<0.01$) in post-expansion years with a concomitant decrease in self-pay/uninsurance (-6.7%, $p<0.01$) and private/other insurance (-2.1%, $p<0.01$). While there was no significant difference in iTBI mortality pre-ME to post-ME (3.4% vs. 3.5%, $p=0.18$), post-ME patients were more likely to receive post-injury discharge care (PIDC) at an inpatient facility or via home health service compared to pre-ME (OR=1.3, $p<0.01$). After controlling for injury severity, post-ME patients had similar mortality to those with private/other insurance (OR=1.0, $p=0.23$) but were less likely to receive PIDC (OR=0.9, $p<0.01$). When comparing post-ME patients to the uninsured, Medicaid patients had less mortality (OR=0.6, $p<0.01$) and increased rates of PIDC (OR=2.5, $p<0.01$).

Conclusion: ME corresponded to increased Medicaid coverage and a higher rate of PIDC among adults with iTBI post-ME compared to pre-ME.

Following expansion, while ME patients were less likely to receive PIDC than privately insured patients, patients with Medicaid were 1.6-times as likely to survive and 2.5-times as likely to be discharged under medical care compared to uninsured patients.

**THE ECONOMIC IMPACT OF LEGAL ADVOCACY FOR
SURVIVORS OF FIREARM INJURY**

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Andrew J. Benjamin, MD, MS; David Hampton, MD, MEng, FACS;
Ryan Boudreau, MD; Susan Rowell, MD, MBA, FACS;
Jennifer Cone, MD, MHS, FACS; Abid Khan, MD;
Phillip Dowzicky, MD, MSHP; Timothy Plackett, DO, MPH;
Mihir Chaudhary, MD, MPH; Toba Bolaji, DO;
Selwyn Rogers, MD, MPH, FACS
University of Chicago Medicine
Invited Discussant: John Scott, MD, MPH

Introduction: Patients affected by firearm violence often have social and structural needs that adversely impact health and require legal solutions. These “health-harming legal needs (HHLNs)” are largely economic and include income, housing, employment, legal status, and personal stability. Medical-Legal Partnerships (MLPs) have addressed these HHLNs in various practice settings, but never in conjunction with a hospital-based violence intervention program (HVIP). Our objective was to measure the economic impact of implementing Recovery Legal Care, a bedside HVIP-MLP program, at an academic level I trauma center where firearm injury is the most common mechanism of injury.

Methods: After establishing a novel collaboration between our trauma center, HVIP and Legal Aid X (the largest provider of free civil legal services in X), we reviewed the type and frequency of successful legal interventions. A legal screening tool was developed to assess HHLNs among patients admitted after firearm injury. Patients that screened positive for an HHLN were referred to an attorney for bedside legal assistance. Economic impact was measured by mean monthly and lump sum increases in public benefits for HHLNs.

Results: Between 11/2022-12/2023, 244 patients were referred for intake (91% African American, 76% male, 17% unstably housed). A total of 363 HHLNs were identified (1.5 HHLNs/patient), of which 181 cases were successfully resolved (50%). A total of 280 HHLNs (77.1%) were related to public benefits. Supplemental Nutritional Assistance Program (SNAP) was the most common (n=23) and remunerative public benefit, granting a mean of \$277.09 in increased monthly benefits. Increased monthly benefits also occurred for Medicare/aid (\$3,708/mo.) and Supplemental Security/Disability Income (\$3,350/mo.). For lump sum benefits, the largest economic impact was dismissal of rental debt for one patient (\$19,652.99). Across the entire cohort, civil law attorneys were able to obtain \$17,742.44 in total monthly benefits, total lump sum benefits of \$42,795.95 and an annualized financial benefit of \$212,909.28, or \$1,047.97/trauma patient, in legally entitled yet previously denied benefits.

Conclusions: Timely legal advocacy through HVIP-MLPs may be a powerful tool to address HHLNs and structural determinants of health. These gaps in access suggest a critical role for legal advocacy among marginalized populations with historical exclusion from economic entitlements.

ACCURACY, RELIABILITY, AND UTILITY OF THE EFAST EXAM IN THE SETTING OF PENETRATING THORACIC TRAUMA

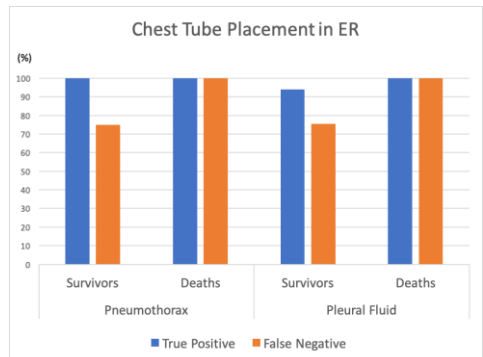
Miharu Arase, MD; Marco Sozzi, MD;
Morgan Schellenberg, MD; Kazuhide Matsushima, MD;
Kenji Inaba, MD; Matthew Martin, MD, McRIB
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Invited Discussant: Kyle Kalkwarf, MD

Introduction: The extended focused assessment with sonography in trauma (eFAST) exam adds additional thoracic views to standard FAST but has limited validation data that is primarily from blunt trauma mechanisms. We sought to analyze eFAST in a large cohort with penetrating thoracic trauma.

Methods: All patients with thoracic GSWs over 5-years who underwent eFAST were included. Overall performance metrics and metrics for each component of eFAST were analyzed besides the impact on interventions and outcomes. Independent factors associated with mortality were assessed by binary logistic regression.

Results: 288 patients were included, (91% male, 48% ISS \geq 15, and 17% died). 39% required tube thoracostomy and 18% required urgent thoracic surgical intervention. Although specificity was high (91% to 100%) for all components, the sensitivity was less than 50% for all thoracic views, except for “no cardiac motion” (100% sens). Sensitivity for pericardial fluid was 47%, pneumothorax was 22%, hemothorax was 36%, and peritoneal fluid was 51%. Comparing survivors vs deaths, the eFAST sensitivity was higher among deaths for all components (all $p < 0.05$). The majority of patients (>70%) with a false negative (FN) eFAST for pneumothorax or hemothorax required tube thoracostomy (Figure). On multivariate analysis GCS < 9 , chest/abdomen AIS ≥ 3 , and eFAST FN were independent predictors of mortality.

Conclusion: The eFAST exam showed highly variable performance metrics among patients with penetrating thoracic trauma, with all thoracic components demonstrating high specificity but low overall sensitivity. Urgent interventions were frequently required in patients with FN studies, and FN studies were independently associated with mortality.



PELVIC ANGIOEMBOLIZATION DOES NOT INCREASE PELVIC ISCHEMIC COMPLICATIONS: A MULTICENTER AAST STUDY

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Invited Discussant: Mark Seamon, MD

Introduction: Controversy exists as to whether pelvic embolization causes ischemia related complications of the pelvis and if selective vs non-selective embolization influences the risk of these complications.

Methods: We conducted a multicenter prospective observational study of adult blunt trauma patients with pelvic fractures who underwent angiography. Patients were divided into embolized (Embo) and non-embolized (No-Embo), then further subdivided into selective (Sel) and non-selective (Non-Sel) groups. The primary outcome was ischemic complications which were defined as gluteal skin/muscle necrosis (GN), pelvic abscess (PA), wound infection, pelvic wound breakdown (WB), and osteomyelitis.

Results: Of the 460 subjects, 381 were embolized. There were no statistical differences on univariate analysis between Embo and Non-Embo in GN (2.6% v 1.3%, $p=0.7$), PA (2.1% v 0%, $p=0.36$), wound infection (3.7% v 2.5%, $p=1.0$), WB (1.0% v 0%, $p=1.0$), and osteomyelitis (0% in both cohorts). Given the low incidence of each, we created a composite outcome of ischemia related complications and performed a multivariate analysis to correct for baseline differences between the groups. There were no significant differences in the composite outcome between the Embo and Non-Embo on multivariate analysis (OR 1.03, $p=0.97$). Of those embolized, we then performed multivariate analysis of the composite outcome based on level of embolization and found no statistically significant difference between Sel and Non-Sel embolization (OR 0.86, $p=0.67$).

Conclusion: The current study is the largest to date of blunt pelvic fracture patients undergoing angiography. Our data suggests that neither the use of embolization nor the choice of embolization level independently increases ischemic complications of the pelvis.

**COAGULATION STUDIES OF A NOVEL CARDIOVASCULAR
SUPPORT FLUID (VBI-1) FOR USE IN HEMORRHAGIC SHOCK:
AUGMENTATION OF THE BLOOD SUPPLY**

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Invited Discussant: Mitchell Cohen, MD

Introduction: According to the American College of Surgeons' manual on trauma there is no fluid other than blood that can raise blood pressure to a survivable level in patients that have lost 30% or more of their blood volume. Yet the supply of blood is continuously in varying stages of crisis. There is a need for a fluid that elevates blood pressure at least as well as blood. We have developed VBI-1, a fluid composed of phospholipid nanoparticles with a mean diameter of 17 nm that meets these requirements.

Methods: In Sprague Dawley rats of both genders, hemorrhagic shock was induced by withdrawing blood from their femoral arteries until respirations ceased. The lost blood volume was replaced by infusion of VBI-1, Ringer's Lactate (LR), or shed blood via the femoral artery. Preliminary studies showed that intra-arterial was superior to intravenous infusion. There were 6 rats in each group. Blood pressure was continuously monitored for 4 hours. In vitro ROTEM analyses of VBI-1 were conducted in triplicate. In vivo testing involved infusion of VBI-1 followed by blood extraction for ROTEM analysis.

Results: Respirations ceased at blood withdrawal levels of 33 to 44% of estimated total blood volume which was removed over 1.5 minutes. Survival rates at 4 hours post infusion were 100% with VBI-1, 83.3% with blood, and 0% with LR. Two-way ANOVA indicated significant MAP differences among fluids ($p=0.0004$). VBI-1 restored breathing and elevated MAP higher compared to shed blood and LR. The addition of VBI-1 inhibited clotting, with a 50% solution causing a significant increase in clotting time of 592 seconds compared to 49 seconds for whole blood. Adding plasma to VBI-1 in a 1: 1 ratio improved clotting time to 164 seconds. In vivo testing showed similarly prolonged CT relative to in vitro experiments and all other ROTEM parameters including clot strength within normal limits.

Conclusion: VBI-1 demonstrated superior efficacy in restoring respiration and MAP elevation compared to other fluids. Like packed red blood cells without clotting factors, large volumes of VBI-1 may induce coagulopathy. Yet, this is monitorable by ROTEM and correctable with plasma. Despite the increased clotting time, no significant friability or bleeding was observed in experiments. VBI-1 presents a promising alternative to blood.

FAR FROM HOME: PATIENT PREFERENCES AND ACCEPTABLE RISK TOLERANCE FOR LOCAL VS REGIONAL TRAUMA CARE

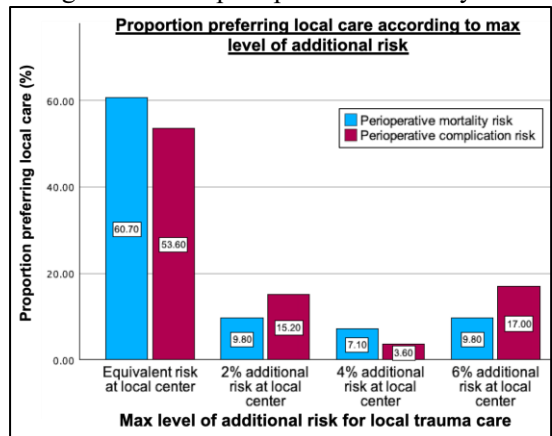
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Invited Discussant: Adil Haider, MD, MPH

Introduction: Regionalization of trauma care is believed to improve outcomes in some populations and injuries but may conflict with patient and family preferences and risk tolerance. We sought to analyze trauma patients' preferences for care across a spectrum of relative risk profiles.

Methods: Structured surveys and risk scenario assessments of adult trauma inpatients were performed. Modified standard gamble utility assessment determined additional perioperative mortality and morbidity risk accepted for local vs regional trauma care. Logistic regression identified predictors of willingness to accept perioperative risk.

Results: 112 patient assessments were performed. If perioperative mortality and complication risks were equivalent, 88% and 89% preferred local trauma care over regional transfer. If mortality and complication risk at the local center was 2% higher vs the regional center, 28% and 36% still preferred local care ($p<0.05$). At 6% increased mortality/complication risk, 10% and 17% still favored local care (see Figure). A larger proportion of blunt trauma patients were willing to accept at least 2% additional perioperative mortality risk for local care ($p=0.016$). Standard gamble preferences showed high utility for regional care with lower perioperative morbidity and mortality risk (0.972 and 0.968). On average, patients accepted a 2.8% excess perioperative mortality and 3.2% excess complication risk for local trauma care. Patients with blunt injury were 4.4 times more likely to prefer regional care if perioperative mortality risk was higher at the local center (CI 1.2-15.8, $p=0.023$).

Conclusion: Patients prefer local care versus distant transfer at equivalent morbidity and mortality risks, and a significant portion still prefer local care with up to 6% excess risk of morbidity and mortality. Patient preference and risk tolerance should be considered as a factor in these decisions.



THE INTERACTION BETWEEN GERIATRIC VULNERABILITY & SOCIAL SUPPORT: VARIATIONS IN COMMUNITY ENGAGEMENT DRIVE RECOVERY AMONG OLDER ADULT TRAUMA PATIENTS

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Invited Discussant: Tasce Bongiovanni, MD, MPP, MHS

Introduction: When presenting for care, older adults frequently experience increased risk of adverse outcomes owing to factors related to age (e.g. frailty, multimorbidity): a phenomenon known as ‘geriatric vulnerability’. Emerging research among younger trauma patients suggests that differences in social support could also play an important role in predicting recovery. Little is known about how these two factors intersect to collectively influence adverse outcomes. In this study, we explored how the interaction between geriatric vulnerability and social support influences longer-term, patient-reported outcomes among older adults.

Methods: Community-dwelling older adults (aged ≥ 65 years) with major injuries (ISS ≥ 9) who presented to three level 1 trauma centers in Boston between 2017-2023 were surveyed at 6 and 12 months after injury. Bayesian latent variable models combined the influence of patient age, functional dependence, diagnosed dementia, and multimorbidity into a single metric of ‘geriatric vulnerability.’ Variations in geriatric vulnerability were then compared across differences in ‘social support’ as measured by patient/caregiver reported variations in patients’ perceived extent of community engagement evaluated on a five-point Likert scale.

Results: A total of 2,016 older adults were included. For patients with low social support, increasing geriatric vulnerability increased patients’ risk-adjusted odds of adverse outcomes (Table 1), including greater extents of health services utilization (e.g. unplanned outpatient visits OR[95%CI]: 2.31[1.51-3.56]), decreased emotional well-being (e.g. decline in mood: 2.19[1.39-3.45]), and lower participation in activities of daily living (e.g. need help going to the bathroom: 4.43[2.42-8.09]). Among patients with high social support, the effect inverted/disappeared, yielding corresponding OR (95%CI) of 0.61(0.38-0.98) a 73.6% reduction, 0.70(0.34-1.44) a 68.0% reduction, and 0.53(0.16-1.75) an 88.0% reduction, respectively. The interaction was even more pronounced among older adults living in areas with high neighborhood vulnerability (lower access to resources/care, SVI >0.80).

Conclusions: Geriatric vulnerability increases the risk of adverse outcomes. For community-dwelling older adults, having access to strong social support is a critical modifier that portends marked improvement in outcomes. Within this population, varying levels of community engagement drove recovery, mitigating the effects of geriatric vulnerability and making otherwise higher-risk patients functionally equivalent to those who were, at baseline, less aged, less frail, and less sick.

Table 1. Risk-adjusted odds of 12-month adverse outcomes among patients with high-vs-low geriatric vulnerability

	High-vs-Low Geriatric Vulnerability				
	Low Social Support		High Social Support		Difference
	OR	95%CI	OR	95%CI	
Health services utilization					
Unplanned outpatient visit(s), injury-related	2.31	1.51-3.56	0.61	0.38-0.98	-73.6%
Unplanned outpatient visit(s), all cause	1.01	0.67-1.55	0.41	0.25-0.67	-59.4%
Unplanned readmission(s), injury-related	1.21	0.62-2.35	0.78	0.33-1.87	-35.5%
Unplanned readmission(s), all cause	1.31	0.77-2.22	0.25	0.08-0.82	-80.9%
Need for assistance at home	4.06	2.21-7.47	3.21	1.56-6.57	-20.9%
Trauma-Specific Quality of Life					
Emotional well-being					
Decline in appetite	2.37	1.55-3.64	0.74	0.39-1.41	-68.8%
Decline in mood	2.19	1.39-3.45	0.70	0.34-1.44	-68.0%
Decline in personal relationships	2.72	1.66-4.44	0.78	0.33-1.87	-71.3%
Felt compelled to rely on others	2.45	1.58-3.80	0.40	0.17-0.95	-83.7%
Functional engagement					
Need help bathing/showering	4.12	2.55-6.67	1.79	1.01-3.17	-56.6%
Need help cooking/preparing meals	5.32	2.73-10.4	0.61	0.19-2.03	-88.5%
Need help going to the bathroom	4.43	2.42-8.09	0.53	0.16-1.75	-88.0%
Need help walking on flat surfaces	3.23	2.02-5.16	1.28	0.70-2.33	-60.4%
Recovery/Resilience					
Decline in perceived quality of life	1.63	1.05-2.54	0.91	0.56-1.48	-44.2%
Prolonged recovery, longer than expected	1.33	0.87-2.04	0.87	0.54-1.40	-34.6%
Physical well-being					
Able to do leisure activities like before injury	1.99	1.31-3.03	1.82	1.10-3.01	-8.5%
Able to exercise like before injury	2.06	1.25-3.38	1.67	1.08-2.58	-18.9%
Have current physical limitations	2.42	1.35-4.35	2.02	1.27-3.23	-16.5%
Have pain on a daily basis	1.17	0.77-1.77	0.86	0.52-1.41	-26.5%

Geriatric vulnerability was derived from a Bayesian latent variable model that accounted for baseline (pre-injury) differences in patient age, functional dependence, dementia, and multimorbidity (number of comorbidities). The resultant bimodal distribution was split into “high” vs “low” geriatric risk.

Risk-adjusted results were taken from propensity-score weighted multilevel logistic regression models that accounted for clustering of patients within hospitals and potential confounding due to known differences in gender, presence of severe head injury, overall ISS, and mechanism of injury (blunt vs penetrating).

COGNITIVE OUTCOMES AND NEUROSTIMULANTS AMONG THE CEREBRALLY INJURED & OBTUNDED IN THE UNITED STATES: THE CONSCIOUS STUDY

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Invited Discussant: Mayur Patel, MD, MPH

Introduction: Neurostimulants (NS) are used to improve cognition after a traumatic brain injury (TBI) in the post-acute care setting, yet their efficacy in the acute period is less clear. We sought to examine the effect of NS on acute cognitive dysfunction in patients with a severe TBI.

Methods: We performed a prospective, multicenter, observational cohort study of patients ≥ 18 years with a severe ($GCS \leq 8$), blunt, TBI at 8 U.S. trauma centers from 2020-2023. Patients were grouped according to whether they received NS (amantadine, methylphenidate, modafinil), which was at the discretion of the intensivist. Our primary outcome was the change in cognitive disability among survivors over 28-days (or until discharge) measured by GCS and Disability Rating Scale (DRS) scores.

Results: There were 457 patients in the cohort; 29.5% ($n=135$) received NS. Groups were similar in age (45 y [29-63]) and sex (male: 74.6%), yet NS patients were more injured (ISS: 29 vs 26, $p=0.02$) with higher rates of diffuse axonal injury (DAI) (39.3% vs 18.3%, $p<0.0001$), neurosurgical interventions (NSI) (64.4% vs 33.2%, $p<0.0001$), and concomitant anti-psychotic (49.6% vs 35.7%, $p=0.01$) and propranolol (57% vs 7.2%, $p<0.0001$) use. NS administration varied between centers ($p<0.0001$). The most common NS was amantadine (97%), then methylphenidate (9.6%) and modafinil (3%). Rates of seizures (4.6%) and tachyarrhythmias (3.9%) were similar between groups. Median time to NS initiation was 8 d (5-15) and median therapy duration was 16 d (7-35). Patients who received NS in ≤ 7 d had better DRS scores compared to when started between 7-14 d and >14 d (10 vs 19 vs 21, respectively, $p=0.0002$). Among all patients who survived ($n=320$), NS patients had a greater improvement in GCS scores from day 7 until discharge (+3 vs +2, $p=0.004$), despite having lower final GCS (11 vs 15, $p<0.0001$) and DRS (18 vs 5, $p<0.0001$) scores. Controlling for DAI, ISS, frailty, NSI, and concomitant medications, NS remained a significant predictor of GCS score improvement by 1.12 points (95% CI 0.06-2.19).

Conclusion: Neurostimulants were used more commonly in patients with worse TBI pathology. Earlier NS use was associated with better DRS scores and NS were independently associated with improved GCS scores. With similar low adverse event rates between groups, NS should be considered as an option to improve acute cognitive disability after a severe TBI.

INVISIBLE INJURIES: ASYMPTOMATIC SPINE FRACTURES AFTER FALLS FROM HEIGHT

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Invited Discussant: Brian Yorkgitis, DO

Introduction: Delayed identification of traumatic thoracolumbar fractures increases the risk of neurological injury. Guidelines recommend that clinical exam alone may be appropriate in non-altered patients with low energy mechanisms; however, this approach may be inadequate after falls from height. We hypothesize that many spinal fractures after falls are asymptomatic on initial exam thus increasing the risk of missed injury if imaging is not obtained.

Methods: Retrospective review of trauma patients ≥ 18 yo admitted to a level 1 Trauma Center over a 5-year period with a fall from ≥ 5 ft. Patients were included if they had thoracolumbar spine imaging and were able to participate in an exam. Chart review determined presence of midline thoracolumbar pain on initial exam. Multivariable logistic regression was used to identify predictors of asymptomatic fractures (ASXF) adjusting for demographics, toxicology, distracting injuries, fall height, fracture location, and BMI.

Results: There were 618 fall patients identified, 424 patients (68.6%) had spinal fractures, of which 17.2% were ASXF. Physical exam had a sensitivity of 82.8% and specificity 39.7% for spinal fractures. Median fall height was 15ft (IQR 11-25), which was similar for patients with and without spinal fractures. On multivariate regression for ASXF, alcohol consumption (OR 5.23, CI 1.77-15.9, $p=0.003$) and lower extremity fractures (OR 2.61 CI 1.22-5.63 $p=0.013$) were risk factors for ASXF. There was no increased risk of ASXF based on fall height, $p=0.245$ (Table). Operative repair was performed in 11.0% of ASXF patients, and 53.4% required long-term bracing.

Conclusions: Screening for spinal fractures after falls from height solely based on symptoms and physical exam is inadequate and could result in missed injuries. Thoracolumbar imaging should be considered for all patients with a fall ≥ 5 ft.

**KETAMINE INFUSION FOR PAIN CONTROL IN SEVERELY
INJURED PATIENTS: RESULTS OF A RANDOMIZED
CONTROLLED TRIAL**

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Invited Discussant: John Harvin, MD, MS

Introduction: Opiate-based pain regimens remain the cornerstone of pain management following traumatic injury, but issues related to opioids have driven research into alternative analgesics. Adjunctive ketamine has been increasingly utilized to decrease opioid use, but little evidence exists to support its efficacy within the trauma population.

Methods: A prospective, randomized, double-blind placebo-controlled trial of severely injured (ISS ≥ 15) adult patients (age 18-64) admitted to a Level 1 trauma center was conducted. Exclusion criteria included GCS < 14 , ISS < 15 , pregnancy, and chronic opiate use. All patients were prescribed a patient-controlled analgesia in addition to being randomized to either adjustable dose ketamine (ADK) starting at 3 mcg/kg/min or an equivalent rate of 0.9% normal saline. Study drug and PCA titration were allowed as part of a treatment algorithm. The primary outcome was reduction in oral morphine equivalent (OME) utilization at 24 hours.

Results: We performed a planned interim analysis upon reaching a predetermined enrollment goal. Thirty-nine of 73 patients (53%) were randomized to the experimental arm. Both groups were similar in makeup and had a median ISS of 29 (range 18-53). Median OME in ADK and placebo groups were 99 (0-358) and 99 (20-469), respectively ($p=0.29$). This p-value exceeded the predetermined futility cutoff.

Conclusion: ADK failed to reduce 24-hour OME totals in a severely injured trauma cohort when compared to placebo. Additional studies are necessary to determine if there is any benefit for adjuvant ketamine in different trauma subpopulations.

ANTI XA GUIDED THROMBOPROPHYLAXIS IN CRITICAL TRAUMA PATIENTS IS ASSOCIATED WITH LESS VTE, EXPERIENCE FROM A TERTIARY CARE TRAUMA CENTER

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Invited Discussant: Galinos Barmparas, MD

Introduction: Venous Thromboembolism (VTE) is common and preventable in trauma. Most VTE prophylaxis (VTEp) protocols mandate standard LMWH doses, which may be inadequate for injured patients. We investigated whether calibrating LMWH doses according to anti-Xa levels is associated with reduced VTE incidence without increasing bleeding.

Methods: VTEp protocol was introduced to a single Level 1 high-volume Trauma Center (Enoxaparin 30mg twice daily), calibrated according to peak plasma Anti Xa measured after 3rd dose. The study compared severely injured adult patients admitted to the Trauma ICU 1 year before and 1 year after protocol implementation, Outcomes were VTE (DVT, PE or both) and unexpected bleeding. Subgroup analysis was done for traumatic brain injury (TBI)

Results: 305 patients after protocol implementation (intervention) were compared to 350 pre-protocol patients (control). Anti-Xa levels were measured in 83% of intervention patients and none of the control. 40.4% of the patients had low levels of anti-Xa, suggesting inappropriate prophylaxis and enoxaparin doses were increased. 51% had the desired anti-Xa levels while 8.6% had higher levels and LMWH doses were reduced.

VTE incidence after protocol implementation (intervention) decreased from 4% to 1.3% (OR 0.31; 95% CI 0.1-0.9, P=0.03) without increasing bleeding rate. Among TBI patients, VTE rates were lower in the intervention group without reaching statistical significance.

75% of the patients with VTE, intervention group, had low Anti Xa levels, while 20% of those with bleeding had high anti-Xa levels.

Conclusion: Among adult critically injured patients, a VTEp protocol with enoxaparin dose calibration according to anti-Xa levels, was associated with significantly lower VTE rates without increasing bleeding. About 40% of the patients receiving standard enoxaparin doses had anti-Xa levels suggestive of inadequate prophylaxis

This study suggests that the calibration of LMWH dosing may improve outcomes.

**IMPACT OF AMERICAN COLLEGE OF SURGEONS TRAUMA
VERIFICATION ON A STATEWIDE
QUALITY COLLABORATIVE**

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Georgia Trauma Commission

Invited Discussant: Eileen Bulger, MD

Introduction: American College of Surgeons (ACS) trauma center verification has demonstrated improved outcomes at individual centers, but its impact on statewide Trauma Quality Improvement Program (TQIP) Collaboratives is unknown. A statewide TQIP Collaborative, founded in 2011, noted underperformance in 6 of 8 patient cohorts identified in the TQIP Collaborative report. We hypothesized that requiring ACS verification for level I and II trauma centers would result in improved outcomes for the state collaborative.

Methods: ACS verification requirement was tied to ongoing Trauma Commission funding. Trauma centers were required to apply for an ACS consultative visit by 2017 and were given until 2023 to achieve ACS verification. The effect of this intervention was measured in the number of centers achieving verification and in the performance of the TQIP Collaborative semi-annual reports.

Results: In 2015, only 1 of 15 (7%) trauma centers were ACS verified, and 4 had undergone consultative visits. By 2023, 11 of 12 (92%) trauma centers achieved ACS verification. Following this intervention, the observed-to-expected odds ratio for all-patient morbidity and mortality improved from 1.60 to 1.17, and variation among patient-specific cohorts narrowed from 0.97-1.82 to 0.96-1.48 (Figure). Performance in all six underperforming patient-specific cohorts improved over the study period.

Conclusions: ACS verification for level I and II trauma centers improves TQIP Collaborative performance. Statewide Collaboratives should consider ACS verification as a requirement for participation.

HIGH INTENSITY TIME SENSITIVE INTERVENTIONS IN GERIATRIC TRAUMA ACTIVATIONS: A MULTICENTER STUDY

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Invited Discussant: Joseph Posluszny, MD

Introduction: As increasing numbers of older adults present to trauma centers, the applicability of existing trauma activation (TA) criteria for this vulnerable population has been debated. This study sought to determine the frequency of high-intensity time-sensitive interventions (HITS) in older adult TAs to begin defining data-driven geriatric-specific TA criteria.

Methods: This multicenter, retrospective study collected data (1/17-12/19) securely from participating centers as NTDB files with TA status (full, partial, other). HITS were derived from TQIP process of care measures as critical interventions requiring trauma expertise (Table). Older adults (65+ yrs) were compared to younger adults (<65 yrs) on demographics, injury characteristics and HITS status by TA status using χ^2 .

Results: 27 Level I/II centers enrolled 165,970 patients (86.6% blunt, 20.4% full activation, median age: 53, median ISS: 9, in-hospital mortality 4.2%). There was a lower proportion of HITS in partial TAs, compared to full TAs ($p<0.001$, Table). Older adults were less likely to receive HITS compared to younger adults (Full TA: 33.0% vs 38.2%, $p<0.001$; Partial TA: 5.0% vs 5.6%, $p=0.003$). Compared to non-HITS, HITS were associated with an increased total mortality (Expired+Hospice) in both full (30.6% vs 7.7%, $p<0.001$) and partial (12.0% vs 1.5%, $p<0.001$) TAs.

Conclusions: Over 1/3 of full TAs required HITS, supporting their high-level resource allocation. However, HITS were uncommon in partial TAs, significantly more so for older adults. These data can help refine geriatric TA criteria in support of optimal resource allocation. Further research is needed to provide additional evidence for other benefits of TA.

High-Intensity Time-Sensitive (HITS) Interventions, n (%)	Total (Full+Partial+ Other) N=165,970	Full TA		Partial TA	
		<65 n=27,481	65+ n=6,297	<65 n=36,545	65+ n=16,212
Endotracheal Tube w/in 4 hrs	6,574 (4.0)	4,379 (15.9)	887 (14.1)*	640 (1.8)	237 (1.5)*
Hem Control Surgery w/in 24 hrs	3,370 (2.0)	2,690 (9.8)	308 (4.9)*	259 (0.7)	54 (0.3)*
Any Blood Product w/in 4 hrs	7,422 (4.5)	5,196 (18.9)	950 (15.1)*	635 (1.7)	269 (1.7)
Any ICP Monitor	1,642 (1.0)	1,057 (3.8)	185 (2.9)*	113 (0.3)	70 (0.4)*
Mechanical Vent w/in 24 hrs	8,176 (4.9)	5,102 (18.6)	1,154 (18.3)	809 (2.2)	328 (2.0)
Chest Tube Placement w/in 4 hrs	4,338 (2.6)	2,657 (9.7)	365 (5.8)*	658 (1.8)	207 (1.3)*
ED Thoracotomy w/in 4 hrs	245 (0.1)	209 (0.8)	25 (0.4)*	3 (0.0)	3 (0.0)
Angiography w/in 24 hrs	1,004 (0.6)	668 (2.4)	144 (2.3)	112 (0.3)	43 (0.3)
Any of the Above HITS	17,217 (10.4)	10,511 (38.2)	2,080 (33.0)*	2,046 (5.6)	804 (5.0)*

* indicates statistically significant difference between the <65 group and the 65+ group ($p<0.05$).

**TXA IMPACT ON PLATELET ADHESION TO THE
ENDOTHELIUM AFTER SHOCK CONDITIONS:
A PROTECTIVE EFFECT?**

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Wayne State University

Invited Discussant: Matthew Kutcher, MD, MS

Introduction: Trauma and hemorrhagic shock (T/HS) leads to microcirculatory disturbances related to endothelial injury and endothelial glycocalyx (EG) degradation. Improved outcomes following T/HS have been linked to protection of the EG layer which is a topic of increasing investigation. Early tranexamic acid (TXA) administration following T/HS improves outcomes in clinic studies. Recent translational studies have also shown that early TXA administration protects the EG following shock insults; the impact on blood-endothelial cell interactions are unknown. Platelet adherence to the vascular endothelium may contribute to microcirculatory disturbances; the effects of TXA on this phenomenon are uncertain. Microfluidic devices have been used to study the behavior of endothelial cells and platelets under flow conditions. We hypothesize that the protective effect of TXA against EG degradation would prevent shock induced platelet adhesion to the microvasculature. This was studied in a microfluidic cell culture model under a controlled microenvironment.

Methods: Human umbilical vein endothelial cell (HUVEC) monolayers were established in microfluidic devices and then subjected to control or shock conditions (hypoxia/reoxygenation + epinephrine; HR/epi). TXA was added to the perfusate at various times following HR/epi, and then diluted whole blood (2:1) with fluorescently labeled platelets was perfused in the microfluidic channels. Platelet adhesion was then determined using fluorescent microscopy. In other experiments, EG thickness was indexed using wheat germ agglutinin staining and fluorescent microscopy.

Results: See attached figure. Platelet adhesion was increased in all experimental groups vs. control. However, TXA decreased platelet adhesion in all HR/epi groups with the greatest effect noted with earlier TXA administration. Endothelial glycocalyx thickness decreased from 45-49% of the control after HR/epi ($p \leq 0.05$). With TXA, the glycocalyx thickness remained 78-86% of the control.

Conclusion: TXA administration resulted in a time dependent decrease in endothelial platelet adhesion following shock conditions. These effects were related to TXA protection of the endothelial glycocalyx layer. Our study supports early administration of TXA in severely injured patients to improve outcomes.

**CLINICAL MANAGEMENT OF BLUNT CEREBROVASCULAR
INJURY-RESULTS FROM THE AAST PROSPECTIVE
OBSERVATIONAL VASCULAR INJURY TRIAL (PROOVIT)**

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Dell Seton Medical Center at the University of Texas
Invited Discussant: Walter Biffi, MD

Introduction: Blunt cerebrovascular injury (BCVI) represents a severe type of injury with risk of debilitating stroke. Contemporary techniques have allowed for varying management strategies including medical management, open surgical repair, and endovascular therapy. We hypothesize that clinical management and injury characteristics determine subsequent stroke risk.

Methods: The AAST Vascular Trauma Registry: PROOVIT was used to identify patients with diagnosed BCVI including both internal carotid and vertebral artery injuries. Data included patient demographics, BCVI characteristics, Abbreviated Injury Scale (AIS), Injury Severity Score (ISS), and clinical management. Primary outcomes were stroke rate and mortality.

Results: From February 2013 to December 2023, 1420 patients were identified sustaining BCVI, including 45.6% internal carotid artery and 54.4% vertebral artery. Of these 65% were male, average age 43 (± 17), with a mean ISS of 24(± 14) and head AIS of 3(± 1). Therapy included medical management [97% (1377/1420)], endovascular therapy [2.9% (41/1420)] and open surgical repair [0.1% (2/1420)]. Excluding open surgical repair, the stroke rate was significantly higher with endovascular versus medical management [26.8% vs 5.7%, $p < 0.001$], however no difference was noted in overall mortality. There was also a significant increase in stroke rate amongst those with multiple vessels injured compared to those with a single injury [12.9% vs 5.6%, $p = 0.013$], as well as in injuries of carotid arteries compared to those of vertebral arteries [8.7% vs 4.4%, $p = 0.001$]. There was no significant difference in stroke rate based on patient age, gender, or admission vital signs.

Conclusion: Most patients with BCVI are treated with medical management alone. Our data suggests that endovascular therapy for BCVI conveys a significantly increased risk of stroke, bringing its role in this setting into question.

IMPACT OF STATE ADMISSION STANDARDS ON PATIENTS WITH ISOLATED RIB FRACTURES

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Invited Discussant: Charles Butts, MD

Introduction: Chest wall injury remains a significant source of admission to trauma centers. Given the prevalence across our region, a network-wide rib fracture protocol has been in effect. In Jan 2020, our state trauma standards changed to allow patients with >3 rib fractures to be admitted to level 4 centers. Our primary objective was to assess the impact of this change in standards on outcomes at our level 4 trauma centers.

Methods: Our network trauma database was queried for patients with isolated uncomplicated rib fractures between 2018–2022. Patients were stratified based on admission before or after change in admission standards. Patients evaluated at level 4 centers were compared for demographics, injury characteristics, transfer rate and outcomes. Analysis was repeated for those with ≤ 3 and > 3 rib fractures. Finally, 1:1 propensity score matching was used to create a matched group of patients with >3 rib fractures to assess outcomes based on level of admitting facility.

Results: 1070 patients with isolated rib fractures were admitted across our trauma network over the study period. Level 4 centers evaluated 360 patients with 132 (36.6%) and 228 (63.3%) in the pre- and post-standard change periods, respectively. There was significant reduction in transfers for isolated rib fractures (56% vs. 21% $p < 0.01$). The number of patients with >3 rib fractures at level 4 centers increased from 13.8% to 30.6% ($p = 0.01$). Patients with >3 rib fractures had the same median HLOS (3 IQR 2-5 vs. 2 IQR 1-4, $p = 0.29$) and mortality (0% vs 2.3%, $p = 0.22$) as those with ≤ 3 rib fractures. After 1:1 propensity matching, patients admitted to network level 1&2 trauma centers ($n = 60$) versus those who were admitted to their local level 4 campus ($n = 60$) had similar median age (71 IQR 60-81 vs. 73 IQR 65-85, $p = 0.24$), injury characteristics, median HLOS (2.5 IQR 2-5 vs. 2 IQR 1-4, $p = 0.37$) and mortality (1.7% vs. 0%, $p = 0.30$).

Conclusion: Change in state admission standards allowed for a substantial reduction in transfer of patients with >3 isolated rib fractures. In a group of matched patients with >3 rib fractures, those admitted to level 4 centers had similar outcomes to those admitted to level 1 or 2 centers.

SOCIAL SUPPORT HELPS MITIGATE DISPARITIES ASSOCIATED WITH VARIATIONS IN NEIGHBORHOOD VULNERABILITY AMONG TRAUMA PATIENTS

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Invited Discussant: Nina Glass, MD

Introduction: Neighborhood vulnerability, measured by the CDC’s Social Vulnerability Index (SVI), has been identified as an important predictor of longer-term outcomes following injury. It has also been shown that lower social support, measured by differences in patients’ perceived social support network (SSN) strength, is associated with diminished functional and mental health recovery. Despite the importance of both factors, the interplay between SVI and SSN remains largely unexplored. Our study aimed to (1) examine the capacity for social support to improve trauma outcomes across varying SVI levels and (2) investigate the capacity for theoretical improvements in SSN to help reduce disparities associated with increased SVI.

Methods: We surveyed all adult trauma patients with moderate or severe injuries (ISS ≥ 9) who presented to three level 1 trauma centers in Boston between 2018-2023. Outcomes were assessed at 6-12 months after their injury. Differences in SVI were categorized by quartiles. Differences in SSN strength were evaluated on a five-point Likert scale and categorized as weak (“weak”/“nonexistent”)–vs–strong (“very strong”/“strong”) social support. Risk-adjusted linear/logistic regression models were used to examine associations between SSN strength and trauma outcomes across quartiles of SVI. Counterfactual models were then used to examine theoretical reductions in SVI’s effect by promoting improvements in SSN strength among (scenario 1) patients with the highest quartile of SVI and (2) all patients within the cohort.

Results: A total of 2,525 patients were included. For patients living in the most vulnerable neighborhoods (highest quartile of SVI, **Table 1**), having weak–vs–strong social support resulted in markedly worse outcomes (*e.g.* chronic disability OR[95%CI]: 2.14[1.44-3.19]). In contrast, among patients living in the least vulnerable neighborhoods (lowest quartile of SVI), risk-adjusted associations between weak–vs–strong social support and trauma outcomes were no longer significant (*e.g.* chronic disability OR[95%CI]: 1.13[0.50-2.55]). Counterfactual models told a similar story, suggesting that while increasing social support to “strong” levels for patients living in the highest risk areas (*i.e.* those with the highest quartile of SVI) reduced the overall risk of chronic disability from 31.2% within the entire population to 28.8% (a relative reduction of 7.7%), increasing social support to “strong” levels for patients living in the other three quartiles only reduced chronic disability by an additional 0.2 percentage-points to 28.6% (an 8.3% relative reduction from baseline).

Conclusion: Social support is an important mitigator of adverse outcomes among trauma patients, particularly those living in neighborhoods with greater vulnerability. The results of our study show that while weak social support significantly worsened outcomes for patients living in areas with high SVI; it had no effect among patients in areas with greater access to resources. Targeted interventions aimed at increasing social support and enhancing community engagement have the potential to help “close the gap” and increase critical access to care for at-risk patients living in our communities’ most vulnerable neighborhoods.

Table 1. Impact of SSN strength on trauma outcomes for patients living in neighborhoods with the lowest (lowest risk)–vs–highest (highest risk) quartile of SVI

Outcome	Weak vs Strong Social Support Network	
	Lowest quartile of SVI	Highest quartile of SVI
	OR [^] (95%CI)	OR [^] (95%CI)
Resultant functional disability	1.13 (0.50-2.55)	2.14 (1.44-3.19)
Need help walking up stairs	0.96 (0.35-2.63)	2.01 (1.29-3.11)
Need help walking on flat surfaces	0.70 (0.20-2.42)	2.01 (1.24-3.21)
Resilient Recovery	1.45 (0.53-3.99)	2.58 (1.46-4.64)
Current physical limitation	1.18 (0.56-2.46)	1.79 (1.15-2.78)
	Mean difference	
Physical health score	-2.7 (-7.60 to 2.16)	-5.21 (-7.7 to -2.65) ^^

[^] Risk adjustment for age, sex, number of comorbidities, Injury severity score

^{^^} The Physical Component Score (PCS-12) is derived from the SF-12 survey. A difference of 3 units is recognized as clinically significant.

UNCOVERING THE ROLE OF PLATELET DRIVEN THROMBO-INFLAMMATION IN POST-TRAUMATIC ARDS

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Ian E. Brown, MD, PhD; Carrie Lewis, MS;
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Invited Discussant: Timothy Pritts, MD, PhD

Introduction: Hemorrhagic shock has been identified as the major risk factor for the development of Acute Respiratory Distress Syndrome (ARDS). The key mechanism is hypothesized to be disordered pathophysiologic crosstalk between inflammatory and coagulation pathways. This study investigates the role of coagulation and inflammatory markers in the development of ARDS.

Methods: A secondary analysis of the biomarker profiles from patients enrolled in the Pragmatic Randomized Optimal Platelet and Plasma Ratio (PROPPR) study was performed. PROPPR was a multicenter randomized trial examining the impact of a balanced resuscitation strategy (1:1:1 vs 1:1:2 plasma:platelet:rbc) on mortality. Forty-eight coagulation and inflammatory candidate biomarkers were investigated. Those patients with complete biomarker data were included in a principal components analysis. This dimensionality-reduction machine learning method was used to identify initial biomarker phenotypes (principal components) associated with ARDS. LASSO regression was performed on the principal components to identify independent predictors of ARDS controlling for age, mechanism, injury severity score (ISS), and significant hemorrhage (≥ 5 units rbc in first 12h).

Results: 286 patients were included. The 24-hour mortality was 14%. For those that survived >24 hours, 18% developed ARDS by Berlin criteria. There was no difference in ARDS incidence by treatment group. Risk for ARDS was predictable using time zero biomarker phenotypes ($p < 0.05$). Among the 14 phenotypes identified, one remained statistically significant for predicting ARDS controlling for age, ISS, blunt injury, and hemorrhage. The phenotype ($p = 0.039$) was predominantly driven by platelet activation integrins CD41 (glycoprotein IIb), CD61 (glycoprotein IIIa), and CD42b (platelet glycoprotein Ib alpha chain).

Conclusions: This study demonstrates the predominant early predictor of ARDS is associated with platelet activated integrins which are known to induce release of immunomodulatory mediators both anti and pro-inflammatory.

DYNAMIC CHANGES IN BLEEDING SITES: EVALUATING CONTRAST EXTRAVASATION ON COMPUTED TOMOGRAPHY AND ANGIOGRAPHY IN PELVIC FRACTURES

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Saiseikai Yokohamashi Tobu Hospital

Invited Discussant: Amy Hildreth, MD

Introduction: Contrast extravasation (“blush”) on contrast-enhanced computed tomography (CT) indicates active bleeding, but diagnostic angiography (AG) following CT sometimes differs from the CT findings in patients with pelvic fractures. The relationship between blush on CT and AG remains unclear. This study aimed to evaluate the concordance between blush on CT and AG based on pelvic regions.

Methods: This was a retrospective single-center study. The study included patients (age ≥ 18 years) with pelvic fractures between 2015 and 2023, who had AG after CT. AG was performed in patients with blush on CT or unstable hemodynamics due to pelvic fracture. Pelvic bleeding regions were categorized separately left and right as anterior internal iliac arteries (IIA), and posterior IIA based on pelvic arterial anatomy. Concordance between blush on CT and AG was assessed using the k statistic.

Results: A total of 87 patients (174 unilateral pelvis) with pelvic fracture were included. Among these, 75 (86%) had blush on CT and 12 (14%) had no blush on CT. Concordance was 83% (95% CI, 0.03-0.57; $k = 0.30$) when assessed by individual patient basis (Table 1), and 51% (95% CI, 0.21-0.40; $k = 0.30$) when evaluated by anatomical regions on a unilateral half of pelvis (Table 2).

Conclusions: The location of active bleeding often differs between CT and AG, indicating that bleeding may change intermittently and at various sites over time. This suggests the importance of evaluating the entire pelvic arteries, including both sides, during AG, rather than solely relying on CT findings.

Table 1. Relationship between Blush on CT
and AG, Based on Individual Patient Basis

	CT +	CT -	Total
AG +	67	7	74
AG -	8	5	13
Total	75	12	87

Table 2. The R

Angiography positive	CT positive				Total
	Anterior	Posterior	Anterior & Posterior IIA	All negative	
Anterior IIA	15	6	3	4	28
Posterior IIA	5	12	2	15	34
Anterior & Posterior IIA	12	6	12	7	37
All negative	13	7	6	49	75
Total	45	31	23	75	174

al Regions

RESUSCITATION TRIGGERS AND OUTCOMES IN A BLOOD-CONSTRAINED TRAUMA ENVIRONMENT: ESTABLISHING TARGETS FOR EVIDENCE-BASED GUIDELINES

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Georges Etoundi-Mballa, MD, MS; Thompson Kingue, MD;
Richard Njock, MD; Daniel Nkusu, MD;
Jean-Gustave Tsiagadigui, MD; Cindy Umoh, MPH;
Rasheedat Oke, MD, MPH; Catherine Juillard, MD, MPH;
Alain Chichom-Mefire, MD; S. Ariane Christie, MD
University of California, Los Angeles
Invited Discussant: James Byrne, MD, PhD

Introduction: Balanced blood transfusion is standard of care for hemorrhagic shock, but many low-resource settings lack sufficient safe blood. Understanding current resuscitation practice in extremely blood-constrained settings is critical to optimize resource allocation. The objective of this study was to evaluate triggers and outcomes for blood-, colloid-, and crystalloid-based resuscitation strategies in a critically-injured Cameroonian cohort.

Methods: In this prospective observational cohort study, we evaluated resuscitation practice among all critically-injured patients presenting to ten trauma hospitals in Cameroon between 2022-23. Demographics, injury characteristics, and clinical trajectory were compared between cohorts receiving minimal fluid (MF), crystalloid (CRYS), colloid (COL), or blood-based (BLD) resuscitation. Multivariate logistic regression (MLR) was used to identify resuscitation triggers and test associations between resuscitation strategy and outcomes including trauma death.

Results: Of 1211 critically-injured patients, 77% (930) received CRYS, 21% (249) MF, 7% (86) COL, and 7% (87) BLD. Demographics and injury severity were similar between cohorts. While BLD was associated with hemodynamic derangements (OR 4.7, 95% CI 2.6-8.5), COL was strongly associated with traumatic brain injury (TBI) (OR 4.9, 95% CI 1.1-21.5). Overall mortality was 26% in COL, 21% in MF, 17% in CRYS, and 16% in BLD ($p=0.17$). MVR adjusted for injury severity, blood pressure, and Glasgow Coma Scale found COL to be independently associated with mortality (OR 3.5, 95% CI 1.4-8.7).

Conclusion: In blood-constrained Cameroon, TBI appears to trigger COL resuscitation and is associated with increased mortality among critically-injured patients. Educating trauma care providers to avoid COL administration in TBI patients and implementing standardized resuscitation protocols could improve trauma survival in Cameroon.

WEALTH IS HEALTH: HIGH ECONOMIC STATUS IN CAMEROON CORRELATES WITH PROTECTIVE GEAR USE IN TRAFFIC INJURIES AND IMPROVED CLINICAL OUTCOMES

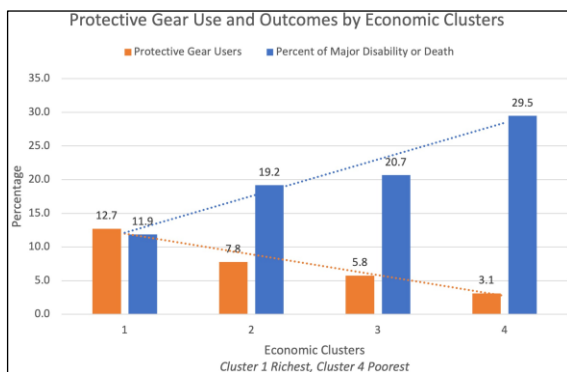
Fanny Dissak-Delon, MD, PhD; Mark T. Yost, MD, MPH;
Darwin Touko, MS; Roland Mfondoum, MS; Rasheedat Oke, MD, MPH;
S. Ariane Christie, MD; Alain Chichom-Mefire, MD;
Alan Hubbard, PhD; Catherine Juillard, MD, MPH
University of California, Los Angeles
Invited Discussant: Mary Schroeder, MD

Introduction: Sub-Saharan Africa has the highest traffic fatality rate globally. Despite laws mandating helmet and seatbelt use, data on protective gear use during road traffic injuries (RTIs) in Cameroon remains sparse.

Methods: We extracted Cameroon Trauma Registry data collected from 10 hospitals during July 2022 to December 2023. Protective gear users wore helmets in motorcycle and seatbelts/car seats in vehicle crashes. We categorized patients into four economic clusters based on ownership of durable goods using parallel distance matrix computation. We analyzed associations between continuous variables with Wilcoxon rank-sum and categorical variables with chi-squared and multivariate logistic regression. Our primary outcome was in-hospital death or major disability at discharge.

Results: In 3685 crashes, 302 (8%) patients used protective gear. The greatest percentage of protective gear users belonged the richest cluster while the poorest cluster patients comprised the smallest proportion of protective gear users (Figure; $p<0.001$). When controlling for age, protective gear use, and injury severity, the poorest cluster patients showed the greatest odds of major disability or death (AOR 2.40; $p<0.001$).

Conclusions: Greater economic status is associated with increased protective gear use during RTIs in Cameroon. Despite suffering the most severe outcomes, the poorest patients remain less likely to use protective gear. Enforcement of mandatory protective gear laws and economic incentives such as price subsidies for helmets and seatbelts would particularly benefit the most economically vulnerable population.



**AUTOMATING EXCELLENCE: A BREAKTHROUGH IN
EMERGENCY GENERAL SURGERY
QUALITY BENCHMARKING**

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Brandon Harris, MD; Zongyang Mou, MD;
Todd W. Costantini, MD, FACS; Laura N. Haines, MD, FACS;
Allison E. Berndtson, MD, FACS; Laura Adams, MD, FACS;
Jay J. Doucet, MD, FACS; Jarrett Santorelli, MD, FACS
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Invited Discussant: Kevin Schuster, MD, MPH

Introduction: With the adoption of the emergency general surgery (EGS) model by institutions nationwide, designing and implementing effective quality assessment tools is imperative. Currently accepted EGS risk scores are limited by the need for manual extraction, which is time-intensive and costly. We developed an automated institutional electronic health record (EHR) linked EGS registry that calculates a Modified Emergency Surgery Score (mESS) and demonstrated its use in benchmarking outcomes.

Methods: The EHR linked automated EGS registry was used to calculate a mESS for patients undergoing emergent laparotomies from 2019-2023. Data captured included demographics, admission and discharge data, diagnoses, procedures, vitals, labs, and imaging. A mESS was calculated based off ESS variables, with estimation of subjective variables using diagnosis codes and other abstracted treatment variables. This was validated against ESS and the POTTER risk calculators by chart review using a two-way mixed effects intraclass correlation coefficient (ICC). Observed vs expected (O:E) 30-Day mortality and complication ratios were generated.

Results: The EGS registry captured 177 emergent laparotomies. There were 32 deaths within 30 days of surgery for a mortality rate of 18%. The mESS demonstrated agreement with ESS and POTTER scores.

Conclusion: Our study highlights the effective implementation of an institutional EHR-linked EGS registry equipped to generate automated quality metrics. This demonstrates potential in enhancing the standardization and assessment of EGS care while mitigating the need for extensive human resources investment.

	O:E mESS	O:E ESS (ICC)	O:E POTTER (ICC)
30-Day Mortality	1.44	1.86 (0.74)	1.30 (0.63)
30-Day Complications	0.84	0.95 (0.87)	0.88 (0.57)

DEFINING AND ASSESSING EQUITY TO CARE IN AN URBAN TRAUMA CENTER

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Boston Medical Center

Invited Discussant: Andre Campbell, MD

Introduction: Every minute of prehospital transport time (TT) is critical to survival. Previous studies have only evaluated community proximity within an hour to a trauma center. Here we assess granular urban community-level access to trauma centers and hypothesize that TT in Boston would be longer for non-white communities as well as those with higher poverty metrics.

Methods: We utilized the 2020 Decennial Census data at the block group (BG) level (the most granular year and geography available) to approximate neighborhoods. Trauma centers were geocoded into BGs from the Census TIGER/Line Shapefiles Database. BG demographics and poverty metrics were joined to the BGs in ArcGIS Pro. BG centroids were calculated and a network analysis of traffic data was used to determine the predicted TT from each BG centroid to the nearest TC. BG characteristics were assessed with regard to TT using linear regression in Stata. Kruskal-Wallis tests were used to analyze differences for non-parametric data amongst multiple groups.

Results: A total of 581 Boston BGs with 273,188 households and 675,647 individuals were identified. Of households, 48,711 (17.8%) were receiving cash/food assistance. Further, 278 (47.8%) of BGs had a white non-Hispanic majority, 79 (13.6%) had a Black non-Hispanic majority and 29 (5.0%) had a Hispanic majority population. Household income quartiles ranged from \$32,394 to \$157,283. Relative to the highest income BGs, TT increased as income decreased for the middle quartiles (β 1.7, 95% CI 0.48 to 2.90, $p < 0.01$ and 2.6 95% CI 1.4 to 3.8, $p < 0.01$ respectively) but not in the lowest income quartile BGs. Public assistance was not associated with TT. An increased proportion of the population that was Black (β 0.10, 95% CI 0.07 to 0.11, $p < 0.01$) or Hispanic (β 0.04, 95% CI 0.01 to 0.07, $p < 0.01$) was related to increased TT; an increased proportion of the population being white non-Hispanic related to shorter TT (β -0.003, 95% CI -0.004 to -0.002, $p < 0.01$). Majority white communities had TT more than 5 minutes shorter than majority Black communities (9.2 min vs. 14.4 min; $p < 0.01$).

Conclusion: Network analysis of BGs in Boston allowed for an analysis of community temporal trauma center access. Communities with higher non-white populations have reduced access to trauma care while some available poverty metrics relate to TT and others do not.

**PATTERNS OF CARE FRAGMENTATION: DO EMERGENCY
GENERAL SURGERY PATIENTS BENEFIT FROM
INTERFACILITY TRANSFER?**

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John O. Hwabejire, MD, MPH; George C. Velmahos, MD, PhD;

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Massachusetts General Hospital

Invited Discussant: Marta McCrum, MD, MPH

Introduction: Fragmentation of Care (FOC) describes non-elective readmission to a non-index hospital and has been associated with poorer clinical outcomes, higher healthcare costs, and increased patient dissatisfaction. We hypothesized that interfacility transfer (IFT) could ameliorate the adverse effects of FOC in emergency general surgery (EGS) patients. The aim of this study was to assess the impact of IFT on patients with FOC and assess the patient-related characteristics associated with patterns of fragmentation.

Methods: We retrospectively analyzed the Nationwide Readmissions Database 2019. We included patients ≥ 18 years old with non-elective readmissions following discharge for an EGS diagnosis. We stratified the patients by patterns of fragmentation. The primary outcome was mortality. We conducted a multivariable logistic regression analysis, accounting for clustering at the hospital level.

Results: A total of 204,481 patients were eligible, of whom 77.0% were non-fragmented, 21.9% were fragmented (FOC only), 0.9% were hyper-fragmented (FOC and transferred to another non-index hospital), and 0.2% were unfragmented (FOC and transferred back to index hospital). The most common causes of readmission in all cohorts were gastrointestinal and infectious complications. After adjusting for patient characteristics, when compared to non-fragmented patients, the risks of 60- and 90-day mortality were significantly higher in the fragmented, unfragmented, and hyper-fragmented cohorts (Table 1). EGS patients experiencing both FOC and IFT (unfragmented and hyper-fragmented) had significantly increased odds of mortality. Index admission characteristics predictive of unfragmented care were initial operative management, discharge home with health services, and higher illness severity.

Conclusion: FOC in EGS patients is associated with higher mortality. Considering that IFT confers an additional mortality risk, EGS patients experiencing FOC may have a survival benefit if they are not transferred back to the index hospital.

STANDARDIZED ELECTRONIC ORDER SETS DECREASES OPIOID USE FOR EMERGENCY GENERAL SURGERY PATIENTS

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Lauren Tanner, MD; Sabrina D. Goddard, MD; Zain G. Hashmi, MD
University of Alabama at Birmingham
Invited Discussant: Andrew Bernard, MD

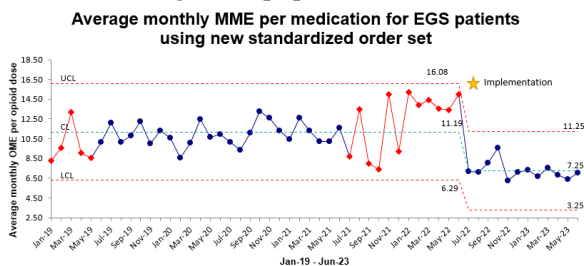
Introduction: Effective pain management while limiting opioid utilization can optimize surgical patient care. Emergency general surgery (EGS) are a vulnerable population as they are often excluded from enhanced recovery pathways. We sought to determine the effect of a protocolized opioid order set among EGS patients at a tertiary care center.

Methods: An interprofessional team imbedded new protocolized pain regimens into an electronic order set in July 2022. Oral and IV morphine milligram equivalents (MME) per opioid administration were monitored from Jan 2019-Jun 2023 for all EGS patients and compared pre and post-implementation. Primary outcome was total MME and MME per opioid dose administered. Secondary outcomes included pain score and formulation trends. Data were analyzed using Welch's t-test for continuous variables, chi-square for categorical variables, and statistical process control charts.

Results: Total monthly MME decreased from 508.9 ± 387.2 to 251.8 ± 128.4 ($p < 0.001$). Average monthly MME per dose decreased from 11.5 ± 4.1 pre-implementation to 7.2 ± 1.9 post-implementation ($p < 0.001$). This difference was sustained when stratifying data by oral (13.3 ± 3.4 vs. 7.7 ± 1.8 , $p < 0.001$) and IV (9.3 ± 3.9 vs. 5.7 ± 1.4 , $p < 0.001$) MMEs. This change resulted in fewer hydromorphone orders in favor of lower dose morphine and fewer opioid-acetaminophen combination medications. Despite fewer MMEs, average patient pain scores decreased from 6.9 ± 2.5 to 6.3 ± 2.8 ($p < 0.001$).

Moreover, MME reduction was sustained with limited variation (Figure 1).

Conclusion: Implementation of a standardized EMR pain management protocol significantly decreased in-hospital opioid use for EGS patients. Opioid optimization is critical in this high-risk population where enhanced recovery strategies are not always applicable. Future research will focus on impact on LOS, opioid adverse events, and opioid utilization post discharge.



OPERATIVE NEUROSURGERY FOR TRAUMATIC SUBDURAL HEMATOMA: TRAUMA CENTER VARIATION IS ASSOCIATED WITH PATIENT OUTCOMES

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Joseph Sakran, MD, MPH, MPA; Christopher Witiw, MD MS; David Gomez, MD, PhD;
Tej Azad, MD, MS; James P. Byrne, MD, PhD
The Johns Hopkins University
Invited Discussant: Weidun Alan Guo, MD, MPH

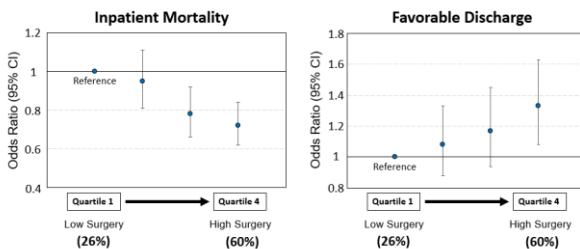
Introduction: Traumatic subdural hematoma (SDH) is a common subtype of traumatic brain injury (TBI) that often represents a neurosurgical emergency. The Brain Trauma Foundation recommends urgent surgical evacuation of SDH with midline shift (MLS) >5mm, regardless of presenting Glasgow Coma Scale (GCS) score. However, real-world practice is unknown. The objective of this study was to measure the association between trauma center (TC) tendency for operative neurosurgery (NSx) and inpatient mortality among patients with traumatic SDH.

Methods: Data for adult patients (age ≥ 18 years) presenting with severe TBI (GCS ≤ 8) and SDH with MLS >5mm were derived from TQIP (2017-2019). Patients with penetrating mechanism, non-survivable injuries (AIS=6), advance directives, or death in the ED were excluded. Hierarchical logistic regression was used to estimate each TC's unique odds of performing NSx for traumatic SDH. Risk-adjustment accounted for patient baseline and injury characteristics, including patterns of intracranial injury and neurological examination (GCS and pupillary response). TCs were then grouped into quartiles of increasing tendency for NSx. The risk-adjusted association between TC tendency for NSx and outcomes was then measured. The primary outcome was inpatient mortality. The secondary outcome was favorable discharge disposition, defined as discharge to home or rehab.

Results: 13,087 patients with traumatic SDH were treated at 454 level I/II TCs. Median age was 57 years and 70% were male. Falls were the most common mechanism (55%). Median GCS was 3 and 57% of patients exhibited abnormal pupillary exam (10%, one reactive; 47%, neither reactive). Significant variation in TC tendency for NSx was observed. Specifically, TCs with the greatest tendency for NSx (**Quartile 4**) performed surgery on 60% of patients, while TCs with the lowest tendency (**Quartile 1**) performed surgery on only 26%, despite no differences in GCS or pupillary exam. After risk-adjustment, greater hospital tendency for NSx was associated with lower inpatient mortality and higher odds of favorable discharge (**Figure**). Patients with traumatic SDH treated at TCs with highest vs. lowest tendency for NSx were 30% less likely to die (aOR, 0.7; 95%CI 0.6–0.8) and 30% more likely to achieve favorable discharge (aOR, 1.3; 95%CI 1.1–1.6). These effects were most pronounced among patients with abnormal pupillary exam.

Conclusions: Significant variation exists in TC tendency to perform NSx for traumatic SDH. This variation is associated with inpatient mortality and potential for favorable discharge disposition.

Impact of Trauma Center Tendency for Operative Neurosurgery on Patient Outcomes



**PREDICTIVE VALUE OF PLATELET FUNCTION ASSAYS IN
TRAUMATIC BRAIN INJURY PATIENTS ON ANTIPLATELET
THERAPY: INSIGHTS FROM A RANDOMIZED
CONTROLLED TRIAL**

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Aishwarrya Arivudainambi, BA; Ronit Kar, BA; Emily Mihalko, PhD;
Patricia Loughran, PhD; Stephen Wisniewski, PhD; David Okonkwo, MD;
Susan Shea, PhD; Jason Sperry, MD, MPH; Matthew D. Neal, MD
University of Pittsburgh

Invited Discussant: Scott Brakenridge, MD

Introduction: Traumatic brain injury (TBI) patients on antiplatelet therapy face elevated mortality risks due to impaired platelet function, with significant controversy remaining regarding the reversal of antiplatelet therapy. In this study, we aimed to evaluate the relationship between objective platelet function assays (PFAs) and mortality in TBI patients on antiplatelet therapy.

Methods: TBI patients, as confirmed by CT scan, aged 18-89 years, who had a history of pre-injury antiplatelet therapy, or required platelet transfusion per standard practice, and were deemed at significant risk for urgent neurosurgical intervention were enrolled in a prospective randomized controlled trial comparing room-temperature- and cold-stored platelet transfusion. Pre- and post-transfusion blood samples were drawn, and assays including flow cytometry, thromboelastography with platelet mapping (TEG-PM), impedance aggregometry, and VerifyNow were run. Logistic regression models were used to assess the association (odds ratios (OR) and confidence intervals (CI)) of the assay results (post-transfusion, and pre-post transfusion change (delta)) with the 30-day all-cause mortality, regardless of the intervention arm.

Results: In total, 101 patients were enrolled (mean [SD] age, 73.4 [10.2] years; 46.5% female) and had a 13.86% 30-day all-cause mortality rate. There were no significant associations between pre-transfusion PFAs and mortality. However, lower post-transfusion maximal amplitude (MA) of TEG-PM with Kaolin (OR=0.906, 95% CI [0.833-0.985], $p=0.021$), ADP (OR=0.957, 95% CI [0.922-0.994], $p=0.022$), and Activator F (OR=0.859, 95% CI [0.770-0.958], $p=0.006$) were all associated with mortality. In comparison to the pre-transfusion values, the change in post-transfusion values of VerifyNow Aspirin (ASA) assay response units correlated with mortality (OR=0.988, 95% CI [0.979-0.998], $p=0.014$). There were no other significant correlations in other parameters of the tested PFAs.

Conclusion: The data show that the MA of TEG-PM values, as well as the magnitude of change in the VerifyNow ASA assay, following platelet transfusion correlated with 30-day mortality in our cohort. Our findings suggest that these PFAs may predict 30-day mortality in TBI patients on antiplatelet agents.

UNCOVERING THE ICEBERG: TRACKING VTE EVENTS IN TRAUMA PATIENTS AFTER DISCHARGE

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John W. Scott, MD, MPH; Naveen F. Sangji, MD, MPH;
Raymond A. Jean, MD, MHS; Mark R. Hemmilla, MD;
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Michigan Medicine
Invited Discussant: Sarah Moore, MD

Introduction: Although the risk of inpatient venous thromboembolism (VTE) is high after major injury, this risk does not end at hospital discharge. The lack of post-discharge surveillance limits our understanding of risk factors for post-discharge VTE and our ability to improve outcomes.

Methods: We used data from adult inpatients (≥ 18 yrs) from a statewide trauma quality improvement program from 2018-2022. Post-discharge information was obtained via longitudinal insurance claims data through a described linkage

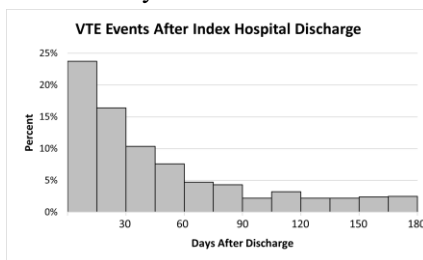
mechanism. Post-discharge VTE events (and dates of occurrence) were identified using these claims data, and multivariable logistic regression was used to identify predictors of post-discharge VTE.

Results: Of 34,421 trauma registry and claims matched patients identified, 1,487 (4.4%) had a post-discharge VTE event, compared to only 280 (0.8%) VTE events diagnosed during the index admission. A high proportion of patients had an event in the first 3 months after discharge (Figure). Multiple patient, injury, and treatment factors were associated with post-discharge VTE risk (Table).

Conclusions: The risk of a VTE event extends well beyond the index

hospitalization for trauma patients. The overwhelming majority of VTE events occurred post-discharge, which highlights the need for a longitudinal patient record that captures these outcomes. Further examination of VTE prophylaxis strategies is also warranted to improve the quality of care.

Factors Associated with a VTE Event After Discharge from a Trauma Center			
Characteristic	OR	95% CI	p-value
Black race	1.68	1.35-2.1	<0.001
AIS Extremity >2	1.19	1.02-1.38	0.028
AIS Head and Neck >2	1.24	1.02-1.5	0.029
Active chemotherapy	1.8	1.25-2.59	0.002
Blood transfusion	1.23	1.03-1.46	0.022
Functionally dependent health status	1.15	1.01-1.31	0.042
Obesity	1.56	1-2.43	0.048
Discharge to other than home	1.83	1.58-2.12	<0.001



INFLAMMATORY CYTOKINES PRESENT ON ARRIVAL PREDICT 28-DAY MORTALITY FOLLOWING TRAUMA

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Invited Discussant: Jonathan Meizoso, MD, MSPH

Introduction: The complex role inflammation plays in post-trauma outcomes has many unanswered questions. It is hypothesized that differential expression of pro- and anti-inflammatory cytokines contribute to patient outcomes. One proposed mechanism is through dysregulation of normally protective inflammatory responses that become pathologic following serious injury. To further elucidate the early biomarker profiles, we characterized the baseline circulating inflammatory cytokines immediately following trauma.

Methods: A prospective cohort study was conducted from March 2021 – February 2024 at a Level I trauma center. Patients were enrolled if a time zero blood sample was obtained within 30 minutes of arrival and prior to transfusion of any blood products. All samples were obtained at the establishment of the first intravenous access in the ED. Demographics, injury characteristics, labs, and outcomes were collected prospectively. A 26-plex Luminex panel of cytokine marker was compared across injury severity (ISS) groups [minor<15, moderate 15-24, severe >24] using Kruskal Wallis and Wilcox rank sums (significance $p \leq 0.05$). Medians (+/-IQR) are reported.

Results: 401 patients were enrolled with median age 43 (IQR 30-59), 69% blunt trauma, and 37% with $ISS \geq 15$. Overall mortality was 7% with higher mortality with increasing ISS ($p < 0.05$, minor 1.2%, moderate 10.6%, severe 21.7%). Proinflammatory markers eotaxin ($p = 0.0001$), MCP1 ($p = 0.0005$), MiP1B ($p = 0.0002$), and anti-inflammatory markers PDGF-BB ($p = 0.0028$) and IL10 ($p = 0.0006$) increased across ISS groups. Time zero cytokine biomarkers Eotaxin, IL6, IL7, MCP1, IL10, PDGF-BB, and VEGF-alpha were higher in patients who died ($p < 0.05$, Table).

Conclusions: Cytokine expression differences occur very early (<30 mins) following traumatic injury.

These appear to cluster in the more severely injured and are associated with mortality differences at 28-days. These early biomarkers have implications for potential therapeutic targets for future investigation.

Biomarker	Mortality		p-value
	No	Yes	
Eotaxin	16.27 (10.15-24.35)	32.83 (17.87-36.69)	<0.0001
IL 6	12.89 (10.55-12.89)	34.34 (12.89-137.66)	0.0005
MCP 1	28.42 (12.93-57.34)	100.37 (25.78-164.24)	0.0003
Mip1B	8.06 (6.64-25.95)	15.18 (5.45-50.19)	0.2255
IL1ra	40.06 (31.22-40.06)	40.06 (40.06-512.44)	0.0447
PDGF-BB	20.38 (8.95-53.97)	60.32 (11.52-177.45)	0.0229
IL 7	2.36 (1.32-3.99)	4.38 (2.06-7.44)	0.0026
VEGF alpha	56.60 (32.90-90.14)	85.10 (50.49-220.02)	0.0088
IL10	1.66 (0.50-2.57)	3.20 (0.52-18.44)	0.0278

INSUFFICIENT OPIOID PRESCRIBING IS ASSOCIATED WITH RETURN TO THE EMERGENCY DEPARTMENT AFTER TRAUMATIC INJURY

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Invited Discussant: Timothy Browder, MD

Introduction: After traumatic injury, up to 20% of patients return to the emergency department (ED) within 30 days, most commonly for uncontrolled pain. The association between inpatient opioid needs and return ED visits has not been studied. We sought to evaluate the impact of discharge opioid prescriptions, based on inpatient opioid needs, on patients returning to the ED for pain.

Methods: We conducted a retrospective cohort study of injured patients, 2018-2021, including demographic, injury, and hospitalization data. Opioids were quantified using milligram morphine equivalents (MME). Discharge pain control (in days) was calculated by dividing MME prescribed by MME required the day before discharge. Multivariable logistic regression was used to determine the impact of discharge pain control on 30 day ED visits for pain, controlling for all covariates with a p-value <0.1 on unadjusted analysis.

Results: Of 691 patients requiring opioids within 24 hours of discharge, 499 (74%) were prescribed opioids at discharge, and 167 (24%) had an ED visit for pain. Those with an opioid prescription had a lower proportion of ED visits for pain (20%) than those without (34%) (OR 0.45, 95% CI 0.30-0.68, $p < 0.001$). The median days of pain control prescribed at discharge was 0.6 (IQR 0.0-2.2) and 1.4 (IQR 0.2-3.9) and the median MME prescribed was 45mg (IQR 0-100) and 60mg (IQR 19-113) for those with and without an ED visit for pain, respectively. Discharge with greater pain control days was associated with lower odds of an ED visit for pain (OR 0.93, 95% CI 0.88-0.98, $p = 0.01$).

Conclusion: This is the first study to evaluate whether discharge opioid prescriptions are associated with ED visits for pain after trauma. Among patients requiring opioids at the time of discharge, insufficient opioids prescribed on discharge based on requirements the day before discharge is associated with higher odds of ED visits for pain. Providers should consider a careful analysis of inpatient pain control needs throughout hospitalization to optimize pain management at discharge and potentially reduce preventable ED visits.

**SILENCING METHYLATION-CONTROLLED J PROTEIN
MITIGATES BURN-INDUCED MITOCHONDRIAL DYSFUNCTION IN
ALPHA MOUSE LIVER-12 CELLS**

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Invited Discussant: Nicholas Namias, MD, MBA

Introduction: Burn injuries trigger systemic responses that severely impact the liver, leading to poor outcomes in patients. Mitochondrial dysfunction is crucial in hepatocyte damage and cell death after burns. Methylation-controlled J (MCJ) protein, an inhibitor of mitochondrial Complex I, plays a significant role in this process. Its inhibition enhances mitochondrial respiration, suggesting a potential method to reduce hepatic damage by improving energy production. This study hypothesizes that hepatocytes treated with burn mouse serum exhibit mitochondrial dysfunction, which can be alleviated by silencing MCJ, restoring **Methods:** Wild-type alpha mouse liver cells (WT AML12) and shMCJ AML12 cells were employed to simulate *in vitro* burn-induced liver damage, with MCJ silenced via short hairpin RNA (shRNA). Serum collected from mice euthanized 24 hours after burn injury was used to treat the cells for a subsequent 24-hour period. Metabolic mitochondrial respiration was evaluated using the Seahorse XF Cell Mito Stress assay and Western blot analysis of whole cell lysates.

Results: After treatment with serum from burn mice, we observed a 150% increase in MCJ expression in WT AML12 cells $p < 0.05$, compared to shMCJ AML12 cells. shMCJ AML12 cells treated with serum from burn mice showed enhanced basal, ATP-linked, and Carbonyl cyanide-*p*-trifluoromethoxy phenylhydrazone (FCCP) induced maximal respiration (75%, $p < 0.05$) and increased spare oxygen consumption rate (OCR) capacity (42%, $p < 0.05$) compared to WT AML12 cells exposed to serum from burn mice. Western blots showed an increased expression of OXPHOS complexes I, II, and III ($p < 0.005$) and a decrease in cytochrome-c leakage (85%, $p < 0.05$) in shMCJ AML12 cells compared to WT AML12 cells exposed both to serum from burn mice.

Conclusion: This *in vitro* study highlights the potential role of elevated MCJ levels in impairing mitochondrial respiration after burns. Silencing MCJ shows promise in mitigating this impairment, enhancing the electron transport chain, and potentially reducing the risk of cell death following burn injury. These findings hint at a potential therapeutic avenue for addressing burn-induced hepatocyte damage, warranting further investigation for replication *in vivo*.

TRAUMATIC ENDOTHELOPATHY PHENOTYPES IN INJURED CHILDREN: A PRINCIPAL COMPONENT ANALYSIS

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Children's Hospital of Pittsburgh of UPMC

Invited Discussant: Romeo Ignacio, Jr., MD

Introduction: Trauma-induced coagulopathy (TIC) is common and associated with poor outcomes in injured children. Our aim was to identify patterns of endothelial dysregulation after injury and associate these phenotypes with relevant patient factors and clinical outcomes in a pediatric trauma cohort.

Methods: Principal component analysis (PCA) was performed on data from injured children between 2018-2022. Laboratories included endothelial markers (syndecan-1, thrombomodulin, tissue factor, and VEGF), INR, platelet count, and base deficit. Variables were reduced to principal components (PC); PC scores were generated for each subject and used in logistic regression with outcomes including mortality, blood transfusion, shock (pediatric-adjusted shock index), and patient characteristics, including age, sex, injury mechanism, and traumatic brain injury.

Results: In total, 59 children had complete data for analysis. Median (IQR) age was 10 years (4-14), 31% female, 21% penetrating mechanism, and the median (IQR) injury severity score was 16 (9-21). PCA identified 2 significant PCs accounting for 67% of overall variance. PC1 included syndecan-1, thrombomodulin, VEGF, INR, and base deficit; PC1 scores were associated with mortality, blood transfusion, and shock (all $p < 0.001$). PC2 included tissue factor and platelet count; PC2 scores were associated with age ($\rho = -0.42$, $p = 0.001$), but no clinical outcome. PCs were not significantly associated with sex, injury mechanism, or traumatic brain injury.

Conclusion: PCA detected two distinct patterns of endothelial dysregulation in injured children. This may represent unique TIC phenotypes (shock/coagulopathy versus endothelial disruption/thrombosis) that would benefit from targeted treatment strategies. Further study is needed to confirm these findings and better understand pediatric TIC mechanisms.

ADIPOSE DERIVED STEM CELLS SECRETE PRO AND ANTI-INFLAMMATORY CYTOKINES AFTER MAJOR BURN INJURY

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Kaitlin Couvillion, BS; Claudia Leonardi, PhD; Asra Feroze, MD;
Tracy Dewenter, MD; Robert Siggins, PhD; Patrick McTernan, PhD;
Patricia Molina, MD, PhD; Jeffrey Carter, MD;
Herbert Phelan, MD; Jonathan Schoen, MD, MPH, FACS
Louisiana State University - New Orleans Department of Surgery
Invited Discussant: Zsolt Balogh, MD, PhD

Introduction: Adipose derived stem cells (ADSCs) are a subset of mesenchymal stem cells derived from adipose tissue which is an abundant and easily obtainable resource. ADSCs have an important role in orchestrating the immune response to injury. However, few studies have evaluated the role of paracrine factors from stem cells in burn wounds. The objective of this research is to examine the paracrine factors secreted from ADSCs in patients with major burn injury. We hypothesized that ADSCs from burn patients would have a different inflammatory profile.

Methods: Adipose tissue was collected from patients with major burn injuries (>20% total body surface area) at their index operation and non-burn adipose tissue was obtained from elective breast surgery patients. ADSCs were extracted from the adipose tissue specimens. Fluorescence activated single cell sorting (FACS) confirmed the presence of ADSCs. ADSCs were grown under standard tissue culture techniques, and the supernatant was extracted for analysis. A ten-analyte cytokine multiplex analysis was performed. Histology staining of the adipose tissue was also performed to identify for the presence of immune cells. A Student's t-test was used to analyze the groups.

Results: A total of 38 patients were included in the study with 17 major burn patients and 21 non-burn patients. FACS demonstrated ADSCs with the expression of CD 90, CD 105, and CD 73 antibodies. Levels of IFN-gamma, IL-6, IL-8, and IL-10 were all significantly higher in the burn cohort ($p < 0.05$). Histologic staining revealed a higher number of lymphocytes in the burn fat compared to the non-burn fat. Two burn samples showed macrophages while none of the non-burn fat samples did.

Conclusions: This is the first study to demonstrate that ADSCs extracted from human burn adipose tissue have both a pro and anti-inflammatory response. A balance inflammatory response is needed to help wounds progress to normal healing. Future studies are needed to investigate the potential role of paracrine factors from ADSCs to improve wound healing in major burn injuries.

ARE PROPHYLACTIC VENA CAVA FILTERS EVER INDICATED IN TRAUMA? A CONTEMPORARY ANALYSIS FROM THE CLOTT STUDY

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Invited Discussant: Marissa Boeck, MD, MPH

Introduction: Recent national data suggest that Inferior Vena Cava Filters (IVCFs) are associated with a slightly reduced rate of pulmonary embolism, increased rates of deep vein thrombosis, other adverse events, and increased cost with no change in mortality. We reviewed the CLOTT study for the current use of prophylactic IVCFs in level 1 trauma centers.

Methods: The Consortium of Leaders in the study of post-Traumatic Thromboembolism (CLOTT) is a prospective, observational, cohort, multi-center study conducted at 17 US level 1 and 2 trauma centers between 2018 – 2020 including patients aged 18-40 to examine the prevention and management of VTE. We conducted a per center analysis of the placement rates, timing, and indications for prophylactic IVCFs.

Results: Of the 7,466 trauma patients, 93 patients (1.25%) had prophylactic IVCFs inserted. The majority sustained blunt trauma with a mean ISS of 18. Most IVCFs were placed by interventional radiologists (72.4%) followed by vascular surgeons (17.2%) and then trauma surgeons (10.3%). The mean time from injury to placement was 7.2 (SD 7.0) days; median 5 (IQR 2-10) days; range 0-32 days. There was wide variability in rates of IVCFs per centers with the lowest rate of 2/ 622 patients (0.3%) and the highest rate of 9/ 71 patients (12.7%). Reported indications for prophylactic IVCF insertion were: neurotrauma 24.7 %, repeat operations 26.9%, spinal cord injury with paralysis 7.5%, coagulopathy 17.2%, solid organ injury 8.6%, spine fracture 7.5% and other 32.3%. The mean time to initiation of VTE prophylaxis was 4.75 days; median 3 days; range 0-38 days. 62% of patients had VTE prophylaxis initiated before or on the same day as insertion of IVCF. All centers had patients who never received pharmacologic VTE prophylaxis (range 2.4% - 30.6%) but this did not correlate with increased use of prophylactic IVCF insertion as shown in the graph.

Conclusions: The CLOTT study group has generated the largest prospective study of VTE management in trauma patients and demonstrated there is little role for inserting prophylactic IVCFs in young trauma patients. Given the potential for harm, this data should inform clinical practice guidelines to avoid the wide variability in IVCF use after injury.

GERI-SCREEN: A MULTICENTER TRIAL OF A NOVEL SCREENING TOOL FOR DEPRESSION AND SUICIDE RISK AMONG US TRAUMA PATIENTS

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 Lisa Allee, LICSW, MSW; Brian Daley, MD, FACS;
 Thomas J. Schroepfel, MD, MS, FACS; Dorian A. Lamis, PhD, ABPP;
 Meghan Fish, MA; Gregory Davis, PhD; Hannah Bard, BS;
 Cat Nordstrom, BSN, RN, TCRN; Deborah Tuggle, RN, CEN;
 Eileen M. Bulger, MD, FACS; Brendan T. Campbell, MD, MPH, FACS
 American College of Surgeons
 Invited Discussant: Esther Tseng, MD

Introduction: Rates of depression and suicidal ideation among geriatric trauma patients admitted to the hospital are not currently known. The objective of this study was to determine the prevalence of depressive symptoms, suicidal ideation, previous suicide attempts, and lethal means access among geriatric patients admitted to US trauma centers. We hypothesized that a significant number of these patients may have unrecognized symptoms of depression and/or suicidal ideation not identified prior to hospital discharge.

Methods: These data are from a prospective multicenter cohort study of injured geriatric (≥ 55 years) patients admitted to non-ICU inpatient trauma services at five US trauma centers. Patients were approached to complete a tablet-based survey with two components, 1) validated depression and suicidal ideation screening tool (PHQ-9) and 2) household firearm ownership. Patients scoring ≥ 5 on PHQ-8 screen were considered to have depressive symptoms. On the PHQ-9, patients reporting “several days”, “more than half the days”, or “nearly every day” on question 9 were considered to have suicidal ideation.

Results: From November 2022 through December 2023, five trauma centers located in five different states administered surveys to 378 patients, who were mostly male, Caucasian, and

over 70 years old. Overall, more than one-third (37.6%) screened positive for depressive symptoms and over forty percent kept a firearm at home. Additionally, nearly one-third (28.6%) of patients experiencing suicidal ideation kept a firearm in the home.

Conclusions: We identified high rates of depressive

symptoms among geriatric patients admitted to trauma centers, and nearly one-third have access to firearms in their home. Identification of depressive symptoms and suicidal ideation among patients admitted to trauma centers may allow for mental health intervention and lethal means safety counseling prior to hospital discharge.

Variable	Total N=378 (100%)	Non- Firearm Owners n=206 (57.4%)	Firearm Owners n=153 (42.6%)	p- value
Male gender	196 (54.8)	100 (48.5)	96 (63.2)	0.006
Any depressive symptoms (PHQ-8 ≥ 5)	135 (37.6)	84 (40.8)	51 (33.3)	0.15
Suicidal ideation (PHQ question #9)	28 (7.9)	20 (9.8)	8 (5.3)	0.12

TIME TO HEMOSTASIS: A POSSIBLE MECHANISM RESPONSIBLE FOR WHOLE BLOOD SURVIVAL BENEFIT

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Ernest E. Moore, MD; Nicholas Namias, MD; Joseph Minei, MD;

Stephen Wisniewski, PhD; Jason Sperry, MD, MPH

University of Pittsburgh

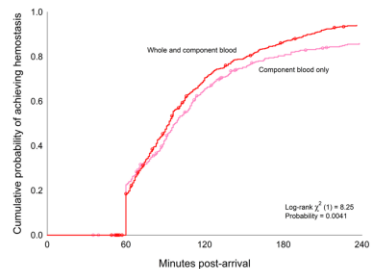
Invited Discussant: Sigrid Burruss, MD

Introduction: Early whole blood (WB) resuscitation has been found to be associated with a survival benefit in recent observational studies. The mechanisms responsible for this benefit are not fully understood. We sought to characterize time to hemostasis and the type of trauma resuscitation (WB vs component) following severe injury.

Methods: We performed a secondary analysis of data derived from a recent prospective observational cohort study comparing early WB to component resuscitation in hemorrhagic shock patients. Inclusion criteria included risk of massive transfusion (+ABC score criteria), need for blood transfusion and hemorrhage control procedures within 60 minutes of trauma center arrival. Achievement of hemostasis was defined by receiving a single unit or less of blood (WB or red cell) transfusion in any 60-minute period in first 4 hours. Those not reaching this nadir or who died were considered not to have achieved hemostasis.

Results: Enrolled patients (n=1,051) were severely injured (median ISS 22 IQR [13,30]), with 70% requiring massive transfusion, and an overall mortality of 17% at 28 days. Over 85% of the cohort achieved hemostasis. WB patients more commonly reached hemostasis (89% vs. 81%, $p<0.01$) Kaplan-Meier analysis showed WB patients reached hemostasis earlier (log rank $\chi^2 = 8.2$, $p<0.01$, FIGURE). Logistic regression verified that WB resuscitation was independently associated with over a 2-fold greater odds of achieving hemostasis (OR 2.4 95%CI 1.6-3.5, $p<0.01$). As the predicated probability of mortality increased the disparity between groups achieving hemostasis similarly increased.

Conclusion: Early WB resuscitation was associated with a shorter time to hemostasis, and an independent higher rate of achieving hemostasis in patients in hemorrhagic shock. These relationships were strengthened as the estimated probability of mortality increased. Achieving early hemostasis may represent an underlying mechanism responsible for early WB survival benefit.



TRAUMATIC AMPUTATION: THE EFFECT OF EARLY GUILLOTINE AMPUTATION ON SURGICAL SITE INFECTION

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Sejul A. Chaudhary, MD; Nicole M. Garcia, MD; Mark A. Newell, MD;

William Irish, PhD; Eric A. Toschlog, MD

East Carolina University

Invited Discussant: Matthew Lissauer, MD

Introduction: Traumatic amputations are an uncommon but extremely morbid complication of blunt traumatic injury. Given the contaminated nature of these wounds, surgical site infections (SSI) are frequent in this population. The natural history of these wounds following guillotine amputation (GA) versus those that undergo an attempt at limb salvage is not well described. The purpose of this study was to assess the relationship between operative technique and timing, and SSI.

Methods: Using a single institution Level 1 trauma registry, data were obtained for all patients who underwent traumatic amputation. SSI versus non-SSI groups were compared using standard two sample T-test or Chi square test. Patients were also compared based on whether they underwent an attempt at limb salvage.

Results: One hundred patients with traumatic extremity wounds were admitted and subsequently underwent completion amputation (2013-22). The majority were male (70%) with mean age 42.7 years. The most prevalent race was white (49%) followed by black (41%). Race was not associated with outcomes. Twenty four percent of the study group were diagnosed with an SSI. Sixty five percent of the study group underwent GA with 39% within 6 hours of arrival. The SSI group had a lower rate of GA within 6 hours (20.8% vs 44.7%, $p=0.036$), higher mean number of operations (7.25 vs 4.05, $p=0.013$), and longer mean hospital LOS (30.2 vs 16.5, $p=0.007$). Patients that underwent GA at index operation had a higher mangled extremity score (8.25 vs 6.14, $p<0.001$), higher ISS (19.4 vs 14.5, $p=0.014$), higher lactate at presentation of (5.37 vs 3.18, $p=0.004$), and longer ICU LOS (8.4 vs 4.2, $p=0.021$).

Conclusion: For mangled extremity patients undergoing amputation, 24% developed an SSI. Early GA is associated with decreased rates of SSI. Futile attempts at limb salvage led to more operations, longer hospital LOS, and ultimately culminated in amputation.

AMBULANCE DESERTS AND INEQUITIES IN ACCESS TO EMS CARE IN THE UNITED STATES: ARE PATIENTS WITHIN SOCIOECONOMICALLY DISADVANTAGED AREAS AT AN INCREASED RISK FOR DELAYS IN PRE-HOSPITAL CARE?

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Spiros Frangos, MD, MPH; Ashley Pfaff, MD; Natalie Esobar, MD;

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New York University School of Medicine

Introduction: Delayed Emergency Medical Services (EMS) response and transport time (from injury occurrence to hospital arrival) is associated with increased mortality. Inequities in accessing EMS care for injured patients are ill-defined. We sought to evaluate the association between the area deprivation index (ADI), a measure of geographic socioeconomic disadvantage, and timely access to EMS care within the U.S.

Methods: The Homeland Infrastructure Foundation Level Data open-source database from the National Geospatial Intelligence Agency was used to evaluate the location of EMS stations across the nation using longitude and latitude coordinates. The ADI was obtained from Neighborhood Atlas at the census block group level. An ambulance desert (AD) was defined as populated census block groups with a geographic center outside of a 25-minute ambulance service area. The total population (urban and rural) located within an AD and outside an AD (non-AD) and the ADI index distribution within those areas were calculated with their statistical significance derived from Chi-square testing. Spearman correlations between the number of EMS stations available within 25-min service areas and ADI were calculated, and statistical significance was derived after accounting for spatial autocorrelation.

Results: 42,472 ground EMS stations were identified. Of the 333,036,755 people (current U.S. population), 2.6% are located within an AD. When stratified by type of population, 0.3% of people within urban populations and 8.9% of people within rural populations were located within an AD ($p < 0.01$). When compared to non-ADs, ADs were more likely to have a higher ADI ($ADI_{AD} = 53.13$; $ADI_{NAD} = 50.41$; $p < 0.01$). The number of EMS stations available per capita was negatively correlated with ADI ($r_s = -0.25$, $p < 0.01$), indicating that people living in more disadvantaged neighborhoods are likely to have fewer EMS stations available.

Conclusion: Ambulance deserts are more likely to affect rural vs. urban populations and are associated with higher ADIs. The impact of inequities in access to EMS care on outcomes deserves further study.

ASSESSING CASE VOLUME VARIATION ACROSS LEVEL 1 AND 2 TRAUMA CENTERS IN THE UNITED STATES

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Raymond A. Jean, MD, MHS; Anne Cain-Nielsen, BS;

Mary Hunter, MD; Naveen F. Sangji, MD, MPH; Staci Aubry, MD;

Lena Napolitano, MD; Christopher Tignanelli, MD, MS;

John W. Scott, MD, MPH; Mark Hemmila, MD

University of Michigan

Invited Discussant: Joshua Brown, MD

Introduction: When trauma center distribution does not fit regional needs, the longstanding volume-outcomes relationship in trauma care is at risk.

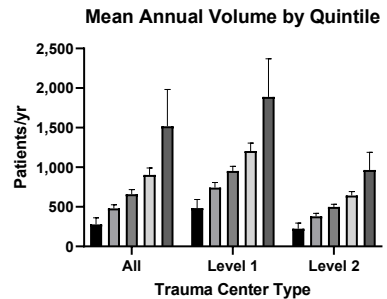
Understanding case volume variability among Level 1 and Level 2 trauma centers in the US has important implications for both optimal distribution of trauma centers and maintenance of clinical skills.

Methods: We evaluated patients ≥ 16 yo meeting ACS TQIP inclusion criteria (AIS ≥ 3 in 1+ body regions, admitted, died, or transferred out) from 2017-21.

Trauma centers were placed in quintiles based on their average annual patient volume.

Characteristics were compared between the overall mean and the highest/lowest quintiles stratified by Level of trauma center.

Results: There were 1,902,005 patients among 228 Level 1, and 288 Level 2 trauma centers. A 5-fold difference in patient volume was present between the highest and lowest quintile trauma centers (Figure). Substantial differences were found for volumes of types of patients treated among the highest and lowest quintile Level 1 trauma centers (Table). Similar differences



were present among the quintiles of Level 2 trauma centers.

Conclusions: One-in-five Level 1 trauma centers average < 2 hemorrhage control operations per month. These findings have important implications for trauma center distribution,

maintenance of clinical skills, training of future providers, and trauma center verification.

Level 1 Trauma Centers	Quintile 1		Overall	Quintile 5	
	Mean (SD)	% Diff	Mean (SD)	Mean (SD)	% Diff
Admitted or died	487 (131)	-53%	1,040 (523)	1,835 (499)	+76%
SBP < 100 mmHg	54 (28)	-54%	118 (84)	226 (108)	+91%
ISS ≥ 25	69 (29)	-61%	178 (123)	352 (150)	+97%
OR for Hemorrhage	22 (18)	-58%	53 (49)	113 (67)	+113%
ICP Monitor	14 (9)	-50%	28 (22)	53 (28)	+89%
Operative Pelvic Fx	10 (8)	-63%	27 (24)	55 (33)	+104%

**ASSESSING TRAUMA INFORMED CARE ADOPTION: A
COMPREHENSIVE SURVEY OF TRAUMA CENTER
PROFESSIONALS AND INSTITUTIONAL TREND**

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Ventura County Medical Center

Invited Discussant: Charity Evans, MD, MS

Introduction: Trauma-informed Care (TIC) affects every race, age, and socioeconomic group, with the goal of preventing re-traumatization. This study aimed to highlight the potential paucity of data in centers involved in the care of injured patients.

Methods: This survey was conducted by the Trauma Prevention Coalition (TPC), including 13 of its 16 member organizations. The Survey Monkey involved 22 questions distributed by e-mail to investigate the prevalence of TIC principles among 946 participants, primarily pediatric and adult trauma centers. The study examined the distribution of TIC integration into institutional core values at different trauma center levels. It also explored participants' awareness and engagement in TIC training. Bivariate regression analysis provided insights into the relationship between trauma center levels and the likelihood of incorporating TIC principles.

Results: Of the participants, 91% (n=861) were affiliated with pediatric or adult trauma centers. Adult trauma center participants reported varying levels, with Level I at 19.34% (n=167), Level II at 9.36% (n=80), Level III at 5.39% (n=46), Level IV at 3.07% (n=26), Level V at 1.16% (n=10), and non-adult trauma center at 1.16% (n=10). In pediatric trauma centers, 18.6% (n=176) were from Level I, 13.00% (n=123) from Level II, 1% (n=9) from Level III, and 67% (n=638) were from non-pediatric trauma centers. 35.52% (n=336) in trauma centers incorporated TIC into core values, while 64.48% (n=610) did not. Only 17% (n=161) reported institutional plans for training, with 57.70% (n=497) lacking or being unaware of such plans. Bivariate regression analysis highlighted decreases in log-odds ratio for adult trauma centers Level II (0.17), Level IV (0.34), and non-trauma centers (0.90), and an increase for Level III (0.026). In pediatric trauma centers, log-odds ratios decreased for Level II (0.90), Level III (1.08), and Level IV (1.36), and non-trauma centers (1.59). Compared to adult trauma centers, pediatric trauma centers have a higher proportion of TIC principles as part of their core values (39.42% vs. 71.58%, $P<0.01$).

Conclusion: The findings depict varying TIC adoption across trauma center levels, emphasizing its prevalence in Level I trauma centers and diminishing occurrence in lower trauma level designations. It highlights the need for broad TIC training in health care.

AWAITING INSURANCE COVERAGE: MEDICAID ENROLLMENT AND POST-ACUTE CARE USE AFTER TRAUMATIC INJURY

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Ella Eisinger, BS; Angela T. Chen, MA; Kristen M. Chreiman, MSN;

Omar I. Ramadan, MD, MS; Anna U. Morgan, MD, MS;

M. Kit Delgado, MD, MS; Niels D. Martin, MD; Mark J. Seamon, MD;

Lisa M. Knowlton, MD, MPH; Elinore J. Kaufman, MD, MSHP

University of Pennsylvania

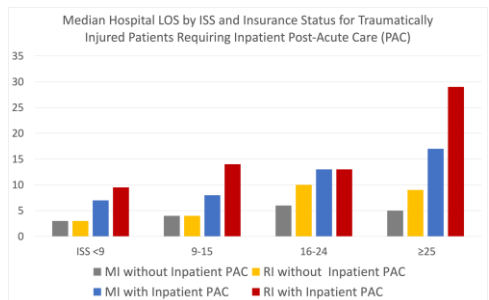
Invited Discussant: Sawyer Smith, MD, MBA

Introduction: Lack of insurance after traumatic injury is associated with decreased use of post-acute care and poor outcomes. Insurance linkage programs enroll eligible patients in Medicaid at the time of an unplanned admission. We hypothesized that Medicaid enrollment would be associated with increased use of post-acute care, but also lead to prolonged hospital length of stay (LOS) while awaiting insurance authorization.

Methods: We linked trauma registry and EMR data to identify patients ages 18-64 admitted from 2017-2021 to a Level 1 trauma center. Patients admitted without insurance and retroactively insured (RI) during hospitalization were compared to patients with established Medicaid (MI) and those remaining uninsured (UI). We measured post-acute care use including home health care, rehabilitation, and skilled nursing facilities. We tested the association between insurance status and discharge disposition and length of stay (primary outcome) using multivariable negative binomial regression. Direct costs were compared between groups.

Results: We compared 494 RI patients to 1706 MI and 148 UI patients. RI patients had longer hospitalization (median LOS [IQR] 4 days [2-9]) than other groups (MI 4 [2-8] and UI 2[1-3]), $p < 0.001$). RI patients were more likely to be discharged with home health care and to inpatient rehabilitation than UI patients ($p < 0.001$). After adjusting for injury and management characteristics, RI was associated with longer LOS compared to MI for patients discharged to inpatient facilities (Figure, $p < 0.001$). Median costs for RI patients discharged to a facility were \$10,284 higher than MI patients, ranging from \$8,582 for ISS < 9 to \$51,883 for ISS ≥ 25 .

Conclusion: Enrollment in Medicaid after traumatic injury is associated with post-acute care use, but the current enrollment process may delay discharge. Streamlining insurance enrollment and permitting discharge with pending application status has the potential to reduce unnecessary hospital days, generate significant cost savings and improve patient experience.



DILUTION IS NOT THE SOLUTION: FACTORS AFFECTING THE DIRECT RED CELL EFFECT ON THROMBOSIS

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University of Cincinnati

Invited Discussant: Rachel Appelbaum, MD

Introduction: Red blood cell (RBC) aggregation can be initiated by calcium and tissue factor, which may independently contribute to micro- and macro-vascular thrombosis following transfusion after injury. Previous studies have also demonstrated that increased blood storage duration may contribute to thrombotic events. The aim of this study was to determine the effect of blood product components, age, and hematocrit (HCT) on the aggregability of RBCs.

Methods: Human whole blood (WB) units (n=7) were obtained following the standard 21-day storage period. WB was separated into components including RBCs, platelet-rich plasma (PRP), and platelet-poor plasma (PPP) via serial centrifugation and diluted to a standardized HCT on product day 23 and following storage to product day 46. WB and component groups were analyzed at both timepoints for RBC aggregability with calcium and tissue factor initiated electrical impedance aggregometry, reported as mean area under the curve (AUC).

Results: At both timepoints, RBCs (variable HCT) demonstrated similar aggregability to RBCs (standardized HCT) (day 23: 14.4 v. 13.6, $p=0.51$; day 46: 8.3 v. 5.3, $p=0.34$). RBCs diluted with PRP demonstrated significantly higher aggregation than RBCs diluted with PBS at both timepoints (day 23: 59.0 v. 13.6, $p<0.01$; day 46: 43.0 v. 5.3, $p=0.01$). A similar effect was observed when RBCs diluted with PPP were compared to RBCs diluted with PBS (day 23: 50.7 v. 13.6, $p<0.01$; day 46: 55.0 v. 5.3, $p<0.01$). Reconstitution with PRP and PPP demonstrated similar aggregability. Additionally, there were no differences in RBC aggregability between the day 23 and day 46 timepoints within each group.

Conclusion: This study demonstrates that the hemoconcentration of donated blood products does not affect the calcium and tissue-factor dependent aggregability of RBCs. Further, RBC aggregation is increased in the presence of plasma, not platelets – indicating a potential role for plasma in regulating the RBC aggregation effect. Finally, reconstituting the groups at a later timepoint did not impact RBC aggregation, indicating that storage duration of WB and its components may not independently affect RBC aggregability.

DO EMERGENCY MEDICAID PROGRAMS IMPROVE POST-DISCHARGE HEALTHCARE ACCESS FOR TRAUMA PATIENTS? A STATEWIDE MIXED-METHODS STUDY

Lisa M. Knowlton, MD, MPH; Katherine Arnow, MS; Zaria Cosby, MPH;

Kristen Davis, MPH; Wesley Hendricks, BA; Alexander Gibson, BS;

Arden M. Morris, MD, MPH; Todd Wagner, PhD

Stanford School of Medicine

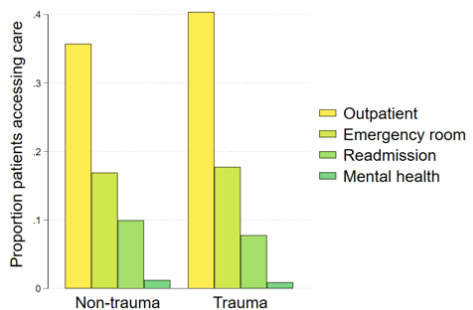
Invited Discussant: John Agapian, MD

Introduction: Hospital Presumptive Eligibility (HPE) emergency Medicaid programs available to the uninsured at hospitalization can provide long-term Medicaid coverage. We aimed to characterize post-discharge healthcare utilization among newly insured HPE trauma patients and identify patient access to care facilitators and barriers. We hypothesized utilization would be increased among HPE trauma patients, but barriers to access would remain.

Methods: We performed a convergent mixed methods study of California HPE beneficiaries using a 2016-2021 customized statewide longitudinal claims dataset from the Department of Health Care Services. We compared injured adults 18 and older to other HPE patients. Patients were tracked for two months post-discharge to evaluate healthcare utilization outcomes: outpatient specialist visits, emergency room (ER) visits, readmissions, and mental health. Thematic analysis of semi-structured interviews with HPE Medicaid patients aimed to understand facilitators and barriers to post-injury access to care (n=20).

Results: Among 206,008 HPE Medicaid patients, 35,497 (17%) had a primary diagnosis of trauma. In the two months post-discharge, 42.4% of trauma vs. 35.7% of non-trauma accessed outpatient services; 17.7% vs. 16.9% returned to ED, 7.8% vs. 9.9% were readmitted; and 0.9% vs. 1.2% accessed mental health services. In adjusted analyses, trauma HPE patients had 1.4 increased odds of accessing outpatient specialist services ($p<0.01$). Patients cited facilitators to accessing care: ease of HPE enrollment, in-hospital support provided for seeking future care. Barriers included: limited HPE program information recall post-discharge and not knowing how and where to seek certain care.

Conclusion: HPE Medicaid is associated with higher rates of outpatient specialist visits and fewer readmissions post-injury, suggesting improved access. Opportunities exist to improve healthcare utilization appropriateness through more robust and longitudinal education and engagement with HPE Medicaid patients that will help them navigate newfound access to services.



EARLY PRIMARY CARE FOLLOW-UP IMPROVES LONG-TERM FUNCTIONAL OUTCOMES AMONG INJURED OLDER ADULTS

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Invited Discussant: Jay Yelon, DO

Introduction: Remaining independent in one's own home is an important functional outcome for older adults. However, the processes of care that improve such functional outcomes among injured older adults are poorly understood. We hypothesized that early primary care physician (PCP) follow-up would increase the probability of being alive and at home in the year following hospitalization for injury.

Methods: We performed a retrospective, population-based cohort study of community-dwelling older adults (age ≥ 65 years) discharged alive after an injury-related hospitalization between 2009 and 2020. Patients with no PCP were excluded. The exposure of interest was early PCP visit (within 14 days of discharge). Visits were categorized as occurring with the patient's own PCP or a different PCP. The primary outcome was time alive and at home (time to death or nursing home admission) in the year after injury. Cox proportional hazards models were used to evaluate the relationship between early PCP visit and death or nursing home admission, adjusting for patient and injury characteristics.

Results: Among 93,422 patients (64% female, mean age 80 years), 19,194 (21%) followed up with their own PCP and 5,461 (6%) with a different PCP within 14 days of discharge. In the year after injury, 16,530 (18%) patients died or were admitted to a nursing home. After risk-adjustment, early follow-up with one's own PCP was associated with a 16% reduction in the hazard of death or nursing home admission relative to no early follow-up (HR 0.84, 95%CI 0.82-0.86). Early follow-up with one's own PCP was associated with reduced hazard of death or nursing home admission for all strata of age, sex, comorbidity, and injury severity. Early follow-up with a different PCP had no impact on outcomes.

Conclusion: Injured older adults who followed up with their own PCP within 14 days of hospital discharge were more likely to remain independent in the year after injury. These findings suggest that trauma center outpatient processes of care, including ensuring early PCP follow-up, may contribute to improving long-term functional outcomes among injured older adults.

ELEVATED CELL-FREE HEMOGLOBIN: A NOVEL EARLY BIOMARKER FOLLOWING TRAUMATIC INJURY

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Ashli Barnes, BS; Alyssa R. Bellini, MD;

Alexandre Mansour, MD; Nicolas Nesseler, MD, PhD;

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University Hospital Cleveland Medical Center

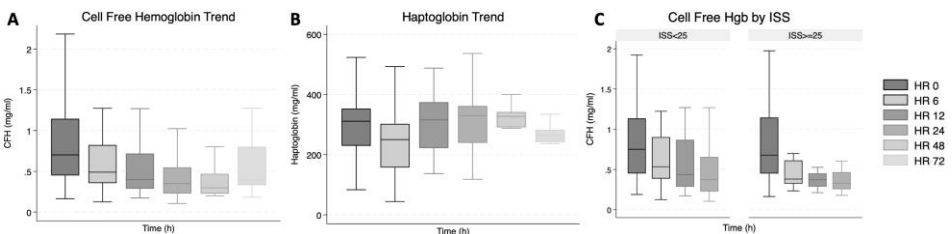
Invited Discussant: Joseph Rappold, MD

Introduction: Cell-free hemoglobin (CFH) is a potent mediator of endotheliopathy and organ injury in sepsis but its role in trauma is unknown. In sepsis, injured erythrocytes release CFH and ultimately heme, which are cleared by haptoglobin and hemopexin respectively. This study investigates the presence of circulating CFH immediately after injury.

Methods: Adult traumas presenting as highest-level activations were enrolled (2021-2023) prospectively at a level-1 trauma center. Venous blood was collected at ED arrival (pre-transfusion), 6, 12, 24, 48 and 72 hours. Plasma CFH, haptoglobin and hemopexin were measured (Drabkin's and ELISA).

Results: The cohort (n=115) had a median age 48 years [31-65], 85% male, with a median ISS 21 [11-29], 11% 28-day mortality, and 61% transfused in first 24h. Median plasma CFH was elevated at 0h and was significantly lower at 12 and 24h (0.7 mg/ml [0.5-1.1] 0h vs. 0.4 mg/ml [0.3-0.7] 12h, $p=0.005$, **Fig A**). Plasma haptoglobin decreased significantly from 0 to 6h, suggesting CFH binding, returning to presentation levels by 24h (311 mg/ml [229-353] 0h vs. 250 mg/ml [158-302] 6h, $p=0.0096$, **Fig B**). There was no change in hemopexin. For $ISS \geq 25$, there was a dramatic decrease in CFH within 6h (0-6h $p=0.005$), with a trend towards lower 6h CFH in $ISS \geq 25$ compared to $ISS < 25$ ($p=0.08$, **Fig C**). The haptoglobin nadir remained at 6h in the $ISS \geq 25$ subset and recovered significantly by 24h ($p=0.03$).

Conclusions: This is the first study to our knowledge to demonstrate that endogenous hemolysis very early after injury generates excess plasma CFH, which is present at ED arrival prior to transfusion, and sufficient to deplete haptoglobin. Notably, more severely injured patients tended towards a lower CFH at 6 hours, possibly due to haptoglobin induction.



**EMERGENCY MEDICAL SERVICES LEVEL OF TRAINING AFFECTS
MORTALITY IN HIGH-RISK TRAUMA PATIENTS: A COMBINED
PREHOSPITAL AND IN-HOSPITAL
DATABASE ANALYSIS**

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Lisa Rogers, MPH; Kristiana Sather, MD; Sarah Knack, MD;

Ayako Sekiya, MPH; Geetha Saarunya-Clarke, PhD;

Christopher Tignanelli, MD, MS; Mike Puskarich, MD;

Schelomo Marmor, PhD; Greg Beilman, MD

University of Minnesota

Invited Discussant: Cynthia Talley, MD

Introduction: There is conflicting evidence regarding prehospital provider level of training and outcomes in trauma. We hypothesized that basic life support (BLS) provider transport is associated with higher mortality compared to advanced life support (ALS) transport for high-risk patients.

Methods: We performed secondary analysis of a combined prehospital and in-hospital database of trauma patients utilizing ESO® electronic medical records from 2018 to 2022. We included encounters with trauma-specific International Classification of Diseases, Tenth Revision (ICD-10-CM) codes, patients aged 15-100 years, transported by ground to a level 1 or 2 trauma center. We excluded patients dead upon EMS arrival and transfers. The primary outcome was composite pre-hospital and in-hospital mortality. The exposure was EMS level of training. We included age, ICD-10 based injury severity score (ISS), blunt versus penetrating mechanism, transport time, race, gender, and year for risk adjustment given previous literature describing their status as confounding variables. We conducted a complete case multivariable logistic regression with subgroup analyses on populations we hypothesized to be high risk. Model discrimination and calibration were assessed via the C statistic and hosmer-lemeshow goodness of fit.

Results: We identified 30,738 ALS and 1,758 BLS encounters. We did not observe a significant association between EMS level of training and mortality (OR 0.93, $p = 0.63$, 95% CI 0.68-1.26, c-stat 0.85). Subgroup analyses identified a significant association between BLS transport and mortality for age > 70 years (odds ratio 1.74, $p = 0.047$, 95% CI 1.01-3.00, c-stat 0.83) and transport time > 60 minutes (odds ratio 1.87, $p = 0.04$, 95% CI 1.03-3.40, c-stat 0.85). There was no significant association between EMS level of training and mortality in subgroup analyses of ISS > 15, ISS > 25, or penetrating mechanism of injury.

Conclusion: In this national sample, we did not identify an independent association between EMS provider level of training and mortality among trauma patients for all comers, however BLS level of training was associated with increased mortality in elderly patients and those with prolonged transport times. This may have implications for policy decisions regarding EMS provider training and trauma system strategies for EMS units responding to trauma calls.

GENOMIC ANALYSIS TO IDENTIFY SURGICAL PATIENTS AT RISK FOR POST-OPERATIVE SEPSIS AND SURGICAL SITE INFECTIONS

Kaleem Sohail Ahmed, MD, MSAI; Mathias Christensen, MD;
Alexander Bonde, MD, PhD; Wei-Qi Wei, MD; Atlas Khan, MD;
Teri Manolio, MD, PhD; Jennifer Pacheco, MS;
Megan Roy-Puckelwartz, PhD; Robert McCarthy, PharmD;
Hasan Alam, MD; Martin Sillesen, MD, PhD
Northwestern University
Invited Discussant: Mehreen Kisat, MD

Introduction: Early and accurate diagnosis of sepsis and the ensuing organ dysfunction remains a challenge in the post-operative setting. Susceptibility to infections, and the subsequent immunological response, are driven to a large extent by the genetic predisposition of the patient. The purpose of this study was to identify novel genetic variants associated with post-operative sepsis (POS) and surgical site infections (SSIs).

Methods: We conducted genome-wide association studies (GWAS) for POS and SSIs in the Electronic Medical Records and Genomics (eMERGE) Network database. All patients with surgical and genomic information in eMERGE were identified. Patients with a new diagnosis of sepsis/SSIs after surgery were classified as cases and those without as controls. Analyses were performed using PLINK 2.0's logistic regression function. A p-value of $< 5 \times 10^{-8}$ was considered statistically significant.

Results: A total of 59,755 participants were included in the analysis. Genetic regions on Chromosome 9 and 14 reached statistical significance for POS ($p < 5 \times 10^{-8}$). The most significant SNPs were rs9413988 ($p = 5.59 \times 10^{-12}$) on Chromosome 9 and rs35407594 ($p = 1.43 \times 10^{-10}$) on Chromosome 14. The rs9413988 region corresponds to an intron near phosphoglucomutase 5 pseudogene (*2PGM5P2*) and Zn regulated GTPase metalloprotein activator 1F (*ZNGF1*) while rs35407594 corresponds to the olfactory receptor gene family, *hOR11*. The same variants were also associated with SSIs.

Conclusions: We have identified two genetic regions of SNPs associated with POS and SSIs. These findings provide new avenues for investigation, which may help identify and guide point of care management for at-risk patients.

IDENTIFYING NOVEL NONCODING GENOMIC REGIONS IN SEPSIS USING RNA SEQUENCING DATA

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Alfred Ayala, PhD; Maya Cohen, MD; William G. Fairbrother, PhD;
Mitchell M. Levy, MD; Sean F. Monaghan, MD

Rhode Island Hospital

Invited Discussant: Anaar Siletz, MD

Introduction: Despite multiple efforts to characterize sepsis pathogenesis, the etiology of dysregulated host response remains unclear. To investigate, many studies have shown novel genes associated with sepsis via DNA microarray or RNA sequencing (RNA-Seq) enriched for protein-coding genes. Given their essential roles in cellular regulation, noncoding genomic regions are also important to examine in sepsis research. We hypothesize that differential gene expression (DGE) analysis of the RNA-Seq data will yield novel, noncoding genomic regions unique to sepsis.

Methods: This is a single center, prospective study of patients with sepsis compared with critically ill patients without sepsis. Whole blood samples were drawn in PAXgene tubes at hospital day 0 then deep RNA sequencing with at least 100 million reads was performed. DGE analysis was performed with DESeq2 package in R. Statistical significance were determined as $\log_2\text{foldchange} > 2$ or < -2 and p value < 0.5 .

Results: A total of 49 critically ill patients – 6 without sepsis and 43 with sepsis – were included. Of the 27,843 differentially expressed genes and genomic regions, 300 non-coding genomic regions were statistically significant. In sepsis group, 30 were downregulated and 270 were upregulated. The categories of non-coding genomic regions consisted of: 80 pseudogenes, 205 non-coding RNAs including long non-coding RNAs (lncRNA) and small nucleolar RNA (snoRNA), and 15 to-be-experimentally confirmed (TEC) regions.

Conclusion: Deep RNA sequencing data can identify noncoding, unannotated genomic regions unique in sepsis. These novel genomic regions can be further investigated to elucidate the molecular mechanism by which dysregulated host response occurs. This will have clinical implications by facilitating the discovery of diagnostic and therapeutic targets. Future studies are necessary to identify the role of these pseudogenes and non-coding RNAs in sepsis.

IMPACT OF PSYCHOSOCIAL INTERVENTION ON QUALITY OF LIFE IN PATIENTS WITH POST-TRAUMATIC LIMB AMPUTATION/S- A RANDOMIZED CONTROLLED TRIAL

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Sushma Sagar, MS, FACS, FRCS; Pratyusha Priyadarshini, MS;

Abhinav Kumar, MS; Junaid Alam, MS; Dinesh Bagaria, MS;

Narendra Choudhary, MS; Amit Gupta, MS, FACS, FRCS;

Biplab Mishra, MS; Anamika Sahu, PhD; Shivam Pandey, PhD

All India Institute of Medical Sciences New Delhi India

Invited Discussant: Terri deRoos-Cassini, MD, PhD

Introduction: Annually, an estimated 1.19 million individuals succumb to acquired trauma on a global scale, with an additional 20-50 million individuals experiencing various forms of disability. Rapid industrialization and motorization have propelled Road Traffic Injury (RTI) to become leading cause of Disability Adjusted Life Years (DALYs) and significant number of amputations. Post- traumatic amputations engender a tumultuous array of emotions for the individual affected which ranges from general anxiety disorders to depression and can even lead to self-harm. These amputations are abrupt in nature and hence impart and heightened psychological impact on patients compared to amputations stemming from other medical reasons. Hence, study was designed to evaluate the effect of brief psychosocial intervention on Quality of Life of post traumatic amputees.

Methods: This was a randomized control study. Patients >18 years of age, well oriented and coherent, with social support and with no prior history of psychological illness who underwent post traumatic extremity amputation/s were recruited. Baseline questionnaires for psychological assessment were filled as soon as possible after the surgery with informed consent. These patients were randomized (n=74), and conventional care was given to Group A (n=39) and psychosocial intervention along with conventional care was given to Group B (n=35) for 7 weeks. Patients of both the groups were asked to fill the same questionnaire after 8 weeks post first assessment.

Results: A total of 74 patients with post- traumatic amputation/s were enrolled in the study. Mean age of cohort was 32.8 years with male predominance (n=70). RTI was the most common mechanism of injury. All the 4 domains (physical health, psychological health, social relationship, environment domain), WHO total and Overall quality of life showed significant improvement in both the groups. However, there was no significant difference between the groups. Depression was significantly decreased in both the groups in 8 weeks but there was no significant difference between two groups ($p=0.101$). Same trend was observed with anxiety and stress. However, body image showed a significant improvement in Group B as compared to Group A ($p=0.023$).

Conclusion: Our study did not show any observable positive effects of psychosocial intervention over conventional care on quality of life, depression, stress or anxiety except on body image. We hypothesize that positive results might be observed in quality of life of amputees if a larger study with longer duration of psychosocial intervention is conducted

INCREASED PULMONARY MORBIDITY AND MORTALITY WITH EARLY VIDEO-ASSISTED THORACIC SURGERY FOR RETAINED HEMOTHORAX

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Invited Discussant: Garth Utter, MD

Introduction: While most hemothoraces can be managed with tube thoracostomy alone, 5 to 30% become retained hemothoraces, with increased morbidity and prolonged hospitalization. Despite the use of video-assisted thoracic surgery (VATS), optimal timing remains debated. We sought to examine the impact of VATS timing for retained hemothorax.

Methods: Adults undergoing VATS for retained hemothorax were isolated from the Trauma Quality Improvement Program (TQIP) in 2017-2021 and categorized into early (≤ 4 days), middle (5-10 days) and late (>10 days). Patient demographics, mechanism of injury, hospital characteristics, morbidity and mortality were compared using Chi-square and Wilcoxon rank-sum tests. Multiple logistic regressions were performed to determine independent risks factors for morbidity and mortality.

Results: Of the 9784 VATS, 82% were early, 12% were middle, and 6.4% were late VATS. The late VATS group had greater injury severity score (ISS) (24 ± 13) than the early (19 ± 11) and middle groups (18 ± 10) ($p < .001$). Severe head, neck and spine injuries were the most common in the late VATS compared to the early and middle groups ($p < .001$). Mortality was highest in the early (4.5%) versus the middle (3.0%) or late VATS groups (2.9%) ($p < .001$). In addition, pulmonary morbidity was greatest in the early VATS group (57%) relative to the middle (41%) and late groups (48%, $p < .001$) with higher rates of reintervention, including more conversion to thoracotomy (4.5 vs. 3.1 vs. 3.2%, respectively, $p = .04$) and need for additional tube thoracostomy (51 vs. 24 vs. 24%, respectively, $p < .001$). Risk-adjusted mortality (odds ratio (OR) 0.80; 95% confidence interval (CI) 0.73-0.87, $p < .001$) and pulmonary morbidity (OR 0.96; 95% CI 0.93-0.99, $p = .009$) were inversely proportional to days to VATS.

Conclusions: Contrary to current literature, our study finds significantly increased morbidity and mortality in early VATS for retained hemothorax, persisting after risk adjustment. The increased pulmonary morbidity associated with early VATS group is driven by higher rates of reintervention. This supports the need for a prospective randomized, clinical trial to determine optimal timing of VATS for retained hemothorax.

LATE VTE CHEMOPROPHYLAXIS IS ASSOCIATED WITH INCREASED RISK OF DVT, PE, AND MORTALITY IN PATIENTS WITH SPINAL INJURIES

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Invited Discussant: Jennifer Leonard, MD, PhD

Introduction: For patients that sustain spinal injuries, the decision to initiate venous thromboembolism (VTE) chemoprophylaxis (CP) is weighed against bleeding risk, especially for those undergoing operative intervention. The aim of the study was to compare outcomes in patients with spinal injuries who receive early vs. late CP.

Methods: This is a retrospective study of the 2021 National Trauma Data Bank, including patients with a length of stay >48 hours who sustained spinal injuries (fracture, dislocation, ligamentous injury or spinal cord injury), according to ICD-10 codes. Data included demographics, injury severity score (ISS), timing and type of CP, and need for surgical procedure for the spine. The early (< 48 hours) and late (\geq 48 hours) CP groups were compared by univariate and multivariate analysis. The primary outcomes were DVT, PE, and mortality.

Results: There were 96,515 patients, with 63,051 (65%) in the early group and 33,464 (35%) in the late group. Average time to CP was 23 hours in the early group and 96 hours in the late group ($p<0.0001$). Patients that received late CP were younger (53 vs. 56, $p<0.0001$), more often male (64% vs. 59%, $p<0.0001$), and had a higher ISS (19 vs. 14, $p<0.0001$). The most common types of CP in both groups were low molecular weight (74% vs. 75%) and unfractionated (21% vs. 21%) heparin. The late group had more spine procedures (34% vs. 13%, $p<0.0001$). The late group more often developed a DVT (3.5% vs. 1.3%, $p<0.0001$), PE (1.8% vs. 0.8%, $p<0.0001$), and had a higher mortality (5.8% vs. 2.5%, $p<0.0001$). On logistic regression, while controlling for age, gender, ISS, type of CP, and surgical procedure, late CP was independently associated with DVT (AOR: 1.9 [95% CI=1.7-2.1], $p<0.0001$) and PE (AOR: 1.4 [95% CI=1.2-1.6], $p<0.0001$). Similarly, late CP was independently associated with mortality (AOR: 1.5 [95% CI=1.3-1.6], $p<0.0001$).

Conclusion: Delayed administration of VTE CP for patients with spinal injuries is independently associated with an increased risk of DVT, PE, and mortality.

POLYMERASE CHAIN REACTION FOR EARLY IDENTIFICATION OF BACTERIA CAUSING PNEUMONIA IN VENTILATED PATIENTS

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Invited Discussant: Joseph Forrester, MD, MS

Introduction: Ventilator associated pneumonia (VAP) occurs in 20-25% of intubated trauma patients and early effective antibiotic treatment decreases morbidity and mortality. We sought to determine the sensitivity and specificity of multiplex polymerase chain reaction amplification of bacterial DNA (Biofire® FilmArray® Pneumonia Panel [BFPP]) obtained during fiberoptic bronchoscopy in predicting the causative bacteria the day of bronchoalveolar lavage (BAL).

Methods: A practice management guideline was established calling for the collection of a BAL with quantitative culture and BFPP testing on all intubated trauma patients suspected of developing pneumonia (PNA). Demographics, hospital data, BAL culture results, and BFPP results were recorded. McNemar analysis was performed.

Results: Over a three-year study period 163 intubated trauma patients suspected of developing PNA underwent 202 BALs with quantitative culture and BFPP testing. BALs that had $\geq 10^5$ colony forming units per mL (CFU) growth were considered consistent with the diagnosis of PNA. Of the 202 BALs, 77 were considered positive and then correlated to the genomic copy number per mL (GCN) reported by BFPP testing. Using 10^6 GCN as the cutoff for a positive BFPP, we found 87% sensitivity and 97.6% specificity, with a positive predictive value (PPV) of 52.3%, and a negative predictive value (NPV) of 99.6%.

Conclusion: In patients with high clinical suspicion for PNA a BFPP cutoff value of 10^6 CFU/mL is a sensitive and specific test to initiate antibiotics targeted to the identified organism. Additionally, a negative BFPP result may limit ineffective and potentially harmful antibiotic coverage as its NPV is 99.6%.

BFPP GCN	Sensitiv ity	Specific ity	PPV	NPV
10^4	93.5 (88, 99)	94.9 (94, 95.9)	35.8 (29.2,42 .5)	99.8 (99.6, 99.9)
10^5	90.9 (84.5, 97.3)	96.2 (95.5, 96.9)	42.2 (34.7, 49.7)	99.7 (99.5, 99.9)
10^6	87 (79.5, 94.5)	97.6 (96.9, 98.2)	52.3 (43.7, 61)	99.6 (99.4, 99.9)
10^7	54.6 (43.4, 65.7)	99.2 (98.9, 99.6)	67.8 (56.1,79 .4)	98.6 (98.2, 99.1)
10^8	19.5 (10.6, 28.3)	99.7 (99.5, 99.9)	65.2 (45.8, 84.7)	97.6 (97, 98.2)

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THE COSTS OF PARENTAL INJURY: IMPACTS ON CHILDREN'S HEALTHCARE UTILIZATION AND FINANCIAL BARRIERS

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Invited Discussant: Lillian Liao, MD, MPH

Introduction: A traumatic injury can disrupt a parent's ability to offer stability in their children's lives. We hypothesize that children of injured parents (C-IP) are likely to exhibit lower healthcare utilization and encounter more financial barriers to access compared to children of non-injured parents (C-NIP).

Methods: We identified parent-child dyads from the 2020-21 National Health Interview Survey (NHIS), which surveys households on a range of health topics. Logistic regression models were calculated for each health utilization and financial barrier outcome to estimate the effect of C-IP (using C-NIP as the reference group). Models were adjusted for household income, parental education level, insurance status, and race. Adjusted odds ratios (aOR, 95% CI) are reported.

Results: We included 8393 dyads, with 296 (3.5%) having an injured parent. aOR for the effect of C-IP on health utilization and financial barriers are presented (Table). C-IP was not significantly associated with healthcare utilization for acute and preventive care but was associated with the use of mental health services and counseling. C-IP was also significantly associated with having financial barriers to healthcare access.

Conclusion: Our findings highlight a relationship between parental injuries and financial barriers to healthcare access for children, underscoring the need for improved support systems for families of injured patients.

Outcome of Interest	aOR for C-IP (95% CI)	p-value
Healthcare Utilization		
Had Urgent/emergency care or hospitalization	1.0 (0.7-1.5)	0.88
Received Flu Vaccine	1.1 (0.9-1.4)	0.26
Had Eye Exam	1.1 (0.9-1.3)	0.56
Took Prescription Medication	1.2 (1.0-1.5)	0.09
Took Medication for Mental Health	1.6 (1.1-2.2)	0.01 *
Received Counseling	1.6 (1.2-2.2)	0.002 *
Financial Barriers		
Problems paying medical bills	1.8 (1.4-2.4)	<0.001 *
Medical care delayed due to cost	2.5 (1.2-4.8)	0.008 *
Needed dental care but couldn't due to cost	1.9 (1.1-3.2)	0.013 *

**TRAUMA CENTERS HAVE HEARD THE WARNING: AVOID
ENDOVASCULAR TREATMENT FOR BLUNT
CEREBROVASCULAR INJURIES**

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Invited Discussant: Niels Martin, MD

Introduction: Blunt cerebrovascular injury (BCVI) are identified in 1-3% of all blunt trauma patients. While antithrombotic agents are the mainstay for the treatment of BCVI, interventionalists are often consulted for higher grade or difficult to access injuries. While several single institution studies have shown a trend towards decreased use of endovascular intervention (EI), it is unclear if these reports have impacted current widespread practice. The purpose of this study was to assess the national use of EI in patients diagnosed with BCVIs.

Methods: Patients with blunt injury mechanism were selected by E-code and cerebrovascular injuries were identified by ICD-10 codes in the Trauma Quality Improvement Program (TQIP) during 2017-2021. Patients undergoing EI were identified with CPT procedure codes. Bivariate analysis was performed with chi-square and Wilcoxon rank sum tests where appropriate.

Results: Of the 13,355 patients with BCVI, 13,136 (98.36%) were managed without EI while 219 (1.64%) were managed with an EI. There was no difference in age, gender, race or preexisting conditions between the two groups. Median injury severity score (ISS) was higher in the endovascular group compared to the non-endovascular group (25.0 [14.0-34.0] vs 19.0 [11.0-29.0]) ($p<.001$). In-hospital stroke rate was highest in the endovascular group (9.1%) compared to the non-endovascular group (2.1%) ($p<.001$). Mortality was highest in the endovascular group (18.7% vs 12.3%) ($p=.004$) as was overall morbidity (20.6% vs 14.2%) ($p=.007$).

Conclusion: This is the first national evaluation of EI for BCVIs. In this modern analysis, less than 2% of all BCVI patients are treated with endovascular techniques, heralding that clinicians have heard the warnings of the single center experience. Reflective of those earlier studies, patients undergoing EI have a higher stroke rate compared to those treated with antithrombotics alone.

FROM LAWS TO LOSS: EXAMINING THE TOLL OF ALCOHOL POLICY REPEALS ON YOUTHFUL DRIVER MORTALITY

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Invited Discussant: Lucas Neff, MD

Introduction: Young drivers aged 15-20 consistently exhibit the highest rates of motor vehicle collisions (MVC) and fatalities. In 2015, Georgia repealed its "use/lose" laws, which previously penalized underage alcohol use in non-driving settings. However, the effects of abolishing these policies remain unexplored.

Methods: Mortality data for drivers and passengers aged 15-20 were extracted from the Fatality Analysis Reporting System (FARS) spanning 2012-2018. Annual population figures for the same age group in each state were sourced from the Centers for Disease Control and Prevention WONDER. Comparative analyses between Georgia and national mortality rates were performed using paired t-tests (two-sided, $\alpha = 0.05$) and generalized linear modeling with a Gamma distribution and log link for the three years preceding and following the law change. National mortality rates were calculated from states that retained their existing legislation during the same period.

Results: Prior to the policy change, young drivers and passengers in Georgia had a 5.9% lower likelihood of MVC fatalities compared to the national average from 2012-2014 ($B = -0.059$, $p < 0.001$). However, after the repeal of the use/lose laws, Georgia experienced a significant increase in MVC mortality rates among adolescents aged 15-20. During the period 2016-2018, young drivers in Georgia were 4.1% more likely to be involved in fatal MVCs compared to their counterparts in other states ($B = 0.041$, $p < 0.001$).

Conclusion: The elimination of laws penalizing underage drinking in Georgia was associated with a notable rise in young driver mortality rates, surpassing the national average. Further research is warranted to investigate the effects of policy changes on a state-specific basis, providing insights into the broader impact of legislative modifications.