Poster #1

BED AND BREAKFAST: AN INSTITUTIONAL APPROACH TO LOW GRADE SPLENIC INJURIES

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Introduction: Low grade splenic injuries (LGSI) defined as grade 1 (G1) and grade 2 (G2) are often managed nonoperatively; however, no consensus regarding their optimal care exists. With the latest update to the AAST guidelines classifying any splenic injury with a pseudoaneurysm (PSA) as at least a grade 4 injury, a uniform approach to the management of LGSI should be defined. The aim of this study was to describe the natural history of LGSI given the new AAST classification.

Method: This is a single-center retrospective analysis of all patients admitted with LGSI after blunt trauma from January 1, 2017 to December 31, 2020. Patients who went to the operating room (OR) or died within 24 hours were excluded. Descriptive statistics were performed after data was abstracted. Primary outcomes included need for angioembolization (AE) or OR for spleen.

Results: 753 adult patients with blunt splenic injuries were identified. 256 patients were originally classified as having LGSI. After reclassification based on the latest AAST guidelines, 241 patients had true LGSI: 134 (56%) G1 and 107 (44%) G2. The majority were male (61%) with a median age and injury severity score of 37 and 19, respectively. 127 patients underwent repeat CT scan at 24 hours: 44 patients with G1 and 83 with G2. Of these, only 3 patients (2 G1 and 1 G2) displayed interval worsening on repeat CT scan (3 vs 124, p=0.211): none required further intervention. 22 patients (7 G1 and 15 G2) underwent angiography. Of these, only 2 (1 G1 and 1 G2) were therapeutic (2 vs 20, p=1.0). 14 patients (6 G1 and 8 G2) required splenectomy; all became symptomatic (decreasing hematocrit, tachycardia, hypotension, physical exam change) within 24 hours post-injury. There were no spleen-related mortalities.

Conclusions: 6.6% patients with LGSI required further intervention prior to discharge – all within the first 24 hours post-injury. Routine 24-hour CT scans in asymptomatic patients did not impact management. Thus, for patients with LGSI, 24-hour observation with repeat hematocrit prior to discharge provides the foundation for a safe and effective management strategy for these injuries.

Poster #2

CHANGES IN REACTIVE ASCITES PROTEINS WHEN CULTURED WITH MESOTHELIAL CELLS

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Introduction: Adhesions involving mesothelial cells (MCs) of the outermost layer of peritoneum are a common response to abdominal surgery and may also form in response to peritoneal inflammation, e.g., acute appendicitis (AA). Molecules in reactive ascites (rA), produced in response to peritoneal insult, may modulate adhesion dynamics. We observed that select rA fluids triggered cultured MCs to produce a glycosaminoglycan (GAG)-rich gelatinous substance (GS) in vitro. We explored what rA components are associated with formation of this GS as well as the GS composition.

Methods: This is a prospective observational study at four level 1 trauma centers where peritoneal rA is collected prior to surgical intervention for non-perforated AA or small bowel obstruction (SBO). Four appendectomy (Appy) and three SBO rA samples met the inclusion criteria required for this cell analysis. Human MCs were treated for 48h with neat rA. Within Appy and SBO groups, GAG-high vs -low MC-conditioned rA proteins were compared and will be referred to as 'Appy GS' and 'SBO GS.' Trypsin digested proteins were identified with liquid chromatography mass spectrometry (LC-MS) and Mascot Distiller software.

Results: Appy GS and SBO GS were enriched ($p< 0.05$) in 'acute phase immune response,' 'complement,' and 'coagulation' cascades. Appy GS was enriched with a classical complement protein, Complement C1q (2.7-fold change (FC), $p < 0.01$), and Complement Factor I (1.4-FC $p < 0.05$), an inhibitor of the downstream membrane attack complex (MAC). Conversely, the MAC complement proteins C5 and C9 were enriched in SBO GS (7.7-and 6.9-FC, respectively, $p < 0.05$). Several extracellular matrix (ECM) proteins were also significantly increased in Appy GS and SBO GS. All three chains of fibrinogen (FIB), FIBA, FIBB and FIBG were significantly decreased in GAG-high vs -low Appy and SBO samples.

Conclusions: rA treatment of MCs produced innate immune and ECM secretory responses. As this GS is extracellular to the cultured MCs, we were also able to confirm the presence of several ECM proteins that increased in MC-conditioned rA. We are exploring if this GS is associated with the cause or resolution of adhesions. These findings add to our knowledge of the molecular mechanisms associated with acute and chronic adhesion formation.

Poster #3

IS THE USE OF NON-STEROIDAL ANTI-INFLAMMATORIES AFTER BOWEL ANASTOMOSIS IN TRAUMA SAFE?

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Background: With an increasing interest in multimodal and opioid reducing pain strategies, non-steroidal anti-inflammatory drugs (NSAIDS) have become common-place in the care of injured patients. Long-standing concerns of increased anastomotic leak rate with the use of NSAIDS, however, have persisted. We hypothesized that there would be no significant risk associated with NSAID use after bowel anastomosis in trauma patients.

Methods: All patients presenting to a level 1 trauma center who required intestinal resection and anastomosis from 2011 to 2017 were reviewed. Patients receiving NSAIDS were compared to those managed without NSAIDS. Primary outcome of interest was anastomosis-related complications (anastomotic leak, intraabdominal abscess, anastomotic bleed, fascial dehiscence, fascial dehiscence, and enterocutaneous fistula). Multivariable logistic regression analyses were performed with propensity adjustment for inverse probability of NSAID treatment weights.

Results: 295 patients met inclusion criteria with 192 receiving NSAIDS. Patients receiving NSAIDS had lower abdominal AIS, and ISS scores($p<0.046$). Arrival SBP, DBP, and GCS were higher in the NSAID group ($p<0.013$). After propensity weighting, NSAID use was not a major predictor of anastomotic complication ($p=0.39$). There was an increased risk of anastomotic leak with perioperative vasopressor exposure (OR=3.33(95%CI=1.17-9.05), $p<0.001$). Increasing RBC transfusions in the first 24 hours were associated with intra-abdominal complications (OR=1.02, 95%CI=1.00-1.04, $p=0.05$). NSAID exposure demonstrated a weak association with anastomotic leak (OR=1.92, 95%CI=0.97-3.90, $p=0.06$).

Conclusion: Consistent with previous studies, peri-operative vasopressor exposure and increased number of RBC transfusions are risk factors for anastomotic leaks and intra-abdominal complications, respectively. NSAID use in trauma patients with multiple risk factors may be associated with an increased risk of anastomotic leak and should be used with caution in the setting of other established risk factors.

Post #4

MULTI-CENTER STUDY OF INTRA-ABDOMINAL ABSCESS FORMATION AFTER MAJOR OPERATIVE HEPATIC TRAUMA

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Introduction: One of the significant complications of operative liver trauma is intra-abdominal abscesses (IAA). The objective of this study was to determine risk factors associated with post-operative IAA in surgical patients with major operative liver trauma.

Methods: A retrospective multi-institutional study was performed at 13 Level 1 and Level 2 trauma centers from 2012-2021. Adult patients with major liver trauma (grade 3 and higher) requiring operative management were enrolled. Univariate and multivariate analyses were performed.

Results: 372 patients were included with 21.2% (n=79/372) developing an IAA. No difference was found for age, gender, injury severity score, liver injury grade, and liver resections in patients between the groups ($p>0.05$). Penetrating mechanism of injury (OR 2.6, 95% CI 1.2-5.3, $p=0.01$), number of days with an open abdomen (OR 1.1, 95% CI 1.0-1.1, $p=0.03$), massive transfusion protocol (MTP) (OR 2.8, 95% CI 1.5-5.4, $p=0.002$), and biloma/bile leak (OR 2.9, 95% CI 1.3-5.2, $p=0.008$) were independent risk factors for IAA. Intra-abdominal drains, damage control laparotomy, total units of packed red blood cells, and blood loss during surgery were not found to be associated with a higher risk of IAA.

Conclusions: Patients with penetrating trauma, open abdomens, and MTP were at higher risk for the development of an IAA following operative liver trauma. Results from this study could help to refine existing guidelines for managing complex operative traumatic liver injuries.

	IAA n=79	**No IAA** n=293	**p value**
Penetrating mechanism, n (%)	66 (83.5)	205 (70.0)	*0.02*
Total units packed red blood cells, median (IQR)	9 (5-15)	4 (2-10)	*<0.001*
Estimated intra-op blood loss L, median (IQR)	1.0 (0.5-2.0)	0.7 (0.3-1.5)	*0.004*
Massive transfusion protocol, n (%)	45 (57.0)	84 (28.7)	*<0.001*
Damage control laparotomy, n (%)	70 (88.6)	203 (69.3)	*<0.001*
Intra-abdominal drain, n (%)	53 (67.1)	152 (51.9)	*0.01*
Days with open abdomen, median (IQR)	1 (1-4)	1 (1-2)	*<0.001*

Poster #5

NATIONAL TRENDS IN THE MANAGEMENT OF TRAUMATIC SPLENIC INJURY IN THE UNITED STATES: 2012-2019

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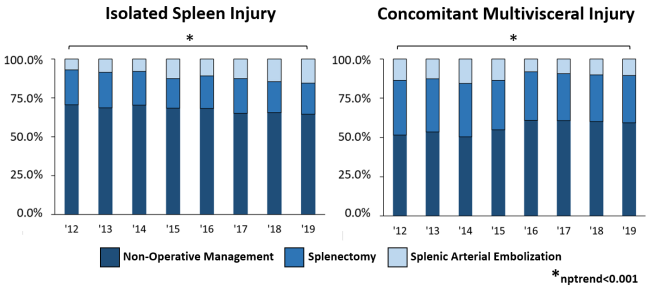
Introduction: Non-operative management and splenic artery embolization have emerged as common approaches to managing traumatic splenic injury. We aimed to characterize trends in operative management and splenic salvage modalities for traumatic splenic injuries using a nationally representative cohort.

Methods: Adults admitted for traumatic splenic injury were identified in the 2012- 2019 National Inpatient Sample. Patients were stratified into isolated splenic injury (ISI) and with concomitant multivisceral injury (MVI) cohorts. ISI was defined as those with only splenic visceral or vascular injury while MVI patients were defined as those with injuries to the spleen and other organs in the abdomen, chest or pelvis. In both cohorts, patients with concomitant injuries to the extremities or head were not excluded. Trends in management approach were examined, while patient characteristics and mortality were subsequently analyzed by approach.

Results: Of an estimated 84,915 patients, 30,415 (35.8%) had ISI while the remainder had MVI. Compared to the ISI cohort, MVI patients with high-grade injuries (grade IV-V) more frequently required splenectomy (40.7 vs 28.6%, P<0.001). From 2012 to 2019, rates of splenectomy decreased among patients with ISI (22.6 vs 20.0%, P<0.001) and those with MVI (34.9 vs 30.2%, P<0.001) (Figure). Unadjusted mortality of ISI cohort remained similar (2.5 vs 2.4 %, P=0.58) while that of MVI group increased over the study period (9.5 vs 11.2%, P=0.003).



Conclusion: In the past decade, splenic salvage has been increasingly adopted in treatment of both isolated and multitrauma splenic injuries. The significant drop in operative management may reflect improvements in conservative treatment algorithms and use of multi-disciplinary teams.

Poster #6

OUTCOMES OF CLOSED PASSIVE GRAVITY AND SUSTAINED LOW NEGATIVE PRESSURE SUCTION DRAINAGE FOR PANCREATIC TRAUMA: A PROPENSITY-MATCHED ANALYSIS

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Background: Although management strategy for operatively placed drains after pancreatic trauma (PT) have been widely recommended, few studies to date have elucidated potential differences in the postoperative outcomes related to drainage type. The current study sought to evaluate the clinical outcomes of closed passive gravity drainage (PG) and sustained low negative pressure suction drainage (NPS) in patients with PT.

Methods: Patients with PT who underwent operative treatment were enrolled consecutively in this study at a tertiary referral trauma center from January 2009 to October 2021, and then divided into PG and NPS groups according to initial drainage type. Primary outcome was the occurrence of severe complications (Clavien-Dindo classification ≥ IIIb). Secondary outcomes were in-hospital mortality, specific postoperative complications, reoperation rate and length of stay (LOS). A 1:1 propensity score matching (PSM) schemes were constructed to account for differences in baseline demographics and injury parameters.

Results: Two hundred seventy-four patients with PT were identified; 196 underwent pancreatic surgery were included in the analysis, and of these, 146 underwent PG drainage and 50 underwent NPS drainage. PSM analysis resulted in a total of 88 patients (44 PG, 44 NPS). The proportion of each operative procedure performed in the PG group was comparable to that of the NPS group ($P > 0.05$). Compared with PG group, patients who underwent NPS were significantly lower risk of severe complications (25.0% vs 45.5%, $P = 0.045$). No significant difference in in-hospital mortality was found between the two groups (6.8% vs 4.5%, $P = 1.000$). The incidence of pancreatic fistula (grade B/C) was significantly higher in the PG group (50.0% vs 25.0%, $P = 0.015$). Furthermore, the reoperation rate of NPS group was significantly lower than that of PG group (15.9% vs 38.6%, $P = 0.017$). There was a shorter LOS in the NPS group (median [IQR], 44.0 [33.0-69.75] vs 62.50 [43.75-97.0] days; $P = 0.047$).

Conclusions: Comparing PG and NPS drainage, decreased Clavien-Dindo severity and improved postoperative outcomes were observed for NPS drainage in patients with PT. Further randomized controlled trials are warranted to validate these results.

Poster #7

THE AAST-OIS IS ASSOCIATED WITH ENDOSCOPIC AND PERCUTANEOUS BILIARY PROCEDURES IN HEPATIC INJURIES

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Background: The American Association for the Surgery of Trauma (AAST) Organ Injury Scale (OIS) for the liver (and other organs) was created in 1989. It has been validated, perhaps best by Tinkoff et al in 2008, to predict mortality, need for operation, length of stay (LOS), and intensive care unit (ICU) LOS. It does not consider mechanism of trauma in its interpretation.

Methods: We analyzed the Trauma Quality Improvement Program (TQIP) database from 2017-2019, including all patients with a liver injury. Outcomes included the rates of mortality, operation, liver-specific operation, hepatic embolization, endoscopic retrograde cholangiopancreatography (ERCP), and percutaneous drainage procedures. Odds ratios and 95% Confidence Intervals (OR, CI) for outcomes were calculated for each grade compared to the immediately lower grade.

Results: 58627 patients had a liver injury with an OIS grade. In penetrating trauma, mortality rates increased at each grade level ($p<0.001$). Operative and percutaneous hepatobiliary drainage rates increased in grades III-V ($p<0.03$). Embolization and ERCP rates increased in grades III-IV ($p<0.001$). In blunt trauma, mortality and operative rates increased in grades IV-VI ($p<0.002$). Hepatic embolization, ERCP, and hepatobiliary drainage rates increased in grades III-V ($p<0.005$).

On binomial logistic regression of AAST-OIS, penetrating trauma is associated with higher odds of mortality (1.80, 1.62-1.99), operation (12.1, 11.4-12.8), ERCP (1.02, 1.01-1.03), and percutaneous hepatobiliary drainage (3.58, 2.88-4.45), but lower embolization rates (0.86, 0.75-0.98).

Conclusion: AAST-OIS is associated with endoscopic and percutaneous biliary procedures in addition to being previously validated for mortality, operative intervention, and hepatic angioembolization. In addition, the AAST-OIS does not appear to equally evaluate penetrating and blunt hepatic injuries.

Poster #8

TO CLOSE OR NOT TO CLOSE: COMPARISON OF THE OPEN ABDOMEN IN THE EGS AND TRAUMA POPULATIONS

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INTRODUCTION: Damage Control Laparotomy (DCL) is well established in the trauma literature. When trauma surgeons expanded their practice to emergency general surgery (EGS), DCL was utilized despite little data to support its utility outside of trauma. Research to date for DCL in EGS has focused on indications. We hypothesized that due to varying populations and pathology that DCL would carry higher complications in EGS.

METHODS: We examined patients admitted to our lvl 1 center from 9/1/12 to 2/28/21 who underwent DCL. All patients >16 yrs who survived to one additional laparotomy were included. Patients were divided into two groups, Trauma (TR) or EGS, based on their operative indications.

RESULTS: 1808 procedures were performed in 509 patients. EGS patients were older and more comorbid but less likely to be in shock on presentation. Mortality was higher in the EGS group when compared to TR (41% vs 22%, $p < .001$) and successful primary fascial closure was lower (77% vs 85%, $p < .001$). Age correlated with mortality in TR with increasing risk of death each decade ($p=0.001$) while the same was not true in EGS. Closure within 48hrs was associated with improved outcomes in both populations although more in the EGS grp, this was especially true in those over age 65.

CONCLUSION: Damage control surgery has nearly twice the mortality in EGS when compared to TR. While this a byproduct of the pathology present it is not explained by age alone. Optimal outcomes are reached when closed within 48hrs, however continued attempts at closure can be successful beyond this period. While the utility of DCL in the TR population is well established, surgeons should consider that DCL may not improve outcomes in the EGS population in particular at risk groups like the elderly.

Poster #9

ENDOVASCULAR BALLOON OCCLUSION OF THE INFERIOR VENA CAVA IN TRAUMA: A SINGLE-CENTER CASE SERIES

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Background: Injury to the inferior vena cava (IVC) can produce bleeding that is difficult to control. Endovascular balloon occlusion provides vascular control without extensive dissection and may be useful in large venous injuries, especially in the juxtarenal IVC. We present the first series utilizing this technique.

Technique: We use the Bridge Occlusion Balloon (Philips Healthcare) which measures 20 mm by 80 mm and is mounted on a 90 cm catheter. We commonly obtain femoral venous access in patients with shock and/or an injury pattern that may be helped with a Bridge balloon. That venous catheter is then then upsized to a 12-French introducer sheath. The Bridge balloon catheter is inserted over a guidewire under direct visualization and palpation to ensure the wire remains intraluminal and the balloon spans the entire injured segment. The balloon is inflated with 60 mL of saline and secured using a three-way stopcock prior to caval mobilization and repair.

Methods: We conducted a single-center retrospective review from January 1, 2021 to October 31, 2021 of injured patients in which endovascular balloon occlusion of the IVC was employed for hemorrhage control. We collected data regarding patient demographics, injury mechanism, hemodynamics, initial laboratory values including serum lactate, transfusion requirements, specific injuries and their management, hospital course and complications, and survival. We used descriptive statistics to summarize the data.

Results: We used emergent endovascular balloon occlusion of the infrahepatic IVC in five patients (see Table 1). All five patients were males with the median age being 35 years old (range 22 - 42 years). They all suffered penetrating injuries with four gunshot wounds and one stab wound. Median presenting Shock Index was 0.7 (range 0.5 – 1.5), and median initial lactate was 5.4 mmol/L (range 4.6 - 6.9 mmol/L). There was one suprarenal IVC injury, two juxtarenal injuries, and three infrarenal injuries. Four patients underwent primary repair of their injury, and one patient underwent IVC ligation. Four patients also had intraoperative Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for inflow control. The median number of total blood products transfused during the initial operation was 37 units (range 16 - 77 units). Four patients underwent damage control operations with planned return to the operating room, and one patient had a single definitive operation. Four of the five patients (80%) survived to 30 days with the lone mortality being due to other injuries.

Conclusions: Endovascular balloon occlusion serves as a valuable adjunct in the management of IVC injury and demonstrates the potential of hybrid open-endovascular operative techniques in abdominal vascular trauma.

Table 1.

Patient and Mechanism	IVC Injury Description	Injury Management	Associated Injuries	30-day survival?
28 y/o M stab	Posterior suprarenal laceration extending to orifice of left renal vein, anterior juxtarenal laceration	Primary repair of both lacerations	Duodenal laceration	Yes
36 y/o M GSW	Anterior juxtarenal laceration	Primary repair	Shattered right renal pelvis, central liver injury, right colon laceration	Yes
22 y/o M GSW	Two small anterior and posterior infrarenal lacerations on lateral wall	Laceration extension into one and primary repair	SMV injury, duodenal laceration	No
35 y/o M GSW	Large anterior and lateral wall infrarenal injury	IVC ligation	Two small bowel lacerations	Yes
42 y/o M GSW	Posterior suprarenal injury extending to but not involving origin of right renal vein	Primary repair	Duodenal laceration, right colon laceration	Yes

Poster #10

IMPACT OF IMPLEMENTING A VTE GUIDELINE AND ORDER SET ON VTE RATES: A MULTICENTER STUDY

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Introduction: Appropriate chemical prophylaxis (ppx) can reduce the risk of venous thromboembolism (VTE) in trauma patients. A systemwide VTE clinical practice guideline (CPG) and electronic medical record (EMR)-based VTE ppx order set was implemented. The CPG initiated ppx earlier, favored low molecular weight heparin (LMWH), and monitored anti-Xa for BMI>35 or ICU admissions. The purpose of this study is to evaluate the impact of CPG implementation and VTE ppx order set on the rate of VTE.

Methods: A retrospective review of trauma patients 15 years or older admitted to three trauma centers between 7/2018—12/2021. Exclusion criteria included burn injury, readmission, length of stay (LOS) <2 days, and comfort care. The VTE CPG and EMR order set were implemented November 2020 and a pre-implementation (PRE)/post-implementation (POST) comparison conducted.

Results: 12,479 patients were included. There were no differences in age, gender, and injury severity score (ISS). The POST group had a higher usage of LMWH (64.0 vs 67.5%, p=0.0001), a lower rate of no ppx (17.2 vs 12.5%, p<0.0001), and a shorter time to ppx (1763 vs 1555 min, p<0.0001). The rates of VTE (1.6 vs 1.0%, p=0.004) and deep vein thrombosis (1.1 vs 0.7%, p=0.032) were lower in the POST group. There was no difference in the rate of pulmonary embolism (0.6 vs 0.4%, p=0.055). The POST group had a higher mortality (0.7 vs 1.1%, p=0.033) on univariable analysis, but there were no differences between groups on adjusted analysis. Independent predictors of VTE were longer time to ppx, higher ISS, bleeding disorder, longer LOS, higher ventilator days, and ventilated-associated pneumonia. Use of LMWH was protective from VTE.

Conclusion: The implementation of systemwide VTE CPG and EMR-based ppx order set was associated with a reduced incidence of VTE in trauma patients without an associated mortality difference.

Poster #11

INCIDENCE, OUTCOMES AND COSTS OF SEVERE SEPSIS AND SEPTIC SHOCK IN GERIATRIC TRAUMA PATIENTS

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INTRODUCTION: Severe sepsis/septic shock (Sepsis) is a leading cause of death in hospitalized trauma patients. Geriatric trauma patients are an increasing proportion of trauma care but little recent, large-scale, research exists in this high-risk demographic. The objectives of this study are to identify incidence, outcomes and costs of Sepsis in geriatric trauma patients.

METHODS: Patients at short-term, non-federal hospitals aged ≥65 with ≥1 injury ICD-10 code were selected from 2016-19 CMS IPSAF. Sepsis was defined as ICD-10 diagnosis codes R6520 and R6521. A log-linear model was used to examine the association of Sepsis with mortality, adjusting for age, sex, race, Elixhauser Score and ISS. Dominance analysis using logistic regression was used to determine the relative importance of individual variables in predicting Sepsis. IRB exemption was granted for this study.

RESULTS: There were 2,563,436 hospitalizations from 3284 hospitals (62.8% female; 90.4% white; 72.7% falls; mean ISS: 6.6). Incidence of Sepsis was 2.1%. Sepsis patients had significantly worse outcomes (Table 1). Mortality risk was significantly higher in septic patients (aRR, 3.98, 95% CI, 3.92-4.04). Elixhauser Score contributed the most to the prediction of Sepsis, followed by ISS (McFadden's R^2=9.7% and 5.8%, respectively).

Table 1. Unadjusted comparisons of outcomes between septic and non-septic patients and overall

Outcomes	Septic		Non-septic		Overall	
	n= 53,001		n= 2,510,435		N= 2,563,436	
CMS payment per capita, mean (SD)	$27,133	($37,487)	$11,735	($12,733)	$12,052	($13,879)
Hospital LOS, mean (SD)	11.2	(13.1)	4.98	(5.1)	5.11	(5.4)
ICU LOS, mean (SD)	7.8	(8.9)	4.14	(4.4)	4.33	(4.8)
ICU use, n (%)	31,528	(59.5)	575,926	(22.9)	607,454	(23.7)
Ventilator use, n (%)	19,022	(35.9)	87,867	(3.5)	106,889	(4.2)
Mortality, n (%)	19,619	(37.0)	151,806	(6.0)	171,425	(6.7)

All comparisons between septic and non-septic were significant at p<.001. ICU=intensive care unit, LOS=length of stay

CONCLUSION: Severe sepsis/septic shock occurs infrequently among geriatric trauma patients but is associated with increased mortality and resource utilization. Pre-existing comorbidities influence Sepsis occurrence more than ISS or age in this group, identifying a population at high risk. Clinical management of geriatric trauma patients should focus on rapid identification and prompt aggressive action in high-risk patients to minimize the occurrence of Sepsis and maximize survival.

Poster #12

LIPID METABOLIC PROFILE IN MESENTERIC LYMPH AFTER INTESTINAL ISCHEMIA/REPERFUSION

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Background: After intestinal ischemia/reperfusion (IR) injury, a variety of inflammatory mediators enter the systemic circulation through mesenteric lymph (ML) ducts, leading to acute lung injury/multiple-organ dysfunction syndrome (MODS). Although intestinal IR injury drives systematic inflammation and MODS, the functions of post-intestinal IR ML are not fully understood. The present study assessed the biological activities of post-IR ML on polymorphonuclear leukocytes (PMNs) and obtained a comprehensive profile of lipids in the ML.

Methods: In this study, we performed superior mesenteric artery occlusion (60 min) and reperfusion (120 min), which is specific for intestinal ischemia, to investigate the post-IR ML biological activities and profile. To assess the biological activities on PMNs, male Sprague-Dawley rat ML was collected before (b-ML) and after (a-ML) intestinal IR. The lipids in the ML were extracted using the methods of Bligh and Dyer, and liquid chromatography/electrospray ionization mass spectrometry was performed. We analyzed the changes in the lipid profile between b-ML and a-ML.

Results: The biological activities of ML were significantly altered by intestinal IR. a-ML induced PMN activities, CD11b expression, reactive oxygen species (ROS) production, and morphological changes ($p<0.05$). Lipid metabolic analyses revealed that arachidonic acid (AA) in ML was significantly increased after intestinal IR. Furthermore, the metabolites of AA, such as prostaglandin E2 (PGE2) and prostaglandin F2α (PGF2α), were significantly increased in a-ML compared with b-ML ($p<0.05$).
Conclusions: ML after intestinal IR has biological functions that activate PMNs. In addition, we found that intestinal IR boosted the concentrations of AA and prostanoids, such as PGE2 and PGF2α, in ML. To our knowledge, this is the first report to identify prostanoids in ML, which might be a pathogenesis of MODS.

Poster #13

OUTCOMES IN CRITICALLY ILL COVID-19 PATIENTS WITH IDENTIFIABLE ANTIMICROBIAL RESISTANCE GENES

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Background: Developments in RNA sequencing technology have increased our capability to use blood samples from critically ill patients and compare them to the human genome. We have been able to identify the presence of unusual sequences in these blood samples that are from non-human organisms' genomes. These unmapped sequences are hypothesized to map to bacterial resistance genes and provide further insight into a patient's clinical course.

Methods: Blood samples from patients on the first day in the ICU were collected in Paxgene tubes after informed consent. RNA was extracted and sequenced with approximately 100 million reads per sample. 30-40 million of those reads were unmapped and subsequently aligned against known antibiotic resistance genes from McMaster University's Comprehensive Antibiotic Resistance Database (CARD). Newly aligned sequences were subject to two-tailed t-tests. Outcome variables studied included death, hospital stays, ICU stays, thrombotic events, ECMO, dialysis and mechanical ventilation. Both absolute number of reads and percentage of reads for each patient were used as basis for analysis.

Results: Reads aligning to a A16S rRNA mutation conferring resistance to Kasugamicin was more common in patients that died versus patients that lived (2.29 vs 0, $p=0.045$). Resistance to tetracyclines was associated with increased thrombotic events ($p=0.022$) and a A23S rRNA mutation conferring resistance to erythromycin increased risk for mechanical ventilation ($p=0.048$).

Discussion: Identification of antibiotic resistance genes, at even very small levels, is associated with some outcomes. Future testing of these genes through techniques such as PCR could not only better guide antimicrobial treatment but could also aid in prognosis. More studies must be done to understand the mechanism as why these resistance genes are associated with clinical outcomes.

Poster #14

PREDICTING THE DIFFICULT GALLBLADDER PREOPERATIVELY: NEUTROPHIL-TO-LYMPHOCYTE RATIO AS A PREDICTOR FOR DIFFICULT CHOLECYSTECTOMY

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Background The Tokyo guidelines recommend percutaneous cholecystostomy (PC) be considered for grade II acute cholecystitis (AC), but this group consists of both uncomplicated and difficult cholecystectomy (DC) patients. Since neutrophil-to-lymphocyte ratio (NLR) can differentiate those with acute versus complicated appendicitis, we hypothesized that it would identify DC patients who might be better served with PC.

Methods We performed a retrospective cohort study of adult emergency patients who underwent cholecystectomy at a single academic medical center from 2016 to 2021. DC was defined as those who had conversion to open, subtotal, or fenestrated cholecystectomy, a CPT 22 modifier, or drain placement. Wilcoxon Rank Sum and Kruskal-Wallis tests were performed for subgroup comparisons. ROC curve analyses were performed to evaluate NLR cutoffs for DC, AC, and gangrenous cholecystitis (GC).

Table 1

	NLR median (IQR)	AUC (95% CI)
All patients (n=787)	4.8 (2.7–7.9)	---
Surgery Type		
Uncomplicated (n=685)	4.6 (2.5–7.6)	---
Difficult Cholecystectomy (n=102)	6.8 (4–10.7)	0.64 (0.58–0.69)
Pathology		
Neither AC or GC (n=341)	3.8 (2.2–6.5)	---
Acute Cholecystitis (n=407)	5.0 (3.2–8.2)	0.57 (0.53–0.61)
Gangrenous Cholecystitis (n=39)	12.1 (7.7–16.7)	0.83 (0.77–0.89)

Table 2

NLR Cutpoint	Sensitivity (%)	Specificity (%)	AUC	Youden's Index
Difficult Cholecystectomy				
≥4.0	75.5	43.1	0.59	18.6
≥5.0	66.7	54.2	0.61	20.9
≥6.0	56.9	63.5	0.60	20.4
≥7.0	46.1	71.5	0.59	17.6
≥8.0	37.3	77.4	0.57	14.7
Gangrenous Cholecystitis				
≥5.0	92.3	53.7	0.71	46.0
≥6.0	87.2	63.4	0.75	50.6
≥7.0	82.1	71.9	0.77	54.0
≥8.0	74.4	78.1	0.76	52.5
≥9.0	69.2	82.5	0.76	51.7
≥10.0	61.5	85.8	0.74	47.3

Results 787 patients were included; 13.0% had DC, 51.7% had AC, and 5.0% had GC. NLR was higher in patients who had a DC compared with uncomplicated cholecystectomy and in patients with AC or GC ($p<0.01$) (Table 1). NLR cutpoints for DC and GC are summarized in Table 2.

Conclusion Preoperative NLR has predictive value for AC, GC, and DC, but is most discriminative for GC. When used in conjunction with other diagnostic tools, it may help identify and appropriately classify patients with severe disease in whom PC may be more appropriate.

Poster #15

PREPERITONEAL PELVIC PACKING IS ASSOCIATED WITH INCREASED RISK OF SURGICAL INFECTIONS AFTER PELVIC FIXATION

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Background: Unstable pelvic fractures are frequently associated with hemorrhage and uniformly require operative fixation. Preperitoneal pelvic packing (PPP) may be used to control hemorrhage, but no large study has evaluated the relationship between PPP and surgical site infection (SSI) following pelvic fixation. We hypothesized that PPP is associated with higher rates of SSI.

Methods: From a 1-year (2019) retrospective review of the American College of Surgeons (ACS) Trauma Quality Improvement Program (TQIP) database, we identified all patients who underwent operative pelvic fixation based on ICD-10 procedure codes. Patients who were discharged to another hospital were excluded. Deep SSI, superficial incisional SSI, osteomyelitis, and organ/space SSI were included. Chi square analysis identified patient and hospital factors. Multivariable logistic regression determined odds ratios (OR) and 95% confidence intervals.

Results: The study population was comprised of 17,299 patients (67% male). In those that received PPP vs those who did not, SSI was more common (7% vs 1%), Injury Severity Score was higher (38 [27-45] vs 14 [8-12]) and median units of blood transfused was greater (7 [3-16] vs 0 [0-0]) (all $p<0.001$). Multivariable logistic regression showed PPP carried an increased risk of developing SSI (OR = 2.31 [1.21-4.43]), as did having an injury severity score (ISS) over 14 (OR = 4.47 [2.78-7.18]) and undergoing pelvic bone fixation as opposed to acetabular or sacral fixation (OR = 2.06 [1.34-3.18]). Controlled risk factors included age, gender, transfusion volume, pelvic angioembolization, TBI, hypotension, ISS, PPP, and type of fixation.

Conclusions: PPP is an independent risk factor for SSI after pelvic fixation. Preventative protocols should be developed to mitigate infection risk in this patient population.

Poster #16

REDUCING OPIOID EXPOSURE AND PAIN IN TRAUMA PATIENTS AT HIGH RISK FOR OPIOID MISUSE

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Introduction: Acute pain strategies are needed that effectively minimize opioid exposure in patients who are at high risk for opioid misuse and opioid use disorder (OUD) after traumatic injury. A recently published trial found that an opioid-minimizing multimodal pain regimen (MMPR) consisting of generic medications (Multimodal Analgesic Strategies for Trauma, or MAST) was more effective for reducing opioid exposure and opioid prescribing at discharge during hospitalization compared to an original MMPR. Here we extend these findings by examining the effects of MAST as a function of opioid misuse risk level.

Methods: The current secondary data analysis included N=631 participants classified as low- or high-risk of opioid misuse via the Opioid Risk Tool (ORT). Analyses evaluated the moderating influence of ORT risk level (high/low) on the effect of MMPR (MAST vs. original) on three outcomes: opioid prescribing at discharge, numeric rating scale (NRS) pain scores, and opioid exposure (morphine milligram equivalents/day; MMEs/d). Bayesian inference characterized the effect of MMPR, including a point estimate (regression coefficient b or relative risk RR), 95% credible interval (CrI), and posterior probability (PP) that the effect exists.

Results: ORT risk moderated the effect of MMPR on opioids prescribed at discharge and pain scores such that the MAST MMPR was more effective than the original MMPR in the high-risk group (opioid prescribing at discharge: 63% vs. 77%, RR=0.86 [0.66, 1.08], PP(RR<1)=90%; NRS: b=3.8 [3.2, 4.4] vs. b=4.0 [3.4, 4.6], PP(b<0)=87%) but not in the low-risk group. There was no differential effect of MMPR by ORT risk on MMEs/d; for both low- and high-risk groups, the MAST MMPR was more effective than original MMPR for reducing MMEs/d (low-risk: 37 [32, 43] vs. 50 [43, 58], PP(b>0) > 99%; high-risk (48 [37, 62] vs. 64 [49, 86], PP(b>0)=98%).

Conclusion: These findings have implications for MMPR use in trauma patients based on opioid misuse risk. The beneficial effects of the opioid-minimizing MAST MMPR appear to be amplified for patients at higher misuse risk.

Poster #17

THE IMPACT OF BACTERIA RESISTANCE TO EMPIRIC ANTIBIOTICS ON MORTALITY AND HOSPITAL LENGTH OF STAY

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Introduction: Early administration of antibiotics (abx) is an essential therapy for presumed sepsis. Empiric, broad-spectrum abx are employed to treat typical organisms. However, clinicians usually do not have timely and easily-available information about bacteria-specific resistance patterns within their unit, and abx resistance causes poor outcomes. The association between empiric abx resistance and patients' outcomes was evaluated.

Methods: All positive blood, urine, and bronchial cultures and the resulting bacteria species and sensitivities at an academic medical center from 2019-2021 were reviewed. Only the first positive culture for any selected bacteria during a hospital stay was analyzed in patients with multiple positive cultures. The five most common gram-negative bacteria were then evaluated for resistance to commonly used empiric abx (piperacillin/ tazobactam, cefepime, and meropenem). Outcomes were death and length of stay. Wilcoxon and Fisher's exact tests were used to compare length of stay and mortality, between sensitive and resistant cultures. P-values <0.05 were considered statistically significant.

Results: During the 3-year period, 103,957 cultures were reported, of which 5,445 were positive for the most common gram-negative bacteria: Acinetobacter (n=117), Enterobacter (n=366), E. coli (n=3,004), Klebsiella (n=1,229), and Pseudomonas (n=729). Mortality in patients found to have any of the five gram-negative bacteria resistant to the empiric abx ranged from 7.8-11.5%. Conversely, when patients with these bacteria were treated with non-resistant empiric abx, the mortality was reduced to 4.3-4.6% (p <0.0001). Similarly, treating patients with bacteria-sensitive empiric abx was associated with a reduced hospital length of stay (p <0.001).

all p < 0.0001	**Mortality**		**HLOS (days)**	
Antibiotic	SENS	RESIST	SENS	RESIST
Pip-tazobactam	4.4%	9.2%	4.3	7.2
Cefepime	4.3%	7.8%	8.8	17.3
Meropenem	4.6%	11.5%	4.6	10.3

Conclusion: Appropriate antibiotic coverage for gram-negative infections was associated with improved mortality and decreased length of stay. Constantly updated, unit-specific sensitivities may improve outcomes by allowing tailored antibiotic therapy after the species is identified, but before culture-based sensitives are available.

Poster #18

WEIGHT-BASED DOSING OF LMWH TO ACHIEVE VENOUS THROMBOEMBOLISM PROPHYLAXIS IN TRAUMA PATIENTS

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Introduction: Patients admitted after traumatic injuries are at high risk for developing venous thromboembolism (VTE). Low-molecular-weight-heparin (LMWH) is commonly used to prevent VTE in this patient population; however, the optimal dosing strategy has not been determined. To address this need, a fixed-dosing strategy of LMWH was compared to a weight-based dosing strategy of LMWH for VTE prophylaxis.

Methods: A retrospective, pre-post implementation cohort study was conducted comparing a fixed vs. weight-based dosing strategy of LMWH for VTE prophylaxis. Patients admitted to a Level 1 trauma center were included if they had an estimated glomerular filtration rate >30 mL/min/1.73m^2, received at least three doses of LMWH, and had an appropriately drawn anti-Xa level on their initial dosing regimen. Patients in the pre cohort received 30 mg LMWH twice daily as the initial dosing regimen. Patients in the post cohort received 0.5 mg/mg (max 60 mg) LMWH twice daily as the initial dosing regimen. A goal anti-Xa of 0.2-0.4 IU/mL was targeted for prophylaxis.

Results: There were 817 patients in the fixed-dosing group (FDG) and 874 patients in the weight-based dosing group (WBDG). In the FDG, 42.8% of the patients achieved goal initial anti-Xa levels, with 54.1% and 3.1% reaching sub- and supratherapeutic doses, respectively. In the WBDG, 66.5% of patients reached goal initial anti-Xa levels, with 23.5% and 10.1% at sub- and supratherapeutic levels. The distribution of dose ranges was significantly different between the dosing strategies (p-value < 0.001). There was no difference in the number of patients who received blood products (39.1% vs 41.7%. p-value = 0.299).

	Dosing		
Anti-Xa levels	**Fixed**	**Weight-Based**	**p-Value**
< 0.2 IU/mL	442 (54.1%)	205 (23.5%)	< 0.001
0.2-0.4 IU/mL	**350 (42.8%)**	**581 (66.5%)**	
> 0.4 IU/mL	25 (3.1%)	88 (10.1%)	
Patients Given Blood Products			
Transfused	320 (39.2%)	364 (41.7%)	0.299

Conclusions: In our study, weight-based dosing of LMWH yielded a significantly higher proportion of patients who achieved goal prophylactic anti-Xa levels when compared to fixed-dosing of LMWH. Larger-scale studies are needed to assess the risk of VTE events and bleeding with these dosing strategies.

Poster #19

PREDICTIVE VALUE OF A PREHOSPITAL TRANEXAMIC ACID PROTOCOL FOR TRAUMA PATIENT HEMORRHAGE

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Introduction: The use of tranexamic acid (TXA) in the civilian trauma setting has dramatically increased following the publication of the CRASH and MATTERs trials. The protocol for prehospital administration of TXA in the pre-hospital setting varies widely, both nationally and among individual EMS agencies within a single trauma system. Accordingly, given growing literature that a minority of the highest level activations arriving at a trauma center are actually hyperfibrinolytic, TXA is likely being significantly over-utilized. The purpose of this study was to evaluate the accuracy of a single, system-wide prehospital TXA protocol for the identification of hemorrhage.

Methods: A prehospital TXA protocol was developed and implemented by our level I trauma center. For individual EMS agencies to utilize TXA, a written letter of authorization from the trauma medical director with oversight of the trauma system must submitted to the central office of Emergency Medical Services. We authorized county-based EMS agencies to utilize TXA predicated upon use of our protocol, thus standardizing administration criteria within the trauma system.

Our system-wide criteria for prehospital administration of TXA includes heart rate greater than 120 or systolic lood pressure less than 90 mmHg and obvious clinical evidence of hemorrhage. To ensure assessment of our standardized protocol, scene transfers only by our trauma center based prehospital division were studied. This prehospital database, as well as the National Trauma Registry of the American College of Surgeons (NTRACS) databases were queried to identify adult trauma patients transferred from the scene to our level one trauma center (2016-2019). We analyzed prehospital administration of TXA and red blood cell transfusion in the initial 4 hours of hospitalization as a marker for hemorrhage.

Patients were divided into four cohorts based on the collected data: true positive (TP) (TXA given and hemorrhage present), false positive (FP) (TXA given and no hemorrhage present), true negative (TN) (TXA not given and no hemorrhage present), false negative (FN) (TXA not given and hemorrhage present). We evaluated the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy of the protocol.

Results: 980 patients met inclusion criteria for this study. 138 (14.1%) patients had signs of hemorrhage, while 94 (9.6%) received TXA. The true positives, as defined by administration of TXA at the scene followed by transfusion of blood in the hospital, was 67 (6.8%). The other indices include: FP 27 (2.8%), TN 815 (83.2%), FN 71 (7.2%). The sensitivity of the protocol, which we interpreted as patient who is bleeding and receives TXA, is 48.6%. The specificity is 96.8%, NPV 92%, and PPV 71.3%. Diagnostic accuracy for the protocol is 90%

Conclusions: Standardization of prehospital TXA administration across a trauma system is an achievable goal. The system wide protocol proved to be 90% accurate. The strong negative predictive value of the protocol allows prehospital providers to exclude patients who would not benefit from TXA, potentially reducing overutilization based upon mechanistic criteria or level of activation alone. We theorize that refinement of the protocol to include both tachycardia and hypotension as triggers will improve sensitivity.

Poster #20

A LOCAL AFFAIR: GEOSPATIAL ANALYSIS OF SOCIOECONOMIC STATUS IN EMERGENCY GENERAL SURGERY OUTCOMES

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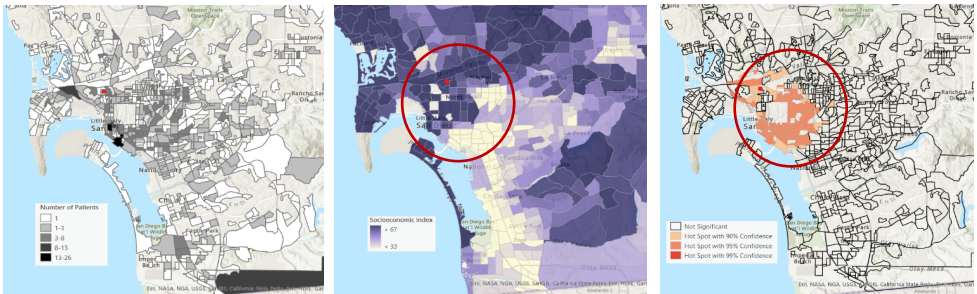
Introduction: Patient socioeconomic status (SES) has been linked to disparities in postoperative outcomes for Emergency General Surgery (EGS) patients. Past studies using national databases consist only of patients undergoing surgery. This excludes patients managed nonoperatively, which represents a significant proportion of EGS clinical work, and may not capture important nuances and heterogeneity in local patient populations. We hypothesize that due to the emergent nature of the patients served by a comprehensive EGS service, negative outcomes will cross SES boundaries and not be clustered only in underserved areas.

Methods: This was a retrospective cohort analysis of all patients managed, both operatively and nonoperatively, by the EGS service at an urban academic hospital from 2018 to 2020. Patients with a hospital length of stay (LOS) > 24 hours and not experiencing homelessness were identified in our previously published local EGS registry. Neighborhood Socioeconomic Status (NSES) was calculated using 2015 American Community Survey, with median NSES set to 50 on a scale of 1 to 100. Outcomes were in-hospital mortality adjusted for total cases per census tract, discharged to rehabilitation facility (Rehab), and LOS. Getis-Ord Gi* statistic was used to evaluate geospatial outcomes by hot/cold spot analysis.

Results: We identified 1589 patients in our cohort (mean age 53.7 years, 57.6% male) with median LOS of 4 days, and median NSES of 46.1. Mortality was 4.9% and Rehab rate was 14%. Geospatial analysis showed that patients come from all NSES areas (Fig. 1A and 1B) and that there was a significant hot spot of mortality in the city center, accounting for 36% of all mortalities ($p < 0.05$, Fig. 1C). However, this hot spot spanned both high and low NSES areas as noted by corresponding red circles in Fig. 1B and 1C. This also held true for Rehab and LOS.

Conclusion: Hot spots of negative EGS outcomes extend beyond low SES areas. This heterogeneity will need to be accounted for in future studies on socioeconomic determinants of EGS outcome and quality improvement initiatives.

1A- All EGS Patients **1B- NSES By Census Tract** **1C- Mortality Hot Spot**



Poster #21

A TALE OF TWO CENTERS: ACS MODEL IS ASSOCIATED WITH DECREASED EGS MORTALITY AT A LEVEL III CENTER

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Introduction: The Acute Care Surgery (ACS) model has had great success; however, little is known regarding its impact on EGS outcomes outside of tertiary centers. The aim of this study was to evaluate the effect of the ACS model on EGS operative mortality between two Level III Trauma Centers (L3TC).

Methods: EGS operative patients were queried from our EGS Registry (based on AAST EGS diagnosis codes) from two ACS-verified L3TC (2013-2020). In April 2016 one center (ACSc) created an in-house ACS service while the other continued a traditional home call model (TRADc). Inpatient mortality was compared before and after implementation and between centers. Multivariate regression (MVR) was performed controlling for age, gender, BMI, race, insurance, high risk cases (HRC) (exploratory laparotomy, colectomy, bowel resection, perforated peptic ulcer repair), and sepsis.

Results: There were 7,833 patients: 5409 (69.0%) at the ACSc, 2,424 (31.0%) TRADc. There were 2068 (38.2%) Before and 3341 (61.8%) After patients at the ACSc. Before ACS implementation the centers had similar rates of HRC (19.8 vs 20.2%), mortality (2.5 vs 2.1%), and HRC mortality (10.5 vs 9.0%; $p>0.05$ for all). Afterwards, the ACSc had higher rates of HRC (24.1 vs 19.0; $p<0.001$), but similar mortality (2.5 vs 2.4, $p=0.875$), and HRC mortality (8.6 vs 10.3%, $p=0.39$). On MVR, after controlling for severity and confounders, ACS model implementation was associated with decreased inpatient mortality (OR 95% CI: 0.49, 0.29-0.84).

Conclusion: Implementation of an ACS model at a L3TC was associated with 50% lower odds of inpatient EGS mortality compared to a contemporaneous control, despite performing more HRCs. Adoption of an ACS model could have significant benefits to EGS patients at community-based trauma centers.

Poster #22

APPENDICITIS ON LOCKDOWN? DECREASED PRESENTATION OF APPENDICITIS IN NEW YORK CITY'S PUBLIC HOSPITALS DURING THE COVID19 PANDEMIC

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Objectives: New York City was the first COVID-19 epicenter in the United States, and city and state response included a shelter-in-place mandate. During this time, a decreased presentation of patients with acute appendicitis was observed. This study aims to establish whether the decrease was a true phenomenon, and to characterize the management of these cases.

Methods: Billing records from New York City Health and Hospitals were utilized to identify admissions for acute appendicitis. Data acquired included demographic, diagnostic, operative and outcome data. Data was compared from January to May for 2019 and 2020.

Results: Twenty-one day moving averages of admissions for acute appendicitis within the system were similar until the third week of February, after which admissions in 2020 diverged to be less than 2019 for the remainder of examined months. On March 22nd, there were 3.43 admissions for acute appendicitis in 2019, compared to 2.29 in 2020. After March 29th, there were consistently 2 or fewer admissions for acute appendicitis per day in 2020, compared to 2.43-3.19 in 2019. While there was a significant decrease in the total number of appendectomies performed in April and May of 2020 compared to 2019, the proportion of overall appendicitis cases managed operatively only trended toward decline, and there was no difference in the frequency of non-operative management of appendicitis. There was no increase in presentation of complicated appendicitis.

Conclusion: Overall, these results demonstrate decreased presentation of appendicitis and to New York's Public Hospitals with fewer appendectomies performed during the height of the COVID-19 pandemic without a concurrent increase in non-operative management or complicated cases. These data raise questions regarding the role of nonsurgical management for acute appendicitis

Poster #23

APPYS AND BEYOND: SAFETY IN ALLOWING RESIDENTS TO INDEPENDENTLY PERFORM CHOLECYSTECTOMY, A RETROSPECTIVE REVIEW

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Introduction: In an era of competency-based education and concern about graduating resident readiness for practice, early resident autonomy in teaching is increasingly important. In this study, we expanded on previous research that demonstrated equivalent patient outcomes in "teaching resident" appendectomies to the more complex cholecystectomy case including both patient and financial outcomes.

Methods: A single-center retrospective review of 781 patients from April 2017 to January 2019 who underwent cholecystectomy at an academic medical center. We examined how two residents (compared to one resident with an attending) attempting a case affect outcomes while controlling for sex, age, ASA class, BMI, prior abdominal surgery, acuity, and attending surgeon seniority.

Results: We identified 622 one-resident cases and 159 teaching resident cases. We performed multiple logistic regression to assess teaching resident cases as a predictor of post-operative outcomes. There were no significant differences in surgical site infection (superficial or organ space) 1.46 (0.45, 4.7); p = 0.53, conversion to open 0.55 (0.20, 1.56); p = 0.26, whether a drain was left 1.21 (0.61, 2.34); p = 0.59, intraoperative perforation 1.51 (0.95, 2.41); p =0.08, prolonged operation 1.67 (0.86, 3.22); p = 0.13, post-operative CT 1.06 (0.48, 2.34); p = 0.88, or readmission within 30 days 0.93 (0.39,2.21); p = 0.86. Additionally, multiple linear regression did not reveal a difference in cost $172 (-248, 591); p = 0.42.

Conclusions: Senior surgical trainees can safely and cost-effectively supervise more junior trainees in performing cholecystectomy procedures. Training programs should encourage such models in order to maximize the educational reach of each case.

Poster #24

COMPARISON OF OUTCOMES AMONGST PATIENTS WITH HIGH SEVERITY AAST SCORES FOR COMMON EGS DISEASES

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Introduction: The AAST Emergency General Surgery (EGS) grading system for anatomic severity has been validated within specific disease processes. Across the spectrum of diseases, however, it is unclear whether equivalent severity grades correlate with comparable patient outcomes. We hypothesize that AAST severity grade is not generalizable across common EGS diseases; similar grades will be associated with different morbidity and mortality between diseases.

Methods: We performed a secondary analysis of patients selected from the AAST-sponsored MERIDIAN database, comprised of 766 patients compiled from 21 sites admitted to the ICU with an open abdomen. Patients with high severity (AAST 3-5) scores for the four most common EGS diagnoses (appendicitis, diverticulitis, small bowel obstruction, mesenteric ischemia) were compared between disease processes for mortality and other complications. Results: There were 596 patients identified with a mean age of 60±16.7 years; 44.1% women. Overall mortality was 18.8%. The was a wide range of complication rates between disease processes (Table 1A).

Table 1A. Diagnoses and Complications for AAST score 3-5

Complications	Appendicitis (%)	Diverticulitis (%)	SBO (%)	Mesenteric Ischemia (%)	p-value
Mortality	3.7	10.4	10.6	39.0	<0.001
AKI	20.0	36.8	47.1	62.5	<0.001
Dehiscence	3.7	8.8	9.4	11.5	0.097
Evisceration	0.7	3.2	1.2	2.0	0.5
Anastomotic Leak	1.5	2.4	5.9	9.5	0.005
Intestinal Fistula	1.5	1.6	5.9	5.0	0.13
C. difficile	0	0.8	5.9	4.0	0.015
Pneumonia	3.0	15.2	18.8	12.0	0.001
UTI	1.5	7.2	14.1	8.0	0.005
Tracheostomy	0.7	4.0	12.9	10.5	<0.001

Conclusion: While the AAST system may have utility in allowing discrete categorization of disease severity within a given disease, morbidity and mortality varies widely between disease presentations despite similar severity ranges. Quality metrics cannot rely on the AAST EGS grading system when comparing amongst diseases.

Poster #25

DEFINING THE EMERGENCY GENERAL SURGERY PATIENT POPULATION IN THE ERA OF ICD10

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Objectives: In 2011, the AAST created a broad list of ICD9 coded conditions that has defined the field of emergency general surgery (EGS). A recent AAST Committee on Patient Assessment effort to translate the ICD9 list to ICD10 faced several limitations. We sought to evaluate the General Equivalence Mapping (GEM) crosswalk from ICD9 to ICD10.

Methods: We used the GEM to generate a list of ICD10 codes equivalent to the ICD9 AAST EGS diagnosis codes. A manual review performed independently by 2 authors identified diagnosis categories and codes that were incompletely or improperly matched. We then used the 2013-2014 (ICD9) and 2016-2017 (ICD10) National Inpatient Sample to evaluate patient volumes across diagnosis categories in each coding era using an observed to expected (O:E) ratio. Diagnosis categories with an O:E ratio of >1.20 or <0.80 (set a priori), underwent further review to identify if specific matched codes were the source of differences in patient volume.

Results: There were 89 clinical diagnosis categories with 485 individual ICD9 diagnosis codes which mapped to 1206 unique ICD10 diagnosis codes, with 192 (39%) of the ICD9 diagnoses having an exact 1-to-1 ICD10 match. There were 13 diagnosis categories considered to be incompletely matched on manual review. There were 16 diagnosis categories over-represented and 18 under-represented in ICD10 patient volumes. We identified 5 key sources of significant discrepancy between the established ICD9 diagnosis code set and the GEM generated set of ICD10 codes.

Issue/Deficiency Identified	Example (ICD9→ICD10)
Change in admission volume despite 1:1 match	"Cardiac tamponade" (423.3) → "Cardiac tamponade" (I31.4); O:E 1.77
Mapping with loss of necessary modifier	"Acute and chronic respiratory failure following trauma and surgery" (518.53) → "Acute and chronic respiratory failure, unspecified whether with hypoxia or hypercapnia" (J96.20)
Lack of specific crosswalk code in ICD10	"Rupture of bladder, nontraumatic" (596.6) → "Other specified disorders of bladder" (N32.89)
Mapping to an ICD10 code for a different condition	"Acute and subacute necrosis of liver" (570) → "Acute and subacute hepatic failure without coma" (K72.00)
Change in coding nomenclature from ICD9 to ICD10	"Regional enteritis of large intestine" (555.1) → "Crohn's disease of large intestine without complications" (K50.10)

Conclusions: We identify several important technical considerations for using the GEM in EGS research, which if not properly accounted for, could result in the unintended inclusion of large numbers of non-EGS patients and/or the exclusion of EGS patients of interest.

Poster #26

LACK OF HEALTH CARE COVERAGE WIDENS THE SURVIVAL GENDER GAP IN EGS: AN ANALYSIS OF 30,000 CASES FROM THE DEVELOPING WORLD

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Introduction: Factors associated with in-hospital mortality in emergency general surgery (EGS) are underexplored in the developing world. Given the very different health care structures, it is important to uncover modifiable risk factors associated with worse outcomes as these may be very different in areas with disparate resources. This study aims to identify the factors associated with in-hospital mortality for EGS patients using a large patient sample from South Asia.

Methods: Patients aged ≥18 with AAST defined EGS diagnoses admitted to a large tertiary hospital from 2010-2019 were identified. Primary outcome was 30-day in-hospital mortality. Parametric survival regression with Weibull distribution was performed and adjusted hazard ratios were reported for significant factors associated with in-hospital mortality.

Results: We analyzed 31, 297 index admissions with a primary EGS diagnosis. Mean age was 49 years (SD±0.10) and 46 % were female. Mortality was 2.14% and 11% had at least 1 complication. Table 1 shows patient factors associated with in-hospital mortality. For both genders, lack of financial health coverage increased the mortality risk. However, there was a substantial increase in mortality risk for women (HR:2.55 95CI:1.54-4.22) compared to men (HR:1.46 95CI:1.01-2.11).

Patient Characteristics	HR(95 CI)
Charlson Comorbidity Index(CCI) (Referent: CCI 0)	
CCI 1	1.61(1.16-2.22)
CCI 2	2.48(1.77-6.46)
CCI ≥ 3	3.00(2.31-3.91)
Number of complications	1.27(1.18-1.37)
Sepsis (Referent: Without sepis)	2.27(1.73-2.99)
Emergency Admission (Referent: Elective Admissions)	2.10(1.64-2.69)
Age Category (Referent: ≤40)	
41-60	0.86(0.69-1.07)
61-80	1.32(1.07-1.63)
>80	1.61(1.13-2.29)
Males	
With financial health coverage (referent)	
Without financial health coverage	1.46(1.01-2.11)
Females	
With financial health coverage (referent)	
Without financial health coverage	2.55(1.54-4.22)

Table 1 Adjusted risk of mortality in all EGS diagnoses

Conclusion: EGS patients in the developing world have the same clinical risk factors; age, co-morbidities and presence of complications independently worsen survival. Additionally, gender disparities in the setting of reduced health coverage widen differences in survival, which may be explained by a lower priority on health care access and delayed care for women. This important finding will help develop policy towards improving emergency surgery access for women.

Poster #27

PATIENT REPORTED OUTCOMES AND PTSD SYMPTOMS IN EMERGENCY GENERAL SURGERY

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Background: Patient reported outcomes (PRO) are increasingly recognized as an important measure of surgical quality and long-term outcomes. While there are good data available regarding morbidity and mortality for patients undergoing emergency general surgery (EGS) procedures, there are few long-term PRO data. Sudden critical illness and injury are associated with worse health-related quality of life, and symptoms of depression and post-traumatic stress. There has been no evaluation of the incidence of these symptoms in EGS patients, and this study aimed to evaluate PRO and PTSD symptoms in an EGS population.

Methods: Patients who underwent an operation from a predetermined list based on national definitions and were included in quality improvement data from Jan 2020-Jan 2021 were eligible for inclusion. Patients were contacted via phone and asked to participate in an online survey of demographics, socio-economic status, PROMIS® PRO measures for general life satisfaction (GLS), general self-efficacy (GSE), and physical function (PF), and the PCL-5 PTSD symptom screening tool. Descriptive statistics and multiple regression were performed.

Results: 128 patients were eligible for inclusion, 72 (56%) were reached via phone. Of those, 40 (56%) completed the study. Median time between operation and response was 308 (IQR 243-337) days. 48% underwent appendectomy, 25% cholecystectomy, 28% small bowel or colon resection. 13% had a pre-existing stress disorder, none PTSD. Mean PRO scores were 52.5±9.3 for GLS, 48.6±8.0 for GSE and 48.7±9.6 for PF. 12.5% had a low or very low GLS and GSE score, while 32.5% had mild, moderate, or severe PF scores. 7 (17.5%) scored >31 on PCL-5, 3 had a pre-existing stress disorder. Regression analysis found ASA score, emergency case, and lower income were associated with lower GLS scores. Age, BMI, and lower income were associated with lower PF scores.

Conclusions: Following EGS most patients have average PRO, but there are a concerning number with lower scores, and some patients may benefit from mental health services based on PTSD symptoms. There may be groups of patients more at risk for adverse outcomes. We plan to use this data to design prospective studies to evaluate the role that EGS plays in these outcomes, and how they can be improved on.

Poster #28

PERIOPERATIVE MANAGEMENT OF PATIENTS UNDERGOING PARTIAL CHOLECYSTECTOMY: DEFINING ADJUNCTIVE CARE REQUIREMENTS AND A PROPOSED CLINICAL PATHWAY

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Introduction: Laparoscopic subtotal cholecystectomy (SC) is a commonly used technique when faced with severe inflammation, especially when the critical view of safety cannot be reliably obtained. Published experience with SC is limited. We hypothesized that increased multidisciplinary resources are required after SC.

Methods: We conducted a retrospective review of all laparoscopic cholecystectomies between 2017 and 2021 at a large regional referral center. SC cases were identified using a centralized medical record-based tool. Primary outcome was endoscopic retrograde cholangiography (ERC) within 60-days post-operatively. Univariate analysis was performed with student's t-test for continuous variables and chi-square for categorical. Logistic regression was performed to assess odds of reconstituting SC on post-op ERC.

Results: A total of 1325 laparoscopic cholecystectomies were performed by our Emergency General Surgery service between 11/2017 and 11/2021. Of these, 89 (7%) were SC with 2 open conversions. Male ($p<0.001$) and older ($p<0.001$) patients were more likely to undergo SC. There were a significantly higher proportion of ERC required post-operatively in the SC group (42% vs. 7%, $p<0.001$). There was no significant difference in pre-op ERC across groups (16% vs 21% $p=0.19$). A majority (97%) of SCs had a surgical drain left at time of operation. Reconstituting SC had significantly lower odds of post-op ERC (OR 0.19, 95% CI 0.02-0.72 $p=0.015$).

Discussion: We present one of the largest case series published to-date. SC is an accepted surgical technique in difficult cholecystectomy operations with low rates of conversion to open surgery. SC should be performed at institutions with access to advanced procedural adjuncts such as interventional gastroenterology/ERC and interventional radiology, as many cases require perioperative intervention for control of biliary fistula. Absent these adjuncts, reconstituting SC decreases the need for early ERC, but long-term outcomes are unknown.

Poster #29

A NATIONAL EVALUATION OF DYSPHAGIA IN THE GERIATRIC TRAUMA POPULATION

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Introduction: Dysphagia is associated with increased morbidity, mortality, and resource utilization in hospitalized patients. The rate of dysphagia increases with age and may be increased by injuries such as cervical spine fractures and traumatic brain injury. Nationwide, the number of injured geriatric patients is increasing, but studies regarding prevalence and impact of dysphagia in this highly vulnerable population are lacking.

Methods: A retrospective study of patients 65 years and older using National Inpatient Sample (NIS) data from 2016 to 2018 was performed to evaluate the association of dysphagia with in-hospital mortality in trauma patients. Trauma patients were identified based on trauma related diagnosis codes (S or T code). Dysphagia was identified with diagnosis of International Classification Code-10 "R131.x". Survey weighted logistic regression analysis with interaction terms (dysphagia x trauma) was used to obtain the odds ratio for in-hospital mortality adjusting covariates age, sex, race, insurance, hospital size, Charlson Comorbidity Index, and frailty.

Results: A total of 7,814,998 patients age 65 and older were identified including 1,749,814 geriatric trauma patients. Dysphagia was identified in 289,486 (4.77%) non-trauma patients and 93,159 (5.32%) trauma patients. In trauma patients, the prevalence of dysphagia increased with age: 5.32% in those 65-79 years, 6.13% in those 80-90 years, and 7.40% in those over 90 years old. The incidence of dysphagia increased with increasing degree of frailty including: 4.84%with moderate frailty and 13.81% with severe frailty. The adjusted odds ratio of inpatient mortality in non-trauma patients with dysphagia was 1.06 (CI:1.05 – 1.06) and increased to 1.14 (CI:1.12 – 1.15) in trauma patients.

Conclusions: Dysphagia was more commonly seen with increasing age and worsening frailty. Additionally, dysphagia was more common in geriatric trauma patients overall and was associated with higher odds of death in both groups. Further studies are necessary to investigate if dysphagia represents a modifiable risk factor or a direct indicator of worsened outcomes in this population.

	Trauma w/ Dysphagia	Trauma w/o Dysphagia	Total Trauma
N	93,159 (5.32%)	1,656,655 (94.68%)	**1,749,814**
AGE			
65-79yo	46,386 (4.52%)	979,747 (95.48%)	**1,026,113**
80-89yo	32,544 (6.13%)	498,742 (93.87%)	**531,286**
90+yo	14,229 (7.40%)	178,166 (92.60%)	**192,395**
Frailty			
Mild	7,549 (1.56%)	477,628 (98.46%)	**485,117**
Moderate	47,977 (4.84%)	944,089 (95.16%)	**992,066**
High	37,633 (13.81%)	234,938 (86.19%)	**272,571**

Poster #30

ASSOCIATION OF FRAILTY WITH OUTCOMES OF RESECTION FOR COLONIC VOLVULUS: A NATIONAL ANALYSIS

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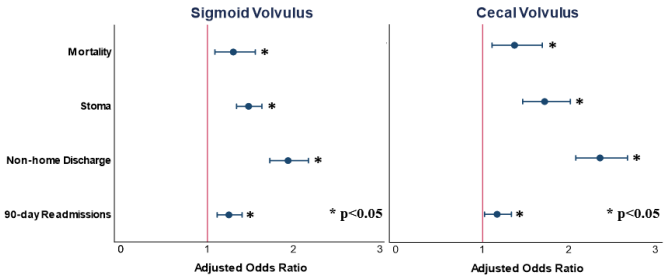
Introduction: With limited national studies available, we characterized the association of frailty with outcomes of surgical resection for colonic volvulus.

Methods: Adults with sigmoid or cecal volvulus undergoing non-elective colectomy were identified in the 2010-'19 Nationwide Readmissions Database. Frailty was identified using the Johns Hopkins indicator which utilizes administrative codes. Multivariable models were developed to examine the association of frailty with in-hospital mortality, stoma use, length of stay (LOS), costs, non-home discharge, and 90-day non-elective readmissions.

Results: Among an estimated 66,766 patients with volvulus (Sigmoid: 30.6%, Cecal: 60.4%) 21.6% were considered frail. Compared to the rest of the group, frail patients were older (76 vs 66 years, p<0.001), less commonly female (46.9% vs 61.5%, p<0.001), and had a greater burden of comorbidities as estimated by the Elixhauser Comorbidity Index (4 vs 2, p<0.001). After adjustment, frailty was independently associated with greater odds of index mortality, stoma use, non-home discharge, and 90-day, non-elective readmissions (Figure). Frailty was also associated with incremental increases in LOS (Sigmoid: +3.0 days, 95% CI 2.5-3.6; Cecal: +3.4 days, 95% CI 2.8-3.9) and hospitalization costs (Sigmoid: +$6.6k, 95% CI 5.0k-8.2k; Cecal: +$10.5k, 95% CI 8.5k-12.5k).

Conclusion: Frailty, measured by using a simplified administrative tool, is associated with significantly worse clinical and financial outcomes following non-elective resections for colonic volvulus. Standard assessment of frailty may aid risk-stratification and better inform shared-decision making.

Figure: Associations of Frailty with Outcomes (ref: non-frail)



Poster #31

DEVELOPING AND VALIDATING AN INDEX FOR MEASURING FRAILTY IN HIP FRACTURE PATIENTS: A NOVEL MODEL FOR PREDICTING SHORT-TERM POSTOPERATIVE MORTALITY

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Introduction: Frailty is common among hip fracture patients and may, in part, contribute to the increased risk of mortality and morbidity following hip fracture surgery. This study aimed to develop a novel frailty index for traumatic hip fracture patients that could be used to predict postoperative mortality as well as facilitate further research into the role of frailty in hip fracture patients.

Methods: The Orthopedic Hip Frailty Index (OFI) was developed using a national dataset, retrieved from the Swedish National Quality Registry for Hip Fractures, that contained all adult patients who underwent surgery for a traumatic hip fracture in Sweden between January 1, 2008, and December 31, 2017. Candidate variables were selected from the Nottingham Hip Fracture Score, Sernbo Score, Charlson Comorbidity Index, 5-factor modified Frailty Index, as well as the Revised Cardiac Risk Index and ranked based on their permutation importance, with the top 5 variables being selected for the index. The OFI was then validated on a local dataset that only included patients from Orebro County, Sweden.

Results: The national dataset consisted of 126,065 patients. 2,365 patients were present in the local dataset. The most important variables for predicting 30-day mortality were congestive heart failure, institutionalization, non-independent functional status, an age ≥85, and a history of malignancy. In the local dataset, the OFI achieved an AUC (95% CI) of 0.77 (0.74-0.80) and 0.76 (0.74-0.78) when predicting 30-day and 90-day postoperative mortality, respectively.

Conclusion: The Orthopedic Hip Frailty Index is a significant predictor of short-term postoperative mortality in hip fracture patients that outperforms, or performs on par with, all other investigated indices.

Poster #32

IDENTIFYING FACTORS AFFECTING CHANGES IN GOALS OF CARE FOLLOWING EMERGENT LAPAROTOMY: A RETROSPECTIVE ANALYSIS

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For patients with surgical emergencies, balancing timely goals of care conversations with acuity of presentation and operative urgency can be challenging. Identifying patients who may benefit from more in-depth pre-operative discussions is critical to providing goal-concordant care and may help some patients avoid surgery at the end-of-life. Failure to do so may lead to changes in goals of care post-operatively. We sought to understand which patient factors are associated with post-operative changes in goals of treatment, including code status. A retrospective analysis was conducted using an institutional database of 484 patients over four years who underwent an exploratory laparotomy within 6 hours of surgical consultation. Demographic and clinical factors were compared between patients who did and did not have a change in treatment goals. Descriptive statistics were computed, and chi square *p*-values were obtained. A total of 66 patients had a post-operative change in goals, either implementing a DNR or transitioning to comfort measures only. Patients who changed code status were more likely to lack pre-operative localization of their abdominal pathology (46.3% vs 28.6%, $p=0.049$), and more likely to have three or more comorbidities (34.3% vs 9.4%, $p<0.001$), including active cancer (36.9% vs 16.8%, $p=0.0002$), neurodegenerative disorder (10.8% vs 4.1%, $p=0.024$), bleeding disorder (6.15% vs 1.29%, $p=0.009$), weight loss > 10% in the past 6 months (7.7% vs 2.3%, $p=0.021$), and malnutrition (15.4% vs 5.7%, $p=0.005$). Finally, patients who were subjectively described as having a “very supportive” social network were more likely to have a change in treatment goals (23.9% vs 13%, $p=0.005$). This analysis demonstrates that individuals with these pre-operative factors could benefit from more in-depth pre-operative discussions to establish values, facilitate limits to post-operative treatment, and potentially avoid surgery altogether. Care should be taken with these patients to ensure operative intervention remains within their goals.

Poster #33

IMPACT OF THE COVID-19 PANDEMIC ON FATAL FALLS IN OLDER ADULTS

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Introduction: Falls are a leading cause of injury and death in older adults (age ≥65). Formal and informal efforts to slow the spread of COVID-19 in the United States (US) led to increased social isolation, decreased physical activity, and hesitancy to seek medical care among many older adults, potentially worsening frailty, leaving elderly individuals particularly vulnerable to falls and fall-related sequelae. We hypothesized that the COVID-19 pandemic led to an increase in fall-related fatalities and that fatalities occurring at medical facilities decreased while fatalities occurring at decedents' homes increased.

Methods: We conducted an interrupted time series analysis using a Poisson regression model on monthly fall fatalities amongst older adults from January 2015 through December 2020. Fall fatality data were extracted from the Centers for Disease Control and Prevention Wide-ranging OnLine Data for Epidemiologic Research (CDC WONDER), along with the estimated annual population of US residents age ≥65. The COVID-19 pandemic, defined as starting in the US in March 2020, was our interruption variable.

Results: There were 192,586 fall fatalities among older adults in the study period, with a mean of 2,614 deaths per month (SD 228.4) pre-pandemic, and 3,051 deaths per month (SD 215.1) post-pandemic onset. Monthly incidence rate of fall fatalities for any place of death increased 4.0% post-pandemic onset (IRR=1.04, 95% CI 1.01, 1.07). Fall fatality incidence rate within a medical facility as place of death did not change (IRR=1.00, 95% CI 0.96, 1.03), while the incidence rate in which death occurred in decedents' homes increased 37% (IRR=1.37, 95% CI 1.30, 1.44).

Conclusion: There was a significant increase in fall-related fatalities among older adults in the United States after onset of the COVID-19 pandemic. Fall-related deaths in the home primarily contributed to this overall increase. The rate of fall fatalities in which death occurred at a medical facility did not change. During times of social distancing increased social supports are needed to prevent and quickly respond to falls among older adults.

Poster #34

PREDICTION MODEL FOR POSTOPERATIVE FUNCTIONAL DECLINE IN THE ELDERLY USING PSOAS MUSCLE AREA

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Introduction: Emergency abdominal surgeries have increasingly been performed in elderly patients worldwide. Accordingly, postoperative functional decline (PFD) has become a public health concern. However, predicting PFD before surgery remains challenging. This study aimed to develop a predictive model for PFD in elderly individuals using the preoperative total psoas muscle area (TPA).

Methods: This retrospective, single-center study included patients aged ≥65 years who underwent emergency abdominal surgery during 2019-2021. TPA was measured using computed tomography (Fig). The TPA (cm^2) was normalized by height to calculate the total psoas index (TPI=TPA/height $[m]^2$). The Barthel index (BI) was used to determine functional evaluation scores. PFD was defined as a ≥5-point decrease in the BI 28 days postoperatively. A simple scoring system was developed to predict PFD using a multivariable logistic regression model.

Results: The data of 270 patients were analyzed. PFD occurred in 78 patients (28.9%). The regression model identified TPI (AOR 7.1; 95% CI 3.5-14.8) as the most significant independent predictor for PFD (age: AOR 5.5, 95% CI 2.6-11.6; albumin: AOR 2.6, 95% CI 1.3-5.1; American Society of Anesthesiologists physical status; AOR 3.8, 95% CI 1.9-7.5). Using these predictors with the cutoff points (table), the area under the curve of the score was 0.856 (the optimal cutoff point was 2.5 [Youden index]). The bootstrap optimism estimate showed a low discrimination (0.001).

Conclusion: This score may be potentially useful to predict PFD in elderly patients who undergo emergency abdominal surgery. Early detection of the condition using this score enables prompt initiation of preventive measures against PFD.

Fig

Table. Diagnostic ability of the scoring system

Cut-off	Specificity	Sensitivity	LR +	LR -	True Positive	True Negative
≧4	0.97	0.27	10.4	0.75	0.81	0.77
≧3	0.83	0.72	4.2	0.34	0.63	0.88
≧2	0.59	0.95	2.3	0.09	0.49	0.97
≧1	0.25	1.00	1.3	0.00	0.35	1.00
0	0.00	1.00	1.0	-	0.29	-

Poster #35

RESTRICTIVE FLUID MANAGEMENT IMPROVES TIME TO AMBULATION FOR GERIATRIC HIP FRACTURES

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Background: Recent studies found restrictive fluid management (RFM) for hemodynamically unstable trauma patients improves outcomes. As geriatric hip fracture patients are not typically hemodynamically unstable, the study objective was to compare outcomes among geriatric hip fracture patients who received RFM to those with standard fluid management (SFM).

Methods: This retrospective propensity matched study at five Level I trauma centers from 1/1/2018-12/21/2018 included geriatric (≥ 65 y/o) hip fractures. Excluded patients had multiple injuries, were managed non-operatively, or received preoperative blood products. Patients were grouped by the fluid volume received preoperatively, or within 24 hours of arrival, whichever came first: 1) SFM was ≥ 150 mL, 2) RFM was < 150 mL. Fluids included normal saline (NS), lactated ringers (LR), dextrose 5% in water (D5W), electrolytes, LR in D5W, potassium chloride (KCl) in NS, KCl in NS and D5W, and medications given in fluid. Outcomes included: postoperative fluid volume, hospital length of stay (LOS), late ambulation (> 1 day), and mortality. Paired Student's t-tests, Wilcoxon paired rank sum test and McNemar's tests were used, $p<0.05$.

Results: There were 523 patients: 209 received RFM, 314 received SFM. After propensity matching on baseline characteristics, there were 266 patients (133/group). The matched patients' characteristics were well balanced, including no difference in time to surgery. They were 67% female, 45% ≥ 85 y/o, and 94% had a ground level fall. The RFM group received a median of 80 mL preoperative fluids and the SFM received 1000 mL, $p<0.001$. The total fluid volume admission to discharge was significantly lower for the RFM group, 3490 vs. 4530 mL, $p<0.001$. The median intraoperative fluid volume was 1000 mL for both groups, $p=0.26$. There was no difference in the median total postoperative fluid volume, 2100 vs 1850 mL, $p=0.13$. LOS was similar for RFM and SFM, 4 days vs 5, $p=0.83$. There was a significantly lower proportion of RFM patients with late ambulation than SFM, 8.3% vs 17.3%, $p=0.04$, mean (SD) time 34.3h (16.7) vs 41.7 (23.8), respectively, $p=0.01$. Mortality and complications, including acute kidney injuries, were similar between groups.

Conclusions: Nil per os orders may impact the results, but RFM led to early ambulation for geriatric hip fractures when compared to SFM.

Poster #36

SECONDARY TRAUMA: A LONGITUDINAL STUDY OF POST-DISCHARGE CAREGIVER BURDEN AMONG INFORMAL CAREGIVERS OF OLDER TRAUMA PATIENTS

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Introduction: Caregiver burden, characterized by psychological distress and physical morbidity, afflicts over 50 million informal caregivers of older adults in the U.S. Risk factors for caregiver burden among caregivers of older trauma patients have not been characterized. We hypothesized that lower caregiver self-efficacy is independently associated with greater caregiver burden.

Methods: Using a repeated cross-sectional design, we conducted telephone interviews with informal caregivers (family or friends who provided unpaid care) of adults ⩾65 years admitted to two level I trauma centers at 4 and 12 weeks post-discharge between December 2019-May 2021. Caregiver burden and self-efficacy were measured using the *Zarit Burden Interview Short Form 12* and *the Revised Scale for Caregiving Self-Efficacy* respectively. Multivariate mixed effect logistic regression tested associations between self-efficacy and caregiver burden.

Results: Among 154 informal caregivers in this study, mean age was 60.6 (SD,13.0) years, most were female (70%) and White (88%). Most caregivers (59%) experienced burden and one third (31%) experienced high burden. Repeated measures showed sustained levels of burden at both time points. Caregivers with lower self-efficacy had significantly greater caregiver burden (odds ratio: 7.79, 95% CI 2.54-23.8, $p < 0.001$).

Conclusion: Most informal caregivers of older trauma patients experience caregiver burden up to 3 months post-discharge. Targeted interventions to increase caregiver self-efficacy may reduce caregiver burden.

Poster #37

THE REVISED CARDIAC RISK INDEX IS ASSOCIATED WITH MORTALITY INDEPENDENT OF INJURY SEVERITY IN ELDERLY PATIENTS WITH ISOLATED THORACIC INJURIES

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Introduction: Thoracic injuries are common among trauma patients. In geriatric patients, who often are frail and burdened with other comorbidities, these injuries could potentially contribute to worse overall outcomes. The Revised Cardiac Risk Index (RCRI) has previously shown to be associated with mortality risk in patients subjected to major surgery or traumatic injury. This investigation aimed to determine the association between the RCRI and in-hospital mortality among geriatric patients who had suffered isolated thoracic injuries.

Methods: All geriatric patients (65 years and older) registered in the TQIP database between 2013 and 2017 who suffered an isolated thoracic injury, defined as a thorax AIS ≥1 with an AIS ≤1 in all other body regions, were included. Patients were excluded if they had a thoracic AIS of 6. The association between different RCRI scores (0,1,2,3, ≥4) and in-hospital mortality was analyzed using a Poisson regression model with robust standard errors while adjusting for potential confounders, with RCRI 0 as the reference.

Results: A total of 77,981 patients met study inclusion criteria. All comorbidities increased in prevalence at higher RCRI scores, except for those related to cancer. After adjustment, an RCRI score ≥2 was significantly associated with elevated risk of mortality. Patients with an RCRI score of 2 had a 60% increased risk of in-hospital mortality compared to those with RCRI 0 ($p < 0.001$). An RCRI score of 3 or ≥4 was associated with an even higher risk of mortality, 216% ($p < 0.001$) and 241% ($p < 0.001$), respectively, as compared to a RCRI score of 0.

Conclusion: An elevated RCRI ≥2 is significantly associated with an increased risk of in-hospital mortality among geriatric patients with isolated thoracic injuries. Patients with an elevated RCRI should be treated as high-risk patients and would most likely benefit from pre-operative cardiac assessment as well as closer postoperative cardiac attention.

Poster #38

VARIATION IN HOSPICE USE AMONG TRAUMA CENTERS MAY IMPACT ANALYSIS OF GERIATRIC TRAUMA OUTCOMES

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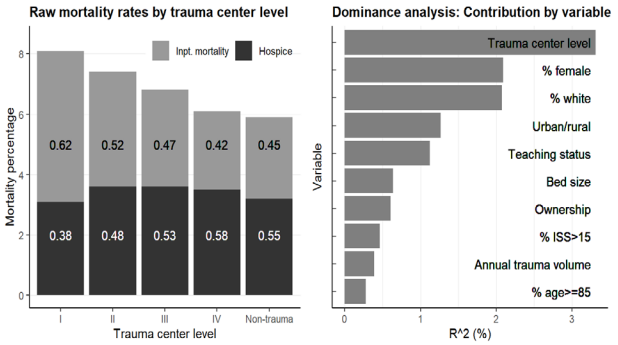
Introduction: Defining patients discharged to hospice as "deaths" has been shown to be vital for proper assessment of trauma center outcomes. This may be even more critical as more geriatric patients are discharged to hospice. The goal of this study was to evaluate differences in hospice use rates between Non-Trauma (NTCs) and Trauma Centers (TCs) and identify variables most affecting hospice use in a representative geriatric cohort.

Methods: Patients from CMS Inpatient Standard Analytical Files for 2017-19 aged ≥65 with ≥1 injury ICD-10 code at hospitals with ≥50 trauma pts/yr were selected. Total Mortality (TM) was defined as inpatient deaths (ID) + hospice discharges (HD). Dominance analysis was used to identify the most important contributors to a multilinear regression model on hospice use rate.

Results: 1.96M hospitalizations (62% female, 90% white, mean ISS 6.6) from 2,317 hospitals (Level I-10%, II-14%, III-18%, IV-7%, NTC-51%) were included. HD as a proportion of TM varied by TC level and was lowest (0.38) at Level I TCs. Dominance analysis showed TC level was the strongest factor explaining HD rate (R^2 = 3.3%) followed by % female (2.1%), % white (2.1%), rural/urban (1.3%), teaching status (1.1%), bed size (0.6%), ownership (0.6%), % ISS>15 (0.5%), trauma volume (0.4%), and %age≥85 (0.3%).



Conclusion: In this near-population based analysis, hospice discharge rates varied significantly among hospital types caring for geriatric trauma and should be included in mortality assessments of hospital outcomes. Level I TCs had lower hospice use rates as a fraction of Total Mortality. As the population ages, accurate assessment of geriatric trauma outcomes becomes more critical. Further studies are needed to evaluate optimal utilization of hospice in end-of-life decision-making for geriatric trauma patients.

Poster #39

ANSWERING THE AGE-OLD QUESTION: SHOULD WE KEEP, OR SHOULD WE TRANSFER OUR SEVERELY INJURED GERIATRIC PATIENTS TO HIGHER LEVELS OF CARE?

Khaled El-Qawaqzeh, MD; Lourdes Castanon, MD, FACS; Omar Obaid, MD; Lynn Gries, MD, FACS; Hamidreza Hosseinpour, MD; Adam Nelson, MD; Collin Stewart, MD; Raul Reina, MD; Tanya Anand, MD, MPH; Bellal A. Joseph, MD, FACS
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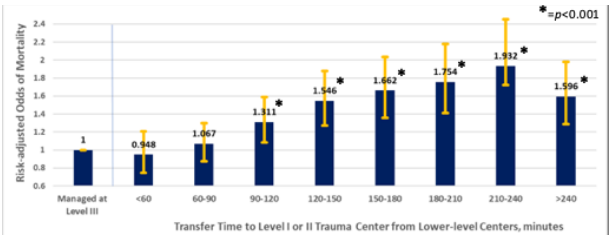
Background: Interfacility transfer to higher levels of care is becoming increasingly common, but drawbacks include potential over-triage, wasteful resource utilization, and poor outcomes from transfer delays. The aim of our study is to evaluate the effect of transfer to higher levels of care and prolonged transfer times on outcomes of severely injured geriatric trauma patients compared to those who are managed definitively at lower-level trauma centers

Methods: Analysis of the 2017-2018 ACS-TQIP. All severely injured (ISS >15) geriatric (≥60 yrs) trauma patients who were managed at an ACS/State Level III trauma center or were transferred to an ACS/State Level I or II trauma center were included. Patients with missing transfer time or ACS/State trauma center verification level information, and those presenting without signs of life were excluded. Outcomes were mortality and withdrawal of care.

Results: 41,135 severely injured patients were identified. Mean age was 76±8 yrs, 54% were male, 97% had blunt injury, and median ISS was 17 [16-21]. For patients transferred to Level I/II trauma centers, median transfer time was 122 [91-164] mins, and transport mode was: ground ambulance (77%); helicopter (22%); fixed-wing (1%). 24-hour and in-hospital mortality were 3% and 10%, and care was withdrawn for 8% of patients. Transfer to higher level of care within 90 minutes was associated with similar risk-adjusted odds of mortality as those managed at Level III centers, but mortality progressively increased with every 30-minute delay in transfer beyond this period (**Figure**). Patients transferred to higher levels of care were more likely to have their care withdrawn than if managed at Level III centers (aOR 8.2, $p<0.001$).

Conclusions: Transfer to higher level of care for geriatric trauma patients may be detrimental compared to definitive management at lower-level centers. Transfer delays longer than 90 mins are independently associated with higher mortality, and such patients are often being transferred only to have their care withdrawn. Transfer decision protocols must be re-evaluated, and if expected transfer time exceeds 90 mins, air transport may be warranted.



Poster #40

DECISIONS, DECISIONS: FUTILITY OF RESUSCITATION MEASURE IDENTIFIES ELDERLY TRAUMA PATIENTS WHO MAY NOT BENEFIT FROM HEROIC MEASURES

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Introduction: Withholding further resuscitation for severely injured geriatric patients with low likelihood of survival is a challenging decision to make, for both caregivers and patient families. There are currently no evidence-based recommendations that can help guide such decisions and reduce potentially inappropriate healthcare resource utilization. The aim of this study is to develop a scoring system that can identify futility of further resuscitation.

Methods: Analysis of the 2017-2018 ACS TQIP. We included all severely injured geriatric patients (≥60 yrs) who received early transfusions (≤4 hrs). We excluded patients who had withdrawal of care. Frailty was defined using the 11-factor modified frailty index (mFI ≥0.27). Patients were stratified into age decades and resuscitative endpoints and interventions employed were identified. Dataset was randomly divided into a derivation cohort (80%) and a validation cohort (20%). Multivariate regression analysis was performed and a regression coefficient-based weighted scoring system for mortality was developed using the Schneeweiss method and subsequently validated.

Results: 5,562 severely injured geriatric trauma patients were identified (4,468 derivation; 1,094 validation). Mean age was 71±8 years, 64% were male, 8% frail, ISS was 25 [18-30], and SBP was 77±33 mm Hg. Eighteen percent underwent emergency laparotomy, 2% ED thoracotomy, 3% REBOA, 1% craniectomy, 3% required early vasopressors, 8% had prehospital cardiac arrest, 13% had an episode of hypotension <50 mm Hg, 22% had severe TBI with GCS≤8, 10% had TBI midline shift, and mortality was 31%. Futility of Resuscitative Measure was developed and validated (AUROC 0.836, p<0.001). On multivariate analysis, FoRM score was associated with mortality in the validation cohort (aOR 1.33, p<0.001).

Conclusion: The FoRM accurately identifies risk of futile resuscitation among geriatric trauma patients where further efforts may not confer additional survival benefit. Our findings inform withdrawal-of-care decision-making between caregivers and patient families. This may improve quality of end-of-life while reducing potentially inappropriate resource utilization.

Futility of Resuscitation Measure	Points
Age 60-70 yrs	0
70-80 yrs	2
>80 yrs	3
Frailty	1
Prehospital Cardiac Arrest	7
≥1 Episode of SBP <50 mm Hg	6
Early Vasopressors (<6 hrs)	2
ED Thoracotomy	9
REBOA	1
PRBC Within 4 hrs ≤5 Units	0
6-10 Units	3
11-15 Units	6
16-20 Units	7
>20 Units	9
Severe TBI and GCS ≤8	7
TBI Midline Shift	1
Craniectomy	1

FoRM Score	Mortality
0-4	10%
5-8	40%
9-12	55%
13-16	79%
17-20	81%
21-24	94%
>24	100%

Poster #41

FALLS ON SAME LEVEL IN PATIENTS WITH PRE-INJURY ANTICOAGULATION USE

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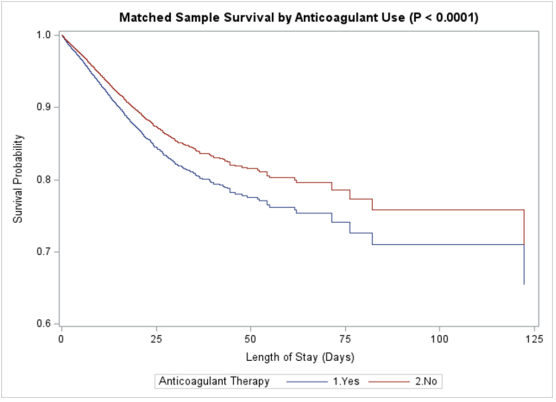
Introduction: Growing evidence has shown that falls on same level (FSL) are a not-so-minor mechanism of injury. FSL are common in the geriatric population who are commonly on anticoagulation (AC) therapy for underlying medical conditions. In this study, we sought to investigate the impact of pre-injury AC on the outcomes after FSL.
Methods: We queried the 2017-2019 TQIP database for patients aged ≥55 years old who sustained FSL. Patients with pre-injury anticoagulation [AC (+)] were propensity-score-matched with those without anticoagulation [AC (–)] to control for possible confounding factors. The outcome measures were mortality, LOS (hospital and ICU), mechanical ventilation, as well as complications.

Results: There were 52,182 patients in each group. The AC (+) patients had a longer hospital and ICU LOS than the AC (–) patients (both $p<0.0001$). The AC (+) patients required more PRBC transfusion within 4 hours of admission (2±62 ml vs 1±39 ml, $p<0.0001$) and more plasma transfusion within 24 hours (60±310 ml vs 45±235ml, $p<0.0001$). The ICU admission rate was higher in the AC (+) than the AC (–) group (33% vs 29%, $p<0.0001$). The complications (MI, pressure ulcer, sepsis, stroke/CVA, VAP) were significantly increased in the AC (+) compared to the AC (–) patients ($p<0.01$). The 24-hour (1.18% vs 0.76%) and in-hospital (4.94% vs 3.64%) mortality was significantly higher in the AC (+) group than the AC (–) group (both $p<0.0001$). The Cox regression model analysis showed a significantly lower survival probability in the AC (+) group than the AC (–) counterpart (HR 1.284, 95% CI 1.206-1.368, $p<0.0001$).



Conclusion: Pre-injury AC use is associated with worse outcomes in patients who sustained FSL. These patients require special attention and care. A prospective trial is warranted to assess whether pre-injury AC use should be incorporated as a criterion for trauma team activation.

Poster #42

GERIATRIC TRAUMA EDUCATION: A NOVEL PROTOCOL FOR ASSESSMENT OF EQUITY AND REACH OF TRADITIONAL DISSEMINATION CHANNELS

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Medical Center of the Rockies

Introduction: The dissemination and implementation of evidence-based practice guidelines is essential for high-quality, up to date care. While effectiveness research abounds in trauma, in-depth analysis of the barriers and facilitators of dissemination are lacking. This methodological approach will elucidate the effectiveness of conventional dissemination channels for a pilot set of evidence-based practices within geriatric trauma care.

Methods: Recorded lecture series on the management of anticoagulation associated traumatic brain injury created by the Geriatrics committee of the American Association for the Surgery of Trauma will be disseminated through parallel channels, including departmental didactics, professional and societal meetings, social media, partner websites, and email campaigns. The target audience will include all United States trauma care providers. Bitly links will be assigned to each source channel (e.g. social media, QR codes at conferences, etc.) so that click volume can be accurately attributed. YouTube analytics will allow us to track video clicks, impressions, view rates and video completion. Both data sources will provide geographic and digital viewer location information. Channels with higher click through rates and video view rates will be identified as more favorable for information dissemination. Further, participants will complete a survey to obtain demographic information, relevant knowledge gained, and to interrogate the participants usual information procurement strategies. Equity of reach with regard to age, race/ethnicity and practice setting will be assessed.

Results: This digital analytics approach, which is novel to professional society medical information dissemination, allows for assessment of dissemination channels as well as granular assessment of the knowledge acquisition process, from initial engagement, to consumption of material, to internalization and endorsement of adoption of that material.

Conclusion: This protocol can help researchers and professional societies understand how to modify efforts to improve the effectiveness and equity of information dissemination in the trauma community.

Poster #43

RISK FOR PEDESTRIAN INJURY: OPPORTUNITY FOR INJURY PREVENTION IN GERIATRICS AND SUBSTANCE ABUSE

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Background: Many individuals utilize walking as their main method of transportation. In 2019, 6,205 pedestrians were killed and 181,599 pedestrians were treated in emergency departments for non-fatal incidents in the US. These large numbers of fatalities and injuries of pedestrians struck, along with their uptrend in recent years, make this an important topic to study. Our goal is to identify risk factors and trends within the pedestrian struck population, which may provide insight into areas of opportunity for intervention and risk reduction in this population.

Methods: The trauma registry at a level 1, urban trauma center was queried for all pedestrian struck patients 1/2017-10/2021. Demographic factors and health based risk factors were collected, including alcohol intoxication, history of mental health problems, and BMI. Hospital outcomes were identified. Patients were divided into children (<14 yrs), adults (14-64), and geriatric (65+). Regression analysis and T tests identified differences in risk factors and outcome between groups, $p<0.05$ significant.

Results: 2,180 patients were identified for inclusion, 180 pediatric, 1767 adult and 233 geriatric. There was a bimodal distribution of age, with peaks at 29 and 57 years. Average ISS was significantly higher in geriatric patients (11.2) than adult patients (8.38) and children (5.875). Overall mortality is 4.4%, but was significantly higher in the geriatric patients (11.3%) than adult (3.9%) or pediatric (0.6%) populations, and is directly correlated with increasing age. 18.3% of all patients, including 9.4% of geriatric patients, were intoxicated with alcohol at the time of injury. Mental health disorders was associated with higher ISS (8.97, 8.44), but no increased risk of death or hospital LOS. BMI was not associated with increased mortality, ISS or hospital LOS.

Discussion: Pedestrian injury prevention programs often focus teaching on safe pedestrian habits to children, however, geriatric patients suffer higher injury burden and mortality than their younger counterparts. Opportunities exist to develop injury prevention programming specific to the geriatric population to address pedestrian safety, and to continue to reinforce the relationship of alcohol use to injury.

Poster #44

THE EPIDEMIOLOGY OF INJURIES IN OLDER ADULTS: IMPLICATIONS FOR THE US TRAUMA SYSTEM

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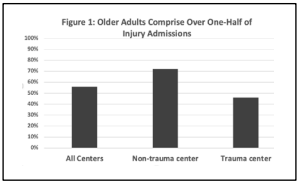
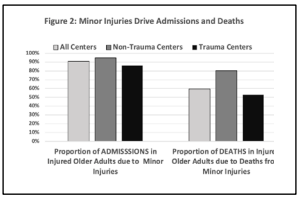
Stanford School of Medicine

Introduction: Older adults are growing segment of the injured population and are known to have worse outcomes. The scope of this challenge in the U.S. has not been fully characterized despite being often quoted. We sought to define the burden of injuries in older adults in both trauma (TC) and non-trauma (non-TC) centers in the U.S. We hypothesized that high proportions of older adults are admitted to non-TCs and that older adults with even minor injuries would have high rates of mortality.

Methods: We analyzed the Nationwide Emergency Department Sample 2018-2019 to evaluate all visits to U.S. emergency departments (EDs). We included all patients seen with a primary diagnosis of injury (ICD-10-CM) and excluded those with missing age. Older adult was defined as age 65 or older. Injury severity scores (ISS) were derived using the ICDP-R program. Unadjusted and adjusted analyses were performed. Weighted numbers are presented.

Results: A total of 34,957,005 injured adults were included in our study. Older adults comprised 19% (n=6,608,874) of ED visits but accounted for 55% of inpatient admissions. Admissions for older adults were divided almost evenly between TCs and non-TCs (48% vs. 52%, respectively). At non-TCs, a large proportion of adults admitted for injury were 65 or older (72%, Figure 1), and for TCs it was almost one half (46%, Figure 1). Most admitted older adults had minor injuries (ISS<15 in 80% for TCs; 95% for non-TCs; Figure 2). However, most inpatient deaths occurred in those with minor injuries. In non-TCs, 80% of deaths were for those with an ISS<15, compared to 53% for TCs (p<0.001).





Conclusion: The largest opportunity to improve outcomes for injured older adults is among those with minor injuries, given this is where the bulk of admissions and mortality occurs. As these patients are evenly distributed throughout U.S. hospitals, quality improvement efforts will need to consider novel models of trauma system care that extend beyond the walls of trauma centers.

Poster #45

THE FINAL DECISION AMONG THE INJURED ELDERLY, TO STOP OR TO CONTINUE? A NATIONWIDE STUDY OF PREDICTORS FOR WITHDRAWAL OF CARE

Khaled El-Qawaqzeh, MD; Adam Nelson, MD; Raul Reina, MD; Collin Stewart, MD; Hamidreza Hosseinpour, MD; Michael Ditillo, DO, FACS; Lynn Gries, MD, FACS; Omar Obaid, MD; Tanya Anand, MD, MPH; Bellal A. Joseph, MD, FACS
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Background: End of life decision practices have been described before, with more severe injuries & racial disparities playing an important role. However, there is paucity of data on these practices among elderly patients & the possible influence of frailty. We aimed to identify predictors of withdrawal of care among elderly patients & evaluate the role of frailty.

Methods: We analyzed the ACS-TQIP (2017–2019) including all severely injured trauma patients ≥65y. Patients were stratified into Frail & Non-Frail using the 11-factor modified Frailty Index (mFI). Outcome measures were withdrawal of care rates & time to withdrawal of care. Multivariable logistic regression was performed to identify independent predictors of withdrawal of care, adjusting for patient demographics, injury parameters & mechanism, admission vitals, severe TBI, & ACS trauma center verification level.

Results: 155,583 severely injured elderly trauma patients (Frail, 29,061; Non-frail, 126,792) were included. Mean age was 77+7 years, 55% were male, 43.5% sustained blunt injury, & the median ISS was 17 [16-25]. Overall withdrawal of care rate was 10.8%. On univariate analysis, Frail group had higher rates of withdrawal of care (11.9% vs 10.5%; p<0.001) & longer time to withdrawal of care (3 days [1-8] vs 2 days [1-7]; p<0.001). On multivariate logistic regression, increasing age, male sex, white race, frailty, penetrating injury, severe TBI, & management at an ACS Level I trauma center were independently associated with higher odds of withdrawal of care (**Table**).

Conclusion: Our results suggest that one in ten severely injured elderly trauma patients undergo withdrawal of care. Severe TBI, older age, & frailty were patient-related factors, while management at an ACS Level I trauma center was a system-related factor associated with higher odds of withdrawal of care. Further research is needed to clarify the reasons behind withdrawal to identify patterns that may help lead to standardization of practice of withdrawal of care.

Table. Independent Predictors of Withdrawal of Care	aOR	95% CI	*p*-value
Age	1.03	1.02 – 1.03	**<0.001**
Male	1.4	1.4 – 1.5	**<0.001**
White	1.2	1.1 – 1.2	**<0.001**
Severe TBI	2.2	2 – 2.3	**<0.001**
Frailty	1.07	1.02 – 1.1	**<0.001**
Blunt	0.8	0.8 – 0.9	**<0.001**
Penetrating	2.8	2.5 – 3.1	**<0.001**
ACS Trauma Center Level I	1.6	1.5 – 1.6	**<0.001**
ACS Trauma Center Level II	1.3	1.3 – 1.4	**<0.001**
ACS Trauma Center Level III	0.2	0.1 – 0.2	**<0.001**

Poster #46

AMONG GERIATRIC TRAUMA PATIENTS, NON-DIABETIC HYPERGLYCEMIA IS AN INDEPENDENT PREDICTOR OF DEATH WHILE DIABETIC HYPERGLYCEMIA IS NOT

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Introduction: Geriatric trauma patients have increased mortality compared to younger patients. Non-Diabetic (stress induced) hyperglycemia is associated with mortality in trauma patients; however, this has not been studied in geriatric patients. We sought to evaluate the association of non-diabetic hyperglycemia with mortality in geriatric trauma patients and compare it to the association of diabetic hyperglycemia with mortality in geriatric trauma patients.

Methods: A retrospective review of geriatric trauma patients who were admitted to our level 1 trauma center from January 2018 to December 2021. IRB approval was obtained, and data collected from the trauma database included vital signs, demographics, injury characteristics, laboratory data and mortality. Emergency Department blood glucose level of >120 mg/dl was considered as hyperglycemia.
Multivariable logistic regression analysis was performed for the association of hyperglycemia and mortality among non-Diabetic (stress-induced) and Diabetic patient, controlling for age-group, pre-existing co-morbidities, injury severity (ISS) and low systolic blood pressure in the emergency department (shock).

Results: 5817 geriatric (age >65) trauma patients were admitted to our level 1 trauma center during the study period. This included 1419 diabetic and 4398 non-diabetic patients. The incidence of hyperglycemia among non-diabetics was 43.9% while among diabetics it was 77.6%. Among those with diabetes, the mean age was 79.2±8 years, median ISS was 5 (4, 9), and median length of stay (LOS) was 5 (3, 8) days. Among those without diabetes, the mean age was 81.5±9 years, median ISS 5 (2, 9), and median length of stay (LOS) 4 (2, 7) days. There were 125 deaths.

Non-Diabetic hyperglycemia was an independent predictor of death (OR 1.54, 95% CI 1.06 to 2.26). Age-group (75-85 vs 65-75: OR 2.5 95% CI: 1.5 to 4.3; 85+ vs 65-75: OR 4.2, 95% CI 2.3 to 7.2), SBP <90mmHg (OR 4.8, 95% CI 2.39 to 9.64), having more than 1 co-morbidity (OR 2.44, 95% CI 1.71 to 3.48) and Injury Severity Score "ISS" (OR 1.11, 95% CI 1.09-1.14) were also independently predictive of death on multivariable logistic regression analysis. Diabetic hyperglycemia was not associated with mortality (OR 0.78, 95% CI 0.40-1.52).

Conclusion: Hyperglycemia is an independent predictor of mortality among non-diabetic geriatric trauma patients, but not among diabetic patients.

Poster #47

DISPARITIES IN RATES OF HOSPITALIZATION AMONG PATIENTS WITH MINOR FIREARM INJURIES

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American College of Surgeons

Introduction: Firearm injuries have an immediate and significant impact on patients, with fears related to personal safety and injury sequelae. Discretionary use of hospital admission might be used to mitigate these fears. We postulated that there might be disparities in access to hospital admission, which might further disadvantage vulnerable populations.

Methods: Admission rates after minor (AIS<3) isolated extremity firearm injuries were evaluated. Vulnerable populations were defined as either racialized or underinsured patients.
The cohort was identified using the Statewide Inpatient Database (SID) linked to State Emergency Department Database over 2016-2017 from four states and hospital characteristics were determined from the AHA database. Patients were defined as having an inpatient admission if there was an associated SID record with their encounter. We evaluated the association between admission status and patient and facility characteristics using a hierarchical multivariable logistic model.

	Odds Ratio (95th CL)
Insurance Status	
Private Insurance	Ref
Medicare	0.83 (0.57, 1.20)
Medicaid	1.04 (0.87, 1.25)
Self-Pay/No-Charge	0.63 (0.52, 0.76)
Gender	
Female	0.81 (0.66, 0.98)
Race	
NH White	Ref
NH Black	0.84 (0.70, 1.01)
Hispanic	0.94 (0.73, 1.21)
Asian/Pacific Islander	1.14 (0.47, 2.82)
Trauma Center Status	
Non-Trauma Center	Ref
Level 1	1.17 (0.78,1.74)
Level 2	1.32 (0.94, 1.84)
Level 3/4	1.23 (0.77, 1.98)

Results: There were 7,428 ED encounters over 2016-17 and 1,741 (23%) patients were admitted. 19.0% of self-pay patients were admitted, compared to 25.4% of other insurance types, ($p<0.001$). On multivariate analyses, female gender, self-pay insurance status and unintentional injury were negatively associated with admission. Black race was associated with 16% lower odds of admission, but this did not meet statistical significance (Table 1).

Discussion: Where hospital admission might be discretionary, vulnerable populations might be further disadvantaged. This effect was not mitigated by trauma center status. Centers should strive to ensure equitable access to social supports to reduce the personal burden of firearm injuries.

Poster #48

LONG-TERM PATIENT-REPORTED OUTCOMES FOR INJURED WOMEN

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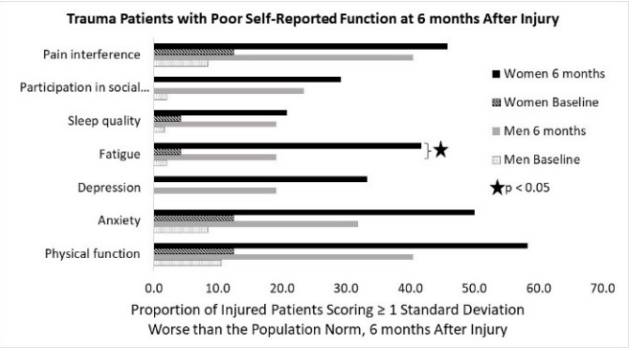
Introduction: One in 3 seriously injured patients treated in U.S. trauma centers is a woman, but gender-specific physical, mental, and social functioning is not established after injury. We compared patient-reported outcomes (PROs) for women and men with the hypothesis that women would have better outcomes at 6 months after injury.

Methods: Trauma patients admitted to an urban Level I trauma center from October 2020 to December 2021 were included. PROs were collected at enrollment (questions referred to pre-injury state) and 6 months using the PROMIS-29 and primary care PTSD screen. PROMIS-29 scores were converted to t-scores to compare outcomes to population norms, and proportions scoring ≥ 1 standard deviation worse than the norm are reported.

Results: Of 376 participants enrolled for > 6m, 71 (18.9%) completed 6-m surveys, including 24 women (33.8%). Compared to men, injured women were older, (median age 47 vs.35, p=0.08), more often bluntly injured (96% vs. 66%, p=0.005), and less often taken to the OR (13% vs. 26%, p=0.20). Median ISS was 9 for women and 10 for men. PTSD rates were equivalent: 4% at baseline and 17% at 6 months for both women and men. PROMIS-29 scores are in the figure.



Conclusion: At 6 months after injury, women and men had high rates of poor physical, mental, and social health. Women fared worse than men in all areas, with a significant difference in fatigue that was not explained by pre-injury differences. Interventions to promote holistic recovery after trauma should attend to the distinctive needs and experiences of injured women.

Poster #49

NATIONAL ANALYSIS OF THE ASSOCIATION WTH RACE AND VENOUS THROMBOEMBOLISM AFTER TRAUMATIC INJURY

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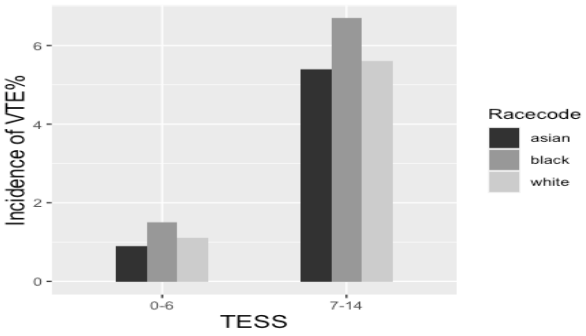
Introduction: Pharmacologic prophylaxis such as heparin and LMWH are recommended for moderate to high venous thromboembolism (VTE) risk patients. However, there is limited data available on the intersection of race and baseline VTE risk profiles. We sought to examine the association of race and VTE rates from a large national trauma dataset.

Methods: The TQIP database (2013-18) was queried for all adult trauma admissions and stratified by injury type and severity. The Trauma Embolic Scoring System (TESS) was used to assess VTE risk. Race was categorized as Black, white, or Asian, and VTE risk was categorized as low (0-6) or moderate to high (7-14) by TESS. Univariate and multivariate models were developed to characterize the association of race and VTE.

Results: There were 477,818 patients in the low-risk group and 231,151 high risk. The unadjusted incidence of VTE for Black race was more than white and Asian patients in the low risk (Black:1.5%; white:1.1%; Asian:0.8%, $p<0.01$) and in moderate/high risk groups (Black:6.7%; white:5.6%; Asian:5.3%, $p<0.01$). After adjusting for gender, comorbidities, obesity, TESS, VTE prophylaxis medication, and injury mechanism, Black race was associated with significantly increased VTE rates in both low and moderate/high risk groups (Figure). Asian race was associated with the lowest incidence and risk of VTE in all risk groups, but remained higher than that reported in non-U.S. Asian populations.

Conclusions: Post-traumatic VTE risk and rates vary significantly between self-reported race categories, and race is an independent risk factor for VTE even after adjustment for injury severity and other risk factors.



Poster #50

PATIENTS LOST-TO-FOLLOW-UP AFTER INJURY: WHO ARE THEY AND WHAT ARE THEIR LONG-TERM OUTCOMES?

Jack Ruske, BS; Manuel Castillo Angeles, MD, MPH; Taylor Lamarre, BA; Ali Salim, MD; Kendall Jenkins, MS, BS; Benjamin Rembetski, BS; Haytham Kaafarani, MD, MPH; Juan Herrera Escobar, MD, MPH; Sabrina Sanchez, MD, MPH
Boston Medical Center

Background: Trauma patients are at a high risk for loss to follow up (LTFU) after hospital discharge. In this study, we sought to identify risk factors for LTFU and investigate associations between being LTFU and long-term health outcomes in the trauma population.

Methods: Trauma patients with an Injury Severity Score ≥9 admitted to three Level-1 trauma centers between 2015 and 2020 and discharged home were surveyed via telephone six months after injury to evaluate health care utilization and functional, physical, and mental health outcomes. LTFU was defined as no outpatient health care contact of any kind after discharge and evaluated based on patient report during research specific phone surveys. Univariate analysis was used to identify factors associated with LTFU. Multivariate models were utilized to assess whether being LTFU was independently associated with several long-term outcomes, including new functional limitations, health-related quality of life, anxiety, depression, PTSD, injury related readmission, and injury related ED visits.

Results: 1692 patients were analyzed, of which 24% were LTFU. Patients LTFU were more likely to be male (71% vs 61%, p=.001), black (22% vs 14%, p=.003), have high school or lower education (50% vs 42%, p=.003), have public insurance (23% vs 13%, p<.001), have a penetrating injury (13% vs 8%, p=.006), have a shorter length of stay (days) (3.64 ± 4.09 vs 5.06 ± 5.99, p<.001), and be discharged home without assistance (79% vs 50%, p<.001). In multivariate analyses, compared to LTFU patients, followed up patients were more likely to require assistance at home (6% vs. 11%; OR 2.23, 1.26-3.92, p=0.005), have new functional limitations for activities of daily living (11% vs. 26%; OR 2.91, 1.97-4.31, p=<0.001), have daily pain (30% vs. 48%; OR 2.11, 1.54-2.88, p=<0.001), and have more injury related ED visits (7% vs. 10%; OR 1.93, 1.15-3.22, p=0.012); there was no difference in mental health outcomes or injury-related readmissions.

Conclusion: Vulnerable populations are more likely to be LTFU after injury. Although LTFU was not associated with worse long-term health outcomes, outcomes such as daily pain rate were still high in the LTFU cohort. Improvement in follow-up rates could help address potential racial and socioeconomic disparities in long-term health outcomes after injury.

Poster #51

RACIAL DISPARITIES IN ADMINISTRATION OF VTE PROPHYLAXIS AND VENOUS THROMBOEMBOLIC EVENTS: A TQIP ANALYSIS

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George Washington University

Introduction: Race has been shown to be associated with worse outcomes in trauma patients with Black patients being more likely to be diagnosed with pulmonary embolism. Disparities in the use of venothromboembolism (VTE) prophylaxis have not been elucidated. We aim to determine if racial disparities exist in the administration of VTE prophylaxis in trauma patients.

Methods: We queried the Trauma Quality Improvement Project database from 2017-2019. Patients ages ≥16 with ISS ≥15 were included. Patients with no signs of life on arrival, AIS ≥6, LOS<1, anticoagulant use before admission, or without recorded race were excluded. Patients were grouped by race: White, Black, Asian, Native American, and Pacific Islander. Variables included demographics, comorbidities and hospital interventions. Primary outcome was the probability of VTE prophylaxis use. A Poisson regression model was used to determine incidence rate ratio for VTE prophylaxis administration.

Results: A total of 285,341 patients were included. Black patients had the highest rates of VTE prophylaxis (73.8%), shortest time to administration (1.6 days) and highest use of low molecular weight heparin (56%). Black patients also had the highest incidence of deep vein thrombosis (2.8%) and pulmonary embolism (1.4%). On regression modeling, Black patients were 5% more likely to receive VTE prophylaxis than White patients [adj. IRR (95% CI):1.05 (1.04-1.06), p<0.001]. Native Americans were 7% less likely to receive VTE prophylaxis [adj. IRR [95% CI]:0.93 (0.89-0.97), p=0.002] than White patients. No differences between White and Asian/Pacific Islander patients existed.

Conclusion: While Black patients had the highest incidence of DVT and PE, they had higher administration and earlier initiation of VTE prophylaxis. Further work can elucidate modifiable causes of these differences.

Poster #52

RACIAL VARIATION IN EMERGENT SURGICAL CARE AND OUTCOMES DURING THE COVID-19 PANDEMIC: POST-HOC ANALYSIS OF AN EAST MCT

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Objective: The COVID-19 pandemic highlighted concerns regarding the equity of medical care across races and ethnicities. We sought to evaluate associations between race, timing of hospital presentation and outcomes of acute appendicitis (AP) and acute cholecystitis (AC) during the initial pandemic peak.

Methods: Post-hoc analysis was performed on a prospective, observational, multicenter study of adults with confirmed or suspected AP or AC. Patients were categorized as admitted pre-pandemic (pre-CoV: October 2019-January 2020), or during the first pandemic peak (CoV: April 2020 through 4 months following the end of local pandemic restrictions). Data including American Association for the Surgery of Trauma (AAST) imaging and pathology grades, duration of symptoms before hospital triage, time from triage to initial intervention and hospital length of stay (LOS) were collected. Student's *t* test and ANOVA were performed to assess differences between races during pre-CoV and CoV. Logistic regression was used to estimate the odds of postoperative complications.

Results: A total of 2,165 patients were included from 19 participating centers. For AC, there was no significant difference in symptom duration prior to hospital triage for CoV versus pre-CoV (42.7 vs 49.6 hours, $P=0.19$). For AP, there was a significant decrease in time to presentation during CoV (52.8 vs 39.9 hours, $P<0.01$). Compared to pre-CoV, time from triage to intervention significantly increased for all AC patients during CoV (34.4 vs 43.3 hours, $P<0.05$) but not AP (28.1 vs 23.8 hours, $P=0.70$). When stratified by race, Asian patients with AC had a significantly longer duration of symptoms prior to presentation during CoV than pre-CoV (100.6 vs 37.5 hours, $P<0.01$) and presented later than Black (100.6 vs 34.3 hours, $P<0.01$) and White (100.6 vs 37.9 hours, $p<0.01$) patients, but there was no difference in time from triage to intervention or hospital length of stay. During CoV, Asian patients presented with higher AAST pathology grade for both AP (1.58 vs 1.90, $P<0.01$) and AC (1.45 vs 2.57, $P<0.01$). Postoperative complications did not differ between groups.

Conclusion: Asian patients had a longer duration of symptoms before presentation during the initial COVID-19 peak and presented with more advanced pathologic disease. Further research is needed to understand the reasons for delayed presentation in this group.

Poster #53

SOCIAL AND RACIAL DISPARITY IMPACTS VICTIMS OF PHYSICAL ABUSE AMONGST TRAUMA PATIENTS IN THE UNITED STATES

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Introduction: Violence in the form of physical abuse is an underreported crime and a significant social problem in the United States. The aim of our study was to assess the prevalence of reported physical abuse among trauma patients, and to identify the predictors of investigation and change in caregiver upon discharge.

Methods: A 3-year (2017-2019) retrospective analysis of the TQIP databank was performed. Trauma patients who had reported physical abuse were identified; Patients were stratified by age into 3 groups: pediatric (<18 years), adults (18-65 years), and geriatric patients (>65 years). We performed multivariate logistic regression analysis to examine the effects of age, sex, race, ethnicity, and insurance status upon the likelihood of initiating an investigation and caregiver change at discharge.

Results: A total of 26,043 patients were included of which 44.1% were pediatric, 49.9% were adults and 6% were geriatric. Among different age groups reported physical abuse were higher in American Indians, Blacks, Pacific Islanders, Asians, and Whites respectively. Black race (OR = 2.55, 95% CI [1.94 – 3.35]) had strongest predictor of initiating an investigation, where Elderly age and Sex did not show a significant predictive value. Black race (OR = 1.52, 95% CI [1.17 – 1.98]) and geriatric age group were more likely to be discharged to different caregiver whereas patients of Hispanic ethnicity with reported physical abuse (OR = 0.80, 95% CI [0.72 – 0.88]) were less likely to have a change of caregiver at the time of discharge. Insurance status was also a predictor of initiating an investigation (OR = 1.1, 95% CI [1.02 – 1.21]) as well as change in caregiver (OR = 1.2, 95% CI [1.16 – 1.35]).

Conclusion: Among trauma patients, racial disparity exists in reporting, investigating, and changing of the caregiver in cases with reported physical abuse. Further studies are warranted to identify possible underlying causes of disparities in reporting, investigation, and intervention for victims of abuse.

Poster #54

THE EXCLUSIVITY OF RACE AND ETHNICITY IN HISPANIC TRAUMA PATIENTS

Stephanie De Mel, BS; Scott Kivitz, MS; Melanie Orr, BS; Alexander Morris, BS
Nanette Talty, RN; Jennifer Feliciano; Dana Schulz, BS; Taner Celebi, BS; Sonia Amanat, BS; Hannah Lynch, BS; Stephen DiRusso, MD, PhD
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Introduction: Historically, Hispanic populations in trauma have not been appropriately characterized based on the exclusivity of ethnicity and race schema. We examined differences in trauma outcomes between combinations of race and Hispanic ethnicity.

Methods: Retrospective analysis of urban Level-II ACS Trauma Center registry (2010-2019) of 3,253 of 5,829 patients after exclusion for missing demographics and discharge disposition. Race and ethnicity were combined (Race+Eth) and grouped into: Black Non-Hispanic (BNH), Black Hispanic (BH), Other Non-Hispanic (ONH), Other Hispanic (OH), White Hispanic (WH), and White Non-Hispanic (NH). Discharge disposition was grouped into: Discharged home (no support), home with support, rehab or other medical care facility, another hospital, died, and left against medical advice (AMA). Discharge outcomes were compared using logistic regression (LR). Odds ratios (ORs) were calculated for significant variables ($p<0.05$). WNH was used as the reference variable for all other Race+Eth. Model discrimination was assessed using the Area under the Receiver Operator Curve (AuROC).

Results: LR AuROC was 0.935. OH were less likely than WNH to be discharged home with increased support (OR; 95%CI (0.67, 0.52-0.86)), to be discharged to an increased medical care facility or rehab facility (OR; 95%CI (0.58, 0.42-0.79)), to be discharged to another hospital (OR; 95%CI (0.60, 0.37-0.97)), and to leave AMA (OR; 95%CI (0.60, 0.41-0.89)). No significant differences were found in the discharge disposition or mortality rates when comparing both ONH and WH to WNH.

Conclusions: Trauma outcomes research is incorrectly using the label "Hispanic" as a racial differentiator even though the term reflects an ethnicity that is separate from race. Our study found that the discharge outcomes in Hispanic trauma patients differ based on their perceived race. Those Hispanics who identify racially as "Other" rather than "White" or "Black" are disproportionately negatively impacted. More research into these labels is required to enhance our understanding of trauma outcomes in minority patients.

Poster #55

UNRECOGNIZED BURDEN OF TRAUMATIC INJURIES RELATED TO HOUSING INSECURITY: A PATIENT LEVEL SOCIAL DETERMINANTS OF HEALTH STUDY

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Intro: Social determinants of health (SDOH) are recognized modifiers of patient outcomes in large epidemiologic studies using community level rather than patient level data to assign social risk factors (SRF). Using patient level data, the goal of this study was to analyze the correlation between the SRF, traumatic injuries and outcomes.

Methods: Patient demographics, social work interview data and trauma admission data were combined for the years 2019-2020 at a large urban academic level 1 trauma center. The SRFs identified included housing insecurity (HI), alcohol use, financial security, food vulnerability, employment, insurance, and education level. Correlations between the SRFs, injuries and outcomes were obtained via non-parametric ANOVA analysis and chi-sq where appropriate. Multivariable negative binomial and logistic regressions with backward selection were used to analyze outcomes.

Results: Of 1058 patients, 904 had complete social work evaluations. After controlling for age, ISS, mechanism of injury (MOI), and SRFs, the SRF were not predictive of mortality, discharge location, in hospital falls, delirium, or pneumonia. The one exception was food insecurity being associated with acute respiratory failure (OR 19.17 CI[1.34-274.04]). Length of stay was associated with injury severity score (ISS)($p<0.001$), graduate education ($p=.039$), alcohol use disorder ($p=.0084$), disability ($p=.0122$), and inversely with falls from height ($p.018$) or standing ($p=.012$) compared to motor crashes. Odds of readmission increased with financial insecurity (OR 5.60 CI[1.34-23.38]) . Interpersonal violence was common among those with HI (50.0%, $p<0.001$), and the unemployed (21.27%, $p<0.001$) (Table 1). Insurance provider was also strongly associated with MOI, including 78.25% presenting after fall from standing were on Medicare and 76.09% of assaults were on Medicaid.

Conclusion: Utilizing patient level determination of modifiable determinants of health in trauma patients, SRFs did not affect outcomes in traumatic injuries however there were strong relationships between SRFs, readmissions and mechanism of injury. MOI may identify a population of patients that would benefit from thorough screening for SRFs.

Poster #56

GENDER DISTRIBUTION OF FIRST AND SENIOR AUTHORSHIP ACROSS MOST CITED STUDIES WITHIN THE TOP TEN SURGICAL JOURNALS FROM 2015-2020: CEMENTING WOMEN ACADEMIC SURGERY REPRESENTATION

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Orlando Regional Medical Center

Introduction: The aim of this study is to investigate the gender distribution of first and senior authors in the most highly cited original research studies published in the top 10 surgical journals from 2015-2020 in order to identify disparities and changes over time.

Methods: A retrospective study analyzing the gender distribution of first and senior authors in the top 10 most cited studies from the top 10 surgical journals from 2015-2020. The genders of the first and senior authors of each study were assessed using National Provider Identifier (NPI) numbers or pronouns from institutional biographies or news articles.

Results: The genders of 1200 first and senior authors from 600 original research studies were assessed. First author gender distribution consisted of 71.8% men, 22.3% women, 0% non-binary, and 5.8% unknown. Senior author gender distribution was 82.3% men, 14.3% women, 0% non-binary, and 3.3% unknown. Studies published by first authors that are women received more citations than those published by first authors that are men in 2015 (169.1 vs 112.9, p=0.002) and 2016 (144.2 vs 101.5, p=0.011). There was an increase in first authorship among men from 2015 to 2020 (p=0.035).

Conclusion: Men represent a significantly higher proportion of both first and senior authorships in top surgical research and the gap has widened from 2015 to 2020. However, studies written by women first authors received significantly more citations than those written by men.

Poster #57

A MULTICENTER TRIAL OF ACCESS TO REHABILITATIVE CARE FOR ADOLESCENT PATIENTS WITH NEUROTRAUMA

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Rady Children's Hospital San Diego

Introduction: Access to rehabilitative care after neurotrauma may be influenced by many factors, which remain poorly-defined and may be inequitably distributed. Pediatric patients often receive different care (e.g., imaging, operative management) when treated in adult (ATCs) versus pediatric trauma centers (PTCs). Adolescents behave like young adults in terms of risk-taking, but emotional/cognitive immaturity can increase vulnerability to long-term sequelae of brain injury and can complicate physical recovery, return to school, etc. Consequently, neurotrauma rehabilitation vital for optimal recovery likely requires a different balance of physical and emotional support in adolescents versus adults. We hypothesized that the neurorehabilitative care of adolescent trauma patients differs when treated at ATC versus PTC.

Methods: Retrospective review of data from 2 ATCs and 1 PTC in a single trauma system, in which patients age <15 are triaged to the PTC and age ≥15 to ATCs. Data were obtained for all adolescents (age 13-19) with moderate/severe injuries admitted from 2013-2020. Demographics and outcomes were obtained from trauma registries, and individual chart review was performed to record details on rehabilitative care. Statistical analysis used Student's t-test.

Results: 345 ATC and 165 PTC patients were included, of whom 302 (60%) had traumatic brain injury (TBI). PTC had 41% moderate/severe TBI, vs 30% in ATCs (p=0.07). Aside from age (14 vs 17, p<0.01), demographics including insurance status were not different between ATCs and PTCs. In the ATCs, 53% had injuries related to violence, compared with 1.8% of those in PTC. There were significant differences between PTC and ATCs in rehabilitative care including discharge to inpatient rehabilitation (Table).

Mild TBI	ATC (n=137)	PTC (n=62)	p-value
Neurorehab Physician Consultation	4 (3%)	25 (40%)	<0.001
Physical Therapy for Neurologic Concerns	26 (19%)	31 (50%)	<0.001
Speech Therapy for Cognitive Evaluation	7 (5%)	14 (23%)	<0.001
Outpatient Rehab Recommendation/Referral	18 (13%)	52 (84%)	<0.001
Moderate/Severe TBI	**ATC (n=60)**	**PTC (n=43)**	**p-value**
Discharge to Inpatient Rehab	20 (33%)	23 (53%)	0.03
Neurorehab Physician Consultation	9 (15%)	32 (74%)	<0.001
Physical Therapy for Neurologic Concerns	38 (63%)	31 (72%)	0.30
Speech Therapy for Neurologic Concerns	31 (52%)	34 (79%)	0.003

Conclusions: The profile of patients treated at ATCs vs PTCs appears to be different. Rehabilitative care of adolescent TBI patients varies when treated at ATCs vs PTCs. Whether this is a function of available resources, or ATC-vs-PTC philosophical approach, is unclear. Further study is required to determine optimal rehabilitation support of adolescent neurotrauma patients.

Poster #58

AMPLIFYING VOICES: PATIENT PERSPECTIVES ON SUCCESSFUL ELEMENTS OF A HOSPITAL VIOLENCE INTERVENTION PROGRAM

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Introduction: Hospital Based Violence Intervention Programs (HVIPs) are wraparound service programs addressing social determinants of health to reduce recidivism and increase self-efficacy among violently injured patients. While we attempt to draw conclusions about the successful elements of these programs from quantitative data, little is published about what makes a successful HVIP from the patient perspective. The objective of this study is to qualitatively explore these elements through semi-structured interviews with program participants.

Methods: An independent Program Evaluator conducted 12 semi-structured interviews with patients who had completed the program, each averaging 12 minutes. The interviews were coded by 2 reviewers, identifying emergent codes and analyzing each. The data was then organized into categories, domains, or themes.

Results: Thematic saturation was reached within the 12 interviews. Patients frequently expressed lack of interest when first approached, but valued the experience once involved, expressing three salient themes for a successful HVIP. First, patients valued the relationships and connections they created. Second, the program allowed them to plan for their future in ways that they had never been able to before. Finally, the program provided work opportunities that they valued.

Conclusions: Clients are not often interested in HVIP programs when initially approached, in part because they are not willing to change immediately. However, after participating in an HVIP program participants are happy and able to see opportunities and connections they did not have in the past. These elements make HVIP programs successful because it makes participants want to stay in the program instead of going back to join in violent activities.

Table

Theme	Representative Quotes
Making Connections	"my friends are there and did make me like a better person and it's like I want to keep building to myself so" "I would say socializing and being in the community and making new friends and connections."
Planning for the future	"I see things in a different perspective than I used to. Well it just enhanced that for me cause yeah I am to myself but my mind is pretty open. I am intelligent and stuff, that just helped expand it so yeah" "I would say being in a program would really open your mind to a whole bunch of opportunities"
Work Opportunities	"But it was really enjoyable like I still got to do the interview which I thought was pretty cool. And it was more personalized to me and I really really liked that. I really enjoyed it. It helped me figure out what I [am] more interested in career-wise."

Poster #59

CONTRAST EXTRAVASATION AS A RISK FACTOR FOR MASSIVE TRANSFUSION IN PEDIATRIC BLUNT LIVER AND SPLEEN INJURY: MULTICENTER RETROSPECTIVE STUDY IN JAPAN

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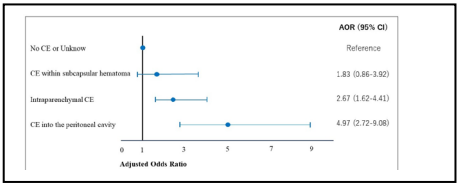
Matsushima, Kazuhide - University of Southern California

Introduction: There are scarce data to guide clinicians in predicting risk for massive transfusion (MT) in pediatric trauma. Although contrast extravasation (CE) was added to the liver/spleen injury scale 2018 revision, little is known about its association with massive transfusion. Therefore, we aimed to assess whether the grade of CE was associated with MT requirements following pediatric blunt liver and/or splenic injuries (BLSI).

Methods: This is a multicenter, retrospective cohort study sponsored by the Japanese Association for Surgery of Trauma. We included pediatric patients (≤16 years old) sustaining BLSI from 2008-2019. MT was defined as transfusion of all blood products ≥40mL/kg within the first 24 hours of admission. The associations between CE and MT were assessed using a multivariable logistic regression analysis with cluster-adjusted-robust standard errors to calculate the adjusted odds ratio (AOR).

Results: A total of 1,407 children from 83 institutions were included for analysis. The median age was 9 [IQR 6-13], 67% were male, median ISS was 10 [6–19], and in-hospital mortality was 1.5%. Of those, 199 patients (14%) received MT. On initial CT scan, CE within subcapsular hematoma was seen in 54 patients (3.8%), intraparenchymal CE was seen in 101 patients (7.2%), CE into the peritoneal cavity was seen in 85 patients (6.0%) among the overall cohort. After adjusting for age, sex, age-adjusted shock index, injury severity, laboratory and other imaging factors, intraparenchymal CE and CE into the peritoneal cavity were significantly associated with the need for MT (AOR: 2.67; 95% CI, 1.62-4.41 and AOR, 4.97; 95% CI, 2.72-9.08, respectively both p <0.001).



Conclusion: Higher grade CE on initial CT scan was independently associated with a greater probability of receiving MT in pediatric BLSI. Our results suggest that the grade of CE may help clinicians to plan blood transfusion strategies.

Poster #60

DETERMINING THE RISK OF SERIOUS VIOLENT INJURY IN ADOLESCENTS: DIFFERING RISK, SIMILAR OUTCOME?

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Background: Serious youth violence causes significant long-term harm to both individuals and communities and puts burden on trauma care systems. Violence reduction caseworkers aim to identify young people at risk, address unmet needs and prevent future harm. Deprivation and adversity can increase the risk of violence exposure. There has not yet been a formal evaluation of whether the violence reduction service identifies those at risk. The aims of this study were to investigate these violence-related risks and evaluate their association with re-attendance to hospital.

Methods: Retrospective evaluation of in-hospital violence reduction service data for young people attending a London Major Trauma Centre between 2015-2019 with weapon-enabled violent injuries. Unsupervised hierarchical clustering was performed to identify risk cohorts. Re-attendance was defined as returning to hospital with violent injuries after the first presentation, up to March 2021.

Results: 708 of 1974 (36%) patients were seen by violence reduction caseworkers and 334 had at least one risk factor formally documented. The three most recorded risks were a previous violent experience (89.9%), a previous criminal conviction (39.9%), and reported mental health issues (16.3%). The hierarchical cluster model created two clusters of 176 and 158 patients. The patients in Cluster 1 were more likely to live in the family home (99.4% to 69.6%, $p<0.001$), be in education (46% to 27.2%, $p<0.001$), and be categorized as low risk by caseworkers (11.4% to 7.6%, p0.268). The patients in Cluster 2 were more likely to have previous convictions (58.9% to 34.7%, $p<0.001$), a history of substance abuse (51.9% to 32.4%, $p<0.001$), be known to children's services (22.2% to 5.7%, $p<0.001$) and have a learning difficulty (21.5% to 1.1%, $p<0.001$). Despite the model indicating that Cluster 2 had patients with more classical identifiers of risk, both clusters exhibited a similar level of re-attendance (11.4% to 10.8%).

Conclusions: Patients attending hospital with violent injury have often experienced prior adversity, but these should not be the sole determinants of future risk of violence. There may be hidden risks that have yet to be identified, and this needs to be built into violence reduction strategy.

Poster #61

MENTAL HEALTH DISORDERS AND DRUG USE INCREASE EMERGENCY DEPARTMENT RETURN VISITS AFTER TRAUMATIC INJURY

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Introduction: Return visits to the Emergency Department (ED) after hospital discharge for traumatic injury are frequent and potentially preventable. This study aimed to evaluate how substance use and mental health disorders affect the rate of ED readmission after injury.

Methods: A retrospective study of adult trauma admissions from June 1, 2015 to December 31, 2021 at an academic Level 1 trauma center was conducted. Patient demographics, alcohol use, drug use, and mental health disorders were assessed. Rates of return to ED were evaluated with a negative binomial log regression adjusted by time from first trauma admission to end of study.

Results: 10,710 trauma patients were included with a mean age of 48.4, with a standard deviation of 23.7, and 64.6% (n=6,919) were males. 16.4% (n=1,761) screened positive for alcohol use, 46.6% (n= 4,990) for drug use, 22.6% (n= 2,419) for polysubstance drug use, and 12.1% (n=1,294) for any mental health disorder. Multivariate analysis showed a significant positive association with ED return visits and alcohol use ($p<0.001$; Rate Ratio (RR)=1.26; 95%CI=1.16-1.36), polysubstance drug use ($p<0.001$; RR=1.92; 95%CI=1.79-2.06) and mental health disorders ($p<0.001$; RR=2.64; 95%CI=2.43-2.86).

Conclusion: Alcohol use, polysubstance drug use, and mental health disorders are associated with high rates of ED return visits by 26%, 92% and 164%, respectively. This highlights areas where appropriate referrals and support may be beneficial to address ED return visits after discharge from hospital for traumatic injuries.

Poster #62

MISSED OPPORTUNITIES: SUBSTANCE USE IN ADOLESCENT TRAUMA PATIENTS

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Purpose: The adolescent population is known to have increased risk-taking behaviors including substance use. To evaluate substance use in this population, toxicology testing is universally ordered in all trauma patients presenting at our center. We hypothesized a high rate of substance use among traumatically injured adolescent trauma patients.

Methods: A single-institution retrospective review of trauma patients aged 16-20 years old from May 2018-July 2021 was completed. A total of 1002 visits met inclusion criteria. Variables including demographics, injury characteristics, procedural data, urine and drug toxicology results, social work intervention and discharge status were analyzed via Chi-square and Fisher's exact tests.

Results: The majority of patients were male (72.6%), black (81.8%), and had penetrating injuries (57.5%). 86.2% were screened for alcohol and/or substances; of those, 6.2% were positive for alcohol and 12.4% were positive for illicit substances. Those that tested positive for alcohol were more likely to experience blunt trauma 61.1% vs 42.6% ($p=0.03$). Patients that self-reported alcohol use had a higher re-injury rate, 72.3% vs 48.1% ($p=0.004$). Substance use had no effect on follow-up or hospital-based social work interventions [48.7% vs 45.9% ($p=0.96$) and 28.6% vs 25.7% ($p=0.15$), respectively]. Any social work intervention was positively correlated with clinic follow-up 31.9% vs 20.2% ($p<0.001$).

Conclusion: In this series, nearly 1 out of 5 adolescent trauma patients screened positive for either alcohol or illicit substances. 13.8% were not screened and nearly three-quarters who were positive did not receive any social work intervention. There is a missed opportunity to provide these patients with substance use education and counseling. Further studies are needed to determine if universal screening and diligent social work interventions help to correct adolescent alcohol and substance use and prevent trauma re-injury.

Poster #63

NATIONWIDE ANALYSIS OF BIOMECHANICS OF MOTOR VEHICLE COLLISIONS INVOLVING PASSENGER VEHICLES AND ASSOCIATED OUTCOMES: TOWARDS IMPROVING VEHICLE SAFETY STANDARDS AND REGULATIONS

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Background: Motor vehicle collisions (MVCs) pose significant mortality and economic burden on the United States. Biomechanics research may guide future vehicle innovation. The objective of this study is to investigate the biomechanics of two-vehicle MVCs involving passenger vehicles (PV) to evaluate associated injury patterns and outcomes including mortality.

Methods: Retrospective cohort study of cases from the Crash Injury Research Engineering Network database was performed to evaluate the biomechanics (angle of impact, impact velocity, seat position, seatbelt use, and airbag deployment) of two-vehicle MVCs involving at least one PV from 2005-2015.

Results: Out of 629 MVCs evaluated, lateral collisions were most common (49.5%), followed by head-on (41.3%) and rear-end (9.2%) collisions. Seatbelt use was associated with shorter ICU stay (10.9 days vs. 19.1 days, p=0.036) and mortality (Cramer's V=0.224, $p<0.001$), but a greater average number of injuries (10.2 injuries vs. 8.6 injuries, $p=0.011$). Restrained occupants suffering abdominal injury had higher average body mass index than those with head ($p<0.001$) or thoracic ($p=0.030$) injury.

Conclusion: Passenger vehicles are commonly involved in MVCs nationwide and efforts are needed to prevent occupant injuries and fatalities. Incorporation of energy-absorbing material into common points of contact within the vehicle interior may decrease the severity of these injuries. Seatbelt use remains a protective factor against MVC-fatalities, but is associated with abdominal injuries in occupants with higher BMIs, and should be a focus of further innovation.

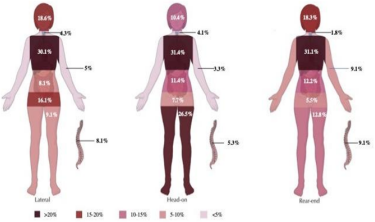

Figure 1. Distribution of Regional Injuries Sustained by Collision Type.
The thorax was the most injured body region in all collision types. Thoracic injuries among lateral, head-on, and rear-end collisions amounted to 30.1%, 31.4%, and 31.1%, respectively. Head injuries were the second most common injury and amounted to 18.6% and 18.3% in lateral and rear-end collisions, respectively. In contrast, lower extremity injuries were the second most affected body region in head-on collisions. Abdominal injuries were most prevalent among those in head-on collisions (11.4%), whereas they comprised 8.1% and 12.2% among lateral and rear-end collisions, respectively.

Poster #64

SCHOOL CLOSURE POLICIES CORRELATE WITH ADOLESCENT FIREARM INJURY DURING COVID-19

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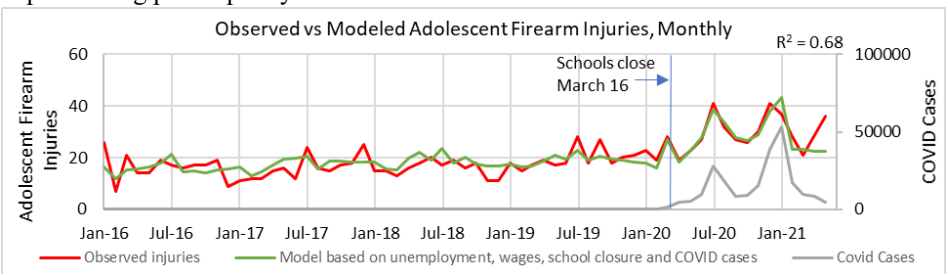
Introduction: Mitigation measures, including school closures, were enacted to protect the public's health from COVID-19. Adolescents are uniquely vulnerable to public policy changes since many depend on schools for physical, mental, and/or nutritional support. This study explores the statistical relationships between school closures and adolescent firearm injuries (AFI) during the pandemic.

Methods: Data were drawn from a collaborative registry of 4 trauma centers in Atlanta, GA (2 adult + 2 pediatric). Firearm injuries affecting adolescents aged 11-21 years from 1/1/2016 to 6/30/2021 were evaluated. Local economic and COVID data were obtained from the Bureau of Labor Statistics and the GA Department of Health. Time series analysis was performed using Dickey-Fuller testing. Linear models of AFI were created based on COVID cases, school closure, unemployment, and wage changes.

Results: There were 1,330 AFI at Atlanta trauma centers during the study period. The mean age was 18.1 years and most were male (88%) and Black (91%). A significant spike in injuries was observed during Spring 2020. A season-adjusted time series of AFI was found to be non-stationary (p=0.60). The correlation between monthly injuries and school closures was 0.58 (P<0.001). The strongest independent contributors to the model were school closure and COVID cases (ΔR^2 0.087 and 0.090).

Conclusion: AFI increased during the COVID pandemic. This rise in violence is statistically attributable in part to school closures after adjustment for COVID cases, unemployment, and seasonal variation. These findings reinforce the need to consider the direct implications on public health and adolescent safety when implementing public policy.



Poster #65

TRENDS IN MASS SHOOTINGS IN THE UNITED STATES (US): AN AMERICAN EPIDEMIC WITHIN THE PANDEMIC

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Introduction: In the past fifty years, ~ 30% of all mass shooting perpetrators were Americans, with recent data suggesting worsening of the American firearm epidemic in the wake of the COVID-19 pandemic. Thus, this study aimed to examine the trends in mass shootings in the United States (US) over time, including the recent pandemic period.

Methods: Mass shooting is defined by the Federal Bureau of Investigation as ≥4 persons shot or killed in a single incident, not including the shooter. Retrospective mass shooting data (1/2013 – 12/2021) were collected from the Gun Violence Archive. A scatterplot was constructed showing predicted (extrapolated from 2013-2019) versus actual total mass shootings in 2020 and 2021 in the US. Additionally, all 50 states were categorized as either "strong gun law" (top 25) or "weak gun law" (bottom 25) states using the Giffords Law Center Annual Gun Law Scorecard. Multivariate linear regressions were performed to determine the trends in mass shootings overtime associated with gun law strength.

Results: On scatterplot, mass shooting incidents, injuries and deaths in 2020 and 2021 significantly exceeded extrapolations made from the previous 7 years. When comparing 2019 to 2020, stronger gun laws were associated with decreased monthly mass shooting deaths (USC B: -0.058, 95% CI: (-0.096, -0.019), p=0.004). Furthermore, for these same strong gun law states, there was a decrease in monthly mass shooting deaths when comparing 2019 to 2021 (USC B: -0.057, 95% CI: (-0.096, -0.018), p=0.005) as well as when comparing 2020 to 2021 (USC B: -0.058, 95% CI: (-0.092, -0.024), p=0.001).

Conclusions: The number of mass shootings in the US has steadily increased over time, with a further spike in 2020 and 2021 during the COVID-19 pandemic that surpassed extrapolated estimates. In addition, stronger gun laws appear to be associated with fewer monthly mass shooting-related deaths during the pandemic time period. Hence, firearm-related legislation may be able to, at least partially, curtail the acute worsening of this substantial "American problem" of mass shootings.

Poster #66

AMANTADINE USE IN ACUTE TRAUMATIC BRAIN INJURY: A PRELIMINARY ANALYSIS OF THE CONSCIOUS STUDY

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INTRODUCTION: Amantadine use after traumatic brain injury (TBI) has been shown to improve cognitive outcomes in the post-acute setting. However, research on amantadine during the initial hospitalization and post-injury period is lacking. We sought to evaluate the impact of amantadine use on patients with severe TBI in the acute setting and hypothesized that amantadine would be associated with more severe TBIs yet correlate with improved 30-day outcomes.

METHODS: We performed a prospective, observational study of patients ≥ 18 years with severe TBI (Glasgow Coma Scale (GCS) ≤ 8 at 4 Level-I trauma centers between 2020-2022. Patients with penetrating trauma, pre-injury amantadine use, or a cognitive disability were excluded. TBI data collected included abbreviated injury score (AIS) head, Marshall classification, and propranolol use. Patients were grouped according to whether they received amantadine. The primary outcome was 30-day risk of non-favorable discharge disposition (death, hospice, skilled nursing facility, long term acute care hospital), which we determined using multivariable Cox proportional hazards regression (with additional censoring for patients expiring ≤ 48 hours from admission). Secondary outcomes included hospital length of stay (LOS), ICU LOS, ventilator days, and Disability Rating Scale (DRS) scores.

RESULTS: There were 72 patients in the cohort; 39% (n=28) received amantadine. There was no difference in age, sex, admission GCS score, AIS head, or incidence of craniotomy and/or craniectomy (all p>.05) between groups. Amantadine patients were more likely to receive propranolol (79% vs 36%, p<.001). Median hospital LOS (32 vs 9.5 d, p<.0001), ICU LOS (16.5 vs 5.5 d, p<.0001), and ventilator days (16 vs 4 d, p<.001) were longer for amantadine patients. Median time to amantadine initiation was 9 (4-15.3) days and median duration of inpatient therapy was 24.5 (9.5-31.5) days. For the 57 patients surviving to 1 week, DRS scores on day 7 were worse for amantadine patients (25 vs 21, p<.01). However, on regression analysis adjusting for age, DRS score, AIS head, Marshall classification, and propranolol use, patients receiving amantadine had a lower risk of non-favorable discharge disposition (aHR 0.1, 95% CI 0.03-0.33, p<.001).

CONCLUSION: In the acute setting, severe TBI patients receiving amantadine had worse DRS scores and longer hospitalizations. However, the 30-day risk of a non-favorable discharge disposition was significantly lower for patients receiving amantadine. Future analyses with a larger patient sample are warranted to evaluate change in cognition throughout the initial hospital stay.

Poster #67

BODY MASS INDEX AND PHARMACOLOGIC VENOUS THROMBOEMBOLISM PROPHYLAXIS IN SEVERE TRAUMATIC BRAIN INJURY

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Background: Patients with traumatic brain injuries (TBI) are at risk for developing venous thromboembolic (VTE) complications. Previous work suggests venous thromboembolism prophylaxis with low molecular weight heparin (LMWH) is protective compared to unfractionated heparin (UH) in trauma patients. The relationship between body mass index (BMI) and VTE in patients with TBI is not well described in the literature. The purpose of this study was to evaluate the role of BMI and type of pharmacological VTE prophylaxis in patients who develop VTE with severe TBI.

Methods: Patients with a severe TBI (identified by using ICD-10 codes and head AIS > 3) who received LMWH or UH for VTE prophylaxis were queried from the 2019 American College of Surgeons Trauma Quality Improvement Program. Demographics, injury characteristics, timing of VTE prophylaxis, BMI (<18.5kg/m2, 18.5 - 24.9kg/m2, 25 – 29.9 kg/m2, and >30 kg/m2), and verification level of the trauma center were collected from the database. Outcome measures include VTE, mortality, and neurosurgical interventions. Multivariable logistic regression (MLR) analysis was performed to determine predictors of VTE.

Results: Of the 39,520 patients with TBI included in the study, 25,671 (64.96%) received LMWH and 13,849 (35.94%) received UH. Overall mortality was 5.24%. Patients diagnosed with VTE were more likely to undergo neurosurgical interventions: external ventriculostomy drain placement (1.1% vs 0.36%, p =0.0007), intracranial pressure monitor placement (4.99% vs 1.56%, p <0.0001), and craniectomy/craniotomy (3.21% vs 1.31%, p <0.0001), compared to those without VTE. MLR found patients with a BMI 25 – 29.9 kg/m2 (OR 1.71; 95% CI 1.130-2.472, p=0.010) and a BMI >30 kg/m2 (OR 2.226; 95% CI 1.505 – 3.292, p <0.0001) were independent predictors of VTE. For every hour delay in initiation to VTE prophylaxis, patients were 0.2% more likely to develop VTE (OR 1.002; 95% CI 1.002 – 1.003, p <0.0001). Patients treated with UH (OR 1.085; 95% CI 1.058 – 1.112, p < 0.0001) were more likely to develop VTE, regardless of BMI and time to initiation of prophylaxis, compared to patients treated with LMWH.

Conclusions: In patients with severe TBI, higher BMI and delay in VTE prophylaxis initiation was associated with increased risk of VTE. LMWH had a protective association with VTE, compared to UH.

Poster #68

BRAIN INJURY GUIDELINE CLASSIFICATION AS A DECISION TOOL FOR ANTICOAGULATION REVERSAL IN TBI

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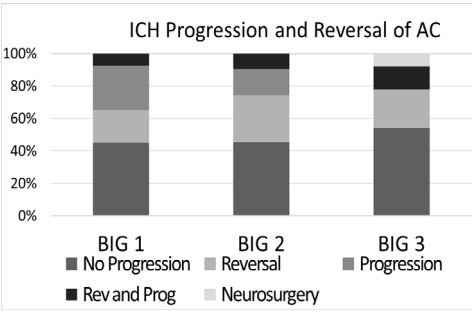
Introduction: Anticoagulation (AC) in trauma is a risk factor for intracranial hemorrhage (ICH), neurosurgical intervention (NSI), and death. Although AC reversal is often given, there are no evidence-based guidelines to aid this decision. The Brain Injury Guideline (BIG) stratifies patients into 3 risk groups but excluded AC from low risk tiers. We analyzed a modified BIG score for risk prediction and as a decision aid for selective AC reversal.

Methods: AC patients ≥55yr with traumatic ICH from two centers were stratified into BIG 1-3 risk groups using modified BIG criteria with AC excluded as a factor. ICH progression, need for NSI, death, and worsened discharge status was compared between groups using univariate and multivariate models.

Results: 221 patients were included, 23%, 29% and 48% were classified as BIG1, BIG2 and BIG3, respectively. The rate of ICH progression was 38%, 26%, and 55% for BIG1, 2, and 3 respectively (Figure). Among BIG1 patients who progressed, 26% had immediate AC reversal (IR) versus 74% with no reversal (NR,p=NS), and the majority of progressions were minor. Similarly, ICH progression was not different between IR and NR in BIG2. BIG3 patients were twice as likely to have progression of ICH versus BIG1 patients ($p<0.05$), and significantly more likely to receive IR (59% vs 28% in BIG1; $p<0.01$). No patient in BIG1/BIG2 required NSI, and there were no deaths related to ICH in the BIG1 group. The BIG category was an independent predictor of the need for NSI, but AC reversal was not independently associated.

Conclusions: Although rates of ICH progression in all BIG categories were higher than reported rates for non-AC patients, the BIG category reliably identified patients at risk for NSI and adverse events. BIG1 and select BIG2 patients may not benefit from AC reversal, and the BIG category could be used to guide the decision to administer or withhold anticoagulation reversal agents.



Poster #69

COMORBIDITIES AND HEMORRHAGE CHARACTERISTICS PREDICTING MORTALITY IN ADULT PATIENTS WITH MILD TRAUMATIC INTRACRANIAL HEMORRHAGE

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Introduction: Patients suffering from traumatic intracranial hemorrhage (tICH) are routinely transferred from presenting hospitals to level 1 and 2 trauma centers, regardless of extent of neurological deficits. The purpose of this project is to identify imaging characteristics of tICH and comorbidities associated with mortality.

Methods: A retrospective cohort study was performed on adult patients admitted or transferred to a level 1 trauma center from October 2015 to September 2019 with Glasgow Coma Score (GCS) 13-15 and tICH on initial computed tomography head (CTH). Categorical Data were compared with Chi-square or Fisher's Exact Test and continuous data with Mann-Whitney U test. Multivariate analysis was performed to determine risk factors for in-hospital mortality and at 60 days, and then used to create a logistic regression analysis. A p-value of 0.05 was considered statistically significant.

Results: 1542 patients that met inclusion criteria were analyzed. 97 (6.3%) died within 60 days, 29 in hospital (29.9%) and another 68 (70.1%) within 60 days. Patients who suffered in-hospital or 60-day mortality had higher Injury Severity Score (ISS) (16.1/16.6 vs 11.8/11.7, $p=0.001$), and higher rates of congestive heart failure (CHF), myocardial infarction (MI), dementia, advance directives, and functional dependence ($p<0.05$). They were more likely to use anticoagulation and require reversal, undergo transfer to another facility, and have poor GCS at arrival (14.8/14.8 vs 14.5/14.5) and at 24 hours (14.7/14.7 vs 13.3/12.9) ($p<0.05$). In-hospital mortality was higher in acute subdural hemorrhage (SDH) and intraventricular hemorrhage (IVH), while 60-day mortality was increased in all morphologies except subarachnoid hemorrhage (SAH) ($p<0.05$). Linear regression analysis showed MI ($p=0.023$), advance directive status ($p=0.001$), ISS ($p=0.044$), platelet transfusion ($p=0.036$), prothrombin complex concentrate (PCC) administration (0.016), and GCS at 24 hours ($p=0.001$) to be predictive of in-hospital mortality. 60-day mortality was predicted by previous spinal cord injury ($p=0.001$), serum creatinine >2 mg ($p=0.016$), advance directive status ($p=0.008$), ISS ($p=0.012$), platelet transfusion ($p=0.004$), GCS at 24 hours ($p=0.001$), operation performed ($p=0.004$), and intraparenchymal hemorrhage (IPH) size ($p=0.008$).

Conclusions: The comorbidities and CTH characteristics above are indicative of higher risk of in-hospital and 60-day mortality in adults suffering from isolated mild tICH. Discussions of goals of care with mild tICH patients surrounding mortality may be informed by using these metrics and to help predict who may require further therapy.

Poster #70

EFFECT OF MARIJUANA (THC) ON PATIENT OUTCOMES WITH TRAUMATIC BRAIN INJURY

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Background: Marijuana use in the United States has been steadily increasing among the trauma population as more states have moved to legalize its recreational and medicinal uses. Previous studies have shown conflicting outcomes in adult patients with positive tetrahydrocannabinol (THC) screen who sustained traumatic brain injury (TBI). We investigated the relationship between marijuana use and outcomes using a large multicenter dataset.

Materials and methods: A retrospective multi-institutional study of patients seen between January 2016 and December 2019 was performed to assess adult patients (>18 years) with TBI who were screened for THC and data regarding outcomes at discharge. Patients were divided into two groups; THC positive and THC negative groups. The primary outcome was mortality and discharge disposition. Secondary outcomes included ICU and hospital length of stay.

Results: A total of 14,970 patients met the inclusion criteria. THC positive patients were younger, and more involved in penetrating trauma. THC positive patients had lower mortality rates at discharge than the THC negative (9.17% vs 10.58%, p-value <0.01). However, upon controlling for confounding factors, THC status was not found to be an independent predictor of mortality at discharge. Logistic regression analysis also showed no significant difference in ICU length of stay or hospital length of stay between the two groups (p-value 0.027 vs 0.262).

Conclusions: Positive THC screens did not increase the likelihood of mortality at discharge or have a significant increase in ICU or hospital length of stay. Our results indicate no survival benefit for TBI patients with THC use.

Poster #71

KEY CT FINDINGS FOR TRAUMA SURGEONS TO RAPIDLY PREDICT EARLY NEED FOR NEUROSURGICAL INTERVENTION OR DEATH FROM TRAUMATIC BRAIN INJURY

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Introduction: Management of moderate & severe traumatic brain injury (TBI) depends on rapid identification of patients who require immediate intervention to avoid secondary brain injury or death. This study evaluated if a simple schema for quickly interpreting CT head (CTH) imaging by trauma surgeons & trainees could be validated to predict need for neurosurgical intervention (NSI) or death from TBI (MORT) in 24 hours in TBI patients.

Methods: This was a retrospective review of TBI patients presenting to our Level 1 trauma center in 2020 with blunt mechanism and GCS <13; patients without CTH were excluded. Primary independent variables were presence of 7 normal findings on CTH (CSF around brainstem at foramen magnum, open fourth ventricle, CSF around quadrigeminal plate within superior cistern, CSF around cerebral peduncles within interpeduncular cistern, absence of midline shift, visible sulci & gyri, gray-white differentiation). A trauma surgeon & a trainee separately evaluated each patient's CTH, scoring the 7 specific findings as Normal or Abnormal. The primary outcome was need for NSI/MORT in 24 hours due to TBI. Kappa statistics, receiver operating curves (ROCs), and χ^2 tests were used to analyze data.

Results: 444 patients formed the study population; 69 received NSI and 28 died within 24 hours. Kappa statistics for the 7 findings ranged from 0.237 (gray-white differentiation) to 0.801 (midline shift). Trainees interpreted 66.2% of scans as normal vs attendings 72.5%; trainees' interpretations were more accurate, with areas under the ROC curve of 0.848 vs 0.793 for attendings. By trainees' interpretation, 5.8% of patients without abnormal findings had NSI/MORT versus 52.0% of patients with at least one abnormal finding ($p<0.001$); by attending interpretation, 8.7% without abnormal findings had NSI/MORT vs 54.9% with at least one abnormal finding ($p<0.001$).

Conclusions: Any single abnormal finding in this schema significantly predicted a large increase in NSI/MORT in 24 hours in TBI patients. This schema may be used to quickly predict need for intervention and expedite operative and critical care management of moderate & severe TBI.

Poster #72

PREHOSPITAL VITAL SIGNS FOR USE AS PREDICTORS OF ORGAN DONATION POTENTIAL AFTER GUNSHOT WOUNDS TO THE HEAD

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Background: Gunshot wounds to the head (GSWH) have a lower rate of organ donation than the general population. As GSWH patients deteriorate rapidly, vital signs at first contact with medical services may help predict injury progression that is not appreciable after transport to the hospital. We hypothesize that prehospital (PH) vital signs have utility in early identification of organ donor potential.

Methods: Retrospective analysis included all adult trauma patients who presented to a Level 1 trauma center with a GSWH and had signs of life on-scene and at the emergency department (ED) before expiring between 2012-2020. Vitals compared include Glasgow Coma Score (GCS), systolic blood pressure (SBP), and respiratory rate (RR). Logistic regression analysis identified PH vital signs predictive of organ donor potential. Receiver operating characteristic (ROC) curve analysis assessed the predictive accuracy of these factors.

Results: Of 187 subjects, 31 (16.6%) donated organs. Compared to non-donors, donors had significantly higher median PH GCS (4 vs 3, p=0.02), SBP (148 vs 115, p=0.001), MAP (109 vs 98, p=0.04), and RR (19 vs 12, p=0.01). There were no significant differences in ED vitals between groups. Logistic regression analysis showed increased PH GCS and increased PH SBP to be predictive of organ donation, while increased PH GCS-Eye was associated with decreased odds of organ donation(A). ROC analysis based on the classification of PH GCS, SBP, and GCS-E showed area under the curve (AUC)=0.75 (95% CI:0.65-0.82) (B).

Conclusion: Screening PH vital signs may help screen GSWH patients for organ donation potential and increase timely referral for donor workup.

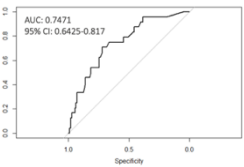
A. Significant predictors of organ donation from regression analysis
B. ROC based on prehospital GCS, GCS-E, and SBP identified by logistic regression

A.

	OR	95% CI
Intercept	0.04	0.01-0.18
Prehospital GCS	1.42	1.06-1.94
Prehospital GCS-E	0.28	0.08-0.79
Prehospital SBP	1.01	1.00-1.03

OR= Odds Ratio, 95% CI= 95% Confidence Interval

B.



Poster #73

THE IMPACT OF HEALTH CARE INSURANCE ON OUTCOMES FOLLOWING TRAUMATIC BRAIN INJURY

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Introduction: According to a 2020 report by the United States Census Bureau, roughly 8.6% of the population lacks health care coverage. Increasing evidence suggests that insurance status plays a role in outcomes after traumatic injury. However, in the setting of traumatic brain injury (TBI), its impact remains poorly understood.

Methods: The American College of Surgeons Trauma Quality Programs Participant Use File (ACS-TQP-PUF) database was queried from 2017-2019. All patients sustaining an isolated TBI were identified. Isolated TBI was defined as 1) Head Abbreviated Injury Scale (AIS) >3 and 2) AIS <3 in all other anatomical regions. Patients dead on arrival, with Head AIS =6, or with any missing data were excluded from analysis. Demographics, Injury Severity Score (ISS), Glasgow Coma Scale (GCS), and outcomes were compared between those with and without insurance. x2- and Student's t-tests were used for univariate comparisons. Multivariate regressions were used to identify independent risk factors for mortality. Analyses were conducted using RStudio (version 1.4.1717).

Results: A total of 92,940 patients met inclusion criteria, of which 83,967 (90.3%) were insured. When compared to their uninsured counterparts, insured TBI patients were older (56.80 + 24.64 vs 39.58 + 17.33, $p<0.001$) with a greater proportion of females (37.0% vs 20.7%, $p<0.001$). Insured patients were more severely injured (ISS>16 50.5% vs 48.8%) and had longer lengths of stay in both the intensive care unit (2.96 + 5.04 vs 2.77 + 5.64, $p=0.002$) and hospital (6.72 days + 9.38 vs 6.32 days + 10.61, $p=0.001$). However, they experienced less mortality (8.4% vs 12.5%, $p<0.001$). When controlling for confounding variables, lack of insurance significantly increased the likelihood of mortality. This effect was most noticeable in patients with Head AIS score = 4 (OR 1.31, 95% CI [1.06-1.61]; $p=0.013$) and =5 (1.91, [1.69-2.16]; $p<0.001$).

Conclusions: These results suggest that insurance coverage is independently associated with improved survival in the setting of isolated, moderate to severe TBI.

Poster #74

USE OF NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE (NICE) HEAD INJURY GUIDELINES AMONG PATIENTS WITH DELAYED PRESENTATION AFTER HEAD TRAUMA CAN LEAD TO MISSED TRAUMATIC BRAIN INJURY

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INTRODUCTION: Traumatic Brain Injury (TBI) accounted for almost 3 million emergency department visits, hospitalisations and deaths in the United States in 2014. National Institute for Health and Care Excellence (NICE) guidelines, originally developed using data from patients presenting within 24 hours of head trauma, are often used to determine the need for computed tomography (CT) of the head even in patients presenting after 24 hours of head trauma. We aimed to investigate the proportion of overall CT scans done for head trauma at our centre that were performed in late presenters (>24 hours after head trauma), determine and compare the incidence of intracranial pathology in patients with early (<24 hours) versus late presentation (>24 hours), and determine the sensitivity of NICE guidelines for TBI in these two sub-populations.

METHOD: We conducted a retrospective chart review at a tertiary care centre in Karachi. All adults (>16 years) who underwent a CT scan of the head for head trauma over 5 years were included. Data on age, sex, primary diagnosis, co-morbid conditions, mechanism-of-injury, duration (in hours) from head trauma to presentation, site and extent of injury (Injury Severity Scale), duration of hospital stay, number and details of surgical procedures performed, CT scan findings, other injuries, and mortality were collected. Means were compared using Independent sample T-test while categorical variables were compared with chi-square tests. Multivariate logistic regression analyses, adjusting for potential confounders, were performed to determine the predictors of TBI.

RESULTS: We found 2009 patients that met the study eligibility criteria; seven of these were excluded as a result of incomplete medical records. Thus, the final statistical analyses included 2002 head trauma patients. Overall, in both early and late presenters, there was evidence of traumatic injury in 52 % of cases, while the overall mortality rate was 2.3%. Almost one-third (32.2%) of the included patients underwent CT after 24 hours of head trauma. There was evidence of traumatic injury in 46.7% of early presenters and 63% of late presenters. The sensitivity of NICE guidelines for presence of traumatic intracranial injury was found to be 93% for early presenters and 83% for late presenters.

CONCLUSION: Patients presenting to the emergency department after 24 hours of head trauma constitute a sizable proportion of the overall head trauma population. The sensitivity of NICE guidelines for head injury among late presenters is lower and may lead to missed intracranial injuries if imaging is not performed.

Poster #75

ARTERIAL ACCESS COMPLICATIONS FOLLOWING PERCUTANEOUS FEMORAL ACCESS FOR REBOA IN 24 HOUR SURVIVORS

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Introduction: With use of resuscitative endovascular balloon occlusion of the aorta (REBOA) comes the potential for arterial access site complications (AC) and limb ischemic sequalae. We aimed to determine the prevalence of vascular AC and associated clinical and technical factors.

Methods: A retrospective cohort analysis of 24-hour survivors undergoing percutaneous REBOA via the femoral artery in the AAST AORTA registry between Oct 2013 and Sep 2021 was performed. The primary outcome was AC defined as at least one of the following: hematoma, pseudoaneurysm, arteriovenous fistula, arterial stenosis, or use of patch angioplasty for arterial closure. Associated clinical and procedural variables were examined. Data were analyzed using Fisher exact test, Mann-Whitney-U tests, and linear regression.

Results: There were 34 (7%) cases with AC among 485 meeting inclusion criteria. Hematoma (40%) was most common followed by pseudoaneurysm (26%), and patch angioplasty (21%). No differences in demographics or injury/shock severity were noted between cases with and without AC. REBOA outside the ER was associated with AC (AC, 44% vs no AC, 27%; p=0.04) while the use of ultrasound (US) was protective (AC, 35% vs no AC, 51%; p=0.05). The AC rate in US cases was 12/242 (5%) vs 22/240 (9.2%) without US. Arterial sheath size > 7 Fr was not associated with AC. US use increased over time (R^2=0.94, p<0.001) with a stable rate of AC (R^2=0.78, p=0.61). AC were associated with limb ischemia (AC, 15% vs no AC, 4%; p=0.006) and arterial bypass procedures (AC 3% vs no AC 0%; p<0.001) but amputation was uncommon (AC, 3% vs no AC, 0.4%; p=0.07).

Conclusion: Percutaneous femoral REBOA had a 7% AC rate which was stable over time. AC are associated with limb ischemia but need for surgical intervention and/or amputation are rare. The use of US-guided access appears to be protective against AC and is recommended for use in all percutaneous femoral REBOA procedures.

Poster #76

ASSESSING ENDOVASCULAR CANDIDACY IN SUBCLAVIAN AND AXILLARY ARTERY TRAUMA: 11-YEAR ANALYSIS OF OPEN AND ENDOVASCULAR AXILLOSUBCLAVIAN INTERVENTIONS AT A LEVEL-1 TRAUMA CENTER

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Introduction: Endovascular stenting (ES) is a less invasive treatment for traumatic axillosubclavian injuries (ASI). The portion of patients that are endovascular candidates is currently unknown. Common pre-requisites for ES include hemodynamic stability and pre-operative CTA-imaging. We reviewed our institutions experience with ASI with a focus on factors influencing endovascular candidacy.

Methods: Single-center retrospective review of patients with ASI requiring repair at a Level-1 center from 2010-2021. Patients that underwent open repairs were classified as potential "endovascular candidates" if they met the following criteria: 1)Hemodynamic stability(systolic>90mmHg) in the trauma bay and 2)If pre-operative CTA-imaging was obtained.

Results: 27-patients (n=16 Blunt, n=11 penetrating) underwent operations for ASI. Overall mortality was 11.1%. ES was performed in 29.6%(n=8) and open repair in 70.3%(n=19). 63% (n=17) of patients had no trauma bay hypotension. 18.5%(n=5) of patients had single episode hypotension that resolved with resuscitation - all subsequently received CTAs. 18.5%(n=5) of patients were non-responders. Overall 94% (15/16) of blunt and 55% (6/11) of penetrating patients either received ES or met screening criteria for endovascular candidacy. Majority of ES patients (6/8,75%) received hybrid repairs involving brachial artery cutdown with stent deployment. Patients operated on in a hybrid-OR suite received ES at higher rates than Non-Hybrid-ORs (4/5, 80%vs 4/22, 18%, p=.017). After excluding non-responders, this finding still persisted (4/5, 80% vs 4/17, 24%, p=.039).

Conclusion: A high portion of blunt and a moderate portion of penetrating patients with traumatic axillosubclavian artery injuries meet screening criteria for endovascular stenting. Operative location may influence repair choice, as hybrid-OR use was associated with a higher portion of patients receiving endovascular stenting.

Poster #77

CONCOMITANT CLAVICLE FRACTURE IN THE RIB FRACTURE PATIENT: SHOULD WE BE FIXING MORE?

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Background: Severity of thoracic trauma is directly correlated with the number of rib fractures, as are incidence of pulmonary complications and severity of pain. While many thoracic trauma patients also sustain clavicle fractures, the impact of this additional fracture on outcomes is not well studied.

Methods: At a single level 1 trauma center, all patients aged 16 and over admitted to the trauma service with acute rib fractures from 1/2018 through 9/2021 were studied. Outcomes of interest included impact of a concomitant clavicle fracture on mortality, ICU length of stay (LOS) and ventilator days.

Results: There were 1862 patients with rib fractures, 157 sustained an additional clavicle fracture (8.4%). Average age was greater in the rib fracture only group (63 vs 58, $p = 0.003$). Patients with clavicle fractures sustained greater number of rib fractures (4.8 vs 4.2, $p = 0.004$), had higher injury severity scores (ISS) (15.2 vs 12.8, $p < 0.001$) and were more likely to trigger a trauma activation (93% vs 82%, $p < 0.001$). There was no difference in mortality, ICU admission or need for intubation; however, patients with a clavicle fracture had significantly longer ICU LOS (6 vs 4.3 days, $p = 0.007$) as well as more days intubated (9.5 vs 5.9 days, $p = 0.02$). When controlling for age, number of rib fractures and ISS, patients with clavicle fractures spent an additional 1.34 days in the ICU ($p = 0.032$) though there was no difference in ventilator days ($p = 0.115$).

Conclusion: The presence of a concomitant clavicle fracture in a rib fracture patient could be a marker of severity of injury or an additional factor contributing to pulmonary compromise as evidenced by longer ICU LOS and trend towards increased ventilator days. Further investigation with a larger population is needed to more definitely explore this trend.

Poster #78

EARLY RESOLUTION OF DEEP VENOUS THROMBOSIS: ARE WE OVER-TREATING?

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Background: Deep venous thrombosis (DVT) is a common phenomenon with treatment comprised largely of systemic anticoagulation (AC) for a set duration. Many trauma patients cannot receive this therapy due to concomitant injuries at presentation. Serial duplex ultrasounds (US) can be used to assess evolution of DVTs over time and may guide treatment for high-risk patients. We hypothesized that many trauma-related DVTs resolve during the initial admission and thus may not require long-term AC.

Methods: A retrospective trauma registry review was performed for all patients diagnosed with DVT at our level 1 trauma center from January 2012 through December 2021. Patient demographics, LOS, injury pattern, initial duplex US results, DVT treatment and prophylaxis regimens, and subsequent DVT US results were assessed. Weekly screening duplex US are obtained on all trauma inpatients regardless of prior DVT at our facility.

Results: 392 patients were diagnosed with lower extremity DVT of which 261 (66.5%) received follow-up duplex US. Median time to follow-up duplex US was 6 days. The mean hospital LOS was 20.9 days. Of these 261 patients with follow-up US, 90 patients (34.5%) showed DVT resolution at the time of the first follow-up US (**table 1**), and 141 patients (54.0%) had DVT resolution prior to discharge.

Table 1: First Follow-Up Duplex Results by Treatment Regimen

Treatment	Resolution (n,%)	Regression (n,%)	Stable (n,%)	Progression (n,%)
Therapeutic AC (n=106)	41 (38.7%)	1 (0.9%)	53 (50%)	11 (10.4%)
Prophylactic AC (n=79)	31 (39.2%)	8 (10.1%)	34 (43%)	6 (7.6%)
No AC (n=76)	18 (23.7%)	9 (11.8%)	41 (53.9%	8 (10.5%)
Total (n=261)	90 (34.5%)	18 (6.9%)	128 (49%)	25 (9.6%)

Conclusion: The rate of DVT resolution is high regardless of inpatient AC dosing in our trauma population with over 50% resolution by discharge based on serial duplex US data. Further prospective studies should determine whether patients at risk of complications from systemic AC can safely receive minimal and effective treatment once diagnosed with DVT.

Poster #79

INFLUENCE OF VENOUS SHUNTING ON LIMB OUTCOMES IN MILITARY LOWER EXTREMITY COMBINED ARTERIAL AND VENOUS INJURIES

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Introduction: Combined arterial and venous lower extremity (LE) injuries present complex management challenges. Temporary arterial shunting is widely accepted, but the effect of vein shunting on limb outcomes is not well studied. This study examines the influence of vein shunting on limb outcomes in military femoropopliteal combined arterial and venous injuries.

Methods: A database of LE vascular injuries from Iraq and Afghanistan casualties from 2004-2012 was queried for cases of combined arterial and venous femoropopliteal injuries. Vein shunted and non-vein shunted groups were identified and pertinent variables statistically compared.

Results: Of 135 arteriovenous injuries, 61 (45%) had the vein injury ligated (5 after shunting), leaving 74 arteriovenous injuries undergoing venous repair (37 grafts (3 synthetic), 34 local repairs, 3 patch venoplasty). The vein was shunted in 16 (22%) of these. The shunt and no shunt cohorts had similar demographics, mechanism (70% blast), and ISS (median 18, IQR 10-26). Tourniquets and fasciotomy were used equally. Venous shunts were used almost exclusively in cases in which the artery was shunted (94% vs 22% no shunt, $P<0.001$) and more commonly in cases with bilateral LE vascular injuries (25% shunt vs 3.4% no shunt, $P=0.01$). Shunted veins more frequently underwent graft (versus local or patch) repair (88% vs 40%, $P<0.001$). Vein shunted limbs had numerically higher median MESS (8, IQR 7-9) than non-shunted limbs (6, 5-7, $P=0.24$) and had a numerically greater incidence of multi-level arterial injury (13% vs 7%, $P=0.47$). Amputation was twice as common in non-shunted (26%) than shunted (13%) limbs ($P=0.33$) but any complication with the arterial repair was more common in shunted (44%) than non-shunted (28%, $P=0.24$) limbs.

Conclusion: In combat casualties with combined arterial and venous femoropopliteal injury, vein shunting was used primarily in severely injured limbs in conjunction with arterial shunts and in injuries ultimately undergoing venous graft reconstruction. Despite greater limb and arterial injury severity, vein shunting resulted in an improved limb salvage rate, though arterial repair complications were more common. Temporary shunting of the venous injury should be considered in cases of severe combined LE vascular injury.

Poster #80

META-ANALYSIS OF SURGICAL FIXATION EFFECTIVENESS FOR MULTIPLE DISPLACED RIB FRACTURES

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Background: Evidence for the treatment of rib fractures without a flail component (non-flail) has not yet been adequately gathered, appraised, and integrated. This study evaluated contemporary evidence for the surgical versus non-surgical treatment of adults with multiple displaced non-flail chest rib fractures.

Methods: A systematic literature review and meta-analysis included studies evaluating patients with surgical fixation of non-flail, multiple displaced rib fractures. Random effects models pooled data for outcomes reported in ≥2 studies. The primary outcome was the duration of mechanical ventilation (DMV). Secondary outcomes included post-procedural pain, respiratory complications, mortality, tracheotomy, sepsis, intensive care unit (ICU), and hospital length of stay (LOS). Studies were critically appraised using Johns Hopkins Nursing Evidence-Based Practice guidelines.

Results: Thirty-one studies (n=99,678 patients) evaluating surgical fixation of multiple displaced rib fracture patients were included in the meta-analysis. Compared to non-surgical treatment, surgical fixation resulted in statistically significantly shorter DMV (-1.81 days, 95% CI -3.14 to -0.49 days; p=0.007), lower 2-week pain intensity (SMD -3.29, 95% CI -5.05 to -1.53; p=0.003), lower risk for atelectasis (RR=0.41, 95% CI=0.25 to 0.67; p=0.0003), p=0.05), lower risk for any respiratory complication (RR=0.63, 95% CI=0.43 to 0.92, p=0.02), and lower mortality risk (RR=0.41, 95% CI=0.23 to 0.73, p=0.003). Statistically significant differences were not observed for: pain three days after intervention (SMD -1.28, 95% CI -3.32 to 0.75; p=0.22); pneumonia (RR=0.66, 95% CI=0.40 to 1.08; p=0.10), acute respiratory distress syndrome (RR 1.19, 95% CI 0.18 to 7.96; p=0.85), tracheotomy (RR 0.66, 95% CI 0.30 to 1.44, p=0.29), sepsis (RR=0.75, 95% CI=0.17 to 3.28, p=0.70), ICU LOS (MD -1.01, 95% CI=-2.42 to 0.939; p=0.16), and hospital LOS (MD-1.52, 95% CI 3.97 to 0.92; p=0.22).

Conclusions: Surgical treatment of patients with multiple displaced rib fractures resulted in statistically significantly shorter DMV, less 2-week pain, lower risk of atelectasis and overall respiratory complications, and reduced mortality compared to non-surgical treatment.

Poster #81

QUALITY OVER QUANTITY; THE IMPACT OF FUNCTIONAL STATUS ON OUTCOMES OF RIB FRACTURES IN THE ELDERLY

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Introduction: Rib fractures (rfx) are the most common chest injury in trauma patients aged ≥ 65 years. We sought to determine the current mortality impact of rib fractures on a population at high risk for pulmonary decompensation, geriatric patients with pre-existing pulmonary disease.

Methods: After IRB exemption, a retrospective study of patients presenting between 1/2016 and 4/2020 was performed, querying the registry for age ≥ 65 years with history of COPD after fall with rfx diagnosed by computed tomographic imaging. Charts were reviewed for patient demographics, past medical history, associated injuries, complications, and outcome.

Results: 88 patients were identified. Average age was 79 years (range 65-102) with the mechanism of injury most commonly being ground level fall (83%). Mean number of fractured ribs was 4.4 (range 1-15). Overall mortality was 11% initially and 22% at 6 months. Mortality was statistically increased in patients with advanced directives (38% vs 2%), preadmission residence at Skilled Nursing Facility versus home (43% vs 9%), or in those functionally dependent at admission (33% vs 2%). A linear pattern of increased mortality was not found with increasing rib fractures nor was an increased number of fractures associated with mortality risk on multivariate analysis. Preadmission oxygen usage also did not affect mortality.

Conclusion: Despite pre-existing pulmonary disease in this cohort, rfx mortality in the elderly is lower than accepted historical comparisons and appears to correlate with pre-injury functional status. Such data may assist in prognostic discussions in this population.

Number of Rib Fractures	Number of Patients	Mortality (%)		
		Total	Functionally Independent	Functionally Dependent
1-2	18	0 (0%)	0/13 (0%)	0/5 (0%)
3-4	36	3 (8%)	1/24 (4%)	2/12 (17%) *
5-6	17	4 (24%)	0/12 (0%)	4/5 (80%) *
> 6	17	3 (18%)	0/12 (0%)	3/5 (60%) *

- Statistically significant

Poster #82

SURGICAL STABILIZATION OF RIB FRACTURES: NATIONWIDE TRENDS IN TIMING, OUTCOMES AND EQUITY

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Introduction: Recent evidence suggests that surgical stabilization of rib fractures (SSRF) within 72 hours may be beneficial. We utilized a national database to test the hypothesis that outcomes were improved with SSRF within 72 hours. We also explored the frequency of early surgery and the changing racial demographics of patients undergoing SSRF over time.

Methods: We studied the Trauma Quality Improvement Program Participant Use File from 2016-2019 and included patients with chest AIS 3-5 that underwent SSRF. We evaluated injury specifics, demographics, time to surgery, and outcomes including mortality, LOS, and adverse events. Variables were compared using chi-square and Wilcoxon rank-sum tests.

Results: 5,234 (2.9%) of patients with chest AIS 3-5 underwent SSRF. The time to SSRF reduced yearly and the proportion of patients receiving SSRF within 72 hours increased annually ($p<0.01$). Association between mortality and early surgery was not observed ($p=0.6$). However, early SSRF was associated with lower rates of VTE, PNA, unplanned intubation/ICU, and total/ICU LOS ($p<0.01$). Patients undergoing SSRF were noted to be more racially diverse by year and African Americans and those listed as "self-pay or others" were more often delayed to surgery ($p<0.03$).

Conclusion: The time to SSRF has decreased over time, and an association between SSRF within 72 hours and fewer complications (excluding mortality) was found. The disparities noted among patients undergoing SSRF should be further examined and addressed accordingly.

	2016	2017	2018	2019	p-value
Median Time in Hours to SSRF from Admission (25th-75th %)	77.8 (45.1-123.2)	72.9 (44.1-119.1)	68.1 (40.1-114.7)	68.6 (41.8-108.2)	<0.001
Patients with SSRF w/in ≤72 Hours, % of total	46.2	49.5	55.3	54.7	<0.001
Latinos Undergoing SSRF, % of total	7.1	10.5	11.4	11.1	<0.001
Afr Am Undergoing SSRF, % of total	6.7	8.7	8.7	9.8	<0.001
"Self-pay or Others," Undergoing SSRF % of total	17.1	15.4	16.7	14.5	0.5

Poster #83

THE CHARACTERISTICS AND RESULTS OF ENDOVASCULAR DEVICES IN TRAUMA (CREDIT) STUDY: MULTI-INSTITUTIONAL RESULTS

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Introduction: Endovascular techniques are increasingly used to repair major traumatic vascular injuries, but most endovascular implants are not designed/approved for trauma-specific indications. No inventory guidelines exist for the devices used in these procedures. We aimed to describe the use and characteristics of endovascular implants used for repair of vascular injuries to allow for better inventory management.

Methods: This CREDiT study is a six-year retrospective cohort analysis of endovascular procedures performed for repair of traumatic arterial injuries at five participating US trauma centers. For each treated vessel, procedural and device details were recorded and outcomes assessed with the aim of defining the range of implants and sizes used for these interventions.

Results: A total of 94 cases were identified; 58 (61%) were descending thoracic aorta, 14 (15%) axillosubclavian, 5 carotid, 4 abdominal aortic, 4 common iliac, 7 femoropopliteal, and 1 renal. Vascular surgeons performed 54% of cases, trauma surgeons 17%, IR/CT Surgery 29%. Systemic heparin was administered in 68% and procedures were performed a median of 9h after arrival (IQR 3-24h). Primary arterial access was femoral in 93% of cases, 49% were bilateral. Brachial/radial access was used primarily in 6 cases, and secondary to femoral in 9. Implant details are listed in **Table (mean, range and n, %).** Five of 94 implants underwent revision (1 open surgery) at a median of 4d postop (range 2-60d). Two occlusions and 1 stenosis were present at follow-up at a median of 1 month (range 0-72m).

Conclusions: Endovascular reconstruction of injured arteries requires a broad range of implant types, diameters, and lengths which should be readily available in trauma centers. Stent occlusions/stenoses are rare and can typically be managed by endovascular means.

	Thoracic. Aorta	Ax/SCA	Carotid	Abd. Aorta	Iliac	FemPop
Self-Expand (n, %)	58 (100)	5 (36)	4 (80)	2 (50)	2 (50)	3 (43)
Vessel Diameter (mm)	23 (14-33)	7.7 (5-14)	6.8 (4-12)	11 (7-13)	13 (12-14)	7 (4-11)
Implant Diameter (mm)	27 (21-34)	7.8 (5-11)	11(6-30)	17 (8-26)	11 (8-12)	6 (6-8)
Implant Length (mm)	98 (20-160)	37 (4-100)	48 (20-100)	69 (38-120)	57 (39-90)	84 (40-150)

Poster #84

DOES IMPLEMENTATION OF A STANDARDIZED BLUNT THORACIC TRAUMA SCORE LEAD TO IMPROVED OUTCOMES?

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Introduction: Blunt thoracic injury (BTI) continues to be a major source of morbidity and mortality**.** Managing the trauma sustained can be a clinical challenge requiring optimal triage of the patient. Prior studies have demonstrated that a standardized score can predict BTI complications. We implemented a novel standardized score (Blunt Thoracic Score, BTS) incorporating age, number of rib fractures, negative inspiratory force (NIF), vital capacity, pain scale, strength of cough, presence of pulmonary contusions, base deficit and history of COPD or smoking to differentiate which patients could benefit from admission to the intensive care unit (ICU).

Methods: Patients admitted to NYU Langone-Long Island from 2018-2020 with BTI who were assigned a BTS and compared to a random sample of patients from 2014-2017 (prior to implementation of BTS). Those with BTS greater than six were admitted to the ICU. Wilcoxon rank-sum, Chi-Square, and Fisher's exact tests were used for bivariate comparisons as appropriate. Logistic and negative binomial regressions were used for multivariable analyses. Using a receiver operating characteristic curve (ROC) and the area under the curve (AUC), the optimal cut-off was determined to predict the need for ICU admission.

Results: From the pre-BTS period, 39 patients were included in the study, and from the post-BTS period 225 patients identified. Median injury severity score (ISS) in both groups was nine. Pre-BTS ICU, admission rate was 61.5% and post-BTS was 43.1%, p=.03. Median (IQR) ICU length of stay (LOS) for pre-BTS was 3 (2-4), and post-BTS was 2 (1-3) days, p=.01. Median (IQR) hospital LOS for pre-BTS was 5 (4-7), and post-BTS was 3 (2-6) days, p<.0001. BTS>6 was associated with a longer hospital LOS (IRR 1.70, 95% CI =1.27-2.28) p< .0001. Analysis using the ROC curve and AUC showed that a BTS of 7 was the optimal cutoff (sensitivity .87, specificity .86) for determining the need for ICU admission.

Conclusion: Use of a standardized Blunt Thoracic Score is associated with improved ICU resource allocation and decreased ICU and hospital LOS. Prospective analysis of the Blunt Thoracic Score will allow further refinement and optimal utility for triage of patients suffering blunt thoracic injury.

Poster #85

ANTIPLATELET AND ANTICOAGULATION STRATEGIES AFTER FEMORAL ARTERY REPAIR FOLLOWING TRAUMA: PRACTICE PATTERNS AND RESULTS

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Introduction: There remains very little data regarding the utility of anticoagulation (AC) and/or antiplatelet (AP) therapy after traumatic arterial repair. We hypothesize that the use of AC/AP is highly variable and has questionable impact upon outcomes after peripheral arterial repair.

Methods: The AAST PROOVIT Registry was utilized to query femoral arterial injuries requiring surgical intervention. Post-operative AC/AP strategies were examined and the rates of thrombosis/ amputation for each strategy compared.

Results: From March 2013 – Sept 2021, 223 open femoral artery repairs were identified [Primary repair 29.2% (65/223); Autologous interposition or bypass 56.1% (125/223); Synthetic graft interposition or bypass 14.8% (33/223)]. Post-operative AC alone was utilized in 25.6% (57/223); [LMWH 16.1% (36/223); IV heparin 7.6% (17/223); Oral warfarin 0.4% (1/223); Subcutaneous heparin 0.9% (2/223). AP therapy was utilized in 17.5% (39/223) [ASA 17.0% (38/223); Plavix + ASA 0.4% (1/223)]. When categorizing these modalities as AC alone, AP alone, or combined regimen, there was no significant difference in adverse outcomes when compared to the group with no recorded AC/ AP (p=0.43). Adverse outcomes were defined as thrombosis and/ or amputation. Repair thrombosis and/or amputation occurred in 20 out of 223 instances for a composite complication rate of 4.5% (20/223). Antiplatelet alone yielded a 5.1% (2/39) rate of complication whereas anticoagulation alone showed a rate 12.3% (7/57). The combined regimen rate was 6.7% (6/90) while the group without documented AC/AP showed a rate of 13.5% (5/37).

The addition of antiplatelet therapy to anticoagulation medication did not confer any significant benefit with regards to avoiding thrombosis or amputation (p = 0.95). Similarly there was no significant difference in adverse outcome with the addition of anticoagulation to antiplatelet regimen (p=0.92).

Conclusion: AC/AP strategies after traumatic femoral artery repair vary widely with no demonstrable benefit to any employed strategy. The addition of antiplatelet or anticoagulation agents does not appear to confer benefit for these injuries when utilizing the presently available data.

Strategy	Total= 223	Thrombosis	Amputation	Total Thrombosis + Amputation
Anticoagulation	25.6% (57/223)	8.8% (5/57)	7% (4/57)	12.3% (7/57)
Antiplatelet	17.5% (39/223)	2.3% (1/39)	2.3% (1/39)	5.1% (2/39)
Anticoagulation + Antiplatelet	40.3% (90/223)	5.6% (5/90)	3.3% (3/90)	6.7% (6/90)
Neither	16.6% (37/223)	0% (0/37)	13.6% (5/37)	13.5% (5/37)

Poster #86

AORTIC OCCLUSION IN THE OPERATING ROOM: RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA) VS. OPEN AORTIC CLAMPING

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Introduction: The use of temporary aortic occlusion (AO) in the operating room is a potentially life-saving intervention that is designed to optimize perfusion to the heart and brain while hemorrhage is controlled within the abdomen itself. Traditionally, this maneuver was achieved during emergent laparotomy via supra-celiac aortic clamping. In recent years, however, the use of REBOA in the operating room for temporary aortic control prior to laparotomy has been introduced. We hypothesize that this newer practice may better avoid the fluctuations in hemodynamics known to occur with emergent entry into an abdominal cavity with uncontrolled bleeding.

Methods: The American Association for the Surgery of Trauma (AAST) Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) database was used to identify patients undergoing Zone 1 REBOA or open abdominal aortic clamping in the operating room from January 2014 to January 2022. Demographics, injury characteristics, required procedures and outcomes were compared between the two groups using SPSS statistical software.

Results: Over the study period, 161 AO meeting criteria were identified, with 114 Zone 1 REBOAs and 47 open AOs. Blunt mechanisms accounted for 50% of injuries, with a mean admission SBP of 94 mm Hg and a mean ISS of 33. In comparing REBOA to open AO, there were no differences in demographics, presentation physiology, overall injury severity or body region abbreviated injury scores (AIS). The overall mean SBP at time of AO was 73 mm Hg and did not vary between the two groups. Resuscitative requirements were not significantly different between REBOA and open abdominal AO and there was no difference in highest lactate, lowest hemoglobin or highest INR values. There were no significant differences in overall complications, lengths of stay or mortality (45% REBOA vs. 47% Open, $p = 0.797$). Patients undergo REBOA, however, were significantly more likely to have an observed improvement in hemodynamics with AO (86.8% vs. 74.5%, $p = 0.017$) and were more likely to achieve durable hemodynamic stability (77.2% vs. 53.2%, $p = 0.001$) than open occlusion counterparts.

Conclusion: At centers participating in the AAST AORTA database, Zone 1 REBOA is now used more commonly than traditional open abdominal aortic clamping after entry. REBOA appears to be comparable to open AO across most discernable outcomes but is superior to open clamping at improving initial hemodynamics and in supporting durable hemodynamic stability during attempts at definitive hemorrhage control.

Poster #87

EARLY FIXATION OF PELVIC FRACTURE IMPROVES LENGTH OF STAY BUT NOT FUNCTIONAL OUTCOMES

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Introduction: Pelvic trauma is a common occurrence following significant force impact and can often lead to life-threatening complications that require prompt intervention. Data comparing the timing of pelvic fracture fixation on functional outcomes is limited. We hypothesized that early fixation is associated with improved clinical outcomes compared to delayed fixation.

Methods: A retrospective chart review was performed of all adult trauma patients admitted to an urban Level 1 Trauma Center who underwent open reduction and internal fixation of a pelvic fracture. Primary outcomes included ability to ambulate and ability to perform at least one transfer independently at the time of discharge. Secondary outcomes included hospitalization-associated complications. Early pelvic fixation was defined as <48 hours following presentation.

Results: A total of 291 patients presented with 210 acetabular and 81 pelvic ring fractures. Of these, 30.5% (n=64) of acetabular fractures and 38.3% (n=31) of pelvic ring fractures underwent early fixation. Univariate analysis showed that there was no significant difference in functional outcome between early and late fixation for either fracture type. When put into a multivariate model adjusting for age, injury burden, and hospital factors, timing of pelvic fixation again was not a predictor of mobility outcomes. There was no statistically significant difference in complication rates between those who underwent early vs late pelvic fixation. Early fixation, however, was associated with a shorter length of stay for patients with pelvic ring fractures and a lower rate of discharge to rehabilitation or nursing facilities for both fracture types.

Conclusion: While early pelvic fixation does not appear to play a role in short term mobility outcomes or hospital-associated complications for patients with pelvic fractures, our findings suggest early fixation should be considered whenever feasible to reduce hospital LOS and increase home discharge rates for patients.

Poster #88

ENOXAPARIN PRIOR TO FEMUR SURGERY DOES NOT AFFECT BLEEDING: A MULTICENTER PRAGMATIC PILOT STUDY

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BACKGROUND: Controversy exists regarding holding prophylactic enoxaparin doses immediately prior to ORIF of femur shaft fracture due to concerns that operative bleeding risk outweighs the VTE prevention benefit. The objective of this study was to determine the incidence of bleeding complications in trauma patients undergoing femur ORIF based on receipt/non-receipt of enoxaparin within 24 hours prior to surgery.

METHODS: Adult patients undergoing ORIF of closed, near-isolated unilateral femur fractures (2017-19) at Level I/II Centers were enrolled and data retrospectively collected via trauma registry and manual chart review. Patients were grouped by if they received enoxaparin within 24 hours pre-op (ENX+) or not (ENX–) and compared on pre-to-post-op Hb change, EBL, and intra-op pRBC use via univariate analysis (α=.05).

RESULTS: Groups did not differ on demographics (Table). For ENX+, median time from last enoxaparin dose to surgery was 12.5 hrs [IQR:9,17]. ENX– patients went to the OR significantly sooner than ENX+ (13.5 v 21.5 hrs, p<.001). Comparing ENX– to ENX+, there were no significant differences in pre-op Hb levels (12.8 v 12.5), Hb change (-2.5 v -2.3), EBL (128 v 137), or intra-op pRBC use (0.5% v 0.0%), p>.05 for all comparisons. There was no significant difference in DVT or PE occurrence.

CONCLUSION: This pilot study suggests that pre-op administration of enoxaparin in femur fracture patients is safe, feasible and not associated with bleeding complications. These findings warrant verification in a prospective trial.

VARIABLE		ENX – n=415	ENX + n=46	p
Male	n,(%)	213 (51.3%)	28 (60.9%)	.22
Age	Mean (SD)	47.6 (23.4)	41.8 (22.2)	.12
ISS	Mean (SD)	10.3 (2.40)	10.7 (2.2)	.02
BMI	Mean (SD)	28.3 (11.6)	28.9 (8.4)	.49
Time to OR (hr)	Mean (SD)	13.5 (8.0)	21.5 (9.1)	<0.001
Hb pre-op (lowest)	Mean (SD)	12.8 (1.8)	12.5 (2.2)	.29
Hb Change	Mean (SD)	- 2.5 (1.4)	-2.3 (1.6)	.25
EBL (cc)	Mean (SD)	128 (105.2)	137 (91.6)	.38
Intra-op pRBC	n,(%)	2 (0.5%)	0 (0.0%)	.81
DVT	n,(%)	1 (0.2%)	1 (2.2%)	.19
PE	n,(%)	2 (0.5%)	1 (2.2%)	.27

Poster #89

ERECTOR SPINAE BLOCKS DECREASE EARLY OPIOID REQUIREMENTS IN NON-OPERATIVE RIB FRACTURE PATIENTS

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Introduction: Erector spinae plane (ESP) block is a novel regional anesthetic utilized with increasing frequency as an adjunct to multimodal pain regimens (MMPR). The impact of ESP is yet to be determined in non-operative rib fractures. We hypothesized that the addition of ESP block to an MMPR in rib fracture patients would increase incentive spirometry (IS) volume, decrease numeric pain scores (NPS), and decrease opioid consumption.

Methods: A retrospective cohort study from Mar 2020 to Aug 2021 at an ACS verified Level I trauma center was performed. Adult patients (> 18 years), blunt mechanism, and a minimum of 3 rib fractures were included. Patients requiring major thoracic procedures, concomitant major abdominal or extremity injuries (AIS>/=2), pregnancy, and incarceration were excluded. IS, NPS, and opioid consumption during the initial hospitalization were recorded. Patients received MMPR alone or MMPR and a single shot bupivacaine ESP block, and these groups were compared.

Results: 148 patients (74 in ESP, 74 MMPR alone) were included in the analysis. There were no significant differences between groups in gender, BMI, ISS or chest AIS, but the ESP block patients were older (median [IQR]: 61.1(50.7-75.1) vs 52.9 (41.1-68.8) p=0.02) and had more ribs fractured (median [IQR]: 5[4-7] vs. 4[3-6]; p=0.03). Opioid consumption was lower in the ESP group on the day following the block (median [IQR]: 7.5[0-15] vs. 15[3.7-45], p=0.002). There were no differences in IS and NPS between the two groups.

Conclusion: The addition of a single shot ESP block to MMPR in rib fracture patients decreased opioid consumption in the first 24 hours. Further study is needed to determine if continuous infusion catheters have a more durable effect on opioid consumption or respiratory performance in these patients. However, an ESP block should be considered a viable adjunct for non-operative management of rib fractures.

Poster #90

IS CLINICAL EVALUATION OBSOLETE IN THE EVALUATION OF PENETRATING THORACIC TRAUMA IN THE ERA OF IMAGING?

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Introduction: Despite the advances in imaging technology in trauma, clinical evaluation has a powerful role on the initial assessment of many trauma scenarios. Especially those with potentially unstable hemodynamic injuries. We therefore, analyzed the role of topographic evaluation and hemodynamic stability in discovering specific injuries in a trauma center with a high volume of penetrating thoracic trauma (PTT).

Methods: Prospective register of PTT patients treated during 2017. Subjects were classified according to the location of the wounds as periclavicular, precordial, thoracoabdominal, transmediastinal, and excluded topographic regions (ETR) (meaning outside the predefined regions described). Unstable patients were operated on. Further studies and procedures were dictated by topographic location (TL). Associations between TL, hypotension and injured organs are presented as OR (95% confidence interval).

Results: We included 824 patients, 773 male (93.8%). Median interquartile range (IQR) age was 25 (20 - 33) years. Wounding mechanisms were stab wounds in 532 (64.6%), and fire arms wounds in 292 (35.4%). Entrance wound location was periclavicular in 109 cases (13.2%), precordial in 213 (25.9%), thoracoabdominal in 396 (48.1%), transmediastinal in 47 (5.7%), and ETR in 513 (62.3%). There were entrances in multiple areas in 364 patients (44.2%). Injuries located in the lungs in 458 subjects (55,8%), the diaphragm in 59 (87.2%), the heart in 44 (5.3%), minor vessels in 36 (4.4%), and major vessels in 17 (2.1%). Periclavicular entrances associated with major vascular injury, OR 10.2 (3.4 - 32.2), precordial location with cardiac injury OR 48.3 (15.1 - 245.5), and thoracoabdominal with diaphragmatic injury OR 9.1 (4.03 - 24.0). Sixty-five patients had hypotension at admission. It was associated with a cardiac or vascular wound, OR 9.5 (5.7 - 15.9). A thoracotomy was performed in 93 cases (11.3%). Hypotension associated with it, OR 13.0 (7.2 - 23.5).

Conclusion: In patients with penetrating thoracic trauma, hypotension at admission and topographic location of the wounds are powerful tools to guide decisions regarding surgical indication, surgical access, and complementary studies.

Poster #91

NONOPERATIVE MANAGEMENT OF TRAUMATIC HEMOPERICARDIUM IN PENETRATING PRECORDIAL TRAUMA.

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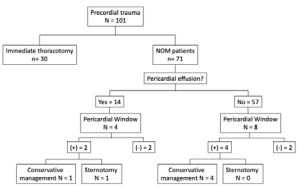
Introduction: A nonoperative management (NOM) protocol of precordial penetrating trauma (PPT) was implemented in our hospital.
We describe the results after three years of the protocol inception.

Methods: Patients ≥15 years with PPT were prospectively registered. Unstable or tamponed subjects were operated on immediately. Stable patients were followed clinically, monitored, and evaluated serially with transthoracic ultrasound (US). Surgery was indicated if unstable or tamponade appeared. PW was performed in cases of clinical doubt.
Demographics, trauma mechanism, clinical presentation, trauma indexes, US results, surgical interventions/findings, and mortality were recorded. Continuous variables are presented as median and interquartile range (IQR).

Results: One hundred-one patients were registered. A resuscitative or emergent thoracotomy was performed in 30. The remaining 71 were included in the NOM protocol. Median (IQR) age was 29 (23 - 41) years; 56 (98.2%) were male, and 34 (47.8%) suffered gunshot wounds. The Median (IQR) of RTS, ISS, and NISS were 7.84 (7.84 – 7.84), 11 (10 – 19), and 14 (10 – 27), respectively. Fluid was detected in the pericardium in 14 (19.7%). In 13 in the first examination. Demographics and trauma severity were similar between the US (+) and US (-) groups.



Twelve PW were performed. Eight in the US (-) group (14.0%), and 4 in the US (+) patients (28.6%). The approach for the PW was transdiaphragmatic in 8 cases, thoracoscopic in three, and transthoracic in one.
The PW was positive in 6 cases. It was managed successfully by drainage, lavage, and observation in five. A sternotomy was performed in one patient to confirm a contusion of the right ventricle.
Among the 14 patients with a US diagnosed hemopericardium, 10 (71.4%) did not undergo surgery. A thoracotomy or sternotomy was avoided in 13 (92.9%),. Five out of 6 positive PW were managed conservatively.
Two deaths not related to the thoracic trauma occurred in the (-) US patients. None patient in the (+) US died.

Conclusion: The (NOM) protocol of precordial penetrating trauma (PPT) avoided most PW and thoracotomies/sternotomies without compromising the safety of the patients.

Poster #92

SPINE IMMOBILIZATION LIMITS MAXIMUM INSPIRATORY EFFORT

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Objectives: Maximum incentive spirometry results correlate with respiratory complications following blunt thoracic trauma and are used as a triage tool for patients with rib fractures. Patients with thoracic trauma often require spine immobilization through use of cervical collar and/or logroll precautions. We hypothesized that the presence of a cervical collar and spinal precautions would reduce maximum inspiratory effort.

Methods: This prospective study included 40 uninjured volunteers. Demographic data, including age, height, weight, and respiratory co-morbidites were obtained. The predicted maximum inspiratory effort was determined for each participant prior to the experiment using the provided chart. Each participant was tasked to perform maximum inspiratory effort, as measured by spirometry, in four different positions: supine ± cervical collar, and upright ± cervical collar. The order in which the subjects performed these values was randomized. The primary outcome variable was spirometry as a percent of predicted volume. The volumes at each position were compared with a paired T-test.

Results: The average age the participants was 25.8 years old and 53%were male. Mean spirometry value in upright position without collar (URWO) was 104% (±20%) of predicted, upright with cervical collar (URW) 93% (±21%), supine without cervical collar (SUWO) 97% (±23%), supine with cervical collar (SUW) was 91% (±22%). When compared to no spinal precautions (UWO), SUWO resulted in a 7% reduction ($p<0.001$), URW 11% reduction ($p<0.001$), and SUW 13% reduction ($p<0.001$).

Conclusion: Maximum incentive spirometry was significantly decreased with spine immobilization in uninjured volunteers. This study highlights the importance of incorporating the presence of a cervical collar and spinal precautions into triage algorithms that use spirometry to predict risk of respiratory complications after thoracic trauma.

Poster #93

SURGICAL RIB FIXATION IN OBESE PATIENTS WITH ISOLATED FLAIL CHEST IMPROVES OUTCOMES: A MATCHED COHORT STUDY

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Introduction: The role of surgical rib fixation (RF) in obese patients is not clear, due to both technical challenges and perceived increased perioperative risk. This study compared outcomes after RF and nonoperative management (NOM) in obesity.

Methods: Adults (BMI>30) with isolated flail chest from the Trauma Quality Improvement Program (TQIP) Database (2016-2018). Patients with RF were propensity score matched 1:2 with NOM. Multivariate regression identified independent factors predicting mortality, prolonged mechanical ventilation, and prolonged ICU stay.

Results: RF was performed in 367/1809 obese patients with flail chest. After matching with 734 NOM, RF was associated with lower mortality rate (1.4% vs. 3.7%; $p<0.05$) and fewer ventilator days (9.2 days vs. 11.5 days; $p<0.05$). On multivariate analysis, RF was associated with improved survival (OR 0.27; $p<0.05$), and early RF (≤72 hours) was associated with lower odds of prolonged ICU stay (>7 days) (OR 0.28; $p<0.05$) and prolonged mechanical ventilation (>7 days) (OR 0.28; $p<0.05$).

Conclusion: RF for isolated flail chest is associated with improved outcomes in obese patients. Earlier implementation decreases the odds of prolonged ventilator use and ICU stay.

Poster #94

ULTRA-PORTABLE ULTRASOUND FOR INPATIENT MANAGEMENT OF CHEST TUBES IN TRAUMA: A PROSPECTIVE FEASIBILITY TRIAL (UPUS)

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Background: Bedside ultrasound (US) has shown promising results in the assessment of recurrent pneumothoraces (PTXs) after thoracostomy tube (TT) removal. Advancements in US technology have allowed for ultra-portable, hand-held ultrasound (UPUS) devices to be both affordable and capable of high-quality images. We hypothesized UPUS is feasible, acceptable to patients, and not inferior to standard chest x-ray (CXR) in the assessment of PTX after TT removal.

Methods: This is a single-center, prospective study of all adult trauma patients requiring TTs at a level 1 trauma center. Patients were excluded if they were unable to provide consent for participation. UPUS examinations were performed by two clinically trained researchers using the Butterfly iQ+™ ultrasound. Images were obtained daily while the TT was in place and 1-6 hours following TT removal. Ultrasound results were compared to post-TT removal CXR results. Significant PTX was defined as lack of lung sliding in ≥2 intercostal spaces on UPUS, and/or radiology read of a PTX on CXR other than “small”, “trace”, or “tiny”. Examiners were blinded to CXR findings.

Results: A total of 32 patients were enrolled with 59% (N=19) developing a post-TT removal PTX on either CXR or UPUS. Two post-TT removal PTX required reintervention. UPUS and CXR findings were concordant in 20 patients (62.5%). Twelve patients had discordant findings, 10 of whom (80%) had a PTX on CXR that was not identified on UPUS. None of these PTX were significant or required reintervention. UPUS identified two PTX (one significant) that were not seen on CXR. UPUS successfully identified both PTX requiring reintervention. On completion survey 86.67% of patients indicated a preference of UPUS over CXR with the majority (84%) of patients citing comfort (vs. 41% with CXR) and radiation concerns (65% of patients) as driving factors.

Conclusion: UPUS successfully identified all clinically significant post-TT removal PTX and appears to be a diagnostically acceptable alternative to CXR. If UPUS alone had been used to evaluate for post-TT PTX, 30% of patients could have avoided additional hospital days and/or repeat imaging.

Poster #95

EPIDURAL ANALGESIA IN PATIENTS WITH ISOLATED RIB FRACTURES THE 24-HOUR EFFECT ON PAIN AND PULMONARY FUNCTION

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Introduction: Epidural catheter placement is used as part of the multimodal approach in the management of rib fractures. The literature supports improved outcomes with the use of epidural analgesia; however, the specific mechanism and timing of effect remains to be determined. We sought to elucidate the effects of epidural analgesia in patients with isolated rib fractures in the first 24 hours after epidural placement.

Methods: A retrospective review of patients with isolated rib fractures and epidural catheter placement admitted to a rural ACS Level 1 trauma center between January 1- December 31, 2021, was conducted. Verbal pain, visual analog pain scale, vital capacity/incentive spirometry, cough and peak flow data was collected 24 hours before and after initiation of epidural analgesia was retrieved. Patients that underwent rib fixation 24 hours before or after epidural placement were excluded to eliminate the surgery as a confounding variable. Demographic and outcome data were also collected and analyzed.
Results: Fifty patients met inclusion criteria with a median age of 72, 40% female, average ISS of 10 ± 3, Chest AIS 3 ± 0.3, GCS 15 ± 0.1, mean number of ribs fractured was 5.1 ± 2.4, six (12%) had a flail chest. Average HLOS 10.5 ± 3.9, ICU LOS 5.5 ± 4.5. Sixteen patients (32%) had rib fixation procedures, 28 (56%) had chest tubes. One patient developed a PE (2%).

Table I. Pain and pulmonary function before and after epidural placement

Variables	Before Epidural Placement	After Epidural	P values
Average total PIC score ± SD, median	7 ± 2, 7	8.4 ± 1.5, 9	0.0002
Average verbal pain score ± SD, median	5.7 ± 2.8, 6	3.2 ± 2.2, 2.5	< 0.0001
Average Wong-Baker ± SD, median	5.2 ± 2.4, 6	3 ± 2.1, 2	0.0001
Average Subjective cough ± SD, median	2.3 ± 0.5, 2	2.5 ± 0.5, 3	0.05
Met incentive spirometry goal	26(52%)	29(58%)	0.49
Average Vital Capacity ± SD, median	1034 ± 532, 1050	1274 ± 673, 1250	0.06
Average Peak Flow ± SD, median	118 ± 100.7, 100	160 ± 85.8, 150	0.11

Conclusions: In patients with isolated rib fractures epidural placement had significant improvement in subjective pain measurements scores by both Wong-Baker and verbal scores, as well as improvements in PIC (Pain, Inspiration, Cough) scores. There was a trend toward improvement in objective measurements of respiratory function (vital capacity and peak flow) although, not statistically different. Epidural catheter placement may be more helpful with subjective measurements of pain than objective pulmonary function measures. Further study is needed to examine the benefits of epidural placement in isolated rib fractures.

Poster #96

A MICROFLUIDIC STUDY ON THE INTERPLAY OF RED BLOOD CELL (RBC) STORAGE DURATION AND INFLAMMATORY STIMULI

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Introduction: Red blood cell (RBC) aging in the blood bank is characterized by biochemical and morphological changes affecting efficacy in shock states. Sphingosine 1-phosphate (S1-P) from RBCs and endothelium are important in endothelial barrier integrity and function. RBC adherence to the microvasculature may also impede flow and lead to disturbances in perfusion and inflammatory responses. Inflammatory conditions also impact S1-P signaling pathways. Storage duration effects on RBC S1-P concentration and endothelial barrier interactions under flow conditions are unknown. This was studied using a microfluidic flow platform.

Methods: Blood samples were obtained from healthy volunteers and RBC segments from the hospital blood bank. RBC groups included fresh, blood bank storage < 14 days and storage > 21 days. Human umbilical vein endothelial cell (HUVEC) monolayers were established in microfluidic flow devices. Cell monolayers were perfused with media containing tumor necrosis factor (TNF) or media alone followed by perfusion with RBC samples. In other experiments S1-P was added to RBC groups at equal concentrations prior to perfusion of HUVEC monolayers. RBC membrane S1-P content was determined by a fluorescent assay. Endothelial glycocalyx integrity was indexed by thickness and shedding of syndecan-1 (syn-1). Endothelial permeability was indexed by measuring the fluorescence intensity of the interaction of biotinylated fibronectin and FITC-avidin.

Results: Mean ± SD, N = 4 for each group.

	RBC adherence	Syn-1 (pg/ml)	Glycocalyx Thickness (Fluorescence intensity)	Endothelial Permeability (Fluorescence intensity)
HUVEC control Fresh RBC	60 ± 12	28.6 ± 3.4#	265.2 ± 9.1#	51 ± 12#
HUVEC control < 14 RBC	84 ± 10*	41.8 ± 2.1*#	253.4 ± 8.6#	55 ± 15#
HUVEC control > 21 RBC	185 ± 26*	56.9 ± 4.4*#	241.7 ± 6.1#	62 ± 18#
HUVEC + TNF (media only)	-------	98.7 ± 7.9	129.4 ± 6.3	235 ± 35
HUVEC + TNF Fresh RBC	98 ± 18*	76.9 ± 6.6*#	143.2 ± 8.7*#	175 ± 20*#
HUVEC + TNF < 14 RBC	148 ± 20*	86.9 ± 7.2*	134.9 ± 6.1*	195 ± 35*
HUVEC + TNF > 21 RBC	305 ± 33*	106.2 ± 7.6*	113.4 ± 5.2*#	255 ± 33*

*p<0.05 vs. Fresh RBC (no TNF), #p<0.05 vs. HUVEC + TNF alone

S1-P fluorescence intensity values in fresh RBC, < 14-day RBC and > 21-day stored RBC were 201.3 ± 14, 133.7 ± 15* and 95.5 ± 20*#, respectively (*p<0.05 vs. fresh RBC, #p<0.05 vs. <14 day RBC). Adding S1-P to RBC in the different groups abrogated the negative effects noted on the endothelium and glycocalyx related to RBC storage duration.

Conclusion: RBC vascular adhesion was related to storage duration and inflammatory conditions. This was associated with endothelial glycocalyx degradation and endothelial permeability. RBC S1-P content was inversely related to storage duration and had barrier protective effects. Nanotechnology using S1-P donors may modulate transfusion exacerbation of shock induced microvascular dysfunction.

Poster #97

A PROSPECTIVE EVALUATION OF PLATELET MITOCHONDRIAL BIOENERGETICS IN A BLUNT TRAUMA COHORT

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Introduction: Platelets are dependent on mitochondria for energy production and activation, and mitochondrial bioenergetic defects can lead to aberrant function. Altered platelet bioenergetics have been shown to correlate with patient outcomes in disease states such as pulmonary hypertension and sepsis. Platelet dysfunction is a hallmark of trauma-induced coagulopathy. However, abnormal platelet activation and agonist response are observed in minimally-injured patients – a finding of unclear clinical significance. Platelet mitochondrial bioenergetics have not been prospectively studied in a trauma population and may better identify true platelet lesion.

Methods: The local Institutional Review Board approved this study. Whole blood and clinical data was obtained at presentation from 24 adult blunt trauma patients who met trauma leveling criteria. Platelet mitochondrial bioenergetics were assayed using Seahorse XF extracellular flux analysis, platelet activation was measured by flow cytometry, and plasma cytokine levels were evaluated by immunosorbent assay. 8 healthy volunteers served as controls. Parametric analyses were performed with α=0.05.

Results: Median age was 49.5 years, with 67% males. Admitted subjects had a median injury severity score (ISS) of 9. Trauma patients had significantly higher mean levels of IL-6 (30.86 vs 0.00 pg/mL, p=0.03), MCP-1 (202.8 vs 46.09 pg/mL, p=0.004), and platelet activation (6.76 vs 1.29%, p<0.001) compared to controls. There was a nonsignificant trend towards decreased mean basal oxygen consumption rate in trauma patients (156.9 vs 201.1 pmol/min/10^6 cells, p=0.067). No significant differences were observed between the trauma and control groups in proton leak (45.24 vs 44.78 pmol/min/10^6 cells, p=0.95), maximal oxygen consumption (350.7 vs 304.8 pmol/min/10^6 cells, p=0.31), non-mitochondrial respiration (23.9 vs 26.6 pmol/min/10^6 cells, p=0.51), extracellular acidification rate (23.71 vs 29.36 mpH/min/10^6 cells, p=0.067), or reactive oxygen species generation (0.043 vs 0.046 pmol/min/50x10^6 cells). Analysis of the above variables as a function of ISS showed no differences.

Conclusion: Despite significant increases in acute-phase cytokines and baseline platelet activation in trauma subjects, platelet bioenergetic parameters were relatively unchanged in this blunt trauma cohort.

Poster #98

EFFECTS OF HYPOCALCEMIA ON HEMORRHAGIC SHOCK IN SEVERELY INJURED TRAUMA PATIENTS

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Background: Calcium is essential to various physiologic processes. It has been proposed that the "lethal triad" (i.e., hypothermia, acidosis, and coagulopathy) be altered to include hypocalcemia (hypoCa) and thus referred to as the "lethal diamond." HypoCa in trauma has been attributed chelation of calcium ions by citrate blood preservatives, but new evidence suggests the traumatic injury itself may independently result in hypoCa that is further exacerbated by blood transfusion. We hypothesize that there is an independent association of hypoCa with increased blood product requirements and mortality.

Methods: We conducted a retrospective study of 1981 severely injured adult trauma patients. Data was collected from a trauma registry from January 2016 to December 2019. Ionized calcium (iCa) levels were obtained from arrival blood draws. Subjects were categorized into two groups by a threshold iCa level of 1.00 mmol/L and compared. Logistic regression analysis was performed to identify independent predictors of mortality at various time points.

Results: Groups were well matched in terms of demographics. The severe hypoCa (iCa <1.00 mmol/L) group showed an increased overall (p=0.001), 4-hr (p=0.007), and 24-hr mortality (p=0.003). There was no difference in prehospital transfusion volumes between the groups (p=0.25). Severe hypoCa was associated with more blood products transfused at 4 hours (p <0.001), 24 hours (p <0.001), and overall hospital length of stay (p <0.001). Subgroup analysis was performed on transfused patients comparing resuscitation with whole blood (WB, n=159) resuscitation and component therapy (CT, n=692). There was no difference in prehospital transfusion volume between the two subgroups. Patients receiving WB were associated with higher iCa (p=0.01) and lower transfusion volumes overall and at both early time points (4-hour, 24-hour, p<0.05), but no observed difference in mortality or in-hospital outcomes. Logistic regression analysis showed increased odds of early (4-hour) mortality with hypoCa (OR 2.67, 95% CI 1.03, 6.91, p = 0.04).

Conclusions: This study supports previous literature showing the association of hypoCa and traumatic injury. We showed that severe hypoCa was associated with increased early and overall mortality and larger blood product requirements without a difference in prehospital blood products amongst these groups. Additionally, hypoCa was found to be an independent predictor of early mortality. These results support the need for future prospective trials assessing the role of hypoCa in trauma and effects of empiric calcium replacement on outcomes and mortality.

Poster #99

EMERGENCY DEPARTMENT REBOA TO STABILIZE PATIENTS FOR CT SCAN PRIOR TO DEFINITIVE HEMORRHAGE CONTROL: AN EMERGING PRACTICE

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Introduction: Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) has emerged as a resuscitative tool of modern trauma care at select centers. Over the past several years, practice using these devices has continued to evolved - including the emerging practice of utilizing REBOA to facilitate emergent CT imaging prior to definitive hemorrhage control. Outcomes of these practices, however, have not been previously described in a multi-institutional fashion. We hypothesize that REBOA is increasingly being utilized to facilitate adavanced imaging en route to hemorrhage control, and that utilization of this practice in appropriately selected patients does not increase adverse outcomes.

Methods: The AAST AORTA database, amended to include greater granularity regarding intent of REOBA use and patient disposition after use in 2020, was queried to identify patients surviving to move out of the ED after REBOA. Specific focus was then given to those patients proceeding from the ED to CT scan as their initial destination, with details of REBOA use and subsequent outcomes analyzed.

Results: From March 2020 to January 2021, 189 REBOA patients survived to move for the ED to another destination in the hospital. Of these, 24% from 9 different ACS level 1 trauma centers went first to the CT scanner. The reported intent of CT was to identify unclear presence or source / location of hemorrhage in 64% or to image other body areas (e.g. head CT) prior to operation or angiography (24%). Mean age of CT first patients was 37.1 62% were male, mean ISS was 33 and blunt mechanism accounted for 82% (37). Mean admission SBP was 80 mm Hg (± 30) and mean SBP at the time of aortic occlusion was 58 mm Hg (± 31). REBOA was deployed in Zone 1 for 51%, Zone 2 2.2%, Zone 3 47%. Hemodynamics improved with REBOA in 87% with SBP rising to > 90 mm Hg in 89%. Hemodynamic stability was achieved in 73%. Among occlusion types, total occlusion was most commonly utilized at 89% [Intermittent occlusion 2%; partial occlusion 4%, NOS 4%). Median balloon occlusion time required was 53.5 minutes (IQR 58). Balloon deflation was ultimately achieved in 76%. After CT scan, patients proceeded to a variety of definitive hemorrhage control interventions, including exploratory laparotomy (44%), embolization of liver/spleen (4%), pelvic embolization (22%), pelvic external fixation (11%) and thoracotomy (4%). Mortality occurred in 56% of patients going first to CT, compared to 51% for all REBOA patients surviving beyond the ED. Complications occurring among survivors of the CT first strategy included AKI (7%), ALI/ARDS (11%), Sepsis/Septic Shock (4%), MODS (4%) and one amputation as a direct result of complication of initial vascular access obtained in the ED (2%).

Conclusion: Initially introduced as a tool to salvage patients who would otherwise not survive delivery to definitive hemorrhage control environments, REBOA practice has continued to evolve. In contemporary practice at multiple level 1 trauma centers, approximately 25% of REBOA patients undergo CT scan immediately following REBOA in order to reportedly assist in hemorrhage source identification and planning or to identify injury in other body regions prior to delivery to OR or IR. Additional research is required to define the appropriate role of this emerging practice.

Poster #100

FLUID RESUSCITATION IN BURN PATIENTS: A RETROSPECTIVE ANALYSIS ON METHAMPHETAMINE'S ROLE IN PLASMA EXTRAVASATION

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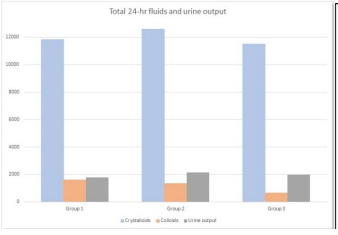
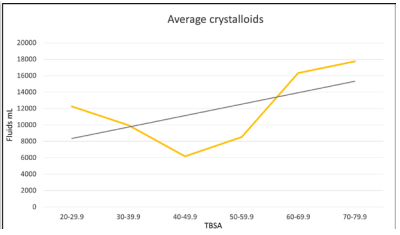
Introduction: Acute care specialists are faced by the dysregulated inflammatory cascade which require fluid resuscitation. Activation of 5-hydroxytrytpamine (5-HT) receptors have been associated with an increase in fluid extravasation. Methamphetamine (METH) is a class II stimulant that stimulates certain 5-HT receptors. METH-induced sensitization has shown upregulation of 5-HT2 receptors and increased release of 5-HT. We posit that these cases will require more intensive resuscitation given their increased serotonin levels.

Methods: Study personnel compared fluid resuscitation in the first 24 hours since burn injury of METH-positive and METH-negative burn patients with a TBSA > 20%. Patients more than 24 hours removed from injury were excluded. A total of 178 patients were selected. 20 patients were METH-positive (Group 1; positive drug screen). 67 patients were METH-negative (Group 2; negative drug screen). 91 patients were deemed METH-negative (Group 3; denial of drug use). Groups were further sequestered into TBSA quartiles. Statistical analysis was done via ANOVA.

Results: Group 1 demonstrated higher average colloids administered than Groups 2-3 (p=.001). 1st, 3rd, and 4th TBSA quartiles of Group 1 showed significance when compared to Groups 2-3 (p=.068, p=.085, p=.085). METH also showed some influence in crystalloids in the 4th TBSA quartile (p=.061).

Conclusion: Given the significance of increased colloid resuscitation for METH-positive patients compared to METH-negative patients, METH may play an indirect role in vascular permeability and fluid expulsion. This is important as colloids are utilized in later stages of resuscitation protocols. Further research on METH's role on fluid imbalances may prove useful for treatment of trauma patients.





Poster #101

OUTCOMES AND SURVIVABILITY IN ADULT TRAUMA PATIENTS UNDERGOING ULTRA-MASSIVE TRANSFUSION

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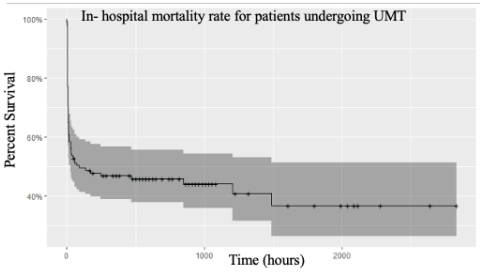
Background: The objective of this study was to determine our institutional efficacy of ultra-massive transfusion (UMT) and to analyze factors associated with outcomes and survivability.

Methods: A retrospective analysis of adult trauma patients undergoing UMT at a Level I trauma center from March 2018-December 2020 was conducted using trauma registry and blood bank databases. UMT was defined as ≥20 units of red blood cell products in 24hrs. Patient demographics, clinical presentation, transfused blood products, complications, and outcomes were compared between trauma patients who survived UMT and those who did not.

Results: Over the study period, there were 14,291 trauma activations. 830 patients required massive transfusion protocol, of which, 123 (14.8%), met criteria for UMT. The in-hospital mortality rate was 56.1% and median survival time was 91.0 hours for those undergoing UMT. There were no significant differences in gender, age, race or pre-existing comorbidities between surviving and deceased patients. The patients who died were more clinically unstable at presentation, with lower mean SBP (81.50 vs 99.41, p=0.031), HR (81.23 vs 125.2, p<0.001), and GCS (6.14 vs 10.48, p<0.001), respectively. The deceased cohort received more total blood products (91.20 vs 70.83, p=0.007) with significantly higher rates of pRBCs (42.28 vs 37.70, p=0.044) and FFP (37.14 vs 25.72, p<0.001).

Discussion: For trauma patients undergoing UMT, higher rates of transfusion did not correlate with higher rates of survival, but rather indicated prolonged time to hemorrhage control. With blood as a limited resource, it is prudent to identify which patients will benefit most from this therapy.

Figure 1.0: Kaplan Meir survival curve for adult trauma patients undergoing ultra-massive transfusion (UMT)



Poster #102

OUTCOMES OF PATIENTS ENROLLED IN THE PROPPR TRIAL ON BASIS OF GESTALT AND ABC SCORE

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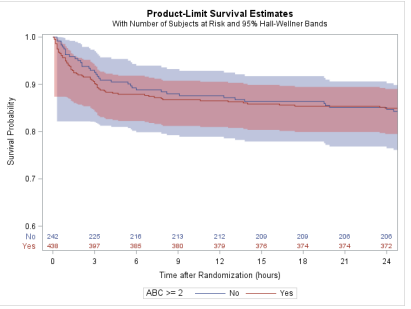
Introduction: The Pragmatic Randomized Optimal Platelet and Plasma Ratios (PROPPR) trial enrolled patients predicted to require large volume transfusion, based on Assessment of Blood Consumption Score (ABC≥2) or physician gestalt (PG). We compared characteristics and outcomes of patients enrolled with an ABC≥2 versus those enrolled by PG.

Methods: Post-hoc analysis of the PROPPR trial by method of predicting transfusion need. Outcomes included proximate (1-hour, 3-hour, 6-hour, 12-hour, and 18-hour), 24-hour, and 30-day mortality, group assignment, time to hemostasis, adverse events, operative procedures, and transfusion requirements.

Results: Of the 680 PROPPR patients, 438 (64%) had ABC≥2, and 242 were enrolled by PG, with equal ISS and treatment arm distribution between the two groups. The ABC group had more black patients (137 (31%) vs. 50 (21%); p=0.003), was younger (median age 30 vs. 44 years, p<.0001), and included more patients with penetrating injuries (278 (63%) vs. 55 (23%); p<.0001), hypotension (median SBP 95mmHg vs. 111mmHg, p<.0001), tachycardia (median HR 124 vs. 100, p<.0001), and higher GCS (median 14 vs. 13, p=0.0452). Those who died in the ABC group had a faster median time to death (268 minutes vs. 855 minutes, p=0.0176), but there were no significant differences in mortality, cause of death, adverse events, operative procedures, or transfusion requirements between the two groups.

Conclusion: The lack of outcomes differences between the two groups suggests that both an ABC≥2 and physician gestalt are clinically useful for identifying severely injured patients and predicting massive transfusion.



Poster #103

PREHOSPITAL PREDICTORS OF MASSIVE TRANSFUSION PROTOCOL AMONG TRAUMA PATIENTS TRANSPORTED FROM THE SCENE VIA FLIGHT EMS

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Background: In trauma patients at high risk of critical bleeding, timely resuscitation with blood products via massive transfusion protocol (MTP) improves survival. Factors measured during prehospital transport are important tools used by the receiving hospital for early preparation of blood products, including shock index (SI), TXA administration, and extremity injuries. Factors predictive of MTP in the subgroup of patients transported via flight EMS have not been previously examined.

Methods: This was a retrospective study on 212 adult (age ≥18 years) trauma patients transported via flight EMS directly from the scene to six level I-III trauma centers between 3/1/2019 and 1/31/2021; 34 patients without documented transport vital signs were excluded. Demographics, injury cause and severity, receiving trauma level, transport blood products, transport TXA, and transport vitals were collected on all patients. Independent associations with MTP were evaluated using adjusted logistic regression analyses.

Results: The majority of patients had a motor vehicle-related cause of injury (66%), and most (87%) were transported from the scene to a level I trauma center, with a median transport time of 19 minutes. Sixteen patients (8%) had MTP initiated at the receiving facility. Transport factors univariately associated with MTP were a cut/pierce cause of injury (P=0.05), receipt of whole blood (P<0.01), PRBCs (P=0.02), or TXA (P=0.02) during transport, abnormal HR (≤60 or ≥120; P<0.01), abnormal SBP (≤90; P<0.01), abnormal GCS (<13; P<0.01), and abnormal SI (≥0.9; P<0.01). In adjusted analyses, receipt of transport whole blood (OR=8.52; P<0.01), abnormal SBP (OR=8.07; P<0.01), and abnormal GCS (OR=8.38; P<0.01) were associated with MTP. The adjusted logistic model containing these three variables was very highly accurate at predicting the outcome of MTP (c-statistic: 0.92).

Conclusions: Three factors—receipt of whole blood during transport, SBP≤90, and GCS<13—were strongly predictive of MTP in this trauma population transported via flight EMS. The combination of these three factors has not been identified previously and can be of vital importance to flight EMS personnel when identifying patients for whom MTP should be initiated immediately upon hospital arrival, potentially allowing for earlier preparation of blood products at the receiving facility.

Poster #104

REBOA AFTER PENETRATING INTRATHORACIC INJURY: AN AORTA REGISTRY ANALYSIS

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Background: Use of resuscitative endovascular balloon occlusion of the aorta (REBOA) for noncompressible torso hemorrhage (NCTH) has shown promise for stabilizing NCTH patients. Currently, there is a gap in evidence on the benefits of REBOA use in the management of penetrating intrathoracic injury. We sought to evaluate the role of REBOA use for penetrating chest trauma.

Methods: This was a review of the Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) registry for patients with penetrating chest injuries from 2013 to 2022 who presented with signs of life and chest Abbreviated Injury Score $\geq$ 2. Those with CPR before or at admission were excluded.

Results: A total of 86 patients, 47 RT (55%) and 39 REBOA (45%), met inclusion criteria. There were no differences between RT and REBOA for median injury severity score, initial systolic blood pressure (SBP), or initiation SBP. (**Table**) REBOA patients had longer occlusion time ($p<0.001$), but higher median response SBP ($p=0.01$), and more frequent hemodynamic improvement and stability. Uncontrolled source of bleeding above the occlusion occurred more frequently in the RT group ($p=0.01$). Ten REBOA patients required thoracotomy within the first 24 hours. Mortality was significantly lower in REBOA vs RT patients ($p<0.001$).

Conclusion: Following penetrating intrathoracic injury, hypotensive patients without hemodynamic collapse may benefit from REBOA. Indications for REBOA use in penetrating chest injuries need to be identified and further developed.

Parameter	RT (n=47)	REBOA (n =39)	P-Value
Injury Severity Score, median (IQR)	26 (21-35)	34 (24-42)	0.196
Initial SBP, median (IQR)	110 (80-140)	109 (84-130)	0.862
Initiation SBP, median (IQR)	88 (59-106)	80 (60-100)	0.886
Occlusion Duration, median (IQR)	18 (9-42)	45 (27-75)	<0.001
Response SBP, median (IQR)	99 (58-130)	120 (101-140)	0.014
Hemodynamic Improvement, n (%)	32 (68)	34 (87)	0.037
Hemodynamic Stability, n (%)	16 (34)	28 (72)	<0.001
Uncontrolled bleeding identified above the occlusion, n (%)	28 (60)	12 (31)	0.012
ED Mortality, n (%)	5 (16)	1 (10)	0.670
OR Mortality, n (%)	18 (58)	5 (50)	
ICU Mortality, n (%)	8 (26)	4 (40)	
Overall Mortality, n (%)	31 (66)	10 (26)	<0.001

Poster #105

SONORHEOMETRY VERSUS ROTATIONAL THROMBOELASTOMETRY IN TRAUMA

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Background: Rotational thromboelastometry (ROTEM) is used to rapidly identify trauma-induced coagulopathy (TIC) and direct targeted interventions in hemorrhaging trauma patients. ROTEM performance, however, may be affected by mechanical interference with the forming clot. A novel technology named sonic estimation of elasticity via resonance (SEER) sonorheometry avoids mechanical clot interference, thus potentially increasing diagnostic accuracy. The aim of this study is to compare the performance of SEER with ROTEM in diagnosing TIC, guiding hemostatic resuscitation, and predicting clinical outcomes.

Methods: Samples were collected from adult trauma patients enrolled into a prospective cohort study (ISRCTN12962642) upon admission to a Level 1 Trauma Centre between 2020-2021. Samples were analyzed using SEER, ROTEM and clotting tests. Statistical analysis utilized Spearman correlations and areas under the receiver operating characteristic curve (AUC).

Results: Samples from 221 patients were analyzed. Patients had a median age of 35 years (interquartile range [IQR] 25-49), 86% (190/221) were male, 64% (142/221) suffered blunt injuries, median injury severity score was 16 (IQR 5-28) and 6% (14/221) died within 24hr. Correlations were strong between SEER and ROTEM parameters (all $p<0.001$): $r=0.902$ for clot stiffness (CS) and EXTEM A5; $r=0.849$ for fibrinogen contribution to clot stiffness (FCS) and FIBTEM A5; and $r=0.726$ for platelet contribution to clot stiffness (PCS) and EXTEM-FIBTEM A5. SEER showed moderate-high discrimination for validated ROTEM cutoffs: CS AUC=0.946 for EXTEM A5≤40mm; FCS AUC=0.923 for FIBTEM A5≤10mm; and PCS AUC=0.870 for EXTEM-FIBTEM A5≤30mm. While CS showed higher discrimination than EXTEM A5 in predicting TIC (INR>1.2) (AUC 0.831 vs 0.790, $p=0.038$), the ability of FCS to detect hypofibrinogenemia (<2g/L) was good, but lower than FIBTEM A5 (AUC 0.792 vs 0.845, $p=0.027$). There was no difference between SEER and ROTEM in detecting thrombocytopenia ($p=0.142$) and predicting major hemorrhage ($p=0.583$) or mortality at 24hr ($p=0.158$).

Conclusions: SEER is comparable to ROTEM for diagnosing TIC with greater accuracy to detect abnormal clotting time parameters but reduced discrimination for hypofibrinogenemia. Prediction of clinical outcomes was similar between devices.

Poster #106

A DECREASE IN PLATELET COUNT IS ASSOCIATED WITH INCREASED MORTALITY IN HEMORRHAGIC SHOCK

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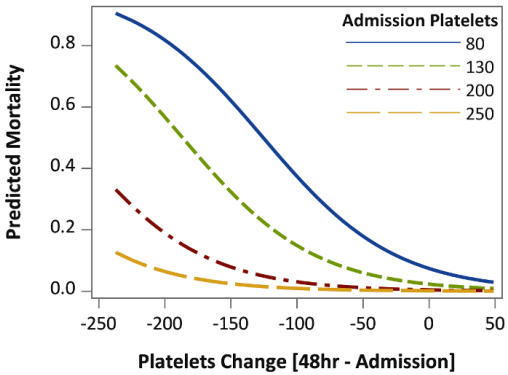
Introduction: Despite advances in trauma care, the mortality rate after hemorrhagic shock remains high. Excessive platelet aggregation leading to microvascular thrombosis may contribute to multisystem organ failure and death. We hypothesized that a decrease in platelet counts would be observed in patients with higher morbidity and mortality after trauma and hemorrhagic shock.

Methods: A retrospective review of severely injured trauma patients at a single ACS-verified Level 1 Trauma center was conducted. Patients who underwent massive transfusion (≥4 units of blood in the first hour or ≥10 units in the first 24 hours after injury), had surgical or procedural control of bleeding, and postoperative ICU admission were included. Those who died within 6 hours of presentation were excluded. Demographics, injury mechanism, initial and 48-hour platelet counts and outcomes were analyzed. Means were compared using Wilcoxon tests, and correlations assessed using Spearman's correlations (r_s). Logistic regression was used to assess factors associated with mortality.

Results: From Jan 2018 to Dec 2019, 144 patients met the inclusion criteria. A blunt mechanism was most common (51%), 86% had an ISS ≥15 and 60% ISS ≥25, and 33% had Glasgow Coma Scale ≤8**.** Platelet counts on admission averaged 201 x 10^9/L (range 17-459). 26 patients (18%) died in hospital with 11 in the first 48 hours. Using a model adjusting for ISS and trauma mechanism with admission platelets and 48-hour change in platelets, mortality increased with lower admission platelets (for each 10 x 10^9/L decrease, OR=1.28 95% CI 1.05, 1.55 *P*=0.013). The average change in platelets at 48 hours, -88 x 10^9/L (SD=90), was associated with increased mortality, OR = 5.89 (CI 1.19, 29.23, *P*=0.030). This model classification accuracy of AUC=0.90.

Conclusion: Patients with an initial low platelet count and those with a decrease platelet count after 48 hours had increased mortality. The exact mechanism of this phenomenon is not understood. Platelet aggregation due to the decreased proteolytic activity of ADAMTS-13 and increased circulation of ultra-large von Willebrand factor may play a role. Future studies examining ADAMTS-13 and microvascular thrombosis are required.



Poster #107

BALANCED RESUSCITATION AND EARLIER MORTALITY ENDPOINTS: A BAYESIAN ANALYSIS OF THE PROPPR TRIAL

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Introduction: The Pragmatic Randomized Optimal Platelet and Plasma Ratios (PROPPR) Trial failed to demonstrate a mortality difference for hemorrhaging patients receiving a balanced (1:1:1) versus a red blood cell heavy (1:1:2) resuscitation at 24-hours and 30-days. Subsequent guidelines recommend utilizing earlier mortality endpoints when assessing hemorrhage-related death to mitigate confounding from later causes of trauma-related death. This study sought to reassess the mortality effects of a balanced resuscitation strategy using Bayesian techniques at earlier time points within the initial resuscitation via a post hoc analysis of the PROPPR Trial.

Methods: Bayesian hierarchical models were created to assess mortality differences at the 1, 3, 6, 12, 18, and 24 hour time periods between study cohorts. Posterior probabilities and Bayes Factors were assessed at each time period.

Results: A 1:1:1 resuscitation displayed at least a 92% probability for mortality benefit at all time periods tested when compared to a 1:1:2 approach and further demonstrated “strong” to “decisive” supporting evidence via each respective Bayes Factor. (Table 1)

Conclusion: Post hoc Bayesian analysis of the PROPPR Trial demonstrates a high probability of mortality reduction with a balanced resuscitation strategy for patients in hemorrhagic shock, especially at more proximal time points during the initial resuscitation. Bayesian approaches should be considered for future studies assessing trauma related outcomes.

Poster #108

DOES AN EARLY, BALANCED RESUSCITATION STRATEGY REDUCE THE NEED FOR CRYOPRECIPITATE TRANSFUSION IN HEMORRHAGIC SHOCK?

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UT Houston McGovern Medical School

Background: With new forms of fibrinogen replacement becoming available and ongoing studies evaluating early cryoprecipitate transfusion, some centers have recommended including concentrated fibrinogen replacement in massive transfusion protocols (MTP). Given our center's policy of balanced resuscitation (1:1:1), beginning in the prehospital setting, we hypothesized that our rate of hypofibrinogenemia would be low and that fibrinogen replacement should remain an on-demand product, and not part of our MTP.

Methods: All patients presenting to our trauma center 11/17-4/21 were reviewed. We then evaluated all patients who received emergency-release and MTP products. Patients were defined as hypofibrinogenemic (HYPOFIB) if admission fibrinogen <150 or r-TEG angle <60. Univariate analysis sought to define risk factors for presenting with HYPOFIB, while multivariate modeling evaluated their impact on outcome (30-day survival).

Results: Of 29,782 patients entered into the trauma registry, 6,618 level-1 trauma activations, and 1,948 patients receiving emergency release blood and MTP products during this time, <1%, 2%, and 7% were HYPOFIB, respectively. HYPOFIB patients were more likely to be younger, have higher head AIS, and arrive with worse coagulopathy and shock (Table). HYPOFIB had lower survival, shorter time to death, and were more likely to die from head injury. Among HYPOFIB patients, 10% received early cryoprecipitate (0-2 hours). However, there was no difference in survival for those that received early cryoprecipitate (40 vs 47%; p=0.630). HYPOFIB patients that died had markedly higher head AIS (5 vs 3) and overall ISS (38 vs 26), but no difference in arrival vitals or evidence of shock.

Conclusion: Early, balanced resuscitation is associated with a low prevalence of admission HYPOFIB. Centers observing higher rates may be using unbalanced ratios for resuscitation and/or delaying the initiation of such ratios. HYPOFIB patients present with a phenotype of severe brain injury, profound shock, and coagulopathy. Routine inclusion of fibrinogen replacement in MTPs does not appear to be warranted at this time.

Poster #109

EARLIER VASOPRESSOR REQUIREMENT AMONG HYPOTENSIVE TRAUMA PATIENTS IS INDEPENDENTLY ASSOCIATED WITH POOR OUTCOMES

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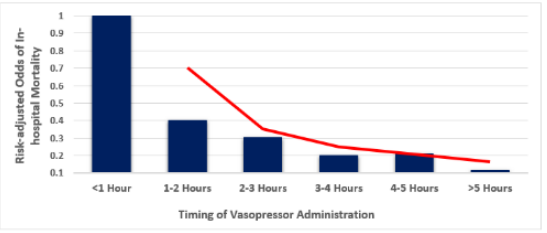
University of Arizona

Background: Early low-dose vasopressin supplementation has shown benefit in the resuscitation of trauma patients. Optimal utilization of any vasopressor agent during early post-injury resuscitation remains unclear, and there is a paucity of data describing the relationship between vasopressor timing (VT) and outcomes. The aim of our study is to assess the current use of vasopressor agents among hypotensive trauma pts and describe the relationship between VT and outcomes.

Methods: Analysis of 2017-2018 ACS-TQIP. All hypotensive adult trauma pts(lowest SBP<90mm Hg) with early vasopressors within 6-h of admission were included. Severe head(AIS>4) and spinal cord injury pts were excluded. VT administration was analyzed. Outcome measures were 24-h & hospital mortality, complications, intensive care unit (ICU) length of stay (LOS) & ventilator use, and 24-h transfusions. Multivariate regression was performed to assess the independent effects of VT on outcomes.

Results: 1,049 hypotensive trauma pts were identified. Mean age was 55y, 70% were male, and 70% were White. Median ISS was 16, 80% had blunt injury, and mean SBP was 61mmHg. 4-h and median time to first vasopressor administration was 319 min. 24-h mortality was 19%, in-hospital mortality 41%, complication rate 26%, and 4-h and 24-h transfusion median were 5 and 7 respectively. Every 1-h delay in vasopressor administration beyond the first hour was independently associated with lower odds of 24-h(**aOR 0.65**; p<0.001), and in-hospital mortality(**aOR 0.65**; p<0.001) (**Figure**), complications(**aOR 0.77**, p=0.003), and higher odds of longer ICU LOS(β+ 2.53, p=0.012). There were no associations between early VT administration and ventilator use duration and 24-h PRBC transfusions (p>0.05).

Conclusion: Earlier vasopressor among hypotensive trauma pts was independently associated with increased mortality and complications. Further research on the utility and optimal VT during the post-injury resuscitative period is warranted, and caution must be used when administering these agents to hypotensive trauma pts in hemorrhagic shock.



Poster #110

END-TIDAL CO2 AS AN INDICATOR FOR RESUSCITATIVE THORACOTOMY

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Introduction: As the last option during traumatic cardiac arrest, surgeons reserve the use of resuscitative thoracotomy (RT) to those that may benefit. National guidelines use time of pulselessness as the primary determinant for RT, although it is often approximate or inaccurate. Quantitative end-tidal CO2 (ETCO2) is an objective measure, rapidly obtainable on arrival, that may improve stratification of patients who could benefit from thoracotomy. We hypothesize that use of ETCO2 increases survivability to the OR after resuscitative thoracotomy.

Methods: A retrospective cohort study of the Trauma Registry of the American College of Surgeons (TRACS) from 2010-2020 was performed. Inclusion criteria were adult patients undergoing RT at a Level 1 Trauma Center. Demographics and resuscitation characteristics were culled. Patients with RT performed outside the ED were excluded. Primary outcome was survival to the operating room (OR). Univariate and multivariate analysis were performed to evaluate whether quantitative ETCO2 improved survival over qualitative ETCO2 and to determine an ETCO2 threshold for improved survival.

Results: 116 patients were included, 61 (52.8%) had quantitative ETCO2 measured. Quantitative ETCO2 patients received more pre-hospital blood transfusions (45.9% vs. 18.2%, $p = 0.001$) and MTP activations (87.9% vs. 69.1%, $p = 0.02$). Survival to OR was higher using quantitative end-tidal CO2 compared to qualitative measurement (OR 3.12, 95% CI 1.12 to 8.78). There was no significant survival improvement when using ETCO2 threshold > 15 mm Hg or >20 mm Hg. Overall cohort survival to discharge after RT was 7% and was not different between ETCO2 groups.

Conclusions: For patients undergoing RT for traumatic cardiac arrest, quantitative ETCO2 predicted higher survival to the operating room compared to patients with qualitative ETCO2, however no distinct ETCO2 threshold was associated with increased odds of survival to OR.

Poster #111

FRESH FROZEN PLASMA AND PLATELETS IS ASSOCIATED WITH BETTER OUTCOMES EVEN IN TRAUMA PATIENTS REQUIRING SUB-MASSIVE TRANSFUSION

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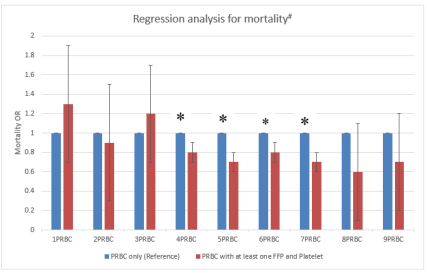
Introduction: Aim of our study was to evaluate if administration of fresh frozen plasma (FFP) and platelets in trauma patients requiring sub-massive transfusion (SMT defined as less than 10 units PRBC within the first 24 hours) effects outcomes.

Methods: 2-year analysis of all adult trauma patients in the TQIP-database. All patients receiving 1-9 units of PRBC within first 24 hours were included. Patients on pre-hospital anticoagulation were excluded. Patients were divided into two groups: those who received PRBC alone (PRBC group) vs. those who received at least one unit of FFP and platelets in addition to PRBC (combined resuscitation or CR group). Primary outcome was hospital mortality, and secondary outcome was in-hospital complications. Multivariable regression analysis and propensity-score matching were used to control for confounders.

Results: Mean age was 48±21 years, 68.5% were male and 74.4% were white. Median ISS was 11[9-17] and 84% had blunt injuries. On regression analysis controlling for age, gender, race, ISS, body region AIS, ED vitals, and admission GCS, patients in the CR had significantly lower mortality in patients who received 4-8 units of blood PRBC, compared to those patients who received PRBC only as demonstrated in Figure 1. Propensity score matching was performed matching the two groups (>3PRBC alone vs. >3CR) for demographics and injuries. CR patients were associated with lower complications overall (18% vs. 29%).



* Significant value (p < 0.05)
# Regression analysis controlling for age, gender, race, ISS, body region AIS, ED vitals, GCS, Temperature, anticoagulant use.

Conclusions: Trauma patients requiring more than 3 units of PRBC had lower complications and death if they received FFP and platelets during the resuscitation even in the SMT group.

Poster #112

HIGHER DOSES OF CALCIUM ARE CORRELATED WITH IMPROVED COAGULOPATHY 24-HOURS AFTER INJURY IN TRAUMA PATIENTS RECEIVING MASSIVE TRANSFUSION.

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Introduction: Calcium is a co-factor for clotting factors and important for platelet and fibrinogen stabilization. Between 85% and 94% of trauma patients treated with massive transfusion protocols (MTP) develop hypocalcemia and 71% of those patients develop severe hypocalcemia. The two primary causes of hypocalcemia are phosphate binding and citrate toxicity. It is unknown if there is a linear relationship between the dose of elemental calcium per blood product administered and improved coagulopathy in trauma patients undergoing MTP. This study aims to evaluate if there is a correlation between increased intravenous Calcium administration during MTP and improved coagulation.

Methods: We performed a retrospective analysis of trauma patients at a level 1 trauma center who received MTP over two years (2018- 2020). Doses of intravenous elemental calcium given within 24 hours of admission were collected, and an elemental calcium to blood product ratio (CBR) was calculated for each patient 4 and 24 hours after hospital arrival. Pearson's correlation coefficient was calculated to measure the degree of linear association between CBR and coagulopathy based on rotational thromboelastometry (ROTEM) values.

Results: Patients had a a mean age of 44 years, a mean Injury Severity Score (ISS) of 36, a mean lactate of 4.9 and mean arterial pH of 7.32 (N = 1246). Pearson correlation coefficient demonstrated a linear relationships between EXTEM A10, EXTEM A20, EXTEM clotting time (CT), EXTEM Maximum Clot Firmness (MCF), INTEM A10, INTEM MCF and INTEM CT and CBR 4 hours after admission (r = 0.32, r = 0.3, r=-0.4, r=0.31, R=0.38, r=0.36, r=-0.38). There was a similar linear relationship between EXTEM A10, EXTEM A 20, EXTEM CT, EXTEM MCF, INTEM A10, INTEM MCF and INTEM CT and CBR 24 hours after admission (r=0.27, r=0.24, r=-0.4, r=0.28, r=0.34, r=0.33, r=-0.5).

Conclusion: CBR calculated at 4 and 24 hours after arrival were positively correlated with ROTEM values that indicate improved coagulation (A10, A20, MCF) and negatively correlated with ROTEM values that demonstrate worsened coagulation (CT). A higher ratio of calcium to blood products is associated with better clotting 24 hours after hospital arrival, and regular intravenous calcium administration should be a standard component of massive transfusion during trauma.

Poster #113

HOPE IN TRAUMA: A SINGLE INSTITUTION'S EXTERNAL VALIDATION OF THE HYPOTHERMIA OUTCOME PREDICTION AFTER EXTRACORPOREAL LIFE SUPPORT (HOPE) SCORE FOR HYPOTHERMIC CARDIAC ARREST AND A CALL FOR RE-CONSIDERATION IN TRAUMA PATIENTS

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Background: Accidental hypothermia requiring hospitalization is associated with a high complication and mortality rate, particularly when associated with hypothermic cardiac arrest. It is challenging to predict outcomes and survivability following rewarming in such patients. The Hypothermia Outcome Prediction after Extracorporeal Life Support (HOPE) score, which includes sex, age, potassium, CPR duration, and temperature, predicts patient benefit from extracorporeal (EC) rewarming with a high negative predictive value. When created, this score did not include trauma patients, and evidence-based guidelines currently do not exist surrounding the management of hypothermic trauma patients. The objective of this study was to externally validate the HOPE score and evaluate its performance in trauma patients. We hypothesize that the HOPE score will perform differently in trauma patients than uninjured patients and highlight different threshold scores for active internal rewarming measures

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Methods: This is a retrospective review of all patients at an urban Level 1 Trauma Center from January 2010 to December 2020 admitted with an initial core body temperature <35oC. Patients were identified based on initial emergency department temperature and grouped based upon the rewarming strategy used: external rewarming (including blankets, heating lamps, etc) or active internal rewarming (including rewarming with closed-loop central venous internal warming circuit [Alsius] or EC arteriovenous rewarming). Pairwise comparisons between external versus internal rewarming patients were completed. Pairwise comparisons between EC rewarming survivors and non-survivors were performed. Finally, HOPE scores were calculated for each patient with an AUROC analysis to assess its predictive performance overall and in a trauma patient sub-group.

Results: Overall, 652 patients were included. The median age was 55.0 years, the majority were male (76%), 18% presented after trauma, and with an average initial temperature of 33.5oC. 84% underwent external rewarming versus 16% internal rewarming (11% Alsius, 5% EC). Compared to patients who underwent external rewarming, internal rewarming patients were more likely to be male (89% vs 74%, p=0.0006), more hypothermic (27.0oC vs 33.8oC, p<0.0001), hypotensive (systolic blood pressure 98 vs 123, p<0.0001), and had higher mortality rate (22% vs 11%, p=0.007). The EC rewarming subgroup (n=30) had an average initial temperature of 23.9oC and 66% presented in cardiac arrest. 27% of the patients had sustained trauma. The mortality rate was 56%, with 41% expiring within the first hour of rewarming. Compared to EC survivors, those who expired after initiation of EC were more coagulopathic (LY30 on thrombelastography of 39.4% vs 0.0%, p=0.009), with more profound shock (base deficit of 18.0 vs 13.0 p=0.04), and had longer CPR time (45 vs 22 minutes, p=0.03). The average HOPE score was 0.67 (0.85 in survivors vs 0.65 in non-survivors, p=0.02), with an AUC of 0.73 and Youden's score of 0.75 (sensitivity of 76.5% and specificity of 61.5%). When the HOPE score was calculated in the cohort of trauma patients, the predictive ability increased, with an AUC of 0.99 and Youden's score of 0.75 (sensitivity of 80% and specificity of 66.7%).

Conclusion: This study is the first to examine accidental hypothermia and the HOPE score in trauma patients and highlights the role of trauma surgeons' engagement in the care of patients with profound accidental hypothermia in which the role of invasive rewarming techniques may be lifesaving. This analysis not only validates the HOPE score at our institution but also highlights its superior performance in trauma patients and the need to reconsider a HOPE score cut-off to pursue invasive resuscitation measures in trauma patients.

Poster #114

MACHINE LEARNING TO AID DECISION MAKING IN PATIENTS WHO MAY BENEFIT FROM PREHOSPITAL TRANEXAMIC ACID

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Background: Trauma-induced coagulopathy (TIC) is characterised in part by hyperfibrinolysis. Tranexamic acid (TXA) confers maximum benefit in patients at risk of TIC if given within one hour of injury. Early TXA treatment relies on clinicians identifying patients at risk of TIC, before any viscoelastic assessments can aid decision making This can be challenging, thus TXA is often given late or not given. A validated Bayesian Network (BN) model that accurately predicts TIC (TIC-BN) using prehospital (PH) variables may help identify patients in whom PH TXA is indicated. The aim was to determine the proportion of patients in each TIC-BN risk strata who received TXA≤1hr from injury. Secondary aims were to compare TXA treatment within TIC-BN risk strata among outcome-related subgroups.

Methods: Retrospective study of the UK trauma audit research network database (TARN) between 2015-2019, of patients aged ≥16 years, who had hemorrhage control intervention or blood transfusion, excluding pregnancies and burns. Patients were risk-stratified using TIC-BN: very low (<2%), low (2-4%), moderate (4-12%), high (12-33%), and very high (>33%).

Results: A total of 27,272 patients were included. Median age was 51 years (interquartile range (IQR) 32-71), 68% were male, 86% suffered blunt injury, median injury severity score was 13 (IQR 9-25). Overall, 5571 (20%) patients received TXA≤1hr, including 368/3403 (11%) with very low risk of TIC, 494/4764 (10%) low risk, 1805/9408 (19%) medium risk, 2003/8173 (25%) high risk, and 901/1524 (59%) very high risk (χ^2 for trend TXA≤1hr vs rest: $p<0.001$). The proportion of patients who had TXA≤1hr increased as TIC risk increased among outcome-related subgroups: major transfusion (≥4U blood products), massive transfusion (≥10U), early (≤24hr) and late (≤28dy) mortality (all $p<0.05$). However, of those with medium or higher TIC risk, 53% of all patients, 37% of massive transfusion patients, and 46% of patients who died early, did not receive TXA≤1hr.

Conclusions: Eighty percent of the patients for whom TXA is indicated do not receive it within one hour of injury, including over half of those at medium TIC risk or greater. Earlier identification of TXA-eligible patients predicated on accurate machine learning risk prediction using prehospital variables, may allow more tailored treatment for patients at risk of TIC.

Poster #115

HYPOCALCEMIA IN TRAUMA: UNDERDIAGNOSED AND UNDERTREATED WITH SEVERE CONSEQUENCES

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Background: Trauma patients receiving massive transfusion of citrated blood are at increased risk for hypocalcemia. Early identification and correction of hypocalcemia may aid in reversal of trauma-induced coagulopathy. We hypothesize that hypocalcemia is common in this population, is inadequately corrected during non-protocolized resuscitation, and is associated with worse outcomes.

Methods: We completed a retrospective review of trauma patients undergoing massive transfusion protocol activation and receiving one or more blood products within 4 hours of admission at our Level I Trauma Center between 2015 and 2020. Demographics, labs including ionized calcium, blood products received, and outcome measures were collected and grouped into discrete time intervals (0-4hrs, 4-24hrs) for bivariate comparisons and multivariable regression. Hypocalcemia was defined as ionized calcium <0.9 mmol/L.

Results: We enrolled 251 patients (77% male, median age 32 yrs, median ISS 27). Patients received a mean of 14.3 blood products. Hypocalcemia was present in 23% of patients on admission and 38% during the first 24 hours. Hypocalcemia on admission was associated with an increased risk of mortality (OR 1.92, 95% CI 1.03-3.59, p=0.038), higher mean ISS (34.1 vs. 28.6, p=0.02), and greater mean transfusion requirement in the first 24 hrs (28.2 vs. 11.5 units, p<0.001). In the first 4 hours following admission, 37% of patients with hypocalcemia did not receive supplemental calcium.

Conclusions: High rates of hypocalcemia are present in trauma patients before, during and after massive transfusion and are associated with higher ISS, increased blood product use, and mortality. Hypocalcemia results from both severe traumatic injury prior to transfusion as well as inadequate supplementation during massive transfusion. Protocolization of calcium administration for severely injured trauma patients is mandatory prior to and during massive transfusion.

Poster #116

SAFER NEIGHBORHOODS? VIOLENT CRIME AND TRAUMA VOLUME PRE/POST TARGETED POLICE INTERVENTIONS

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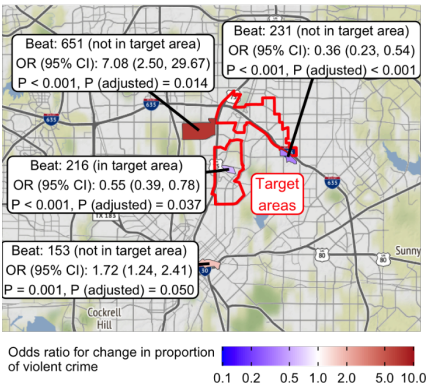
Introduction: *Project Safe Neighborhoods: Dallas* (PSND) is part of a national initiative that brings together federal, state, and local stakeholders and law enforcement to reduce violent crime, especially firearm violence, in select communities. The authors' hospital is located centrally in PSND's target areas, and the trauma center's service area fully covers the target areas. This study evaluated PSND's effectiveness by examining if PSND's launch in April 2018 was associated with decreases in (1) violent crime or (2) the rate of patients presenting with firearm and assaultive injuries.

Methods: Data on index violent crime (murder/non-negligent homicide, robbery, and aggravated assault) were obtained from all municipalities in the county (Jan. 2015 – Dec. 2020). Patient volume data were queried from the trauma registry. Nonlinear spatiotemporal models were used to calculate estimated rates and confidence intervals; first derivatives were used to determine periods of significant change. Spatial point pattern tests assessed potential relocation of criminal activity. Given the importance of reducing violent crime, alpha was set at 0.05.

Results: The target areas' violent crime rate never significantly changed, but crime in the non-target area increased significantly during PSND—including a 7-fold increase in one patrol beat just outside of the target areas (see figure). After years of decreases, rates of patients presenting with assault or firearm injuries began significantly increasing and nearly doubled within two years of PSND.



Conclusion: These data suggest PSND was not effective. Criminal activity was not reduced, and it appears to have moved outside the target areas to evade increased scrutiny. Additionally, rates of patients presenting to our hospital with firearm and assaultive injuries increased.

Poster #117

DOLLARS AND SENSE – THE CASE FOR DEDICATED POST-TRAUMA CENTER CARE

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Rutgers New Jersey Medical School

INTRODUCTION: A dedicated Center for Trauma Survivorship (CTS) has been demonstrated to increase adherence with follow-up visits and overall aftercare in severely injured patients discharged from the trauma center. A potential impediment to the universal creation of such centers is the assumed prohibitive financial burden they engender. We hypothesize that a CTS is not costly but a potential positive financial boon, increasing the contribution margin (revenue minus variable costs) and generating absolute revenue for the institution.

METHODS: This pre-and post-cohort study examines the financial impact of patients treated by the CTS. Eligibility criteria for CTS follow up include ≥18 years of age, NISS≥16 and ICU stay ≥2 days. Patients in the PRE cohort were those treated in the year prior to CTS inception. There were no patients in the PRE cohort that crossed over into CTS care. Financial data was obtained from the hospital's billing and cost accounting systems for the initial trauma center admission as well as all costs and revenues for a one-year time period following discharge. Behavioral health services and direct payments for physician services were not included in this analysis.

RESULTS: There were 182 patients in the PRE and 265 in the CTS cohorts. There were no significant differences in overall demographics, injury pattern, length of stay, or insurance coverage between the PRE and CTS cohorts. The CTS cohort generated 1623 subsequent visits vs. 748 in the PRE cohort. CTS patients underwent more follow-up surgery in their first year of recovery as compared to the PRE cohort (52 vs 19 procedures). The financial impact of the CTS is summarized in the Table below. These data demonstrate a $7,752 increase in net revenue with a positive contribution margin of $4,558 for each patient receiving CTS services.

Cohort (dates of trauma admission)	Mean # of subsequent visits	Mean Net Revenue per case	Total Additional Net Revenue	Mean Contribution Margin per visit	Total Add'l Contribution Margin per patient
PRE (7/17-6/18)	4	$2,963	$11,852	$1,397	$5,588
CTS (7/18-6/20)	6	$3,269	$19,604	$1,691	$10,146

CONCLUSION: A dedicated CTS not only improves patient retention and increases subsequent necessary procedures but is a positive revenue source for the trauma center. The exclusion of behavioral health services as well as direct health care provider services in this analysis likely underestimates the financial impact of the CTS. These data further support the necessity for a dedicated CTS at all trauma centers as we work to improve outcomes along the continuum of care following severe injury.

Poster #118

EVALUATION OF VENOUS THROMBOEMBOLISM PROPHYLAXIS PRESCRIBING PRACTICES AMONG TRAUMA CENTERS

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Objectives: Venous thromboembolism (VTE) prophylaxis is standard-of-care in the vast majority of trauma patients. The purpose of this study was to characterize current dosing practices and timing of initiation of pharmacologic VTE prophylaxis in trauma patients.

Methods: This was an international, cross-sectional survey of healthcare providers at trauma centers. The survey was sponsored by the AAST and distributed to AAST members. The survey included 35 questions about practitioner demographics, experience, level and location of Trauma Center, and individual/site-specific practices regarding the dosing, selection, and initial timing of pharmacologic VTE prophylaxis in trauma patients.

Results: One hundred eighteen AAST members or associate members representing 98 institutions responded. 94% of respondents were at Level 1 Trauma centers and 58% had > 10 years of experience. While multiple dosing regimens were used, the most common strategy reported was enoxaparin 30mg q12h (68%). The majority of respondents (75%) indicated adjusting the dose in overweight patients. Additionally, 78 (66%) routinely use anti-factor Xa levels to guide dosing. Adherence to guideline-directed VTE prophylaxis (based on EAST or WTA guidelines) was more common at academic institutions compared to non-academic centers (85% vs 63%; p=0.02) and if the trauma team included a clinical pharmacist (88% vs. 69%; p=0.01). Trauma teams with clinical pharmacists were also more likely to dose adjust VTE prophylaxis for overweight patients (82% vs. 62%; p=0.02). Wide variability in initial timing of VTE prophylaxis after traumatic brain injury, solid organ injury, and spinal cord fractures existed across trauma centers.

Conclusions: A high degree of variability exists in prescribing and monitoring practices for the prevention of VTE in trauma patients. Clinical pharmacists may be helpful on trauma teams to optimize dosing and increase prescribing of guideline-concordant VTE prophylaxis.

Poster #119

HIGHER CENTER VOLUME IS SIGNIFICANTLY ASSOCIATED WITH IMPROVED MORTALITY IN TRAUMA PATIENTS WITH SHOCKLEAVE BLANK

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Introduction: Differences in outcomes among centers for injured patients in shock could yield insights to improve performance. We hypothesized that trauma centers treating higher volumes of patients in shock would achieve lower risk-adjusted mortality rates.

Methods: We queried the Pennsylvania Trauma Outcomes Study (2016-2018) for injured patients ≥16 years who had an initial SBP of <90 mmHg. We excluded patients with severe head injury (AIS head ≥5) and patients coming from centers with a total shock patient volume of ≤10. We compared risk-adjusted mortality by tertile of center-level shock patient volume using multivariable Cox proportional hazards model incorporating age, injury severity, mechanism, and physiology.

Results: Of 1,975 included patients at 29 centers, 1,041 (52.7%) died. The median annual shock trauma patient volume was 9 for low volume centers, medium 19.5, and high 37. Median ISS score and unadjusted mortality were higher at high volume centers. Time elapsed from arrival to ED to the OR and minutes spent in ED were lower at high volume centers, whereas MTP activation and unexpected survivorship were higher (**Table**). In adjusted analysis, high volume centers had 24% lower mortality compared to low volume centers (HR 0.76, 95% CI 0.61-0.94, *p*=0.013).

Conclusion: After adjusting for confounders, center-level volume is significantly associated with mortality for patients in shock. Our data suggests that high volume centers may share key practices to improve outcomes at low-volume centers, and trauma centers should be allocated to balance population access with center volume.

	High Volume (n=1,125)	**Medium Volume (n=514)**	**Low Volume (n=283)**	***p* value**
Age, median (IQR)	35 (25-58)	51 (30-68)	55 (33-67)	<0.001
Male Sex, n(%)	908 (80.7%)	395 (69.7%)	196 (69.3%)	<0.001
Penetrating Mechanism, n(%)	600 (53.3%)	139 (24.5%)	44 (15.5%)	<0.001
ISS, median (IQR)	22 (14-33)	18 (13-27)	18 (13-26)	<0.001
Massive Transfusion Protocol Activated, n(%)	341 (30.4%)	174 (30.7%)	78 (27.7%)	<0.001
Time spent in ED in minutes, median (IQR)	24 (12-74.5)	49 (17-139)	71 (21-147)	<0.001
Time to OR in minutes, median (IQR)	47 (30-114)	69 (35-275)	76 (49-231)	0.002
Unexpected Survivor*, n(%)	70 (6.2%)	21 (3.7%)	7 (2.5%)	0.009
Mortality	641 (57.0%)	274 (48.3%)	126 (44.5%)	<0.001

IQR, interquartile range; ISS, injury severity score; ED, emergency department; OR, operating room
*Defined as patients with TRISS (Trauma Injury Severity Score) ≤0.5 that survived hospitalization

Poster #120

IMPACT OF STATE OPIOID LAWS ON PRESCRIBING IN TRAUMA PATIENTS

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Introduction: Excessive opioid prescribing has culminated in widespread misuse and diversion. Public Act 246, which took effect June 1, 2018, established a policy to address the opioid epidemic in our state. The impact of laws limiting opioid prescribing in trauma patients remains unknown. To determine the relationship between prescribing policy and opioid use in trauma patients, we compared inpatient and outpatient opioid prescribing by oral morphine equivalents (OME) before and after implementation of Public Act 246.

Methods: Adult patients from a Level 1 trauma center were identified who received any oral opioid from 1/1/2016 to 6/30/2021. The exposure was patients admitted after 6/1/2018. Patients who died were excluded. Inpatient OME/day for the 48hrs prior to discharge and the discharge prescription OME/day were calculated. Comparisons of mean inpatient and discharge OME/day pre- and post-law were performed using t-tests. Each cohort was divided into quintiles based on inpatient OME/day. Multivariable risk adjustment accounted for patient/injury factors and inpatient OME use.

Results: 3,748 patients prescribed opioids were included in the study (pre-law n=2,063; post-law n=1,685). Implementation of an opioid prescribing policy was associated with a significant decrease in mean discharge OME/day (34.8±49.5 vs. 16.7±32.3, $p<0.001$). There were no differences between inpatient OME/day within quintiles pre-post law. Significant differences were observed in discharge OME/day pre-post law (Figure). After adjusting for patient factors, injury type/burden, and inpatient OME use, a -19.2 OME/day (95% CI -21.7 to -16.8, $p< 0.001$) difference in discharge prescriptions was present post-law implementation.

Conclusions: Risk-adjusted discharge prescriptions for opioids decreased by half after implementation of Public Act 246. Future work is needed to evaluate adequacy of pain relief, refill burden, and changes in long-term opioid use.

Poster #121

NATIONWIDE ANALYSIS OF PROXIMITY OF ACS-VERIFIED AND STATE-DESIGNATED TRAUMA CENTERS TO THE NEAREST HIGHWAY EXIT AND ASSOCIATED MVC-FATALITIES

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Background: Motor vehicle collisions (MVCs) remain a leading cause of trauma-related deaths. The aim of this study is to investigate the relationship between the proximity of ACS-verified and/or state-designated Level 1-4 TCs to the nearest highway exit and MVC-fatalities at the county level nationwide.

Methods: This is a cross-sectional study evaluating the association between distance of TCs to nearest highway exit and MVC-fatalities between the years 2014-2019. MVC-fatalities were obtained from National Highway Traffic Safety Administration (NHTSA). Mapping software was used to determine distance of TC to the nearest highway exit and transport time. ANOVA and linear regression analysis were performed with significance defined as $p<0.05$.

Results: 2,019 ACS-verified and/or state-designated TCs were included (211 Level (L) 1-TCs, 356 L2-TCs, 491 L3-TCs, 961 L4-TCs). MVC-fatalities were positively correlated with distance of TC to nearest highway exit for counties with TCs located within 5 miles from the nearest highway exit ($r=0.328$, $p<0.001$). In the 612 counties with a 10% increase in MVC-fatalities from 2014-2019, MVC-fatalities were also positively correlated with distance to the nearest highway exit ($r=0.302$, $p<0.001$). Counties with more dispersed distributions of TCs were significantly associated with MVC-fatalities (Spearman $\rho=0.456$, 95% CI [0.163,0.675], $p=0.003$).

Conclusions: Shorter distances between trauma centers and the nearest highway exit are associated with fewer MVC-fatalities for counties with TCs within 5 miles of nearest highway exit. Further enhancement of existing highway infrastructure and standardization of EMS transport protocols are needed to address the burden of MVC-fatalities in the United States.

Poster #122

RECENT CHANGES IN PREHOSPITAL INTERVENTIONS IN TRAUMA PATIENTS ARE ASSOCIATED WITH DECREASED MORTALITY

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Introduction: Optimal prehospital management in trauma is hotly debated, with many studies arguing that aggressive prehospital treatment does not improve outcomes. However, no studies have assessed how EMS practices have changed over time in response to new evidence. The aim of this study is to quantify the frequency of prehospital interventions (PHI) performed by EMS over time. We hypothesize that the frequency of PHI has increased.

Methods: We performed a retrospective chart review of adult patients transported by EMS to our ACS verified Level 1 trauma center from January 1, 2014, to December 31, 2020. PHI were manually recorded and changes in their frequency over time were assessed via year-by-year trend analysis and multivariate regression.

Results: 2,501 patients were included, of which 21% were transported by air EMS and 79% were transported by ground EMS. Over the 7-year study period, male gender (74% vs. 79%, p=0.005) and age (41 vs. 43, p=0.02) increased, while the proportion of blunt trauma (73% vs. 59%, p<0.001) decreased. Changes in PHI over time are demonstrated in **Table 1**. ED mortality decreased from 9% to 5% (p=0.004) and in-hospital mortality decreased from 18% to 14% (p=0.001) over the study period. On multivariate regression adjusting for confounding variables, advanced airway procedures were the only PHI independently associated with increasing in-hospital mortality (Adjusted OR [95% CI] 1.84 [1.1–3.1], p=0.02).

Table 1: Changes in Prehospital Interventions Over Time

Interventions That Increased Over Time			Interventions That Decreased Over Time		
Variable	**% Increase***	**P-value+**	**Variable**	**% Decrease***	**P-value+**
Thoracostomy	↑ 50%	0.003	Fluid Administration	↓ 32%	<0.001
Tourniquet	↑ 175%	<0.001	Advanced Airway	↓ 38%	<0.001
Blood Transfusion	↑ 390%	<0.001	Cervical Spine Collar	↓ 38%	<0.001
Pelvic Stabilization	↑ 700%	<0.001	Backboard	↓ 60%	<0.001

* % Change from beginning to end of study period
\+ P-value for trend by regression

Conclusion: PHI in trauma patients have changed significantly over the past six years. These changes were associated with improvements in ED and hospital mortality. PHI for trauma should be further refined to optimize outcomes.

Poster #123

ROUTINE SCREENING RARELY ROUTINE: AN ASSESSMENT OF HOSPITAL VARIABILITY IN ALCOHOL AND DRUG SCREENING IN ADULT TRAUMA PATIENTS

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Introduction: Despite recommendations to screen trauma patients for alcohol and drugs, single-center studies report underscreening. National hospital variability has not been assessed. This study sought to evaluate hospital variability in screening practices.

Methods: This was a retrospective cohort study of adult trauma patients ≥18 years in TQIP 2017-2018. Hierarchical multivariable logistic regressions modeled the odds of screening for alcohol and drugs while controlling for patient and hospital variables. Statistically significant high and low-screening outlier hospitals were then identified based on estimated random intercepts and their confidence intervals.

Results: Of 1,290,618 patients at 760 hospitals, 625,691 (48.5%) were screened for alcohol. Only 395,861 (30.7%) were screened for drugs. Hospital alcohol and drug screening rates ranged from 0-100% of patients. Presentation to a trauma center was associated with higher adjusted odds of both alcohol screening (aOR 1.32, 95% CI 1.23-1.41) and drug screening (aOR 1.17, 95% CI 1.09-1.25). However, 38.1% (95% CI 35.7-40.6%) of variance in alcohol screening and 39.5% (95% CI 37.0-42.1%) of variance in drug screening was at the hospital level. After adjusting for patient and hospital variables, we found 265 high outlier hospitals in alcohol screening and 227 in drug screening (Table 1). Of the high outliers in alcohol screening, 213 (80.3%) were trauma centers.

Conclusions: There is significant hospital variability in screening practices for alcohol and drug use among TQIP hospitals.

Table 1: Hospital outliers in alcohol and drug screening

Substance	Hospital Designation (after controlling for patient/hospital variables)	All Hospitals n (%)	Unadjusted Screening Rate % (SD)
Alcohol	High Outliers	265 (41.0)	63.4 (15.1)
	Intermediate	108 (16.7)	39.7 (14.4)
	Low Outliers	274 (42.3)	28.5 (13.3)
Drugs	High Outliers	227 (40.8)	49.7 (14.4)
	Intermediate	83 (14.9)	27.7 (9.0)
	Low Outliers	247 (44.3)	18.6 (6.8)

Poster #124

STOP THE BLEED – NOW WAIT FOR EMS OR GET IN THE CAR AND DRIVE? A SECONDARY ANALYSIS OF AN EAST MCT

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Background: The Stop the Bleed campaign asks that bystanders take an active role in controlling hemorrhage after trauma. However, whether extending the bystanders' duty to perform private vehicle transport (PVT) results in improved survival is unknown. We hypothesized that in urban penetrating trauma, where pre-hospital procedures have shown to be harmful, PVT would result in improved outcomes compared to transport by advanced life support (ALS) ambulances.

Methods Post-hoc analysis of an EAST multicenter, prospective observational trial was performed on adult patients with penetrating torso or proximal extremity trauma at 25 urban trauma centers. Patients were allocated to PVT or ALS using nearest neighbor propensity score matching. Wilcoxon signed rank or McNemar Test and logistic regression were performed for univariate and multivariate analyses.

Results: Of 1830 total patients, 397 (21.7%) had PVT and 1433 (78.3%) had ALS transport. Propensity matching yielded 778 patients, distributed equally into balanced groups. Patients were primarily male (n = 702, 90.2%), Black (n = 537, 69%), and injured by gunshot wounds (n = 497, 63.9%). ALS transport had significantly higher ED (4.8% vs 1.9%, p = 0.02) and overall mortality (5.4% vs 2.8%, p = 0.02). Logistic regression demonstrated PVT was associated with survival (OR = 0.30, 95% CI 0.10-0.84, p = 0.02). Variables associated with mortality included increasing ISS and thoracic injuries (Table). Complications did not differ between groups.

Conclusion: Immediate PVT in lieu of prehospital procedures (by ALS) may improve outcomes in urban penetrating trauma. Bystander education incorporating PVT in this specific patient population could save lives.

Parameter	Odds Ratio	95% CI	*p* value
Age in years	1.02	0.98-1.05	0.40
Male	2.95	0.31-27.8	0.34
ISS	1.10	1.07-1.13	0.001
Private vehicle transport	0.30	0.10-0.84	0.02
Thoracic injury	8.39	2.64-36.6	0.001
Abdomen injury	2.10	0.80-5.52	0.13
Pelvis injury	0.92	0.18-4.76	0.92
Extremity injury	1.18	0.47-2.97	0.72

Poster #125

VARIATION IN NON-ADMINISTRATION OF PHARMACOLOGIC VENOUS THROMBOEMBOLISM PROPHYLAXIS IN CLOTT-1

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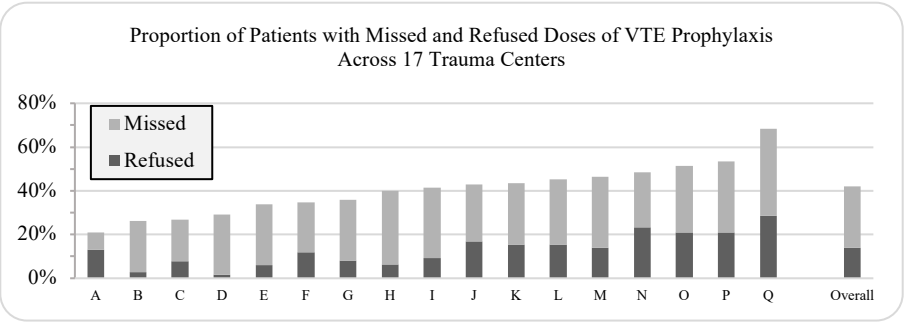
Introduction: Non-administration of prescribed pharmacologic venous thromboembolism (VTE) prophylaxis is a common quality of care deficit and associated with VTE events. We hypothesized that non-administration of VTE prophylaxis is common and varies widely among trauma centers.

Methods: The Consortium of Leaders in the Study of Traumatic Thromboembolism (CLOTT-1) was a multi-center prospective observational study conducted in 17 US trauma centers. Trauma patient inclusion criteria were: inpatient admission ≥48 hours; age 18-40 years; and high risk for VTE. We excluded patients not prescribed pharmacologic VTE prophylaxis. We analyzed overall and institution-specific rates of non-administration and refused doses of pharmacologic VTE prophylaxis. We compared these rates between centers using Chi-squared tests.

Results: Of 6,710 patients prescribed VTE prophylaxis, 2,811 (42%) missed ≥1 dose. The proportion of patients who missed ≥1 dose differed significantly between trauma centers (p-value<0.001, range 21.0%-68.4%). 943 (14.1%) patients refused ≥1 VTE prophylaxis dose. The proportion who refused also differed across centers (p-value<0.001, range 2.7%-28.4%). The mean number of doses missed among patients who missed ≥1 dose was 2.9 (95% CI 2.8-3.1), and the median was 2 (IQR 1,3). Among 8,158 total doses missed, 2,202 (27%) were missed due to patient refusal.

Conclusion: Non-administration of pharmacologic VTE prophylaxis is common in US trauma patients. Further research is urgently needed to identify the causes of VTE prophylaxis non-administration and implement interventions to reduce this important cause of preventable patient harm.



Poster #126

A LONGER VIEW: PREDICTING THE HIDDEN MORTALITY OF TRAUMA PATIENTS AFTER DISCHARGE

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Introduction: Traditional 30-day trauma mortality statistics likely miss a wave of outpatient deaths in the year after injury. There is currently no effective way to predict this risk, which limits advanced care planning and identification of modifiable risk factors. We hypothesized that clinical and social variables during the index admission can accurately estimate a patient's risk of death in the year after injury.

Methods: Adult trauma patients admitted to our institution from 2010 to 2017 were matched to mortality data in the National Death Index. We excluded deaths prior to discharge and compared survivors and non-survivors using univariable statistics. Using 60% of the study population, we derived a multi-variable logistic regression predicting mortality within the year after injury. The model was validated on the remaining 40%. We generated a receiver operating characteristic (ROC) curve and calculated area under the curve (AUC), accuracy, sensitivity and specificity.

Results: We identified 16,778 patients, of whom 529 (3.2%) died within a year of their injury. Compared with survivors, patients who died were older, mean age 76 vs 49 years ($p<0.0001$), and had a higher median (IQR) Injury Severity Score (ISS):10 (5,17) vs 9 (4,17) ($p<0.0001$). Intensive care unit (ICU) length of stay (LOS) differed as well ($p<0.0001$): 36% of those who died had an ICU LOS >2 days vs 18% in those who survived. Median time from injury to death was 53 days and 75% of deaths occurred within 117 days of injury. The ROC curve of our model had an AUC of 0.88. Using a predicted probability cutoff of 0.01, it had an accuracy of 62.3%, sensitivity of 92.6%, and specificity of 61.4% for prediction of death within one year.

Conclusion: These data derive a multi-variable model that accurately predicts a trauma patient's risk of death in the year after injury. It was built and tested using variables available during the index hospital stay, thereby increasing potential clinical utility. These findings describe a broadly applicable tool with the potential to estimate risk of death in the year after injury and warrant multi-center and prospective validation.

Poster #127

ARE CRITICALLY INJURED PATIENTS WITH INSURANCE BEING TRANSPORTED TO NON-TRAUMA CENTERS?

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Introduction: Prior studies have demonstrated that outcomes for critically injured patients are better when they are treated at verified trauma centers (TCs). Based on this information, the Centers for Disease Control and Prevention Field Triage Criteria (CDC FTC) recommend transport of critically injured patients to TCs when defined criteria are met. We evaluated the association of insurance status and the transport of critically injured patients to verified and state-designated TCs.

Methods: We used the 2020 National Emergency Medical Service Information System (NEMSIS) database to create a cohort of critically or emergently injured patients within the National Association of EMS State Officials East region using patient final acuity status designated by EMS. Within this critically injured cohort, we identified a subgroup of patients meeting CDC FTC by EMS (CDC FTC subgroup). Using multivariable logistic regression analyses, we measured the association of insured status, defined as private insurance or Medicare, vs. underinsured status, defined as self-pay, no insurance, or Medicaid, with transport destination (TC vs. non-TC) for both the full cohort and the CDC FTC subgroup.

Results: There were 18,505 patients in the full cohort. Of these, 47.0% (n=8690) were insured and 53.0% (n=9815) were underinsured. Of the insured, 56.8% (n=4932) were taken to a TC vs 78.0% (n=7653) of underinsured patients ($p<0.001$). On logistic regression, insured critically injured patients were 50% less likely to be taken to a TC (OR 0.50, 95% CI 0.44-0.55, $p<0.001$). In the subgroup analysis, of the 5409 patients meeting CDC FTC, 77.0% (n=1507) of those with insurance (n=1956) were transported to a TC vs 89.3% (n=3083) of the underinsured (n=3453, $p<0.001$). On logistic regression, insured patients meeting CDC FTC criteria were 49% less likely to be transported to a TC (OR 0.51, 0.48-0.55, $p< 0.001$).

Conclusion: Critically injured insured patients were less likely to be transported to TCs when compared to their underinsured counterparts, even when meeting CDC FTC. These findings suggest that factors unrelated to injury severity, patient physiology, or TC proximity may be affecting field triage decisions.

Poster #128

CHALLENGING DOGMA: IS UNPLANNED ICU ADMISSION IN TRAUMA A FLAWED QUALITY INDICATOR?

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Introduction: Unplanned ICU admission (UP-ICU) is an ACS-TQIP benchmark that has been previously linked to mortality. However, reasons for UP-ICU in trauma patients are diverse and have variable mortality risk. Clinical surveillance and care escalation pathways that lead to UP-ICU may prevent failure-to-rescue (FTR) and indicate high-quality care. We hypothesized that UP-ICU admission prevents mortality from FTR and therefore should not be utilized as a negative quality indicator.

Methods: We performed a retrospective case-controlled study of adult trauma patients admitted to a level 1 trauma center from 2016 to 2020 with a hospital length of stay (LOS) > 24 hours. A matched cohort of control cases was obtained by 1:1 propensity score matching using: age, sex, new injury severity score, revised trauma score, admission base deficit, GCS, traumatic brain injury, need for mechanical ventilation on arrival, initial level of care, injury mechanism, need for operative intervention on admission. The primary outcome was mortality. Secondary outcomes were discharge to a rehabilitation facility (Rehab), LOS, and mortality risk by cause.

Results: We identified 7620 patients, with UP-ICU admission rate of 3.3% (254 patients). UP-ICU group had higher mortality than non-UP-ICU group in unmatched cohort (8.6% vs 2.3%, $p<0.001$). Compared to matched controls, UP-ICU group had equal mortality, but longer LOS and higher Rehab rate (see table). Analysis of UP-ICU group showed that intracranial hemorrhage, arrythmias, sepsis, and primary respiratory distress accounted for 60% of UP-ICU events and 87% of mortality. However, only respiratory distress was associated with increased mortality (21.5% vs 5.1%, $p<0.001$).

	UP-ICU (N= 254)	Matched Controls (N = 254)	P Value
Mortality	8.6% (22)	8.3% (21)	0.99
Hospital LOS (d)	19 ± 19.6	12 ± 28.6	p<0.001
Rehab	54% (126)	40% (92)	p<0.001

Conclusion: Propensity-matched analysis of UP-ICU patients show they do not have increased mortality and not all causes had equivalent mortality risk. This suggests that UP-ICU may prevent FTR and should not be viewed as a marker of poor quality of care.

Poster #129

DEDICATED ACUTE CARE SURGERY OPERATING ROOM: THE HALO EFFECT OF COVID

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Introduction: Timing of Acute Care Surgery (ACS) cases is critical to reduce morbidity and optimize patient flow. Lengthy wait times for the operating room are common in centers lacking a daily dedicated room for urgent cases. The COVID pandemic resulted in a decreased volume of scheduled procedures, creating an opportunity to simulate the impact of a dedicated operating room (DOR) for urgent laparoscopic cholecystectomy (LC). We hypothesized there would be more availability for these add-on cases thus decreasing time to operation.

Methods: Patients requiring urgent LC admitted between January 2016-November 2020 were reviewed. Patients were excluded if they had factors prohibiting them from being immediately available to undergo operation (choledocholithiasis and gallstone pancreatitis). A decrease in scheduled procedures occurred between March-April 2020 at our center. This 'COVID' intense time period was compared to other periods to determine if a dedicated ACS room would improve timing of urgent operations in our system.

Results: 1043 patients underwent urgent LC, including 632 who met inclusion criteria. During the COVID period, there was a notable decrease median time from admission to OR from 31.6 hours to 16.97 hours ($p<0.05$) and time from surgical case request to operation from 19.3 to 8.2 hours ($p<0.5$). The attributable difference was found to be secondary to increased availability of OR time. Length of stay decreased from 2.91 to 2.11 ($p=0.09$).

Conclusion: Increased access to the OR due to COVID scheduling restrictions created an opportunity to simulate the impact of a DOR. This study demonstrates the major barrier to patient throughput and LOS for urgent ACS cases is OR access. Having a DOR is an important factor to address quality metrics like LOS.

Poster #130

ERRORS OF OMISSION IN INTERFACILITY TRAUMA TRANSFER COMMUNICATIONS: USE OF A CHECKLIST

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Introduction: Optimal interfacility trauma patient transfer requires initiation of treatment and stabilization at the referring facility (RF) and safe transfer under the direction of a trauma surgeon at a higher-level trauma center (TC). This process is typically effected by physician-to-physician conversation. We hypothesized that these unstructured conversations are prone to omissions and errors, and that a checklist for structured communication may capture opportunities for improvement in these critical "hand-off" communications.

Methods: Trauma surgeons at the state's highest level trauma center created a "do-confirm" checklist to be followed by the TC when communicating with the RF. This checklist was refined through state-wide meetings with interdisciplinary practitioners, then was prospectively beta-tested during actual physician-to-physician transfer conversations. The resulting 35-point checklist was then used to evaluate sequential archived physician-to-physician transfer conversations over a five-week period in 2017, noting missing checkpoints. Records from the RF and TC were reviewed for patient physiology, imaging, labs and urgent unanticipated interventions performed upon patient arrival at the TC. Data were analyzed by descriptive statistics and Chi-square test.

Results: Audio transcripts and medical records of 41 transferred acute trauma patients were reviewed. Frequently missing or incorrectly communicated elements included c spine clearance for blunt trauma (83%), and anticoagulants (54%). Eighteen patients (44%) had interventions upon arrival to the TC that optimally should have been initiated or completed at the RF. These interventions were reflected by missing checklist communication points including seizure prophylaxis (n=8), spine precautions (n=6), tube placement (n=3), code status (n=2), osmotics (n=1) and hypotension (n=1). Patients requiring unanticipated intervention at the TC were more likely to be ≥75 years old or have a neurologic injury (94%, $p<0.001$).

Conclusion: Omissions are common in unstructured physician-to-physician trauma transfer communications. Use of a checklist may identify opportunities for earlier intervention, particularly in patents who are elderly or have neurologic injury.

Poster #131

MIND THE GAP: RESIDENCY CASE VOLUMES, PROPOSED FELLOWSHIP REQUIREMENTS, AND THE REALITY OF OPERATIVE BURN SURGERY

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INTRODUCTION: Exposure to burn patients and their management has been restricted in the years following ACGME requirements for standard general surgery residency training. This continues to put a strain on the current workforce, especially a third of burn surgeons will be retiring in the next five years. Appropriately targeted training is of paramount importance to ensuring care for future burn patients. The authors hypothesized a) that current surgical residents do not finish residency with sufficient burn case experience to warrant early independence during a burn fellowship year, and b) current proposed fellowship requirements do not reflect a standard year in practice.

METHODS: Three large burn institutions in geographically distinct parts of the country were involved in this study. Available case logs from residents graduating in the last three years were reviewed for cases congruent with those proposed by the American Burn Association (ABA) for a Burn Fellowship. Fellowship case requirements were also compared to case logs of faculty from those three institutions.

RESULTS: A total of 45 resident case logs were evaluated. 11378 CPT codes (253 per resident) were deemed potentially applicable to a career in Burn Surgery. Of these, the majority were patient management (Critical Care (65/resident), Non-operative Trauma (41/resident), Trauma Assessment & Resuscitation (20/resident)). Procedures specific to training in Burn Surgery included: Wound bed preparation & grafting (15/resident), Fasciotomy (2/resident), Amputation (7/resident), Other skin grafting (2/resident). Basic Reconstruction approaches are not tracked by the AGCME; associated tissue rearrangement techniques were extrapolated from Plastic Surgery procedures (8/resident). Laser scar revision, Escharotomy, and Formal Burn Resuscitation could not be identified. Compared to suggested ABA case volumes for fellowship training, over five years residents are exposed to only 25% of cases needed for practice (33/135). Compared to a attending case load at high-volume centers, residents are exposed to only 10-15% of cases performed in a year (33/200-250).

CONCLUSION: Resident exposure to burn specific care is low even at programs with rotations through high volume Burn Centers. While patient management volumes are suggestive of preparation to manage complex critically ill burn patients, procedural volumes are very low. Case number requirements during residency and fellowship should appropriately reflect potential practice.

Poster #132

NIL PER OS IN PATIENTS WITH PROTECTED AIRWAYS: AN UNNECESSARY PRECAUTION?

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Background: The American Society of Anesthesiology recommends fasting in the pre-anesthesia setting to mitigate the risk of periprocedural aspiration in healthy patients undergoing elective surgeries. However, critically ill burn patients with large total body surface area (TBSA) involvement require multiple operative interventions, and are at significant risk from diminished nutritional supplementation with nil per os (NPO) orders placed With a long-standing practice of continuing peri- and intra-operative tube feeding in mechanically ventilated burn patients undergoing non-airway surgeries in the supine or lateral position routine practice, the authors hypothesized that this practice permits near goal tube feeding delivery with minimal risk of aspiration complications.

Methods: A retrospective chart review was conducted of all intubated burn patients over 18 years of age admitted to the Burn ICU that required at least one return to the OR while a protected airway was in place. Data collected included volume of tube feeding delivered in the 24 hours preceding a trip to the operating room, number of returns to the operating room with a protected airway, incidence of pneumonia with time frame & associated organism, and other demographic data. Aspiration complications were primarily defined as pneumonia from a non-burn wound related organism within 48h of surgery.

Results: 116 operative interventions with complete peri-and intraoperative enteral feeding were available for evaluation. Patient included had an average age of 54±20y and a TBSA of 28±21%; they underwent a range of 1-12 operations while meeting criteria for study. Pneumonia was identified after 19% of operative interventions; of these four were bacteria that could be associated with a gastrointestinal source (E. coli x 3, Klebsiella x 1), and three had concurrent wound cultures with the bacteria. Delivery of tube feeds was 83+32% of goal in the peri-operative period in this patient population.

Conclusion: Intraoperative enteral feeding in the burn population is not associated with a high rate of aspiration pneumonia in the setting of a protected airway. Continuing enteral feeding allows for increased caloric delivery to patients with high energy requirements for wound healing during the acute phase of injury.

Poster #133

PREHOSPITAL KETAMINE ADMINISTRATION FOR TRAUMA PATIENTS RESULTS IN MORE ED INTUBATIONS

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Background: The use of ketamine in the prehospital setting has increased with EMS providers. Adverse effects of prehospital ketamine administration have not been well-established in the trauma population. The objective of this study was to evaluate the effects of pre-hospital ketamine on trauma patients presenting to a Level 1 trauma center. This study hypothesized that respiratory depression or oversedation from ketamine would increase the number of ED (Emergency Department) intubations.

Methods: A retrospective chart review of adult trauma patients receiving prehospital ketamine from 2016-2021 was performed. Patients with severe traumatic brain injuries were excluded. A 1:1 propensity match was performed of patients with similar demographics, injury severity, and mechanism of injury who did not receive prehospital ketamine. Univariate analyses were used to compare the groups. The primary outcome was the incidence of intubation in the Emergency Department.

Results: 74 trauma patients who received prehospital ketamine were identified. The average ketamine dose was 39 mg IV and 226.4 mg IM. 35.1% of patients received ketamine for pain while 29.7% received it for agitation. The ED intubation rate was higher in the prehospital ketamine group with 17.6% (n=13/74) requiring intubation as compared with 4.8% (n=3/63) who did not receive ketamine (p=0.03). Patients who required intubation in the ED had higher average doses of both IV/IO (37.7 +/- 4.8 mg vs. 55.0 +/- 24.2 mg) and IM ketamine (196.4 +/- 41.7 mg vs 290.0 +/- 41.3 mg).

Conclusion: This study demonstrated that pre-hospital ketamine increased ED intubations. Further studies are necessary to help refine prehospital protocols studies to allow for more efficacious utilization of pre-hospital ketamine given its increasing popularity.

Poster #134

SURGICAL CRITICAL CARE: IS WORK LIFE EXPECTANCY INCREASING? AN ANALYSIS OF AMERICAN BOARD OF SURGERY RECERTIFICATION RATES ACROSS SUBSPECIALTIES

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Background: The practice of Surgical Critical Care (SCC) has traditionally necessitated additional in-house, extended night and weekend clinical commitments, which can be viewed as less desirable for many surgeons. Therefore, some SCC surgeons elect to focus solely on the practice of General Surgery (GS) rather than continuing practicing both SCC and GS. We hypothesized that surgeons with a practice focused on SCC have a shorter work life span when compared to other sub-specialties and that this will be evident when looking at American Board of Surgery (ABS) recertification rates.

Methods: Deidentified data for all surgeons certified by the ABS in GS, Pediatric Surgery (PS), Vascular Surgery (VS), and SCC were obtained from the ABS after obtaining approval from the IRB and the ABS Research Committee. We compared recertification rates between SCC, VS, and PS since 1994 when it became necessary to complete SCC fellowship training to obtain added qualifications in and to practice SCC. Surgeons with a single sub-specialty certification who obtained initial certification between 1994 and 2009 were included, with four groups created in four-year increments to look for trends over time. ANOVA analyses were used to compare the 10-year recertification rate and the 20-year recertification rate between each sub-specialty and between genders. Only those that obtained initial certification between 1994 and 1997 were analyzed for 20 -year recertification.

Results: 3102 surgeons met inclusion criteria, including 1241 (40%) SCC, 387 (12%) PS, and 1474 (47%) VS. Over time, SCC surgeons have increased their 10-year recertification rate from 77% to 90% while PS and VS have persistently high recertification rates >93% ($p < 0.001$ at each timepoint) (Figure 1). There was no difference between genders in 10-year or 20-year recertification rates. Of those who did not recertify in their subspecialty at 10 years, recertification in GS was more prevalent in SCC (137/171 (80%)) than PS (0/9 (0%)) or VS (34/72 (47%) ($p < 0.001$).

Conclusion: Based on the recertification rates, these results suggest that the time a SCC surgeon remains active in the workforce is increasing overtime. However, it still lags behind those of vascular and pediatric surgery that have remained relatively stable. Unlike PS and VS surgeons, those in the SCC field have a higher recertification rate in GS. This may reflect the inclusion of general surgery as part of their practice, especially with the merge of emergency general surgery, trauma surgery and SCC as part of Acute Care Surgery. Issues of work life balance cannot be distinguished from these data. Further research is warranted.

Poster #135

ONGOING TRANSFUSION MEDICINE FEEDBACK IS ASSOCIATED WITH IMPROVED PLASMA DEFICIT IN INITIAL RESUSCITATION OF HEMORRHAGIC SHOCK

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INTRODUCTION: The implementation of damage control resuscitation with balanced transfusion ratios of packed red blood cells (PRBC), plasma, and platelets in severely injured trauma patients has been associated with improved outcomes. However, despite widespread acceptance of the superiority of this resuscitation strategy, trauma centers still struggle to maintain balanced transfusion ratios in the modern era. We hypothesized that regular monthly feedback on transfusion ratios would lead to improved plasma deficits (PD) in severely injured trauma patients with hemorrhagic shock.

METHODS: This was an ambispective, observational study at a single ACS-verified Level 1 trauma center. As part of a trauma quality improvement project, a transfusion medicine physician began attending the monthly trauma multidisciplinary quality improvement meeting and presented the previous month's blood product utilization, including ratios. Transfusion data in the post-intervention period (May 2018-January 2020) were collected and compared to the immediate pre-intervention period (September 2016-April 2018). All patients requiring transfusion in the trauma bay or requiring massive transfusion (≥4 units of blood in the first hour or ≥10 units in the first 24 hours) were included. PD, defined as the difference between transfused pRBC and plasma in the trauma bay over time, was measured. No changes in the massive transfusion protocol or blood availability were made during the study time period.

RESULTS: Compared to the pre-intervention time period, an improved PD was observed in the post-intervention period (PD -1.93 vs 0.94, $p<0.001$) (Figure).

CONCLUSION: Transfusion medicine physician review of transfusion data, including transfusion ratios, at a monthly trauma quality improvement meeting resulted in significant improvements in balanced resuscitation. Ongoing review of transfusion practices is an important component of a trauma quality improvement program and is associated with improved resuscitation ratios.