Poster #1

DON'T WAIT, OPERATE! LATE CHOLECYSTECTOMY IN PREGNANCY IS ASSOCIATED WITH PREGNANCY RELATED ADVERSE OUTCOMES

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Introduction: Delayed intervention for acute cholecystitis (AC) is associated with higher costs, longer length of stay (LOS), and more operative complications. Time to intervention and outcomes has not been evaluated in pregnant patients. We aim to evaluate the association between time to intervention and pregnancy related adverse outcomes (PRAO).
Methods: New York Statewide Planning and Research Cooperative System inpatient dataset was queried for adult pregnant patients presenting with AC from 2016 to 2020. Exclusion criteria included patients who received a cholecystectomy prior to admission, had a concurrent diagnosis of choledocholithiasis or gallstone pancreatitis, or were in labor on admission. Early cholecystectomy (EC) was defined as occurring within 72 hours of admission, and late cholecystectomy (LC) at ≥ 72 hours after admission. Univariable analysis was performed.
Results: 203 patients were included: 71 in their first trimester, 103 in their second, and 29 in their third. The rate of spontaneous abortions in second trimester was higher in patients who underwent LC, compared to EC (6 vs. 0%, $p<0.05$); there was no statistically significant difference for first or third trimester patients. Regardless of trimester, length of stay (5 (5-7) vs 2 (2-3)) and total charges ($60,249.04 (44,359.9-$84,291.68) vs $32,692.15 (23,176.45-$48,094.84)) were higher in the LC group ($p < 0.001$).
Conclusion: For pregnant patients with AC, LC is associated with longer LOS and higher total charges. Pregnant patients in the second trimester who underwent LC had higher rates of spontaneous abortion, indicating EC is should be offered for second trimester patients.

Poster #2

DRIVING ADOPTION: PERSPECTIVES DIFFER ON LAP COMMON BILE DUCT EXPLORATION FOR ACS AND MIS SURGEONS

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Introduction: Choledocholithiasis (CDL) is frequently encountered in emergency general surgery and need for endoscopic clearance can extend hospital stays and drive-up costs. Laparoscopic common bile duct exploration (LCBDE) can mitigate this problem but requires greater adoption. Outreach efforts must begin by understanding practice patterns, attitudes, and barriers. Acute care surgeons' (ACS) perspectives on LCBDE are not well described and this technique has generally been viewed as an advanced minimally invasive skill. Therefore, we surveyed and compared ACS and minimally invasive (MIS) surgeons on CDL management.

Methods: A survey of CDL management preferences was developed by content experts and distributed by email to members of the Society of American Gastrointestinal and Endoscopic Surgeon (SAGES) and the American Association for the Surgery of Trauma (AAST). Results were analyzed utilizing descriptive statistics.

Results: A total of 543 US surgeons performing laparoscopic cholecystectomy completed the survey (ACS=124, MIS=175). Similar proportions of ACS and MIS surgeons preferred to manage choledocholithiasis by LCBDE (27% vs 28%). A majority (86%) of both cohorts asserted that ERCP and laparoscopic cholecystectomy (LC) would be associated with increased length of stay as compared to LCBDE+LC. MIS surgeons perform cholangiogram more frequently than ACS surgeons (Figure 1). A greater percentage of ACS surgeons favored LCBDE than MIS (58% vs 49%, p=.02). Neither group felt that routine LCBDE would negatively affect patient referral patterns (11% vs 6%, p=0.13). A third of MIS surgeons felt that LCBDE was too time consuming versus 25% of ACS surgeons (p=0.37). When asked if LCBDE is a difficult skill to master, 56% of MIS surgeons agreed compared to only 32% of ACS surgeons ($p<0.01$).

Conclusion: LCBDE is underutilized by both ACS and MIS surgeons, but ACS surgeons are more apt to advocate for surgical management of CLD. Courses and educational content designed to teach these techniques may drive adoption in ACS and decrease healthcare costs and lengths of stay. Understanding surgeon perspectives can enhance outreach to target audiences.

Poster #3

PROGNOSTIC PERFORMANCE OF THE PREHOSPITAL NATIONAL EARLY WARNING SCORE (pNEWS) IN PATIENTS WITH ACUTE ABDOMEN SYNDROME

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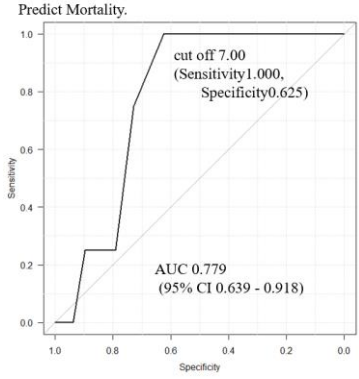
Introduction: The National Early Warning Score (NEWS, Fig.1) is utilized in emergency departments and rapid response teams as a prognostic indicator for acute illnesses. It has been reported that the prehospital NEWS (pNEWS), based on vital signs assessed before transportation, may be associated with in-hospital mortality. The aim of this study was to compare pNEWS and in-hospital mortality among patients undergoing emergency surgery for acute abdomen.
Methods: This retrospective observational study was conducted on patients aged 16 years or older who underwent emergency abdominal surgery at a tertiary care center from April 2020 to August 2023. The primary outcome assessed was in-hospital mortality, with the predictive performance of pNEWS evaluated using receiver operating characteristic (ROC) analysis.
Results: Fifty-two patients underwent emergency laparotomy for acute abdomen, resulting in an in-hospital mortality rate of 7.7% (4/52). Half of the patients had gastrointestinal perforation, followed by bowel obstruction. Non-survivors included cases of gastrointestinal perforation, bowel obstruction, and bowel ischemia, all of which were associated with NEWS of 7 points or higher. The area under the ROC curve for pNEWS(Fig.2) was 0.779 with a cut-off value of 7(sensitivity 1.000, specificity 0.625).
Conclusion: The pNEWS may be a useful prognostic tool for assessing acute abdomen cases before transportation.

Fig.1 National Early Warning Score (NEWS).

Physiological parameters	3	2	1	0	1	2	3
Respiratory Rate	≦8		9-11	12-20		21-24	≧25
Oxygen Saturations	≦91	92-93	94-95	≧96			
Any Supplemental Oxygen		Yes		No			
Temperature	≦35.0		35.1-36.0	36.1-38.0	38.1-39.0	≧39.1	
Systolic Blood Pressure	≦90	91-100	101-110	111-219			≧220
Heart Rate	≦40		41-50	51-90	91-110	111--130	≧131
Level of Consciousness				A			V, P, or U

A: alert, V: voice, P: pain, U: unresponsive

Fig.2
Diagnostic Ability and Test Performance of NEWS to Predict Mortality.



Poster #4

THE SECOND VICTIM IN EMERGENCY SURGERY: THE TOLL OF HOSPITALIZATION ON INFORMAL CAREGIVERS

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Introduction: Emergency general surgery (EGS) patients are usually hospitalized unexpectedly, often with complex conditions and chronic post-discharge needs. The impact of EGS hospitalization on informal caregivers (e.g. family members) is unknown. We aimed to explore how an EGS hospitalization impacts the lives of informal caregivers and identify specific stressors of hospitalization.
Methods: We conducted 30-minute semi-structured interviews of EGS patients and their caregivers at a single academic center (April–October 2023) using purposeful sampling to include adult EGS patients hospitalized ≥ 7 days. Patients identified their primary caregiver for participation. Interviews were completed until thematic saturation was reached, coded in duplicate, and analyzed using a modified grounded theory approach. All participants also completed the 36-Item Short Form Heath Survey (SF-36), a validated quality of life (QoL) questionnaire, to assess perceived QoL during hospitalization. The SF-36 scores are standardized on a 100-point scale, with the worst score being 0 (poor QoL) and the best being 100 (excellent QoL).
Results: Of 26 total participants, 17 were patients and 9 were caregivers. All caregivers were family members, with most identifying as a patient's child. Most caregivers were female (mean age 44.9y +/-15.0y). Caregivers displayed profound decrease in QoL, most significantly in the following domains: vitality, role limitations due to emotional problems, and mental health. (Figure 1) The most common caregiver stressors in qualitative analysis included emotional stress secondary to the patient's EGS condition, difficulties with travel, financial concerns, and job security. (Figure 2)
Conclusion: EGS hospitalization has a profound impact on informal caregivers, most of whom are female family members. QoL was impacted in all domains with the largest impact on energy and mental health. Future steps should include targeted interventions that address logistic concerns and offer formalized emotional support for EGS caregivers. Optimizing the mental and physical health of EGS caregivers may aide in sustained recovery of patients after EGS hospitalization.

Poster #5

RESTRICTING ROUTINE DAILY CBC ORDERING IS SAFE AND EFFECTIVE IN TRAUMA AND ACUTE CARE SURGERY PATIENTS

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Introduction: A nationwide shortage of phlebotomy tubes caused a level I trauma center to limit ordering of complete blood counts (CBCs) and remove recurring order options. This restriction was used as a natural experiment evaluating elimination of routine CBCs on surgical outcomes.

Methods: Acute Care Surgery (ACS) Service patients were evaluated for 60 months before and 4 months after the restriction. Patient demographics, admission characteristics, and outcomes were extracted from patient charts and the NSQIP database. Pre- and post-restriction patients were compared.

Results: Analysis included 9,372 patients, 8755 pre-restriction and 617 post-restriction. For all admissions, the number of CBCs performed per admission was significantly reduced post-restriction (6.99 vs 6.1, p=0.011) and when normalized to length of stay (LOS), (1.26 vs 1.12, p<.001). There was no significant change in other labs, imaging studies performed, antibiotic days, LOS, or 30-day mortality (Table). There was a significant reduction in transfusion of packed red blood cells per admission, from 3.95 units to 2.95 units (p=0.018). In patients who underwent an operation, the rate of 30-day re-admission was lower post-restriction (p=.029).

Conclusion: Restricting the ability to order multiple CBCs reduced the number of CBCs, did not adversely affect outcomes, and may have reduced transfusions and readmissions.

	Before Restriction (n=8755)	After Restriction (n=617)	p-value
Length of Stay (days)	5.96	6.09	0.748
Age (years)	58.86	59.60	0.391
CBC count per admission	6.99	6.10	0.011
CBC per day	1.26	1.12	<0.001
BMP count per admission	6.50	6.22	0.455
Minimum Hemoglobin (g/dl)	10.72	10.68	0.748
Xray count per admission	3.51	3.52	0.955
CT count per admission	2.69	2.54	0.184
MR count per admission	0.28	0.29	0.953
US count per admission	0.55	0.56	0.793
Transfused units/admission	3.95	2.95	0.018
30 day readmissions	1.15	1.13	0.736
Ventilator days	5.62	5.29	0.763
Antibiotic days	4.49	4.93	0.773

Poster #6

DO ALL PENETRATING ZONE II HEMATOMAS REQUIRE SURGICAL EXPLORATION: A SECONDARY ANALYSIS OF AN AAST-SPONSORED MULTICENTER STUDY

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Introduction: Classic teaching is to explore penetrating zone II hematomas to rule out active renal bleeding and/or ureteropelvic injury. The objective of this study was to characterize the need for surgical intervention in penetrating renal trauma. We hypothesized that a large proportion of penetrating renal injuries do not require surgical intervention for bleeding control, and therefore, routine surgical exploration is not needed.
Methods: This was a secondary analysis of a AAST sponsored prospective observational trial that enrolled patients with high-grade renal injuries (III-VI-V) at 14 trauma centers from 01/2014 to 02/2017. Adult (≥18 years) patients with penetrating injuries were selected and stratified according to their initial management as: 1) nonoperative (NOM), including interventional radiology (IR), 2) operative (OR) without initial CT imaging, and OR with initial CT imaging (OR-CT). The primary outcome was requirement for surgical intervention for bleeding control. Secondary outcomes included delayed surgical or IR re-intervention for bleeding control. Standard statistical tools were utilized for this descriptive study.
Results: A total of 255 patients met inclusion criteria. The median age was 28 years, 87% were male, and median ISS was 25. Overall, 14% underwent NOM, 49% required emergent OR, and the remaining 37% required OR after an initial CT (OR-CT.) Surgical intervention to control renal bleeding was required for 6% of NOM, 74% of patients requiring emergent OR, and 38% of patients with OR-CT. Overall, of those requiring intervention (n=130), 59% required a nephrectomy, and 25% required a nephrorrhaphy.
Conclusion: Nonoperative management is frequently employed for high-grade penetrating renal injuries, and even when exploratory laparotomy is required, intervention to control bleeding from the kidney is not universally required, especially when preoperative imaging is available. Further studies are required to characterize the subset of patients that would require routine exploration of zone II hematoma following penetrating trauma.

Poster #7

MACHINE LEARNING IDENTIFICATION OF PERSONALIZED PATIENT RISK FACTORS FOR PROLONGED LENGTH OF STAY AFTER TRAUMA LAPAROTOMY

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Introduction: Trauma laparotomy patients often experience prolonged hospital length of stay (PLOS). Previous studies have relied on standard statistical analyses to identify contributing factors for PLOS, but machine learning (ML) algorithms can discern complex interactions and nonlinear relationships among variables, capturing unique patient trajectories. By assigning individualized relative weights to features, ML can enhance accuracy and provide a nuanced understanding of PLOS determinants. This study tests the hypothesis that ML can predict PLOS and provide personalized risk profiles for individual patients.

Methods: Patients from the American College of Surgeons Trauma Quality Improvement Project database (TQIP) who received a laparotomy within 90 minutes of arrival were included. ML models were created to predict a greater than 90th percentile length of stay (LOS). Patients with missing data for LOS were excluded. A game theoretical approach was used to estimate the relative significance of each variable towards the final prediction.

Results: Of 5,481,046 patients in TQIP from 2017 to 2021, 74,806 met inclusion criteria. Median LOS was 7 days and 90th percentile LOS was 28 days. A gradient-boosted decision tree model performed the best with area under the receiver-operator curve of 0.920. The most impactful predictor variables are displayed in Fig 1.

Conclusions: ML can identify patients at high risk of PLOS. Direct electronic medical record implementation can identify the most important factors contributing to PLOS in each individual patient and prospective implementation may allow for personalized care plans tailored to each patient's risk profile. This algorithm is designed to improve over time and can capture complex non-linear relationships that may not be apparent to humans or standard statistics.

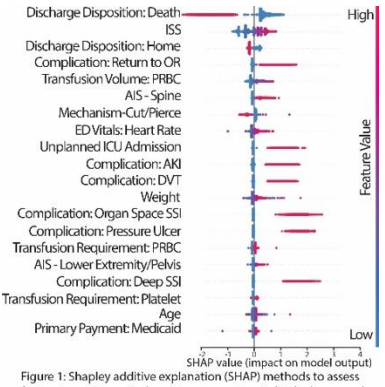

Figure 1: Shapley additive explanation (SHAP) methods to assess feature importance. Each point represents an individual case, and the grouping of points demonstrate how that variable contributes to the model's outcome prediction for each individual case.

Poster #8

REBOA IN SHOCKED PENETRATING ABDOMINAL TRAUMA PATIENTS: IMPACT ON OUTCOMES

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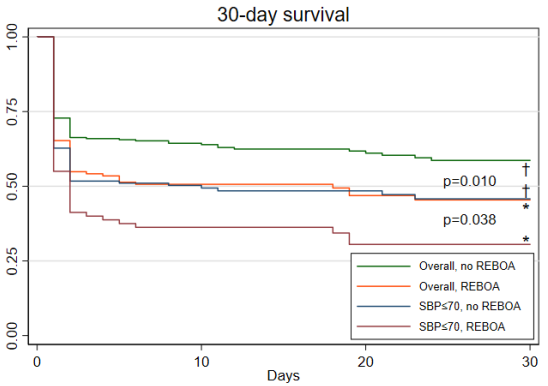
Introduction: The role of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) in trauma is debated. We hypothesized that the use of REBOA for patients presenting in shock after penetrating abdominal trauma is associated with delay to laparotomy and increased mortality.
Methods: We used 2017-2021 Trauma Quality Improvement Project (TQIP) data to identify adult (≥16 years) penetrating abdominal trauma patients with systolic blood pressure (SBP) ≤90mmHg undergoing laparotomy. REBOA was defined by ICD-10 code, with a procedure timestamp preceding or simultaneous to laparotomy incision. We propensity score matched REBOA to non-REBOA patients on demographics, mechanism, injury characteristics and severity, solid organ injury, abdominal vascular injury, SBP, heart rate, and GCS motor score. Outcomes were time to incision, transfusion requirements, complications, and in-hospital mortality. We additionally performed a survival analysis stratified by presenting SBP.
Results: There were 148 REBOA patients with complete data for matching to 286 non-REBOA patients. Among patients with REBOA timestamps preceding laparotomy incision, there was a delay to laparotomy (time to incision 40 [31, 50] vs 33 [23, 43.5] minutes, p=0.001). Overall, REBOA was associated with increased transfusion volume (median [IQR] pRBCs 5,125 [2,100, 9,100] vs 2,500 [1,050, 5,450] ccs in the first 4 hours, p<0.001), leg amputations (3.4% vs 0.4%, p=0.010), and mortality (53.4% vs 42.7%, p=0.034). The mortality relationship persisted among patients presenting with SBP ≤70mmHg (Figure).
Conclusion: REBOA for patients in shock after penetrating abdominal trauma is associated with delay to operation, greater transfusion requirement, leg amputation and mortality. Our data support the need for expeditious definitive hemorrhage control in these patients.



Poster #9

REFINING KIDNEY ORGAN INJURY SCALING: EVIDENCE-BASED UPDATES TO THE AAST RENAL TRAUMA GRADING

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Introduction: The American Association for the Surgery of Trauma (AAST) introduced the Organ Injury Scale (OIS) for kidney injuries in 1989, primarily based on anatomic and operative findings. The OIS was updated in 2018 and added important radiologic findings. With the near-universal use of CT scans for initial trauma assessment and the widespread adoption of non-operative management for renal trauma, further refinement of the OIS is necessary.
Methods: A multidisciplinary workgroup of trauma surgeons, urologists, and radiologists reviewed the kidney OIS and developed a consensus aligned with recent literature. Priorities in the process were assigning injury grades to better predict the need for therapeutic interventions and provide objective measures to assign injury grades based on imaging, operative, and pathologic findings.
Results: Key modifications to the kidney OIS include: increasing the cutoff for laceration length from 1 cm to 2.5 cm or greater for Grade III injuries; introducing a 3.5 cm hematoma rim size cutoff for Grade III injuries; and focusing more on active bleeding (defined by presence of vascular contrast extravasation) in grade IV injuries. The term "shattered kidney" is replaced with "multi-fragmented kidney", now defined as the presence of three or more parenchymal fragments separated by blood or fluid. Urinary extravasation is also downgraded to grade III due to its high rates of spontaneous resolution and limited need for intervention.
Conclusion: We present an updated kidney OIS based on the contemporary evidence-based data and collaborative efforts of a multi-disciplinary group. The emphasis of the updated OIS is on the overall need for interventions depending on the modality used for diagnosis. These revisions align with the widespread adoption of CT imaging and the growing acceptance of non-operative management for renal trauma across all grades.

Poster #10

VARIATION AMONG TRAUMA CENTERS IN THE USE OF ANGIOEMBOLIZATION AND SPLENECTOMY RATE IN ISOLATED HIGH-GRADE BLUNT SPLENIC INJURIES

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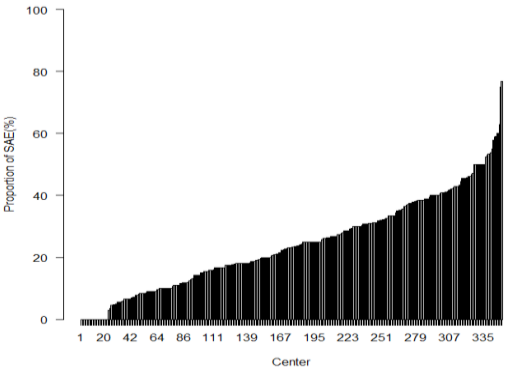
Introduction: Many US trauma centers have recently adopted splenic angioembolization (SAE) as an adjunct in patients with high-grade blunt splenic injuries (BSI) undergoing non-operative management (NOM). However, it remains unclear whether the use of SAE is associated with successful NOM. We hypothesized that trauma centers with higher rates of SAE would have decreased splenectomy rates for high-grade BSI.

Methods: This is a retrospective cohort study using data from the ACS-TQIP database (2013-2021). We included patients (age ≥16 years) with isolated high-grade BSI (Abbreviated Injury Scale: 3–5) treated at trauma centers that admitted ≥10 high-grade BSI cases during the study period. Study patients were classified into three groups based on the percentage of patients undergoing SAE: 0% (no-SAE centers); 1% to 39.9% (low-SAE centers); and more than 40% (high-SAE centers). The cutoff for high SAE centers (≥40%) represented the 90th percentile for trauma center SAE use. Hierarchical logistic regression controlling for clustering at the hospital level was performed to examine the association between trauma center SAE use and splenectomy rate.

Results: A total of 7,434 patients with isolated high-grade BSI were included (no-SAE: 375 from 23 centers, low-SAE: 5,792 from 267 centers, high-SAE: 1,267 from 60 centers). The median percentage of SAE use was 23.2% (IQR: 11.9-34.8) (**Figure**). Overall splenectomy rates were 14.4%, 9.8%, and 7.3% in the no-SAE, low- SAE, and high-SAE centers, respectively. After adjusting for hospital case mix, low-SAE and high-SAE centers were associated with decreased odds of splenectomy compared with no SAE centers (OR: 0.71, 95%CI: 0.51-0.99 and OR: 0.57, 95% CI: 0.38-0.85, respectively).

Conclusions: Our results suggest that trauma centers with higher rates of SAE use had lower splenectomy rates in patients with isolated high-grade BSI.



Poster #11

DISCRIMINATION OF PATHOPHYSIOLOGY IN SYSTEMIC INFLAMMATION BY CANONICAL DISCRIMINANT ANALYSIS BASED ON TRANSCRIPTOME ANALYSIS

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Introduction: It is difficult to diagnose the pathophysiology of systemic inflammation by a single biomarker. We aimed to develop a novel method to discriminate pathophysiology by evaluating multiple gene expressions as a pattern using transcriptome analysis.
Methods: We employed cecal ligation and puncture (CLP) using 25G needle, and 20% full thickness burn injury model for systemic inflammation models. RNA was extracted from whole blood 24 hours after injury, and RNA sequencing was performed on a next-generation sequencer (NGS) (n=3 per group). qPCR was performed on genes (Cr2, Fcer2a, Hspa1b, Ngp, Olfm4, Mrgpra2, Vcan) that showed significant changes between groups in the statistical analysis after NGS (n=6 per group). The gene expression patterns were compared by canonical discriminant analysis (CDA).
Results: Statistical analysis after NGS showed significant difference in 1746 mRNAs among the 3 groups (ANOVA $p<0.05$). The gene expression of Ngp, Olfm4, Mrgpra2, and Vcan was significantly upregulated in CLP and Burn compared to Sham, and Ngp and Olfm4 were significantly upregulated in CLP compared to Burn ($p<0.05$). Cr2, Fcer2a was significantly lower in CLP compared to Sham and Burn ($p<0.05$) (Fig.1). Each group showed a characteristic gene expression pattern, and CDA showed that each pathopysiology could be discriminated 100%, and, using only three parameters, it could be discriminated more than 90% for all specimens (Fig.2).
Conclusion: The results suggested the possibility of a novel method to discriminate pathophysiology based on gene expression patterns extracted by transcriptome analysis.

Fig.1

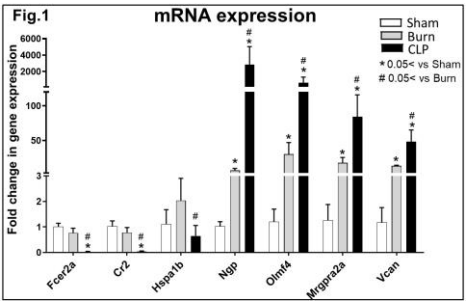
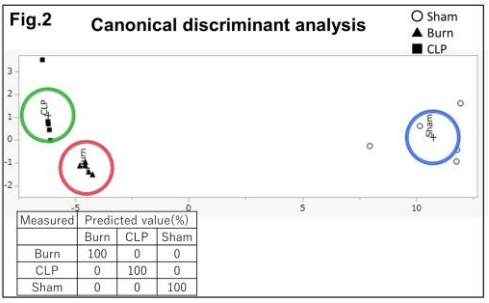


Fig.2



Measured	Predicted value(%)		
	Burn	CLP	Sham
Burn	100	0	0
CLP	0	100	0
Sham	0	0	100

Poster #12

DO AS I SAY AND NOT AS I TEACH: SURGICAL CRITICAL CARE PROGRAM DIRECTORS AND DIPLOMATES SHAPE THE FUTURE OF SURGICAL CRITICAL CARE

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Thomas K. Duncan, DO; Amy N. Hildreth, MD; Kenji Inaba, MD;
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American Board of Surgery

Introduction: In 1987, the Trauma, Burn, Surgical Critical Care Board (TBSCCB) began providing certification in surgical critical care through a certification examination (CE) process. The blueprint for the CE has remained largely unchanged since that time. In 2020, the TBSCC began to revise the CE, and wanted to evaluate the relevance of exam content to SCC training programs and diplomates. The purpose of the study was to evaluate whether the material being tested aligns with clinical practice.

Methods: SCC program directors (PDs) and diplomates were identified, and on-line surveys administered. A draft blueprint was vetted with SCC PDs and diplomates to determine how frequently each item should be tested. Respondents were asked to rank each item by how frequently they felt it should be tested on the exam (4 = each year, 3 = every other year, 2 = every few years, 1 = never). Diplomates were also asked to identify how frequently specific topics were encountered in their practice. Results were compared with both t-tests and Mann-Whitney U test. Cohen's *d* was calculated as a measure of effect size. Given the large sample size, we used a p-value of < 0.001 and at least a moderate effect size as an indication of relevant differences.

Results: Response rates were 42% (n=70) and 30% (n=1307), respectively. 188 topics were evaluated. Program directors requested more frequent assessment than diplomates in 28 categories. Obstetrical emergencies and ICU billing and coding were the most discordant. There were 17 topics for which diplomates expressed high discordance between the importance of the topic and everyday practice (Table). The most frequently performed procedures were ultrasound for trauma, central line, arterial line and tube thoracostomy. Transthoracic echocardiography was performed more frequently than pulmonary artery catheter placement.

Conclusions: SCC practice has evolved significantly since the CE began. PDs and diplomates identified notable differences in the importance of various topics for testing indicating a discrepancy in the training vs practice paradigms. Assessments used to measure knowledge should be aligned with practice but require a balance of topics that are infrequently encountered but exquisitely life-threatening and time sensitive.

Table. Ranking of various items by diplomates "for testing" vs. "see in practice."

Topic	For testing	See in practice
ICU coding	2.18	3.33
Thoracic esophageal injury	2.74	1.74
Tracheal and bronchial injuries	2.92	1.92
Cardiac tamponade	3.28	1.96
Rectal injury	3.11	2.09
Pancreatic injury	3.21	2.13
Duodenal injury	3.13	2.12
Malignant hyperthermia	2.58	1.39
Great vessel injury	3.13	2.13
Larynx/thyroid/airway injury	2.86	1.85
Abdominal compartment syndrome	3.45	2.35
Anaphylaxis	2.92	1.9
SIADH and cerebral salt wasting	3.38	2.37
Extremity compartment syndrome	3.55	2.49
Diabetes insipidus	3.38	2.34
Surgical airways	3.59	2.58

Poster #13

IS PHENOBARBITAL THE DRUG OF CHOICE FOR ALCOHOL WITHDRAWAL SYNDROME PROPHYLAXIS IN TRAUMA PATIENTS?

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Introduction: The development of alcohol withdrawal syndrome (AWS) poses significant risk to the hospitalized trauma patient irrespective of injury severity. Although diazepam is a commonly used agent to prevent or treat AWS, phenobarbital is being increasingly used as an alternative. The purpose of this study was to compare both the efficacy and adverse effects of these two drugs in preventing AWS. We hypothesized that phenobarbital would be associated with a lower incidence of AWS than diazepam.
Methods: Adult trauma patients from a level 1 trauma center who received either scheduled-dose diazepam or phenobarbital for AWS prevention between 2015 and 2022 were reviewed. Primary outcome was development of AWS, defined as dose or frequency increase of the prophylactic agent, high usage of prn CIWA protocol, and/or medication regimen changes. Secondary outcomes included development of somnolence or unplanned intubation.
Results: 172 patients (89% male) with an average age of 49.6±14.5 years and median injury severity score of 12 (5-17) were identified. 54 (31.4%) patients were initiated on diazepam, at a median daily dose of 20mg (15 – 20) and 118 (68.6%) patients were initiated on phenobarbital, at a median daily dose of 130 mg (130 - 195). Overall, 14 (8.1%) patients developed AWS. Comparing groups, 10 (18.5%) patients in the diazepam group developed AWS vs. 4 (3.4%) in the phenobarbital group ($P<0.001$). Median daily dose was not different between patients who developed AWS vs those who did not for diazepam (27.5 mg vs 20 mg. $P = 0.806$) or phenobarbital (162.5 mg vs 130 mg, $P = 0.841$). Rate of somnolence was significantly higher in the diazepam group (diazepam 20.4% vs phenobarbital 8.5%, $P=0.024$). No patient with AWS required intubation secondary to development of withdrawal.
Conclusion: Among hospitalized trauma patients, those treated with prophylactic phenobarbital were significantly less likely to develop AWS and experience somnolence vs prophylactic diazepam. Phenobarbital should be considered as a first-line agent for AWS prevention.

Poster #14

MRSA NASAL SWABS PREDICT NEED FOR ANTIBIOTIC COVERAGE IN A TRAUMA POPULATION

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Introduction: Methicillin Resistant Staphylococcus Aureus (MRSA) nasal swab screening in a general intensive care unit (ICU) population has a high negative predictive value (NPV) and is used to guide antibiotic stewardship. The role of MRSA nasal swabs to de-escalate broad-spectrum antibiotics in trauma populations, known to be susceptible to hospital acquired pneumonia, has not been defined. The goal of this study was to assess the utility of the MRSA nasal swab in predicting MRSA pneumonia in a trauma population, hypothesizing that MRSA swabs would have a high NPV.
Methods: A retrospective review of trauma ICU patients at a Level 1 trauma center who received an MRSA nasal swab and respiratory culture from 2020-2023 was performed. Positive and negative MRSA nasal swab groups were compared and sensitivity, specificity, positive predictive value (PPV), and NPV for MRSA culture growth and pneumonia ($\geq 10^5$ colonies) were calculated. The area under the curve (AUC) of a receiver operating characteristic was measured.
Results: A total of 163 patients were screened and cultured, of these, 22 (13.5%) had positive MRSA nasal swabs, with 15 (9.2%) having MRSA growth and 5 (3.1%) diagnosed with MRSA pneumonia. There were no significant differences in age, BMI, smoking, or COPD between the positive and negative swab groups. Sensitivity and specificity were 66.7% and 91.9% respectively with a PPV 45.5% and NPV of 96.5% for any MRSA growth (Table). AUC for MRSA culture growth was calculated to be 0.79. Nasal swabs had an NPV of 100% for MRSA pneumonia.
Conclusion: This study, which is the largest to date on this topic, found MRSA nasal swabs to have a high NPV for MRSA growth and pneumonia and can help deescalate empiric antibiotic coverage in trauma patients. Further studies are needed to investigate the incidence of MRSA and role of routine nasal swabs in these high-risk trauma patients.

	Culture positive	Culture negative	Total
Swab positive	10 (6.1%)	12 (7.4%)	22 (13.5%)
Swab negative	5 (3.1%)	136 (83.4%)	141 (86.5%)
Total	15 (9.2%)	148 (90.8%)	163 (100%)

Table: Nasal swab as a predictor of MRSA culture growth

Poster #15

PREDICTING READMISSIONS FOLLOWING SEPSIS: AN INTERPRETABLE MACHINE LEARNING APPROACH

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Introduction: Sepsis survivors are a leading cause of hospital readmissions. We developed an interpretable machine learning (ML) model to predict 30-day readmissions for post-operative sepsis and septic shock survivors.
Methods: NSQIP (2018-2021) was queried for post-operative sepsis or septic shock during admission. Univariate analysis compared readmitted and non-readmitted patients. Using demographics, comorbidities, pre-operative labs, surgical specialty, diagnoses present at time of surgery (PATOS), operative time, length of stay, post-operative complications, and discharge destination, AutoML, LightGBM and XGBoost models were developed with Shapley Additive Explanations (SHAP) for interpretability. Models were validated with an 80/20 train-test split.
Results: The cohort had 52,025 patients (75% sepsis and 25% septic shock); 75% had sepsis or septic shock PATOS. 6,374 (12.5%) had an unplanned readmission. Readmitted patients had more comorbidities ($p<0.05$) and higher 30-day rates of surgical site infection (SSI), pneumonia, unplanned intubation, pulmonary embolism, renal failure, cardiac arrest, DVT, MI, UTI, and reoperation ($p<0.05$). During initial admission, readmitted patients had shorter average length of stay (12.7 vs 13.3 days, $p<0.01$) and lower rates of pneumonia, unplanned intubation, stroke, and cardiac arrest ($p<0.05$) with no significant differences in other complications. LightGBM (accuracy=0.81; AUC=0.71) was chosen. The F1 maximizing threshold (0.6) resulted in a readmission rate of 29% and captured 37% of all readmissions. Mean absolute SHAP values revealed organ space SSI PATOS (0.26), days from operation to discharge (0.2), and post-operative organ space SSI (0.18) as the most influential factors in predictions.
Conclusions: Interpretable ML accurately predicts risk of readmission after survival of sepsis. SHAP identifies the contributing factors for each patient. Early identification of high-risk patients could inform decisions on discharge timing, disposition, and follow-up.

Poster #16

SPONTANEOUS BREATHING TRIAL PARAMETERS (NIF AND RSBI) ARE NOT PREDICTORS OF TRAUMA PATIENT REINTUBATION

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Introduction: Reintubation in trauma patients is linked to increased morbidity and mortality. While spontaneous breathing trial (SBT) factors such as negative inspiratory force (NIF) and rapid shallow breathing index (RSBI) are recognized in general intensive care unit populations, their applicability to trauma patients is less clear. This study aims to identify clinical predictors of reintubation in trauma patients, thereby offering insights for better management and prognostication.

Methods: A single center, retrospective (1/2017-12/2023) study of trauma patients ≥18 years-old who underwent extubation from endotracheal mechanical ventilation was performed. Exclusion criteria included self-extubation, patients with a tracheostomy or comfort measures, and death before extubation. The study compared patients unexpectedly reintubated at any point during their admission versus those who weren't, using multivariable logistic regression to identify risk factors associated with reintubation.

Results: From 424 trauma patients, 51 (12.0%) underwent reintubation. Patients reintubated were older (55 vs 39 years-old, p=0.016) and more often had congestive heart failure (7.9% vs 1.6%, p=0.023), cirrhosis (7.8% vs 1.9%, p=0.032), and a higher injury severity score (ISS) (27 vs 18, p<0.001). Reintubated patients had lower NIF (-24.0 vs -27.0, p=0.037) but increased ventilator days (6 vs 2, p<0.001) prior to extubation, whereas RSBI was similar between cohorts (32.0 vs 36.5, p=0.076). Multivariable logistic regression revealed that neither RSBI <50 or <100, nor NIF <-20 were associated with reintubation, whereas increased age (OR 1.024, CI 1.004-1.044, p=0.017), ISS (OR 1.040, CI 1.005-1.076, p=0.026), and ventilator days before extubation (OR 1.132, CI 1.041-1.231 p=0.004) were associated with increased risk of reintubation (Table 1).

Conclusion: Over 10% of extubated trauma patients underwent reintubation. SBT parameters like RSBI and NIF were not associated with reintubation, whereas age, ISS, and ventilator days before extubation were independently associated risk factors for reintubation. This suggests patient-specific factors, beyond SBT parameters, should help guide extubation decisions.

Poster #17

STRESS HYPERGLYCEMIA RATIO PREDICTS MORTALITY IN TRAUMA PATIENTS

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Introduction: The relationship between hyperglycemia and poor outcomes after injury, including mortality, is well-established. This effect has been observed in patients both with and without diabetes mellitus (DM). Admission glucose (AG) alone may be inferior to more global markers of glycemic status such as the stress hyperglycemia ratio (SHR). The SHR has been demonstrated to correlate with mortality in non-trauma, critically ill populations. The purpose of our study was to investigate the relationship between SHR and outcomes in a trauma population.
Methods: Using a single institution Level 1 trauma center registry, data from all trauma admissions with HbA1c (2017-23) were obtained. The SHR was calculated as admission glucose divided by HbA1c-derived average glucose. Individual cohorts were compared using Student's T-test and Chi-Squared. SHR was studied across the cohort using a cutoff value of 1.14, identified in previous literature. Lastly, logistic regression analyses were performed to identify the odds ratio for death associated with increased SHR.
Results: 10,038 patients were studied (1,764 diabetic). The DM cohort had significantly higher AG, HbA1c, lower SHR, and higher mortality (6.9 vs 5.3%, $p=0.009$). Using an SHR cutoff of 1.14 in the entire study population, the high SHR cohort (4,337) had a longer ICU and hospital LOS, and mortality (9.1 vs 2.9%, $p<0.001$). On regression analysis, SHR > 1.14 was predictive of mortality (OR 3.38, CI 2.8-4.1), as was AG > 180 (OR 4.4, CI 3.7-5.3). In subgroup analysis, AG and SHR were strongly predictive of mortality for both DM and non-DM patients. However, SHR was more sensitive than AG in the non-DM cohort. In quartile analysis, a significant increase was seen in the OR for death within the 4^{th} quartile, at an SHR of 1.33 (OR 5.7, CI 4.3-7.6).
Conclusions: Similar to AG, SHR is strongly predictive of mortality in both DM and non-DM trauma patients. SHR is a more sensitive predictor of mortality than AG in the non-DM patient and is more sensitive in the non-DM patient versus the DM cohort. Utilization of SHR appears to identify a cohort of patients at risk for death at a lower threshold than conventional measures such as AG.

Poster #18

THE ASSOCIATION OF WHOLE BLOOD VERSUS COMPONENTS WITH EARLY LABORATORY VALUE CHANGES

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Introduction: Many studies compare whole blood (WB) to component only (CO) transfusions with respect to overall outcomes in trauma patients. These studies are plagued by shortcomings including small volume transfusions, whole blood groups with minimal volumes of WB delivered and CO groups with low ratios of plasma to platelets to red blood cells. We aimed to compare early laboratory value changes in trauma patients receiving massive transfusions with either large volumes of WB or CO.
Methods: Retrospective review from a single level-1 academic trauma center performed from 2016-2021. We included patients >15 years old who received a massive transfusion with a minimum of 3 units in the 1st hour of either WB or red blood cells. Low titer group O leukoreduced whole blood (LTOWB) was utilized. Our primary outcome measures were early laboratory value changes including hematologic, organ specific, perfusion and coagulation from baseline to 8-12 hours. Appropriate tests for categorical, normally and abnormally distributed data were performed. Significance was set at $p<0.05$.
Results: The WB group received a median of 5 units of WB and 0 units of other components and CO received a median of 6 units of red blood cells, 5 units of plasma and 1 unit of apheresis platelets. The median time to the 2nd blood draw was 9.4 hours after admission. There was a larger change in baseline to early platelet counts in the CO group (114 vs 80 x 10^3/uL, $p < 0.048$). and lesser change in LY30 (0 vs 0.7%, p =.037). There were no significant changes in baseline to early values for lactate (0.3 vs 0.8 mmol/L, p>0.9), potassium (-0.4 vs -0.2 mmol/L, p =0.9), creatinine (0.13 vs 0.12 mg/dL, p=0.4), aPTT (1.2 vs 0.1 sec, p>0.9), INR (-0.05 vs –0.05, p>0.9), fibrinogen (-1 vs -25 mg/dL, p = 0.7), hemoglobin (1.4 vs 0.95 g/dL, p=0.2), pH (-0.12 vs –0.11, p=0.2), or base excess (-2.3 vs -2.45 mmol/L, p=0.7)
Conclusion: CO resuscitation with high ratios results in a greater increase in platelet count and no change in LY30 compared to resuscitation with leukoreduced LTOWB. Overall differences in laboratory values between the 2 resuscitation techniques are minimal.

Poster #19

ENHANCING TRAUMA PATIENT SAFETY: A RELATIONSHIP-FOCUSED FEEDBACK WORKSHOP IN THE INTENSIVE CARE UNIT

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Introduction: Communication skills amongst health care workers are essential to provide safe patient care. It can be uniquely challenging to provide considered, well-timed, respectful peer feedback in high-pressure settings such as a Surgical Trauma Intensive Care Unit (STICU). Formally training trauma nurse team members in providing relationship-focused feedback has the potential for improving patient safety.
Methods: In a large Level I trauma center, STICU RN quality committee and communication experts developed a simulation-based workshop for bedside nurses with practice scenarios drawn from STICU RN experiences. Workshop content was derived from nursing/medical education literature. The SPIKES protocol, most used for "breaking bad news" in medical education, was adapted as a framework for difficult peer-feedback discussions. Pre/post surveys captured previous training, attitudes, and confidence performing target skills. Observers, small group facilitators, and nurse-actors rated learners on simulation performances.
Results: STICU RNs (N=54) participated in half-day workshops. In pretests, 93% agreed they had recently avoided giving feedback due to being uncomfortable; only 19% had received previous training in and felt empowered giving/receiving peer feedback. "Years in profession," "leadership role," and "trauma certification" were not statistically significantly related to simulation performance. RNs <30 years scored significantly higher in simulation skills than older RNs. Importantly, RNs stating they "feel empowered to provide feedback" performed statistically significantly better in simulation. After training, median STICU RN confidence increased ($p<.001$) regarding 1) ability to offer useful feedback, 2) using a framework to guide feedback, 3) ability to listen and problem solve with peers struggling with clinical skills. Most (79%) follow up surveys indicated that STICU RNs felt empowered to and had recently offered feedback when observing an opportunity.
Conclusion: A simulation-based feedback workshop designed for and implemented by trauma RNs and communication specialists can improve RN confidence, willingness, and skill engaging in important feedback discussions with peers, and lead to increased patient safety.

Poster #20

GROWING TRENDS OF PREHOSPITAL KETAMINE USE IN SEVERELY INJURED PATIENTS

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Introduction: Our local EMS guidelines prioritize the use of ketamine for acute pain management in patients with hypotension and respiratory failure. We hypothesize that prehospital ketamine for pain has increased and is a safe option for prehospital pain control. The specific aim of this study was to compare patients who received prehospital ketamine vs. fentanyl for pain.
Methods: This was a retrospective study (2014-2022) of adult trauma patients transported by EMS to our trauma center at the highest level of activation. We compared patients who received only fentanyl vs. only ketamine for prehospital pain. The ketamine and fentanyl groups were compared by univariate and multivariate analysis.
Results: 878 patients were included, 27% received ketamine and 73% received fentanyl. Ketamine use increased significantly from 2014-2022, $p<0.001$. Ketamine patients were younger (39 vs. 42, $p=0.0008$), but there was no difference in white/non-Hispanic ethnicity (53% vs. 55%, $p=0.58$), male gender (74% vs. 70%, $p=0.31$), or blunt mechanism (69% vs. 63%, $p=0.15$). Ketamine patients had a higher prehospital heart rate (103 vs. 99, $p=0.02$) and a lower systolic blood pressure (119 vs. 128, $p=0.0002$) and lower GCS (12 vs. 15, $p<0.0001$). These physiologic derangements persisted in the ED. Ketamine patients had a higher ISS (18 vs. 14, $p<0.0001$) and more often required an emergent hemorrhage control procedure (22% vs. 15%, $p=0.02$). Ketamine patients had a higher ED mortality (3% vs. 0.2%, $p=0.003$), and double the hospital mortality (6% vs. 3%, $p=0.06$). Ketamine patients spent more days in the hospital, ICU, and on the ventilator (all $p<0.05$). On logistic regression, prehospital GCS (AOR: 0.79 [0.73-0.87], $p<0.0001$) and blood pressure (AOR: 0.99 [0.98-0.99], $p=0.008$) were independently associated with receiving ketamine. While ketamine patients had worse outcomes, ketamine was not independently associated with mortality (AOR: 0.32 [0.09-1.2], $p=0.09$).
Conclusion: Ketamine use for prehospital pain control is increasing. Ketamine is being given to more severely injured patients with more physiologic derangement. Though patients who receive ketamine have worse outcomes, ketamine is not independently associated with mortality.
We anticipate that due to its mechanism of action leading to pain control without further respiratory suppression, ketamine will continue to be used more commonly for acute pain in trauma patients in the pre-hospital setting.

Poster #21

A FRAGILE BODY AND AN INJURED BRAIN: THE EFFECT OF FRAILTY ON OUTCOMES IN OLDER ADULTS WITH TRAUMATIC BRAIN INJURY

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Introduction: The aim of this study is to assess the effect of frailty on admission and 3-month post-discharge outcomes in older adults (OAs) with isolated traumatic brain injury (TBI).
Methods: This is a secondary analysis of the prospective observational AAST frailty multi-institutional trial conducted across 17 trauma centers (2019-2022). OAs (³ 65 years) with isolated TBI (head AIS³2 and other-body region AIS ≤2) were included. Frailty was measured using the TSFI. Outcomes included in-hospital mortality and major complications, unfavorable discharge disposition (hospice/SNF), and 3-month post-discharge readmissions. Multivariable regression analyses were performed to identify the independent effect of frailty on outcomes.
Results: Of the 249 patients identified, 132 (53%) were non-frail and 117 (47%) were frail. Mean age was 78±9, 56% were male, 69% presented after a fall, median head AIS was 3 [2-3], and 66% presented with a mild (GCS≥13) TBI. Frail patients experienced an increased in-hospital mortality (OR 2.8, p=0.04) and major complications (OR 3.4, p<0.001), unfavorable discharge disposition (OR 2.1, p=0.02), readmission (OR 2.3, p=0.047) and post readmission major complications (OR 9.8 p=0.004). Similar trends were seen on subgroup analysis stratified by TBI severity. (**Table**)
Conclusion: Frailty in OAs with TBI significantly impacts outcomes, emphasizing the need for early screening of OAs with TBI to facilitate goals of care discussions and treatment plans in this vulnerable population.

Table - Independent Effect of Frailty on the Outcomes Stratified By Head Injury Severity (n=249)

	Mild TBI			Moderate TBI			Severe TBI		
Outcome Measures	**aOR**	**95% CI**	***p*-value**	**aOR**	**95% CI**	***p*-value**	**aOR**	**95% CI**	***p*-value**
Index Admission									
Mortality	4. 84	1.47-15.94	**0.010**	1.42	0.53-3.30	0.409	1.65	0.12-3.45	0.619
Major Complications	4.03	1.62-10.01	**0.003**	8.00	1.93-18.62	**0.048**	1.69	0.15-3.13	0.635
Discharge to Home	0.44	0.22-0.88	**0.021**	0.74	0.18-0.83	**0.016**	0.27	0.03-0.96	**0.042**
Unfavorable Disch. Disp.	2.72	1.09-6.82	**0.032**	1.87	1.35-4.05	**0.037**	2.80	1.71-11.09	**0.033**
3-months Post-discharge									
Readmissions	2.64	1.50-4.56	**0.046**	-*	-	-	-	-	-
Major Complications	5.42	2.75-17.13	**0.027**	2.01	1.03-3.45	**0.011**	-	-	-

aOR–adjusted odds ratio; CI–confidence interval; Unfavorable Disch. Disp.–discharge disposition to skilled nurse facility or Rehabilitation center or hospice
*– Multivariable regression analysis was not performed due to the small number of cases in these outcomes.

Poster #22

AGE MATTERS: ADMISSION ENDOTHELIAL DIFFERENCES ARE ASSOCIATED WITH WORSE OUTCOMES IN OLDER ADULT PATIENTS AN ANALYSIS OF THE TXA IN TBI PREHOSPITAL CLINICAL TRIAL

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Introduction: Injured older adults represent 25% of trauma admissions, with increased morbidity and mortality compared to younger adults. Factors contributing to their poor outcomes are not fully characterized. Endothelial dysfunction has been associated with poor outcomes in trauma patients. We aimed to characterize post-traumatic endothelial changes in older versus younger adult trauma patients and compare outcomes.
Methods: We performed a secondary analysis of the "Prehospital Tranexamic Acid (TXA) for TBI" trial. We studied patients with admission endothelial biomarkers: ICAM1, angiotensin-1, thrombomodulin, VCAM1, angiotensin-2, syndecan-1, thrombospondin. To avoid using an arbitrary age cut off, we divided patients into age quartiles and defined the upper quartile as the oldest age quartile (OA) and compared it to the three youngest quartiles (YA). In-hospital, discharge, and mortality outcomes were compared. Significance was set at $p < 0.05$.
Results: 436 patients met our criteria. Mean OA age was 66 years (54-88 years, n=327), similar to the ACS older patient guidelines of >55 years. YA mean age was 30 years (15-54 years, n=107). No difference was observed between the OA and YA in rates of penetrating trauma (3.4% vs 1.8%, p=0.626), head AIS score (mean 3 vs 3, p=0.582), or ISS (mean 19 vs 21, p=0.265). TXA dosing was not different between cohorts (p=0.571). OA was associated with higher thrombomodulin (median 693.3 vs 593.4 pg/mL, p<0.001), VCAM1 (median 71035.6 vs 59708.3 pg/mL, p<0.001) and angiotensin-2 (164.9 vs 134.7 pg/mL, p=0.007). No differences in Syndecan-1 was observed (median 291.1 vs 247.7 pg/mL, p=0.267). OA patients had fewer hospital free days (median 8 vs 18, p<0.0001), ICU free days (median 20 vs 24, p=0.002), and ventilator free days (median 24 vs 26, p=0.005), lower Glasgow Outcome Scale Extended scores at discharge (mean 3.5 vs 4.2, p<0.001), lower Glasgow Outcome Scale Extended scores at discharge (mean 3.5 vs 4.2, p<0.001), and higher 28-day mortality (20.5% vs 9.8%, p=0.011).
Conclusion: Despite similar injury patterns, OA patients presented with higher admission endothelial plasma biomarkers and had worse outcomes. This warrants further investigation into the association between endothelial dysfunction post-traumatic outcomes.

Poster #23

FALL-RELATED REINJURY: IDENTIFYING INJURY PATTERNS ASSOCIATED WITH GERIATRIC FALL RECIDIVISM

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Introduction: Falls represent a major source of morbidity and mortality for geriatric patients. This is especially true for patients who suffer repeated falls, as they often experience more severe injuries and greater disability. This study sought to identify injury patterns most associated with repeat fall admission using a nationally representative database.
Methods: Using the 2019 National Readmissions Database, patients ≥ 65 years admitted with fall-related injuries were identified. Patients that died during the index fall admission, out-of-state residents, and those with less than 90 days of follow-up were excluded. Patients were classified by their injury pattern into the following mutually exclusive cohorts: traumatic brain injury, spine fracture, thoracic fracture, pelvic fracture, upper extremity fracture, lower extremity fracture, femoral neck fracture, superficial injuries, or multi-region injuries. Mortality risk for the index admission was assessed using the Trauma Mortality Prediction Model for ICD-10. Using survey-weighted estimates, descriptive statistics and logistic regression were used to compare outcomes by injury type, with a primary outcome of repeat fall-related admission within 90 days.
Results: A total of 236,903 patients met criteria, correlating to a survey-weighted population of 410,107 individuals. The most common injury patterns were femoral neck fractures (38%), multi-region injuries (15%), and traumatic brain injury (12%). Overall, 3% of patients were readmitted within 90 days for repeat fall-related injuries. In addition, 19% were readmitted within 90 days for any non-elective cause, and 2% died within 90 days of discharge. After adjusting for patient age, gender, number of comorbidities, mortality risk, non-home discharge after fall, and occurrence of a major operative procedure, traumatic brain injury was significantly associated with greater risk of repeat fall-related readmission than all other patient injury cohorts, including 72% greater odds than patients with femoral neck fractures (OR 1.72, 95% CI 1.54-1.92, $p < 0.001$).
Conclusions: Geriatric patients with traumatic brain injury after fall are at increased risk of readmission for fall-related injuries within 90 days. Increased screening and preventative interventions within this population are warranted to target patients at greatest risk and reduce rates of potentially preventable reinjury.

Poster #24

FRATILTY ASSESSMENT FOR PREDICTING ADVERSE OUTCOMES IN HIP FRACTURE PATIENTS: A COMPARARIVE ANALYSIS USING THE UNITED STATES NATIONAL INPATIENT SAMPLE

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Introduction: With the annual number of hip fractures increasing globally, it is important to be able to determine which patients suffer from a disproportionate risk of further deterioration. The aim of the current investigation was to compare the ability of several frailty scores to predict morbidity and mortality in hip fracture patients.
Methods: All adult patients (18 years or older) who suffered a hip fracture due to a fall and underwent surgical fixation were extracted from the 2019 National Inpatient Sample (NIS) Database. A combination of logistic regression and bootstrapping was used to compare the predictive ability of several frailty scores for adverse outcomes. These scores included the Orthopedic Frailty Score (OFS), the Nottingham Hip Fracture Score (NHFS), the 11-factor (11-mFI) and 5-factor (5-mFI) modified frailty index, as well as the Johns Hopkins Frailty Indicator.
Results: 227,850 patients were extracted from the NIS. In the prediction of both in-hospital mortality and FTR, the OFS surpassed all other frailty measures, approaching an acceptable predictive ability for mortality [AUC (95% CI): 0.69 (0.67-0.72)] and achieving an acceptable predictive ability for FTR [AUC (95% CI): 0.70 (0.67-0.72)]. All scores struggled to predict complications; however, the NHFS demonstrated the highest predictive ability [AUC (95% CI): 0.62 (0.62-0.63)]. On the other hand, the 11-mFI demonstrated the highest predictive ability for cardiovascular complications [AUC (95% CI): 0.66 (0.64-0.67)] and the NHFS achieved the highest predictive ability for delirium [AUC (95% CI): 0.69 (0.68-0.70)]. No score succeeded in effectively predicting venous thromboembolism or infections.
Conclusion: The OFS surpassed all other frailty scores when predicting mortality and failure-to-rescue, while the NHFS and 11-mFI demonstrated the best ability to predict delirium and cardiovascular complications, respectively.

Poster #25

GETTING WITH THE GUIDELINES: GERIATRIC TRAUMA ACTIVATION

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Introduction: The ACS Committee on Trauma recently revised geriatric trauma activation criteria. Accordingly at our facility, the partial or full trauma team is activated for geriatric patients with SBP <110, HR>120, fall on anticoagulant/antiplatelets, any long bone fracture, or GCS<13. We evaluated the effects of the revised criteria.

Methods: A retrospective review of the trauma registry at a level 1 trauma center for all patients age >65 years presenting to the ED who were hospitalized with blunt traumatic injury during the 11 months before (2022) and after (2023) institution of the revised trauma team activation criteria.

Results: Geriatric Trauma Team Activations

	2022	2023	P value
Partial & Full activations (n)	190	532	<0.001
Mechanism of Injury: Fall	71.6%	85.2%	0.01
Anticoagulant/antiplatelets (%)	41.1%	68.1%	<0.001
Injury Severity Score	10 (5, 17.7)	9 (4,10)	<0.001
Head/neck AIS>3 (%)	30%	22%	<0.001
Hospital LOS (days)	8 (3.2, 13.7)	5 (2,9)	<0.01
ICU admission (%)	56%	37%	<0.001
Complications (%)	21%	32%	0.003
In-hospital mortality (%)	12%	5.6%	0.003

Conclusions: Trauma team activation reduced (p<0.001)the time to CT vs non-activations (2022: 48 (41,61) vs 217 (145, 303) min, p<0.001 and 2023: 46 (38,55) vs 186 (130, 251) min, p<0.001). The volume of trauma activations increased by 2.5-fold (190/1136 vs 532/1286 geriatric admissions) following the revised guidelines. Post guideline implementation patients were more often on anticoagulants/antiplatelets but were less severely injured including less often severe head injury. They had less ICU admissions, shorter hospital length of stay, and lower mortality. Given the intensive resources required for trauma activation in less severely injured patients, further study is indicated for optimal activation criteria.

Poster #26

IDENTIFYING OLDER ADULTS AT RISK FOR FUTURE FALLS VIA PHYSICAL & OCCUPATIONAL THERAPY ASSESSMENTS

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Introduction: Unintentional falls are the leading cause of non-fatal injuries for admitted adults ≥65 years, and many of these encounters are for recurrent events. This project examined predictors of subsequent fall admissions based on physical and occupational therapy assessments, treatments, and recommendations during an index admission.
Methods: This retrospective matched case-control study examined patients ≥65 years admitted to our trauma center for a fall in 2015-2019. Cases were those with a second fall admission within one year of discharge. Controls did not admit for a second fall within one year. Patients were identified via the trauma registry and matched 1:1 on age, sex, race, ethnicity, fall height, initial Glasgow Coma Scale - motor, anatomic injury grade in each body region, insurance type, and admission year. Predictors of subsequent admissions were screened with cross-validated LASSO regression and tested in a paired Cox hazards model. Alpha was set at 0.05.
Results: 208 total patients were included. Median [Q1, Q3] age at index was 84 [77, 88] years, 69% were female. Injury Severity Scores were 9 [5, 10] at index and second admission. The model revealed increased fall hazard from requiring minimal or moderate assistance with bathing at discharge (HR = 2.27, 95% CI = 1.11 - 4.64), requiring minimal assistance walking at discharge (HR = 4.97, 95% CI = 1.05 - 23.56), using a rolling walker prior to index injury (HR = 1.70, 95% CI = 1.05 - 2.75), and physical therapy recommending discharge to a skilled nursing facility (HR = 1.92, 95% CI = 1.32 - 2.81). In contrast, there was reduced fall hazard from being referred to outpatient occupational therapy (HR = 0.42, 95% CI = 0.24 - 0.76) and having no deficit in toileting-related activities of daily living at discharge (HR = 0.60, 95% CI = 0.38 - 0.93).
Conclusion: This study of older adults suggests using a rolling walker prior to injury or needing even minimal assistance with walking, bathing, or toileting at discharge may increase the risk of serious falls within one year. Further work is needed to clarify which additional referrals or services would help mitigate the risk of future falls in this population.

Poster #27

RIB FRACTURE INJURY GUIDELINES FOR PATIENTS OVER AGE 65: SHOULD THESE PATIENTS ROUTINELY BE ADMITTED TO THE ICU?

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Introduction: Elderly patients with rib fractures have a high incidence of complications including pneumonia, extended intensive care unit (ICU) stay, and mortality. To date, there are small studies assessing proper admission triage of elderly patients with rib fractures. 2022 EAST guidelines state there is insufficient data to recommend ICU versus non-ICU admission for patients over age 65 with greater than three rib fractures and 2016 WEST guidelines recommend ICU admission for patients over age 65 with two rib fractures. At our institution, we routinely admit patients over age 65 with three or more rib fractures to the ICU for at least 24 hours to achieve adequate pain control and maximize pulmonary hygiene; however, this may lead to an overutilization of scarce resources. The goal of this study is to determine which factors are associated with worse outcomes to create a new admission triage algorithm for elderly patients with rib fractures.
Methods: Patients aged 65 or older with three or more rib fractures were identified between 2016 and 2023 using our institutional trauma database. Patient demographics, comorbidities, and injury characteristics were collected. The primary outcome was predictors of a composite negative outcome (mortality, pneumonia, and readmission to ICU).
Results: 495 patients were included in the analysis with 340 patients admitted to the ICU and 155 patients admitted to the floor. ICU patients were more likely to be older, frail, and have ≥5 rib fractures (all $p<0.05$). Less than 1% of patients initially admitted to the floor had an unplanned ICU admission and 25% of patients who ultimately died were readmitted to the ICU from the floor. Multivariable analysis demonstrated that frailty (OR:11.82, $p<0.001$), ≥5 rib fractures (OR:2.64, $p=0.04$), chest tube placement (OR:3.31, $p=0.04$), and regional nerve block (OR:4.66, $p=0.001$) were all associated with worse outcomes.
Conclusions: Patients with blunt thoracic trauma who are 65 or older, frail, and have ≥5 rib fractures may benefit from ICU admission. Future studies will assess the safety of this new proposed admission triage algorithm.

Poster #28

TRAUMA ACTIVATION FOR GERIATRIC FALLS ON BLOOD THINNERS RESULTS IN OVER TRIAGE

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Introduction: Unintentional falls account for approximately 70% of all geriatric emergency department visits. Patients on blood thinners who suffer low level falls are at an increased risk for deterioration from intracranial hemorrhage (ICH). Early recognition of ICH is crucial for prevention of a life-threatening event. However, our previous assessment found that implementing a trauma triage criterion for any patient over the age of 65 who had a fall on a blood thinner resulted in significantly over-triage. Further analysis aims to show that the removal of this trauma activation criteria does not significantly impact the mortality of patients due to ICH.
Methods: A retrospective case-controlled study was conducted comparing patients over 65 on a blood thinner who fell and had an intracranial hemorrhage with a partial trauma activation (initial criteria) and without an activation (modified criteria). Patients meeting only this criterion were accrued for a period of 6 months prior to the modification (n=20), then for a full year following (n=33). Primary outcome measure was all cause in hospital mortality. Secondary outcomes included the time from initial presentation in the emergency department to receiving a head CT.
Results: There was no significant difference in mortality between the patients within the initial criteria (10% mortality) vs the modified criteria (15% mortality) ($p=0.59$). Time (min) from door to CT was significantly higher for the patients in the modified criteria (median 169 [6.00, 391]) vs the initial criteria (median 39.0 [21.0,88.0]) ($p < 0.001$).
Conclusion: Inclusion of a trauma activation criterion for patients over 65 on a blood thinner who fell results in over triage, and its removal does not increase the risk of mortality. For patients with an intracranial hemorrhage, time to receive a head CT was significantly increased with the removal of the low-level trauma team activation criteria. It is still important to implement systems in the emergency department that recognize patients at risk of mortality from ICH and ensure that they receive a CT scan promptly.

Poster #29

TRAUMA IN CENTENARIAN: WHAT AFFECTS IN-HOSPITAL MORTALITYAND FUNCTIONAL OUTCOMES?

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Introduction: Advances in health care and the development of various technologies have improved disease-free longevity and healthy centenarians are gradually increasing. While independent living can help to maintain quality of life in centenarians, a risk of injury is also expanding due to sustained physical functions. As literature is sparse on post-injury functions in centenarians, we aimed to elucidate clinical predictors for mortality and unfavorable functions after injury among centenarians.
Methods: A retrospective observational study was conducted using a nationwide trauma database, including patients aged ≥ 100 years who required admission due to injury at ≥ 250 institutions in 2019-2022. Patient demographics, comorbidities, mechanism and severity of injury, vital signs on hospital arrival, and pre- and in-hospital treatments were obtained and compared between survivors and non-survivors. Among survivors, patient, injury, and treatment characteristics were also compared between those with and without dependency in daily life at discharge, which was defined as Glasgow Outcome Scale ≤ 3 out of 1 to 5 scale. Independent predictors for in-hospital mortality and unfavorable function at discharge were examined using a generalizing estimating equation model to consider institutional and regional differences in management and characteristics of centenarians.
Results: Among 409 centenarians in this study, 384 (93.9%) survived to discharge. While 208 patients (50.9%) had lived independently before the injury, only 91 (22.2%) could live independently at discharge. All patients suffered from blunt injury and fall from standing was most frequent (86.6%). Injury Severity Score was 10 ± 5 and surgeries/angiographies were performed in < 2% of centenarians, except for fracture fixation in extremity/pelvis which was conducted in 225 patients (55.0%). The adjusted model revealed three independent predictors for in-hospital mortality; male sex, mechanism of injury other than fall from standing; and Glasgow Coma Scale (GCS) on arrival, whereas only injury severity in extremity/pelvis was the independent predictor for dependency in daily life after injury.
Conclusion: Male sex, non-fall-from-standing injury, and GCS on arrival were associated with in-hospital mortality. Severe injury in extremity/pelvis was related to dependent living after injury in centenarians.

Poster #30

TRAUMA OUTCOMES IN PATIENTS WITH A HISTORY OF CEREBROVASCULAR ACCIDENT

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Introduction: Traumatic brain injury (TBI) and cerebral vascular accident (CVA); are both leading causes of mortality and morbidity, worldwide. Outcomes in patients who have suffered TBI have been studied extensively, however, outcomes in TBI patients who have a history of CVA (HxCVA) are not well defined. Here we aimed to seek the differences in outcomes between TBI patients with and without a history of CVA (HwoCVA).
Methods: Using the TQIP, adult patients (age≥18) with isolated blunt TBI from 2017 to 2019 were selected. Transferred patients and those who were dead on arrival were excluded. Patients were then grouped based on CVA as a comorbidity. Morality, hospital disposition, hospital and ICU length of stay, were compared.
Results: 655,686 patients with isolated blunt TBI patients were identified. The HxCVA group (n = 23,482) were older (72.18±12.1 years vs. 54.10±21.28 years, $p<0.001$) and had a lower ISS (13.60±8.4 vs. 14.33±10.4, $p<0.001$), than HwoCVA. TGCS was higher in HxCVA patients (13.58±3.9 vs. 12.99±3.0, $p< 0.001$). Mortality rates were higher in HxCVA (8.39% vs 7.94%, $p<0.001$). Hospital disposition was also significantly different between groups ($p<0.001$) with HxCVA more likely to be discharged to a nursing facility (22.88% vs. 9.11%). The mean hospital length of stay was significantly higher in the HxCVA (7.10±13.35 days vs. and 6.68±10.30 days, $p<0.001$), in comparison to HwoCVA. However, ICU length of stay was significantly lower in HxCVA (4.46±5.22 days vs. 5.44±6.98 days, $p<0.001$). Having a history of CVA significantly increased odds of mortality (OR: 1.283, 95% CI: 1.208 – 1.363, $p< 0.001$).
Conclusion: TBI patients with a history of CVA were associated with significantly increased odds of mortality, spent more days in the hospital, and less days in the ICU in comparison to TBI patients without a history of CVA. These results suggest a significant relationship between CVA history and TBI outcomes, potentially due to increased comorbidity burden, autonomic/endocrine dysfunction, and chronic post stroke systemic inflammation.

Poster #31

CAN POWERPOINT SAVE LIVES? ASSESSMENT OF EQUITY AND REACH OF TRADITIONAL DISSEMINATION CHANNELS IN GERIATRIC TRAUMA EDUCATION—A MIXED-METHODS STUDY USING DIGITAL ANALYTICS

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Ilinca Barsan, MS; Caroline Buck, BS; Victoria Bandera, MS;
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Introduction: Creation of evidence-based clinical guidance resources does not necessarily improve patient outcomes or standardize care without deliberate education, dissemination, and implementation. We sought to better understand the effectiveness of recorded didactics in improving knowledge as well as the equity, effectiveness, and reach of various information dissemination strategies, and to elucidate providers' typical means of knowledge acquisition.
Methods: An observational mixed-methods study was conducted amongst all United States' trauma care clinicians from March to August 2023. A 20-minute didactic video on anticoagulant management in geriatric traumatic brain injury (TBI), along with pre-and post-video knowledge surveys, was created by the American Association for the Surgery of Trauma (AAST) Geriatric Committee. This was circulated via email and social media accounts affiliated with 7 professional trauma societies as well as state and regional health departments. Digital analytics were captured, and descriptive and regression analyses conducted.
Results: The didactic video was viewed 1,407 times on YouTube with a mean view time of 7 minutes. Email was the primary point of access (85%), usually via computer (75.1%), and yielded the highest mean view time (9:13 minutes) and overall watch time (152.8 hours). Computers also yielded the longest mean view time (8:10 minutes) and overall watch time (143.9 hours). A total of 311 participants responded to the survey. Most were registered nurses (RNs) from urban, non-academic institutions with 11+ years of clinical experience. Of these, 31.9% were in a rural practice and 38.6% at a Level III/IV trauma center. Only 16.1% of respondents correctly answered all pre-video knowledge question (n=48/298); this increased to 51.6% post-video (n=94/182). Surgeons and advanced practice providers (APPs) ($r=0.148$, $p<0.05$), male respondents ($r=0.131$, $p<0.05$), and clinicians at higher-level trauma centers ($r=-0.140$, $p<0.05$) answered more pre-video questions correctly. Surgeons and APPs were more likely than RNs to report primary use of literature ($r=0.134$, $p<0.05$) and point-of-care medical information ($r=0.133$, $p<0.05$). Less experienced ($r=-0.174$, $p<0.01$) and academic clinicians ($r=0.126$, $p<0.05$) were more likely to confer with colleagues. Neither trauma center designation, urban/rural location, nor race/ethnicity was associated with means of knowledge acquisition.
Conclusion: Recorded didactics are associated with improved knowledge of anticoagulation management in geriatric TBI. Trauma society-sponsored email is an effective means of information dissemination to urban, Level I/II trauma centers, but still fails to reach many rural and Level III/IV trauma centers. Further study is needed to better understand end-user needs to optimize dissemination and implementation of up-to-date clinical guidance.

Poster #32

DIVERSITY IN CRISIS: THE IMPACT OF RACE AND ETHNICITY ON FAILURE-TO-RESCUE AMONG GERIATRIC TRAUMA PATIENTS OVER THE YEARS

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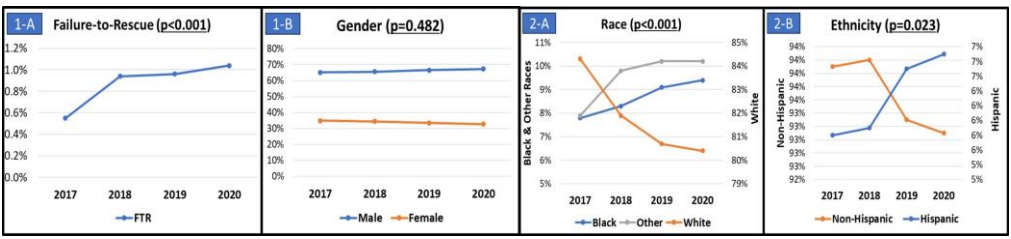
Introduction: This study aimed to examine the trends of failure-to-rescue (FTR) (death from a major complication) incidence in geriatric trauma patients over the years and to determine whether race, ethnicity, and gender impact the FTR incidence among these patients across the United States.
Methods: In this retrospective analysis of ACS-TQIP (2017-2020), Geriatric (≥60yrs) trauma patients were included. FTR was defined as death following a major complication (cardiac arrest, MI, sepsis, ARDS, unplanned intubation, acute renal failure, CVA, ventilator-associated pneumonia, or pulmonary embolism). Patients were stratified based on Race (White vs. Black vs. Others), ethnicity (Hispanic vs. non-Hispanic), and gender.
Results: 1,105,651 geriatric patients were identified, of which 30,984 (2.8%) developed major complications and 10,684 (34.5% of those with complications) had FTR. Mean age was 75, 46% were male, 86% were White, and 6% were Hispanic. Median [IQR] ISS was 9 [4-10] with no change over the years (p=0.364). Over the 4 years, the rate of FTR increased from 0.55% in 2017 to 1.04% in 2020 (p<0.001) (Fig 1A). An analysis of trends in FTR patients revealed no significant difference in the proportion of males and females over the years (p=0.482) (Fig 1B). However, there was a notable increase in the proportion of Black and Hispanic patients in comparison to White (p<0.001) and non-Hispanic patients (p=0.023), respectively (Fig 1C&1D). After controlling for confounding factors, odds of developing FTR increased over the years (aOR:1.08, p<0.001), with Black race (aOR:1.29, p<0.001) and Hispanic Ethnicity (aOR:1.12, p=0.005) identified as independent risk factors for FTR.
Conclusion: Despite the recent advancements in geriatric trauma care, the risk-adjusted odds of developing FTR have been increasing over the years, with one in every three patients developing complications not surviving to discharge. Our findings demonstrate that racial and ethnic factors significantly impact the incidence of FTR. Whether these disparities are attributable to the quality of care or patient-related factors is yet to be defined.



Poster #33

A GEOSPATIAL ANALYSIS OF GENTRIFICATION, GUN VIOLENCE AND DISPARITIES IN CARE FOR SHOOTING VICTIMS

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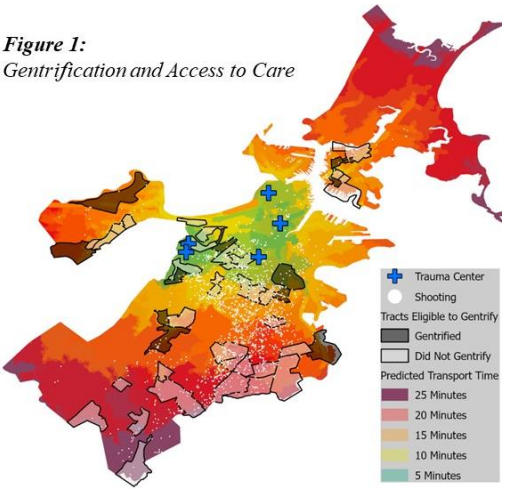
Introduction: Gentrification (GN) is associated with a displacement of shootings from gentrifying areas and 20% of American neighborhoods have undergone GN. However, the relationship between GN and access to trauma care is unknown. We evaluate the impact of GN on shooting rates, transport times to trauma centers, and survival in Boston, Massachusetts.
Methods: Using 2010-2020 census data, GN was defined by educational attainment and median home value. Shooting data were obtained from the Boston Police and geocoded into census tracts (CT) stratified by GN. Transport times were calculated using ArcGIS Pro analysis of traffic data. The primary outcome was shooting rates. Secondary outcomes were fatality rates, race of shooting victims and transport times. Poisson regression was used for shooting/fatality rates and Kruskal-Wallis tests for transport times.
Results: Of 171 CT, 57 (33%) were eligible for GN and 11 (19%) gentrified. There were 2,311 shootings, with lower shooting rates in gentrifying CT (β -0.69, 95% CI -0.93 to -0.45, $p<0.0001$) but no differences in fatality rates or racial distribution of shootings. Median transport times were longer in non-gentrifying CT (11.71, IQR 5.82-15.51) than gentrifying (7.10, IQR 7.08-10.92) and ineligible CT (9.54, IQR 6.20-13.63, $p<0.0001$). This data is presented in Figure 1.
Conclusion: GN was associated with lower shooting rates, resulting in more shooting victims with longer transport times in non-gentrifying areas. Understanding redistribution patterns of shootings may help to inform future violence prevention efforts and trauma system planning.

Figure 1:
Gentrification and Access to Care



Poster #34

CARE COMPLEXITY PREDICTS OUTPATIENT EMERGENCY HEALTHCARE UTILIZATION IN FIREARM INJURY SURVIVORS

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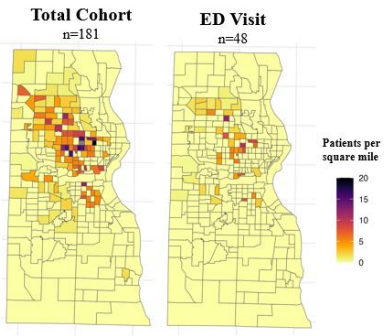
Introduction: Firearm injury survivors (FIS) may have difficulty accessing outpatient care and are more likely to visit the emergency department (ED) after hospital discharge. Having implemented a longitudinal care team consisting of a medical social worker and a nurse navigator to improve outcomes for FIS, our objective was to review predictors of ED utilization and unplanned readmissions within 60 days of hospital discharge.
Methods: This was a prospective study where FIS were randomized 1:1 to the care team or standard of care (SOC) groups. The main outcomes were ED visits and unplanned readmissions. Patient demographics, home address, injury patterns, operative characteristics, and clinic follow-up were utilized to determine predictors of the main outcomes.
Results: There were 110 patients in the SOC and 109 in the care team groups. There were no differences in the number of patients who visited the ED (27% SOC vs 20% care team) or who were readmitted (16% SOC vs 18% care team). As there were no differences between groups, predictors were compared in aggregate. Those who were discharged with a drain (n=17) were 3x more likely to visit the ED (OR 2.86; 95% CI 1.0 – 8.0; p=0.04). Discharge with an ostomy (n=11) had a four-fold increased risk of being readmitted (OR 4.23; 95% CI 1.1 – 15.2; p=0.03). Most patients who visited the ED attended their outpatient follow-up appointment. The mean social vulnerability index of the entire cohort was 0.86 (SD=0.12) indicating high vulnerability, and patients who visited the ED came from specific, vulnerable areas (Figure 1).
Conclusion: Emergency healthcare utilization is common after firearm injury, and complex care needs are predictors. In light of high social vulnerability and geographic distribution, a comprehensive approach to care addressing social determinants of health is necessary to improve outcomes.



Poster #35

CRIME VICTIM COMPENSATION AFTER FIREARM INJURY - AN UNFULFILLED PROMISE?

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Selwyn Rogers, MD, MPH, FACS; David Hampton, MD, MEng, FACS;
Toba Bolaji, DO; Jennifer Cone, MD, MHS, FACS;
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Introduction: The Crime Victim Compensation (CVC) program is a reparations program from the 1980s. It was established to offer significant financial support for survivors of violence and/or families to help recovery after trauma. In Illinois, CVC provides up to $45,000 of financial assistance, however few firearm injury survivors receive this support. Barriers to CVC may exacerbate injured patients' trauma, hinder their ability to recover physically, financially, and emotionally, and may increase the risk of re-injury. The purpose of this study was to quantify and understand barriers that violently injured patients face in receiving CVC.
Methods: Mixed methods were used to conduct semi-structured interviews using qualitative methodology of federal program stakeholders, CVC advocates and facilitators (community violence interrupters & intervention specialists), survivors and family members. We further filed a Freedom of Information Act claim with the Office of the Illinois Secretary of State, to analyze claims for homicide from 2012-2023.
Results: 30 participants (stakeholders (n=9), advocates & facilitators (n=12), survivors & family members (n=9)) were interviewed. Administrative burdens, including those unique to Illinois, was the dominant theme. These burdens included the timeliness of compensation, the reimbursement vs. compensation model, necessity of "court-of-claims" processing, police department obstructionism, and adequacy of perceived reparations. These burdens eroded trust in violence prevention programs. There were 42,390 applications for CVC in Illinois over the study period. The median age of applicants was 30 years IQR [22,41]. A total of 16,803 (39.6%) applicants were women. Only 16,075 (37.9%) applicants were awarded pay, with an average of $4,995.85 per successful applicant. In comparing claimants who self-identified as white, claims from those of all other races took longer to process ($P< 0.0001$).
Conclusions: Administrative burdens prevent access to CVC funds in Illinois, undermining its original intent as a reparations program. Less than half of applicants receive CVC. Removing these barriers is vital to making CVC more accessible to promote healing and prevent re-injury for patients and families. Elimination of these barriers is also critical to maintaining trust between patients, hospital-based injury prevention programs and state welfare institutions, which is compromised when extensive application processes yield no results.

Poster #36

EFFICIENCY AND EQUITY IN TRAUMA CARE COSTS: A NATIONWIDE PROPENSITY-MATCHED ANALYSIS OF SEVERELY INJURED PATIENTS IN SAFETY NET HOSPITALS

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Introduction: Safety net hospitals are key providers for marginalized populations and face distinct challenges and, consequently, may exhibit variations in length of stay, discharge disposition, and hospitalization costs. The purpose of this study was to analyze these aspects to enhance equity and efficiency in caring for severely injured trauma patients including readmissions throughout the US.
Methods: The Nationwide Readmissions Database for 2016-2020 was queried for all surviving trauma patients over 17 years of age and with an Injury Severity Score over 15. Patients admitted to safety net hospitals were identified as publicly funded, metropolitan academic, and large by bed size per region of the country. Propensity matching was performed one to one for safety net patients to non-safety net patients using predictors for age, gender, comorbidities, injury characteristics, household income, and insurance status. The primary outcome was length of stay (LOS) and the secondary outcomes were discharge disposition, and total hospitalization charges and cost including 30-day readmissions. Chi-squared was used for categorical variables and Student's t test was used for continuous variables.
Results: There were 852,397 total patients meeting inclusion criteria with 13.2% (n=112,614) admitted to safety net hospitals. After matching, the mean LOS for safety net hospitals was 9.3 ±13.6 days and for non-safety net hospitals the mean LOS was 8.2 ±11.3 days ($p< 0.01$). The overall most common discharge disposition was routine (home or self-care) with a rate of 50.9% (n= 80,807). The rate of transfer to rehab or skilled nursing facility (SNF) was 30.7% (n=48,705) and home healthcare (HHC) was 15.5% (n=24,686). Safety net hospitals were less likely to utilize HHC (OR 0.86 [0.83-0.88] $p< 0.01$). Safety net hospitals had lower mean total charges than non-safety net hospitals ($138,056 ±$204,651 versus $142,904 ±$223,239, $p< 0.01$). Safety net hospitals had a higher mean total cost than non-safety net hospitals ($38,664 ±$55,174 versus $31,336 ±$44,845).
Conclusions: This study represents a unique analysis of trauma hospitalization costs by including readmissions. Safety net hospitals, despite facing distinct challenges, demonstrate longer lengths of stay and underutilize home healthcare. Safety net hospitals incur lower mean total charges, however higher total cost suggests underlying complexities in resource allocation and financial dynamics. These findings emphasize the need for targeted interventions to enhance the efficiency and equity of trauma care delivery in safety net hospitals.

Poster #37

MENTAL HEALTH SCREENING AND CONSULTATION RATES DEMONSTRATE HIGH NEED AT TRAUMA CENTERS

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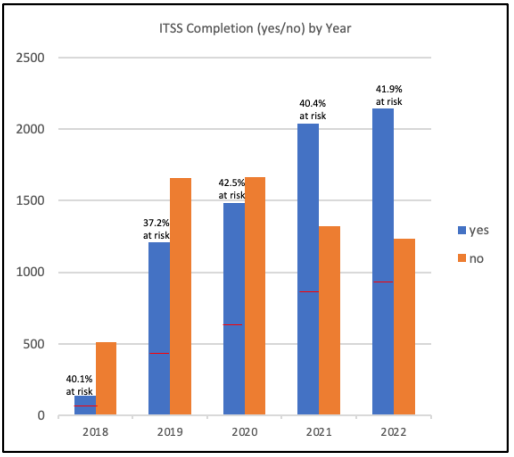
Introduction: Given risk of psychopathology post-injury, the ACS-CoT requires protocols for mental health screening and referral. We examined implementation of the multitier approach to psychological intervention after traumatic injury (MAPIT) which incorporates screening, inpatient psychological evaluation, and ongoing, as-needed intervention.

Methods: A retrospective study at a Level 1 trauma center explored the MAPIT model which includes four tiers: 1) screening for PTSD and depression using the Injured Trauma Survivor Screen (ITSS); 2) psychology consultation for positive risk; 3) inpatient psychology evaluation; 4) as needed intervention. Screening and consultation were evaluated in relation to hospital characteristics including length of stay (LOS) and injury severity (ISS).

Results: Participants (N=6997) included adults admitted after injury from 2018-2022. Overall, 40.8% of patients screened at risk. Screening rates increased each year (Fig 1), consults quadrupled over time (175 vs 703), and were completed on average at hospital day 4 (SD=7.48). ISS correlated with increased time to consult (r=.26, p<.001) but more follow ups (r=.18, p<.001) and cumulative intervention time (r=.09, p=.002). Those who were less likely to get a consult had lower ISS (B=-.04, p<.001) and shorter LOS (B=-.06, p<.001); yet, 36.4%-42.0% of those screened at risk still did not receive consult [$X^2(3)=495.67, p<.001$].



Conclusion: The MAPIT model successfully screens for risk and provides early intervention, particularly for patients with long LOS waiting to access outpatient treatment. Future work must continue to address barriers (e.g., early discharge) to ensure equitable mental health care for high-risk trauma patients and meet growing needs.

Poster #38

RACIAL AND ETHNIC DISPARITIES IN DISCHARGE SERVICES AMONG ELDERLY PATIENTS WITH MODERATE TO SEVERE TRAUMATIC BRAIN INJURIES IN THE UNITED STATES

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Introduction: Elderly trauma patients are at the greatest risk of requiring post-discharge services, including home health, nursing care, or inpatient rehabilitation. We sought to identify potential racial and ethnic disparities in services available to elderly traumatic brain injury (TBI) patients in the United States (US).
Methods: We analyzed the US National Trauma Data Bank (2011-2021). Medicare patients over the age of 65 with AIS of 3 or greater who survived discharge were stratified by race and ethnicity (non-Hispanic White; non-Hispanic Black; Hispanic; non-Hispanic Asian), and propensity score matched based on age, sex, Charlson Comorbidity Index, and Injury Severity Score (ISS). An ordered logistic regression was performed on the matched cohorts to estimate the odds ratio of receiving a higher level of discharge services compared to white patients. Discharge services included home, home with home health services, skilled nursing facility (SNF), and inpatient rehabilitation.
Results: We analyzed 387,274 patients. Race and ethnicity composition was 86.2% non-Hispanic White, 5.6% non-Hispanic Black, 5.0% Hispanic, and 3.2% non-Hispanic Asian. The mPoean age was 77.9 (SD 6.9) years, with a slight female preponderance (50.6%). The mean ISS was 16.4 (SD 7.7). After propensity matching, the cohorts were well-balanced. The odds ratio for a higher level of discharge services was lower for each minority group compared to white patients (Table 1).
Conclusions: In a propensity-matched cohort, all analyzed minority groups had lower odds of receiving a higher level of discharge services than white patients. Urgent work is needed to improve access to discharge services for racial minority groups to improve patient outcomes.

Patient Race/Ethnicity	Odds Ratio of Higher Level of Discharge Services (95% CI)
Non-Hispanic White	1.00
Non-Hispanic Black	0.94 (0.92, 0.96)
Non-Hispanic Asian	0.90 (0.87, 0.93)
Hispanic	0.77 (0.75, 0.79)

Table 1. Odds ratio for higher level of discharge services compared to white patients

Poster #39

RACIAL DISPARITIES IN INTUBATION WITHOUT CRITICAL INJURIES

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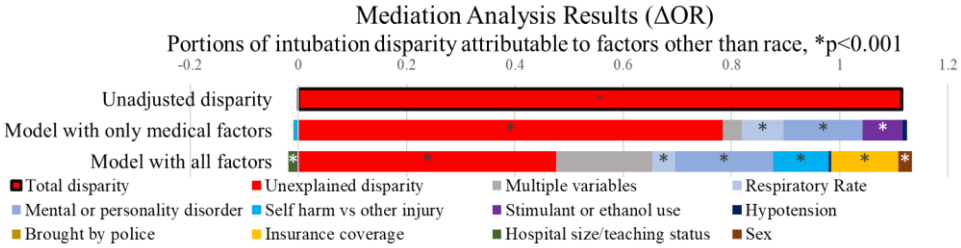
Introduction: Injuries that compromise the airway are inherently life-threatening and require intubation. However, patients are sometimes intubated for less objective reasons, such as 'combative' behavior. This study investigates whether there is a racial disparity in intubation among patients without typical indications in the National Trauma Data Bank.
Methods: Years 2017-2021 were queried from NTDB. Patients with Glasgow Coma Scale ≤ 8, Abbreviated Injury Scale ≥ 4 in any region, hypoxia (SpO2 < 88%), or ED disposition to the OR were excluded. A raw disparity in the rate of intubation within an hour of arrival was calculated and examined over time by comparing intubation in the trauma bay by racial group. Multiple mediation analysis was performed to evaluate potential contributors to these disparities.
Results: 3.4 million patients met criteria to be included. The largest disadvantage affected Black patients. In 2021, Black patients were more likely to be intubated than non-Black patients (1.27% vs. 0.64%), and this ratio has increased since 2017 (1.98:1 from 1.66:1). On multiple mediation analysis, about ¼ of the racial disparity could be alternatively associated with medical factors (such as respiratory rate), ¼ to non-medical factors (such as insurance), and ½ remained unexplained.
Conclusion: A racial disparity exists in how trauma centers manage airways. Institution-level investigations are needed to definitively determine the underlying causes of this gap. However, strategies to improve rapport in the trauma bay, such as increasing provider diversity or Trauma Informed Care, could reduce the quantity of these intubations performed.



Poster #40

DEMOGRAPHIC VARIATION IN TRAUMA TEAM ACTIVATION AFTER MOTOR VEHICLE CRASH PATIENTS

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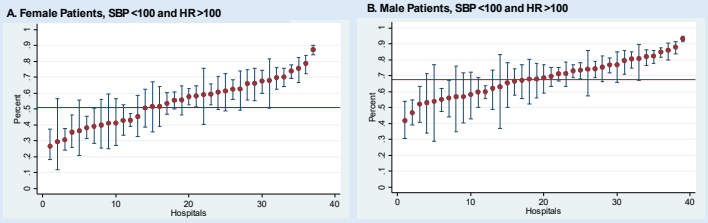
Introduction: Patients involved in motor vehicle crashes (MVCs) are known to be at risk for under-triage, where patients at risk for severe injuries do not receive a full trauma team activation. We sought to investigate hospital-level variation in under-triage among patients who presented with a decreased systolic blood pressure (SBP) and elevated heart rate (HR).
Methods: Patients were identified from a linkage between publicly available crash data with trauma registry data from a statewide quality collaborative from 2020 to 2022. We compared mean hospital-level activation rates among patients with first emergency department vitals of SBP<100 and HR>100. Risk- and reliability-adjusted mean activation rates were calculated for each trauma center, and compared across demographic cohorts of sex, age, and race.
Results: There were a total of 14,840 patients, of whom 2,299 (15.1%) received a full trauma activation. A total of 296 (1.9%) of patients had SBP less than 100 and HR greater than 100. The overall full trauma activation rate among patients with SBP<100 and HR >100 was 60.4%. Within this subset, there were similar average variation rates for age and racial groups, however there was a significant difference in mean full trauma activation between male and female patients (male 67.8% vs female 51.0%, p-value <0.01).
Conclusion: Across level 1 and level 2 trauma centers, there was significant sex-based variation in full trauma activation, even among patients with evidence of hypotension and tachycardia on presentation. These data highlight the ongoing risk for under-triage among patient subgroups, necessitating standardization and implementation of trauma protocols.

Figure 1. Hospital Average Full Trauma Activation after Motor Vehicle Crash by Patient Sex



Patient Sex, (n)	Hospitals, (N)	Full Trauma Activation Rate, Mean (%)	Full Trauma Activation Range, (%)	Top/Bottom Variation
Female	36	51.0%	26.7%-87.3%	3.3
Male	39	67.6%	41.8%-93.1%	2.2

Poster #41

CHALLENGES AND OPPORTUNITIES IN ADDRESSING ALCOHOL AND SUBSTANCE ABUSE AMONG PENETRATING TRAUMA PATIENTS

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Introduction: Alcohol and drug use impact a significant proportion of trauma patients at our urban, academic, level one trauma center. We recently introduced a Hospital Violence Intervention Program (HVIP) focusing on the holistic care of our penetrating trauma patients. At that time, we enhanced screening efforts for alcohol and substance abuse using provider questionnaires. We hypothesized that with these intensified efforts, we would identify more patients who may benefit from attention and resources related to alcohol and substance abuse through future HVIP initiatives.
Methods: We performed a retrospective chart review of all patients injured by gunfire or stab wounds one year prior to the initiation of the HVIP (October 2021-September 2022) and during the first year of the HVIP (October 2022-September 2023). Descriptive statistics were conducted, and the comparisons between groups (pre- vs. post-implementation) were tested with Independent-Samples Mann-Whitney U tests or Person Chi-square/Fisher's Exact tests.
Results: Overall 357 patients were included (pre-HVIP = 165, HVIP = 192). The majority of penetrating trauma cases were observed in Hispanic/Latino males. Upon increased screening, substance and/or alcohol use disorder rates were notably higher in the HVIP group compared to the pre-HVIP group (48 patients, 25% vs. 22 patients, 13.3%; p-value = 0.006). The incidence of comorbid mental health disorders was marginally lower in the HVIP group (15.1% vs. 17.6%; p-value = 0.528), although this difference was not statistically significant. The overall rate of post-discharge rehabilitation for drug and alcohol treatment was 17.1%, consisting of behavioral therapy (7.1%), outpatient detoxification (5.7%), and inpatient detoxification (5.7%), with no statistically significant variation observed between the two groups.
Conclusions: Increased surveillance of alcohol and substance use disorders among patients injured by gunfire or stab wounds revealed alarmingly high prevalence rates, yet effective intervention rates remained low. Recovery services for drug and alcohol abuse represent a crucial area of future focus for our HVIP.

Poster #42

COULD WE HAVE STOPPED THE BLEED? AN EXAMINATION OF 5765 HOMICIDE AUTOPSIES ACROSS 13 YEARS

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Introduction: Since 2015, the Stop the Bleed (STB) Campaign has taught bystanders to render aid in bleeding emergencies, through tourniquet application, wound packing, and compression of extremity injuries. Despite training more than 3 million Americans, little is known about potential lives saved by STB at the population-level. We performed a statewide evaluation of autopsy reports to quantify such deaths.
Methods: The Maryland Chief Medical Examiner's office investigates all homicides statewide. We analyzed autopsies for all gunshot (GS) or stab wound (SW) homicide victims from 2005-2017. We categorized homicides into isolated extremity or non-isolated extremity wound groups. We identified patients with vascular injuries amenable to STB techniques, including femoral, axillary, popliteal, brachial, and other uncategorized peripheral arterial injuries. Multivariate logistic regressions compared odds of major vascular injury between isolated vs. non-isolated extremity injuries. Analyses were stratified by injury mechanism (GS or SW).
Results: 5765 homicides were analyzed (88% male, 82% black, median age 28 years). The majority were due to GS only (84%), followed by SW only (16%). 47% of GS and 35% of SW victims had extremity injuries. For GS victims with extremity injuries, 2.4% (n=55) had isolated wounds; 5.3% (n=17) of SW victims with extremity injuries had isolated wounds. Victims with isolated vs. non-isolated extremity injuries had higher prevalence of major vascular injuries (GS: 33% vs. 5.0%, SW: 59% vs. 9.5%). GS victims with isolated extremity wounds had 10-fold greater odds of concomitant vascular injury relative to GS victims with non-isolated extremity injuries (OR = 10.1 [95%-CI: 5.8 – 17.5], $P < 0.01$). The difference was not significant for SW victims (OR = 3.7 [95% CI: 0.5 – 17.1], $P = 0.11$).
Conclusion: We found a significant burden of extremity wounds with major vascular injury amongst a large cohort of GS and SW homicide victims. GS victims who died from isolated extremity injuries were significantly more likely to have sustained major vascular injury. Isolated extremity wounds therefore provide an ideal, focused opportunity for hemorrhage control through STB techniques, which may save lives. This reinforces the utility of STB training as a potentially life-saving public health intervention.

Poster #43

INVOLVEMENT WITH HOSPITAL BASED VIOLENCE INTERVENTION PROGRAM IMPROVES CLINIC FOLLOW UP AFTER VIOLENT TRAUMATIC INJURY

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Introduction: Patients who have suffered a violent traumatic injury may develop medical and psychological complications after discharge, such as wound infections, poorly healing wounds, acute traumatic stress disorder (ATSD), and post-traumatic stress disorder (PTSD). These complications are most easily detected in outpatient follow up visits. However, clinic follow up after a suffered trauma is typically low. Hospital Based Violence Intervention Programs (HVIPs) assist patients who have suffered a violent traumatic injury with psychological and logistical resources. Previously it has not been studied whether HVIPs improve clinic follow up. We hypothesized that increased involvement with a HVIP leads to increased follow up in trauma, specialty, and primary care (PCP) clinics.
Methods: This was a retrospective chart review study analyzing 185 patients who had suffered a violent traumatic injury and were treated at an urban Level 1 Trauma Center, and who had at least one HVIP encounter. Patients were analyzed for amount of PCP, trauma, and specialty clinic appointments scheduled and attended. Other factors studied were sex, race, ethnicity, zip code, substance use, stable housing, employment, and incarceration. We performed univariate analyses followed by a multivariate linear regression.
Results: There was a statistically significant difference in trauma appointments attended ($p = .0063$) as well as specialty clinic appointments scheduled ($p=.0293$) and attended ($p= .0294$) based on number of HVIP encounters. Those in the medium (2-3) and high (4+) encounter groups, had higher numbers of clinic follow up. No significant difference was found with PCP appointments scheduled or attended based on HVIP encounters. The number of trauma clinic appointments attended were independent of injury type and age and there was no difference in appointments scheduled or attended based on race, housing stability, incarceration, or amount of substance use.
Conclusion: Increased involvement with HVIPs improves clinic follow up both in trauma clinics and specialty clinics. Clinic appointments are useful in detecting medical or psychological complications after a violent traumatic injury thus hopefully improving outcomes and reducing disparities.

Poster #44

TREAD LIGHTLY: EVALUATING GEOGRAPHIC DISTRIBUTION AND SEVERITY OF PEDESTRIAN VS. AUTO INJURIES IN A MAJOR METROPOLITAN AREA

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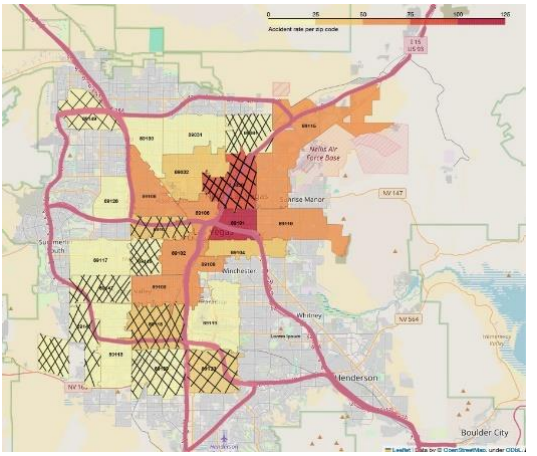
Introduction: Pedestrian vs. automobile collisions are a prevalent cause of traumatic injury, leading to significant morbidity and mortality. The United States Department of Transportation (DOT) mandates annual Transparency Reports from state DOTs, focusing on locations with severe traffic safety needs. This study aims to identify high-risk areas for such collisions within our city and determine which high-volume injury locations are associated with severe injury.

Methods: Following IRB approval, we conducted a retrospective cohort study on adult trauma patients with the ICD-10 injury mechanism "Pedestrian vs. Auto" from January 2018 to December 2022. After obtaining injury incidence, we grouped patients according to injury ZIP code. Heat maps were then generated, with darker colors indicating higher injury incidence. We then calculated the median patient ISS and added cross-hatching to the heat map for all ZIP codes with >33% of patients with ISS greater than 15.

Results: We identified 1172 patients, of which 67.6% were male, median ISS was 9, and 30.5% of the total cohort had an ISS > 15. After heat mapping, we identified ten ZIP codes with >33% of patients with ISS>15. ZIP code 89030 exhibited both a high incidence of injuries (89 patients) and a high proportion of severe injury (33.7%, see Figure).

Conclusions: Our study is the first of its kind to examine a major metropolitan area by ZIP code to identify "hot spots" for severe pedestrian vs. automobile collisions, in a way that can be easily replicated in other cities, to help inform DOT investigations into associated factors. Incorporation of injury severity in our analysis helps to further focus safety interventions to the areas that need it most.



Poster #45

SIGNIFICANT VARIATIONS IN THE RATES AND TIMING OF TRACHEOSTOMY AND GASTROSTOMY FOR ADOLESCENTS WITH SEVERE TRAUMATIC BRAIN INJURY

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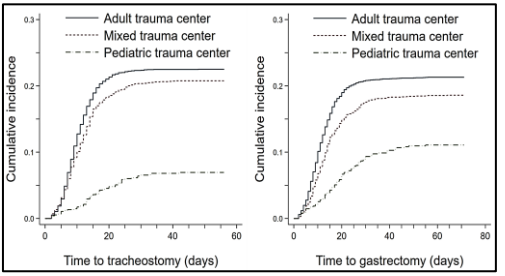
Introduction: The objective of this study is to explore variations between different trauma center types in the rates and timing of tracheostomy and gastrostomy for adolescent patients with severe traumatic brain injury (TBI).
Methods: This retrospective cohort study analyzed the ACS-TQIP database (2017-2021). We included trauma patients aged 14-18 years with severe TBI (Head AIS:3-5 & GCS:3-8). Trauma centers were classified as: adult (ATC), mixed (MTC), and pediatric trauma centers (PTC). We developed a multilevel mixed-effect Poisson regression model to assess the association between trauma center type and rates of tracheostomy and gastrostomy.
Results: Of 6,978 adolescent patients, tracheostomy and gastrostomy were performed in 22.5% and 21.3% at ATC, 20.8% and 21.3% at MTC, and 6.9% and 11.1% at PTC, respectively. The timing of tracheostomy and gastrostomy were significantly later at PTC (Figure). In the regression model adjusting for covariates, compared to ATC, the adjusted incidence rate ratios (IRR) for tracheostomy and gastrostomy were 0.38 (95 % CI: 0.28-0.52, p<0.001) and 0.58 (95 % CI: 0.44-0.75, p<0.001) at PTC (Table). There was no significant difference in the incidence of ventilator-associated pneumonia between ATC and PTC.



Conclusions: Our results suggest that there are significant practice variations in performing tracheostomy and gastrostomy for adolescent patients with severe TBI between ATC, MTC, and PTC. Further research is warranted to examine the impact on short- and long-term outcomes and to standardize care process for adolescent patients.

Trauma center type	IRR for Tracheostomy	IRR for Gastrostomy
ATC	Reference	Reference
MTC	0.94 (0.82-1.07)	0.87 (0.76-1.01)
PTC	0.38 (0.28-0.52)	0.58 (0.44-0.75)

Poster #46

SIMILAR RISK OF COMPLICATIONS AND DEATH FOR ADOLESCENTS WITH GUNSHOT WOUNDS TREATED AT PEDIATRIC ONLY HOSPITALS WHEN COMPARED TO COMBINED ADULT/PEDIATRIC CENTERS

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Introduction: Adult trauma centers including combined adult/pediatric centers (CPAC) see a higher volume of penetrating trauma. Thus, adolescents with gunshot wounds (GSWs) may have improved outcomes at CPACs vs pediatric only hospitals (POHs). This study aimed to compare differences in injury patterns, complications, and mortality for adolescents sustaining GSWs presenting to CPACs vs POHs, hypothesizing decreased associated risk of complications and mortality at CPACs.
Methods: The 2017-2021 TQIP was queried to identify adolescents (aged 12-17) who sustained GSWs. Patients transferred and those with a traumatic brain injury were excluded. CPAC included centers with both adult and pediatric ACS-verification while POHs only had pediatric ACS-verification. A multivariable logistic regression analysis was performed to identify risk factors for in-hospital complications and mortality while controlling for age, injury severity score (ISS), vitals on arrival, and need for transfusion.
Results: Of the 3,064 adolescent GSWs, 1,512 (49.3%) presented to a CPAC. CPAC patients were slightly older (median, 16 vs. 15 years old, $p<0.001$) and had a higher median ISS (9 vs. 4, $p<0.001$), as well as increased injuries to the spine (9.3% vs. 5.7%, $p<0.001$), heart (2.3% vs. 0.7%, $p<0.001$), lung (19.1% vs. 10.6%, $p<0.001$), liver (8.5% vs. 4.8%, $p<0.001$), and spleen (3.2% vs. 1.5%, $p=0.002$). CPAC adolescents also more frequently underwent emergent operations (31.9% vs. 23.5%, $p<0.001$). CPAC adolescents had higher rates of complications (5.2% vs. 3.1%, $p=0.003$) and mortality (7.7% vs. 3.1%, $p<0.001$). However, after adjusting for confounders, CPAC adolescents had similar associated risk of in-hospital complications (OR 0.81, CI 0.53-1.25, $p=0.34$) and mortality (OR 0.75, CI 0.40, 1.43, $p=0.38$).
Conclusion: Adolescent trauma patients after risk adjustment had similar outcomes at POHs compared to CPACs, confirming similar care across different types of pediatric centers.

Poster #47

THE ABDOMEN DOES NOT LIE, BUT THE LABS MIGHT: PREDICTORS OF INTRAABDOMINAL INJURY ON CT IMAGING AMONG PEDIATRIC BLUNT TRAUMA PATIENTS

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Introduction: Based on latest ACS practice guidelines, isolated abnormal laboratory tests necessitate obtaining abdominal CT for pediatric patients with blunt abdominal trauma (BAT), regardless of the abdominal examination. This study aims to identify the predictors of intra-abdominal injury (IAI) and the role of blood tests in CT imaging in pediatric BAT patients.

Methods: This is a retrospective review at a Level I adult and Level II pediatric trauma center (2018-2022). Children (<17 years) who presented with BAT and received abdominal CT imaging were included. Outcomes included the rates of intra-abdominal injuries and interventions. Multivariable regression analysis was performed to identify the predictors of IAI on CT imaging, using clinical and lab information available in the trauma bay.

Results: Of 3,707 pediatric patients over 5 years, 483 patients with BAT and abdominal CT imaging were identified. Mean age was 13, 58% were male, mean lowest SBP was 85, and median GCS was 15. Overall, 19% had abdominal pain, 6 had post-injury emesis, 26% had abdominal tenderness, and 11% had pelvic tenderness on initial evaluation. Moreover, 90% had an initial FAST examination, of which 9.5% were positive. Based on initial lab tests, 8% had abnormal serum aspartate aminotransferase (AST) (>200 U/L), 3% had abnormal hematocrit (<30%), 1.2% had abnormal UA (>5 RBC/hpf), and 0.8% had abnormal lipase. 17% had at least one IAI, of which 17% underwent operative or interventional procedures. On multivariable regression analysis, abdominal tenderness, abnormal plain x-ray, positive FAST, blood transfusion requirements, and abnormal AST were identified as independent predictors of IAI upon abdominal CT findings (Table). Among patients with IAI, only 37% had abnormal labs, all of whom had one of the predictors of IAI. Among patients with abnormal lab results (n=57), only 9 patients had none of the predictors of IAI, out of which none were found to have IAI on abdominal CT.

Conclusion: More than 80% of all abdominal CT imaging had negative results, with less than 5% receiving any intervention. Our findings highlight the significant role of clinical findings in the trauma bay, regardless of lab findings, when deciding about requesting abdominal CT imaging for pediatric trauma patients with BAT.

Table – Independent Predictors of Intraabdominal Injuries on Abdominal CT Imaging

variables	aOR	95% CI	p-value
Abdominal Tenderness	1.78	1.21-3.12	**0.021**
Abnormal Plain X-ray	2.23	1.04 - 4.75	**0.038**
Positive FAST	17.28	5.80-51.50	**<0.001**
Blood Transfusion Requirements	4.30	1.15-15.94	**0.030**
Abnormal AST	18.42	6.96-48.75	**<0.001**

Poster #48

THE GRAY ZONE: COMPARING TEENAGE TRAUMA RESUSCITATION IN ADULT AND PEDIATRIC EMERGENCY DEPARTMENTS.

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Introduction: Evidence shows injured children < 15 years old are most effectively treated at Pediatric Trauma Centers. There is no consensus for teen trauma patients (TTP) 15-17.99 years old. We historically treated TTP in our Adult ED (AED). To enhance our Pediatric ED (PED) readiness, we transitioned to treating TTP in our PED. Our hypothesis was that transitioning would not affect hospital length of stay (LOS) or mortality but lead to longer ED LOS given unfamiliarity with high acuity patients in PED.
Methods: This is a retrospective review of two consecutive 13-month time periods (1/21-1/22 and 2/22-2/23) comparing trauma resuscitations in TTP in AED with TTP in PED, respectively. This occurred at our combined ACS verified, Level 1 Trauma Center. Trauma specific variables were collected. Outcomes of interest were ED LOS (primary), inpatient mortality and hospital LOS (secondary). Univariate and multivariate analysis was performed. The analysis was repeated for Code 1 (highest acuity) patients.
Results: A total of 743 TTP were identified: 378 were treated in AED and 365 were treated in PED. For Code 1 activations, 77 TTP were treated in AED and 76 in PED. There was no difference in mortality between AED vs PED. There was no significant difference between groups with univariate or multivariate analysis. (Table 1)
Conclusion: Determining the best location for teen trauma resuscitation remains a challenge. This study provides evidence that TTP receive excellent, timely care in both AED and PED. Further study is needed to determine the impacts for younger pediatric patients.

	Adult ED Triage	Peds-ED Triage	p-value
All-Code Mortality	13 (3.44%)	7 (1.94%)	p=0.21
All-Code Hospital LOS (days)	4.70 (STD 13.6)	3.66 (STD 6.07)	p=0.79
All-Code ED LOS (min)	234 (IQR 124-312)	252 (IQR 136-336)	p=0.10
All-Code Injury Severity Score	11.1 (IQR 4-16)	10.0 (IQR 4-13)	p=0.17
Code 1 Mortality	13 (16.9%)	6 (8.11%)	p=0.10
Code 1 Hospital LOS (days)	6.06 (STD 8.0)	6.04 (STD 7.8)	p=0.82
Code 1 ED LOS (min)	126 (IQR 38-158)	153 (IQR 47-248)	p=0.05
Code 1 Injury Severity Score	17.3 (IQR 7-25)	13.9 (IQR 3-20)	p=0.05

Poster #49

VALIDATION OF A PEDIATRIC PREDICTION MODEL FOR MORTALITY IN ADULTS WITH TRAUMATIC BRAIN INJURY

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Introduction: Traumatic brain injury (TBI) is a significant cause of morbidity and mortality. While most TBI-related admissions are mild, identifying early predictors of poor outcome may assist with timely medical decisions and effective triage utilization. We sought to validate a clinical tool built in pediatric patients for predicting in-hospital death in adults with a TBI.

Methods: Data was collected from the National Trauma Data Bank between the years of 2007 to 2015. We included adults who sustained any TBI, defined as: (i) open and closed skull fractures, (ii) cerebellar, cortical, or brain stem contusions, and (iii) subarachnoid, subdural, or epidural hemorrhages. Our interest was in assessing the performance of a pediatric trauma mortality model in adults with TBI. The development cohort (years 2007 to 2015) was randomly split into a training (70%) and test set (30%). Model performance was calculated via C-statistic followed by external validation (year 2016).

Results: Mortality rate was 7.2% in the development cohort (n=351,642; median [IQR] age: 60 [41, 77]; 63% males) and 9.8% in the validation cohort (n=9,970; median [IQR] age:58 [38,74]; 66% males). The prediction model included 11 variables: age, gender, race, mechanism, transportation mode, systolic blood pressure, pulse, respiratory rate, oxygen saturation, temperature, and Glasgow coma scale (GCS). The C-statistic in the development cohort was 86.7% (95% CI 86.3, 87.1) and 89.5% (95% CI 88.7, 90.4) in the validation cohort. Our model outperformed some of the currently used and validated trauma scores.

Conclusions: We derived a clinical model that can accurately predict in-hospital death in adult TBI patients. The model was translated into a web-based application that can be quickly implemented to assist in patient triaging and resource allocation.

Poster #50

IMPROVING KNOWLEDGE, ATTITUDES AND BELIEFS ABOUT TRAUMA-INFORMED CARE BY IMPLEMENTATING A NOVEL NATIONAL CURRICULUM: A STUDY OF 23 US TRAUMA CENTERS

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Introduction: Trauma-informed care (TIC) is a framework acknowledging "trauma" as a complex psychological state based upon past and present experiences. Understanding this state improves patient-provider interactions, reduces bias, and improves outcomes. Few TIC educational opportunities exist for those caring for injured patients. We aim to test the effectiveness of a novel educational curriculum on TIC knowledge, attitudes and beliefs.
Methods: We conducted a multi-site pilot at 23 US trauma centers using a standardized curriculum given in-person or via a virtual platform. We measured knowledge, attitudes and beliefs using online pre and post questionnaires developed by our multidisciplinary team. Descriptive statistics were used to analyze the data.
Results: 1,255 surveys were completed with diverse participants (see table). Despite 40% having >5 years trauma work experience, TIC was a new concept for 64% of participants and 72% never had training, although concepts of social determinants of health were well understood (86.3%). There was a notable effect of the intervention on knowledge and beliefs. Participants rated the training as high-quality, informative and relevant.
Conclusion: TIC requires education and cultural shifts that have historically been difficult to reliably implement without a sanctioned national curriculum. Our study demonstrates that this relatively short, accessible, and effective educational intervention could be delivered widely to various providers and using various platforms with fidelity, with the ultimate goal of improving equitable quality care for all patients.

Percentage (N=1,255)																
27	25	24	6	5	4	2	2	1	.7	.3	3	21	42	28	2	6
Trainee	Nurse	Surgeon	Allied Health*	APP	Social Work	Administrator	Comm	Chaplain	Paramedic	Mental Health	Other	New Concept	Little familiarity	Some familiarity	Expert	Did not Answer
Occupation												TIC Exposure				

*Includes Physical, Occupational, Speech and Respiratory Therapists, Dieticians and Pharmacists

Poster #51

REVISITING TRAUMATIC BRAIN INJURY IN THE GOLDEN YEARS

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Introduction: Traumatic brain injury (TBI) is a significant health concern, particularly among geriatric patients. Readmission after TBI could be associated with increased worse outcomes. In this study, we aimed to investigate the rates and causes of readmission in geriatric patients that sustain TBI.
Methods: We used National Readmission Database 2015-2016 and included all geriatric patients (age≥65 years) that were admitted due to TBI in the index hospital. Primary outcomes of this study were rates of readmission and mortality when readmitted. Secondary outcomes were relations between index discharge disposition and hospital length of stay (LOS) and readmission and rates of recurrent TBI.
Results: Totally, 284,817 patients were identified with TBI on their first visit. Of them, 73,152 patients (25.7%) were readmitted. Rates of readmission was highest in patients that were discharged to a short-term hospital (34.5%) followed by Skilled Nursing Facility (SNF)\ Intermediate Care Facility (ICF) (30.8%) and was lowest in patients that were discharged home in the first admission (22%) ($p<0.001$). The mean age of readmitted TBI patients was 80.08±7.83 years and 34,324 patients (46.9%) were male. Totally, 4,066 patients (5.6%) died on the readmission. The mean time to readmissions was 69.86±74.24 days. The mean index hospital LOS was significantly longer in patients who were later readmitted (7.02±9.28 vs. 6.06±8.76 days, $p<0.001$). 16.7% of readmissions were due to recurrent TBI and 12.2% were due to falls. On a sub-analysis on patients with readmission less than 30 days, recurrent TBI was the reason of readmission in 24.2% of patients and 14.4% were readmitted due to falls. The odds of readmission in TBI patients increased significantly with advanced age (OR=1.008), longer index hospital LOS (OR=1.012) and primary discharge to short-term hospital (OR=1.789) and SNF\ICF (OR=1.497) ($p<0.001$ for all).
Conclusion: Readmissions, especially within less than a month, due to recurrent TBI and falls are high among geriatric population who are admitted for TBI. The readmission rate is higher in patients who are discharged to short-term hospital or SNF\ICF. Targeted interventions and comprehensive care planning are imperative to reduce readmission rates and improve outcomes for geriatric TBI patients.

Poster #52

CURRENT STATE OF TRAUMA CLINICAL GUIDANCE GLOBALLY: A SYSTEMATIC REVIEW

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Introduction: Investments in cost-effective healthcare system strengthening have led to the development of clinical practice guidelines (CPGs), defined as clinical decision-making aids built on scientific evidence, experiential knowledge, and patient values. This review evaluates accessibility, relevance, and quality of existing trauma CPGs globally.
Methods: A systematic review evaluated trauma-related clinical aid sources published from 2016 to 2023, searching in English across eight databases and 28 professional society websites. Using a combination of Medical Subject Headings (MeSH) terms or similar we included protocols, guidelines, position papers, reviews and consensus documents, assessing their quality using the National Guideline Clearinghouse Extent Adherence to Trust-worthy Standards (NEATS).
Results: Out of 986 records, 108 met review criteria, excluding unretrievable (13), outdated (25), non-trauma (110), and not fitting CPG definition (730). Ninety percent of trauma CPGs, featured a first author from a high-income country (HIC). When categorizing CPGs by the first author's region, 43% came from North America, 8% from South America, 35% from Europe, 13% from Asia & Pacific and 1% from Africa. Eighty-two percent of CPGs were public access with no registration required, the remaining 18% had an average cost of 45.7 USD (13.38 SD). Regarding guideline standard adherence, the mean quality score of all guidelines was 3.81 (scale 1-5), 77% disclosed the source of funding, 91% involved a multidisciplinary group and 54% explicitly mentioned inclusion of a methodologic expert. On logistic regression, the tested variables included English language, public access, first/senior author from HIC, multidisciplinary group, methodological expert, and professional society endorsement. The only factor predictive of a high (≥4) NEATS score was the reported presence of a methodological expert.
Conclusion: Current CPGs largely feature authors from HIC with minimal representation from low and middle-income countries (LMIC), despite LMIC bearing a higher injury burden. Promoting LMIC authorship recognizes the value of cultural perspectives and local expertise in resource allocation. Improving CPGs impact may involve expert methodological input and addressing accessibility barriers like cost, registration, and language.

Poster #53

PENETRATING TRAUMA RE-INJURY: WHAT IS THE PROGNOSIS OF PATIENTS WITH MULTIPLE TRAUMAS?

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Introduction: Recurrent presentations for separate traumatic injuries account for a large proportion of urban trauma activations, with rates as high as 10-44%. However, injury patterns and in-hospital surgical and critical care needs for patients experiencing penetrating trauma reinjury outside the United States have not been thoroughly evaluated. Trauma is a global public health issue with a disproportionately high burden of morbidity and mortality in immature trauma systems. This study analyzed the injury burden, need for surgical and critical care resources, and short-term outcomes in patients presenting with penetrating trauma reinjury in a single urban trauma center in Chile.

Methods: In a retrospective review of a prospectively collected hospital trauma registry, we included patients over age 15 treated from 1/2019-12/2020 for penetrating trauma, defined as stab wounds (SW), gunshot wounds (GSW), and other high-velocity projectile injuries. Reinjury was defined as any subsequent hospitalization for new penetrating injury; previous injuries' sequelae were excluded. The primary outcome was all-cause mortality, and secondary outcomes included hospital length of stay (LOS), intensive care unit (ICU) LOS, length of vasoactive drug requirement, operating room (OR) time, and need for blood transfusion within 3 hours of arrival. Chi-squared test and Student's t-test were used for group comparisons, logistic regressions for independent association of mortality with reinjury.

Results: Of 1,028 included patients, 100 (9.72%) experienced penetrating trauma reinjury, and 22 (2.1%) experienced two or more reinjuries. Most patients were male (92.96%), and 65.8% of cases were GSWs. Greater number of reinjuries was associated with greater mortality, higher proportion of GSW to SW, longer ICU and hospital LOS, longer vasoactive drug requirement, and higher 3-hour transfusion need.

Conclusion: Patients suffering penetrating trauma reinjury had poorer outcomes and required more hospital resources than those with one incident of penetrating trauma. To reduce armed violence and prevent penetrating reinjuries, successful community- and hospital-based violence prevention and intervention programs should be adapted to the Chilean context.

Poster #54

MODIFIED BRAIN INJURY GUIDELINES IMPROVE RESOURCE UTILIZATION IN A PUBLIC HEALTHCARE SYSTEM

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Introduction: The management of traumatic brain injury (TBI) and intracranial hemorrhage (ICH) can be resource-intensive and present considerable challenges in a public healthcare system. The modified Brain Injury Guidelines (mBIG) provide an algorithmic approach to determine which patients need additional computed tomography (CT) scans of the head, neurosurgical consultation, and hospitalization. Although mBIG has demonstrated improved resource utilization in several studies, it has not been evaluated within a publicly-funded healthcare model. We sought to determine whether implementation of mBIG at two tertiary-care trauma centres in Canada would reduce repeat imaging and unnecessary neurosurgical consultations, without adverse outcomes.
Methods: We conducted a retrospective review of all adults (≥18 years) presenting to two university-affiliated tertiary-care trauma centres in Edmonton with ICH or TBI, between July 1, 2022 and March 31, 2023. Patients were excluded if their initial Glasgow Coma Score (GCS) was less than 13, did not receive a CT head scan, or had focal neurological findings. mBIG score (mBIG 1,2, or 3) was assigned based on imaging and clinical findings on arrival to hospital. Clinical characteristics, including the number of repeat CT scans, neurosurgical consultation, and neurological deterioration in hospital, were evaluated.
Results: We reviewed 911 charts, of whom 322 patients had ICH on imaging. Among this group, 29 (9%) were mBIG1; 62 (19%) were mBIG2; 231 (72%) were classified as mBIG3. Among the 91 patients with mBIG1 or mBIG2 ICH, 66 (73%) received unnecessary neurosurgical consultation, and 50 unnecessary repeat CT scans were performed. There was no neurological deterioration among mBIG1 or mBIG2 patients and repeat imaging did not change management.
Conclusions: A sizeable proportion of patients with ICH may be managed without repeat imaging or neurosurgical consultation, without suffering adverse outcomes. Modified Brain Injury Guidelines (mBIG) are a safe and resource-efficient tool for managing patients with TBI and ICH within a public healthcare system.

Poster #55

ANALYSIS OF NERVE REGENERATION INHIBITOR RGMA AND MICROGLIA IN THE MURINE CONTROLLED CORTICAL IMPACT MODEL

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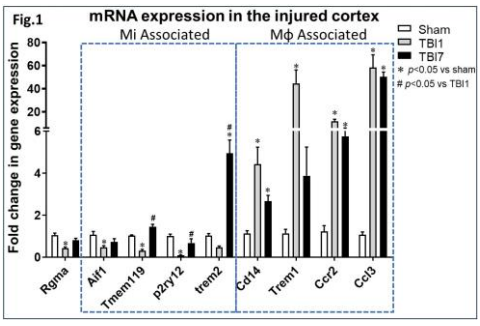
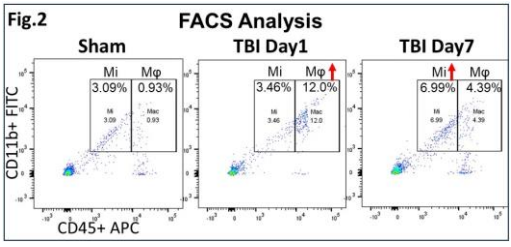
Introduction: We have previously reported that microglia (Mi) are suspected to be involved in the expression of repulsive guidance molecule a (RGMa), a neuroregeneration inhibitor, in a murine traumatic brain injury (TBI) model. We aimed to clarify the changes over time in Mi and macrophage (Mφ) activation, and RGMa expression in the injured brain after TBI.
Methods: We employed controlled cortical impact (CCI) model for TBI. Brains were extracted 1 and 7 days after the injury (n=6 per group), and RNA was extracted from brain contusion sites. RT-PCR was performed on RGMa and activation markers for Mi and Mφ (Aif1, Tmem119, P2ry12, Trem2, Cd14, Trem1, Ccr2, Ccl3). Flow cytometry (FACS) was performed to evaluate changes in Mi and Mφ at the site of TBI.
Results: In RT-PCR, RGMa showed a significant decrease at day 1 ($p<0.05$), but recovered at day 7, comparable to Sham. The Mi markers Aif1, Tmem119, Trem2 and P2ry12 also showed a significant decrease at day 1 ($p<0.05$), similar to RGMa, but recovered at day 7. (Fig.1) FACS analysis showed that both Mi (CD11b+, CD45 intermediate) and Mφ (CD11b+, CD45 high) increased at day1 and day 7 compared to Sham. However, by day7, the percentage of Mi increased and that of Mφ decreased (Fig.2).
Conclusion: In TBI, Mφ was activated and the activation of RGMa and Mi was decreased on day 1, while RGMa and Mi increased on day 7, suggesting that RGMa-expressing Mi may be involved in the inhibition of nerve regeneration after TBI.





Poster #56

ASSOCIATION BETWEEN CT VOLUMETRY AND INTRACRANIAL PRESSURE ELEVATION IN TRAUMATIC BRAIN INJURY: A RETROSPECTIVE COHORT STUDY

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Introduction: Intracranial pressure (ICP) elevation is associated with poor outcomes in patients with traumatic brain injury (TBI), and ICP is one of the key indicators in the management of TBI patients. Although ICP elevation is sometimes estimated from CT images as a substitute for ICP sensor placement, the association between CT images and ICP elevation remains unclear. This study aimed to objectively elucidate this association through the utilization of a freely available programming code for CT assessment.
Methods: We conducted a retrospective cohort study at Rinku General Medical Center in Japan from April 2014 to August 2023, including patients of all ages with TBI and inserted ICP sensors. ICP values were compared with CT series taken at the same timing. 'CT volumetry' was employed to analyze CT series, visualizing and calculating intracranial volume (ICV) and three density volumes: low-density volume (LDV), middle-density volume (MDV), and high-density volume (HDV). The thresholds for the density areas were determined as averages by three blinded trauma physicians. The code was developed using Python and the OpenCV module, enabling cost-free and versatile utilization. The primary outcome was ICP value, and an ICP elevation was defined as ICP > 22mmHg for a dichotomous outcome to assess diagnostic accuracy.
Results: A total of 123 TBI patients and 267 CT series were analyzed. The percentage of LDV to ICV (LDV%) was related to ICP elevation (Odds ratio 0.55 [95% confidence interval (CI), 0.42-0.73]). The area under the receiver operating characteristic curve for LDV% predicting ICP elevation was 0.852 [95%CI,0.777-0.927]. LDV% > 5% had a negative likelihood ratio of 0.13 [95%CI, 0.00-0.49], and LDV% > 10% could completely exclude ICP elevation.
Conclusion: CT volumetry was associated with ICP elevation in TBI. LDV% was a useful indicator to exclude ICP elevation in TBI.

Poster #57

IMPACT OF TRAUMATIC BRAIN INJURY ON FIBRINOLYTIC DYNAMICS IN SEVERELY INJURED PATIENTS

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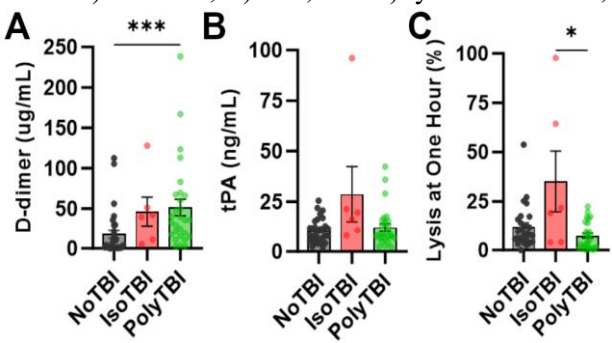
Introduction: In severely injured patients, dysregulated coagulation impairs stable clot formation and increases mortality. Traumatic brain injury (TBI) notably precipitates a spectrum of derangements to normal clot formation and breakdown. This study examined profiles of clot mechanics and stability, specifically in patients suffering TBI.
Methods: Plasma was isolated from 63 trauma patients upon emergency department arrival. Clotting kinetics, mechanics, and fibrinolysis rates were measured with rheological and turbidity assays. ELISAs were performed to assess tissue plasminogen activator (tPA) and D-dimer levels.
Results: Patients with TBI had higher mortality, and significantly higher D-dimer levels, indicating pre-hospital lysis, when compared to patients without TBI. This early lysis was seen across injury severity. To isolate the specific contribution of TBI, patients were divided into those with isolated TBI (IsoTBI), TBI with extracranial injuries (PolyTBI), and no head injury (NoTBI). IsoTBI and PolyTBI exhibited increases in pre-hospital lysis (A). IsoTBI exhibited increased tPA levels (B) and a significant increase in clot lysis rate one hour after clot activation compared to the other groups (C).
Conclusion: Our study demonstrates that early hyperfibrinolysis and predisposition to excess lysis were not due to injury severity or quantity of injury but were attributable to TBI. Turbidity measurement was uniquely sensitive in detecting persistent fibrinolysis in isoTBI patients. Therefore, the utilization of turbidity assays and D-dimer as complementary tools to classify clotting status can inform early treatment approaches.

Figure: Fibrinolytic markers A) D-dimer, B) tPA, and C) lysis at one hour, in NoTBI (n=29), isoTBI (n=6) and polyTBI (n=26) patients. Significance between groups indicated by * $p < 0.05$, *** $p < 0.001$.



Poster #58

OPTIMIZING THE MODIFIED BERNIE NORWOOD CRITERIA FOR EARLY PROPHYLAXIS ADMINISTRATION

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Introduction: The clinical decision to administer venous thromboembolism prophylaxis (VTE PPX) is determined by an assumption of low re-bleeding risk. There is very little research on the timing of the higher risk groups and very early administration of VTE PPX, which prohibits the facilitation of an evidence-based strategy. Findings from this study will inform clinical decisions designed to help TBI patients avoid VTE complications.
Methods: This retrospective cohort study utilized the ACS-TQIP-PUF from 2017 to 2021. The study involved a review of VTE PPX type and timing, demographics, injury categories, in-hospital complications, morbidity factors, comorbidity, neurosurgical procedures with timing, and in-hospital mortality. The study population consisted of adult (≥15 years) patients who received LMWH, UFH, or mechanical filter VTE PPX with no missing times and had a blunt isolated TBI based upon the mBNC. The population was split into two groups, patients with and without a comorbid history of anticoagulation or bleeding disorder (BLEED). The mBNC was applied to distinguish each group into a low-risk, moderate-risk, and high-risk of re-bleeding. The risk groups were stratified into early (≤ 24-hour), mid (> 24 to < 72-hour), and late (≥ 72-hour) VTE PPX administration.
Results: A total of 99,078 patients were included in the analysis; 75,952 (76.6%) did not have a comorbid BLEED. Multivariable regression models found a protective effect against mortality (BLEED OR .36, CI = .25 to .51; vs no BLEED OR .30, CI = .23 to .39), DVT (BLEED OR .28, CI = .14 to .57; vs no BLEED OR .22, CI = .15 to .33) and PE (BLEED OR .31, CI = .09 to 1.03; vs no BLEED OR .29, CI = .16 to .55) if VTE PPX was given early in both the low and moderate-risk groups (all values $p < .01$). The high-risk group found a higher odds of mortality in the early (OR 2.11, CI = 1.06 to 4.18, $p = .03$) and mid (OR 1.39, CI = 1.10 to 1.75, $p < .01$) VTE PPX BLEED group.
Conclusion: Early VTE PPX in the low and moderate risk mBNC reports to be effective in preventing VTE and mortality, with the absence of neurosurgical procedures only in the low-risk group regardless of BLEED. Early VTE PPX in the high-risk group prevents VTE; however, associates with a higher odds of mortality.

Poster #59

SERUM BIOMARKERS TO PREDICT THERAPEUTIC INTESNITY AND LOSS OF CEREBRAL AUTOREGULATION IN SEVERE TBI

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Introduction: Current treatment of severe traumatic brain injury involves reducing cerebral edema and resultant intracranial hypertension. Intracranial pressure (ICP) elevations can compress brain parenchyma and decrease cerebral perfusion, altering cerebral autoregulation. Disruption of the endothelial glycocalyx increases vascular permeability and disrupts coagulation and inflammation. The goal of this study is to determine if serum biomarkers can predict loss of cerebral autoregulation and if serum biomarkers are predictive of a malignant ICP phenotype requiring higher therapeutic intensity.

Methods: 25 trauma patients with severe TBI (GCS <9) underwent continuous ICP monitoring. Serum biomarkers of acute phase reactants were obtained on admission and serially after ICP monitor placement. Modified PILOT scale quantified therapeutic intensity. Pressure Reactivity index (PRx), correlation between ICP and mean arterial pressure (MAP) was used as a metric for cerebral autoregulation

Results: Multiple regression modeling demonstrated higher initial acute phase reactants correlated with greater area under the curve (AUC) PILOT scores. Syndecan-1 release greater than 40 predicted higher PILOT AUC. Pearson's correlation analysis demonstrated a correlation between soluble thrombomodulin (sTM) levels at 48hrs and the PRx between 48-72hrs (Pcc=0.4376, p=0.06). Additionally, sTM levels within 24 hrs were correlated with PRx between 36-48hrs (0.35, p=0.10) and PRx 48-72hrs (0.3955, p=0.0938). Syndecan-1 levels 2hrs post-admission showed a correlation with PRx between 36-48hrs (r=0.55, p=0.02).

Conclusion: This suggests an association between endothelial dysfunction and both therapeutic intensity and the brain's autoregulatory capacity after acute TBI. Increased release of acute phase reactant proteins and Syndecan-1 is associated with increased PILOT scores, demonstrating a relationship between elevated serum biomarkers and higher therapeutic intensity. Elevations in sTM and Synd-1 precede a loss of cerebral autoregulation. Identification of these biomarkers can alter TBI management.

Poster # 60

CIVILIAN PREHOSPITAL TOURNIQUETS FOR EXTREMITY TRAUMA: MORE COMMON AND GETTING BETTER ALL THE TIME

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Pedro G. Teixeira, MD; Marc Trust, MD; Tatiana CP Cardenas, MD;
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Introduction: From lessons learned in recent U.S. military conflicts, extremity tourniquets (TQ) have become standard practice in civilian prehospital care. We hypothesized that civilian EMS TQ use has increased and TQ are more often applied correctly to patients with extremity vascular injury. The specific aim of this study was to investigate the rate of civilian TQ placement and compare TQ placement in patients with and without vascular injury.
Methods: This was a retrospective study (2014-2022) of all adult trauma patients who had a prehospital extremity TQ placed and were transported to our trauma center at the highest level of activation. Data collected includes demographics, mechanism, physiology, injury severity, presence of extremity vascular injury (ICD-9 and 10 codes), and TQ year, number, and location. The primary outcome was the rate of TQ placement over time, while secondary outcome was the presence of an extremity vascular injury.
Results: There were 353 patients who had a total of 482 prehospital extremity TQ placed. The TQ patients were on average 37 years old, 82% male, 61% sustained penetrating trauma with an ISS=15, and 26% had an extremity vascular injury. There was an average of 1.4 TQ placed per patient, with 44% placed on an arm and 59% placed on a leg. TQ placement increased during the study period for both TQ placement per EMS transport (4% → 15%, $p<0.0001$) and TQ placement per vascular injury (11% → 39%, $p<0.0001$). When comparing TQ patients with and without vascular injury, there was no difference in age, gender, race/ethnicity, or ISS, but the vascular injury patients more often sustained penetrating trauma (82% vs. 54%, $p<0.0001$) and had a lower prehospital systolic blood pressure (106 vs. 116, $p=0.03$). On logistic regression, while controlling for age, gender, as well as number and location of tourniquets, only penetrating injury (AOR: 3.4 [1.7-6.8], $p=0.0004$) and prehospital hypotension (AOR: 2.9 [1.6-5.4], $p=0.0005$) were independently associated with the patient having an underlying extremity vascular injury.
Conclusions: Civilian EMS TQ use has increased over the past decade, and one in four patients with a TQ had an extremity vascular injury. There may be room to further refine indications for civilian prehospital TQ application, considering mechanism and hemodynamic condition in the decision making.

Poster #61

COMPUTED TOMOGRAPHY AFTER PENETRATING CARDIAC BOX INJURY IS SAFE IN STABLE PATIENTS: A REVIEW OF THE NTDB AND A TRAUMA CENTER REGISTRY

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Introduction: Surgeons may be reluctant to bring stable patients with penetrating cardiac box injuries to the CT scanner due to a perceived risk of sudden cardiopulmonary deterioration. The primary purpose of this study is to address this concern by evaluating the risk of complications during CT in these patients. A secondary purpose is to explore how CT guides management.
Methods: Penetrating cardiac box injuries were selected from one Level I Trauma Center's registry, and penetrating thoracic injuries were selected from the National Trauma Data Bank (NTDB) for years 2017-2021. Patients were included if they were stable (shock index <1) and received a CT chest as part of their trauma workup. Patients were excluded if they had critical or worse head injuries (AIS>4). Variables extracted included mechanism, vitals, abbreviated injury scale, procedures performed, and mortality.
Results: Out of 290 penetrating thoracic injuries in stable registry patients, 74 were to the box, and 42,987 NTDB patients met criteria. FAST was negative in all registry patients. There were no complications associated with going to CT in the registry. There were 93 deaths (0.2%) within 6 hours of presentation in the NTDB. After CT, in the registry and the NTDB respectively, 27.0% and 25.7% received a chest tube, 95.9% and 89.8% avoided open chest exploration, and 18.9% and 18.5% underwent abdominal exploration. Among the registry cohort, 85.0% of post-CT chest tubes were placed for findings absent on trauma bay chest X-ray.
Conclusion: In stable patients with penetrating box injuries, CT is rarely associated with complications and often seems to guide management.

Cohort and post-CT management	N	Died in under 6 hrs	Chest tube, no thoracotomy	Abdominal exploration	Thoracic exploration
Registry "cardiac box" injuries	74	0	20, 27.0%	14, 18.9%	3, 4.1%
NTDB penetrating thoracic injuries	42987	93, 0.2%	10224, 23.8%	7964, 18.5%	4386, 10.2%
NTDB firearm thoracic injuries	19490	82, 0.4%	4949, 25.4%	4574, 23.5%	2291, 11.8%

Poster #62

GROWING PAINS: EXPANDING ON BIG CRITERIA TO INCLUDE MINOR FRACTURES

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Introduction: The Brain Injury Guidelines (BIG) were developed to reduce the use of repeat CT, ICU and neurosurgical resources in patients that were unlikely to benefit. Until this time, all trauma patients that have a TBI and an additional injury have been excluded from the BIG, regardless of injury severity. We propose that minor fractures (AIS <4) can be safely included within BIG without an increase in morbidity or mortality in patients who would otherwise meet BIG 1 or 2 stratification.
Methods: Retrospective chart review of polytrauma patients with traumatic brain injury patients from a single level-1 trauma center presenting from January 2017 to November 2022. Patients who died in or were discharged from the emergency department, stratified to BIG 3, admitted to ICU or did not have an additional injury were excluded. The remaining patients were stratified by their assigned BIG category or given one based off their imaging and GCS on presentation if they were initially excluded.
Results: 766 patients underwent chart review. 88 patients met final inclusion criteria. 31 patients were assigned BIG 1, and 57 patients were assigned BIG 2. Neurosurgery was consulted in 20 patients (22.7%, BIG 1 35% vs BIG 2 65%) with 0 interventions performed. 27 patients (30.6%) underwent repeat head CT, but progression of TBI was found only in 1 patient (3.7% overall) who underwent observation only. All patients had minor fracture injuries (AIS <4) with a median AIS of 2. 15 (17%) patients underwent surgery a median of 1 day from admission (range 0 to 22 days) with 4 (26.6%) receiving a preoperative neurosurgery consult, 7 (25.9%) of these repeat head CT. Mean time to OR after neurosurgical consultation was 1 day. We observed no in-hospital mortality, no ICU upgrades and 5.6% morbidity. 82% were discharged home, 6.7% to rehab, 4.5% to SNF and 3.3% to inpatient psychiatry.
Conclusions: Addition of minor fracture injuries to institutional BIG criteria can be safe, as demonstrated by our low morbidity, in-hospital mortality and ICU upgrade rates with high rate of home discharge. We additionally demonstrate the low utility of neurosurgical consultation and routine repeat head CT scanning in patients with minor fractures in the setting of TBI meeting BIG 1 or 2 criteria. We were unable to demonstrate a significant delay to OR for fracture fixation imposed by neurosurgical consultation or repeat head CT scanning.

Poster #63

INITIAL IMPLEMENTATION OF A POST-MORTEM CT PROTOCOL AT A LEVEL 1 TRAUMA CENTER

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Introduction: The national rate of autopsies has declined to <8% due to limited resources. There is accumulating evidence that post-mortem computed axial tomography (PMCT) is a valuable tool in forensic pathology, but its potential role as an alternative to conventional autopsy has not yet been fully defined. We hypothesize that PMCT will improve injury severity reporting accuracy by identifying unknown injuries and increasing ISS.

Methods: This is a retrospective study of PMCTs in trauma patients who were dead on arrival (DOA) or arrived with signs of life (SOL) and died shortly after arrival from 3/2023 to 11/2023. PMCT is a noncontrast CT performed from the skull vertex to the upper thighs with options to image the lower extremities if relevant. Patients were divided into two cohorts: (1) those with SOL who received interventions and (2) those who did not. ISS was calculated with and without PMCT.

Results: The majority of patients (79.3%) were male who presented with blunt mechanism with 27.6% from falls, 13.8% motorcycle crashes, 17.2% motor vehicle crashes, 20.7% pedestrians hit by cars, 3.4% jet ski collision and 3.4% bicyclist hit by van. The remaining 13.8% were gunshot wounds. The time from death to performing PMCT was <7hours for all patients. Of the 29 patients, 13 (44.8%) arrived with SOL and received interventions whereas 15 (55.2%) were DOA and received no hospital intervention. Of those who received interventions, the median ISS without PMCT was 11 [IQR: 3.5-23] compared to 50 [IQR: 44-58] with PMCT ($p=0.001$). For patients who did not receive interventions, the median ISS without PMCT was 2.5 [IQR:0.25-8] compared to 47.5 [IQR:35.8-54] with PMCT ($p<0.001$). PMCT identified a lethal injury in 3 patients (10.3%), updating ISS to 75 (I.e. nonsurvivable injury). Only 6 (20.7%) conventional autopsies were completed by the medical examiner at the time of this writing.

Conclusion: PMCTs can be a valuable adjunct, and even a potential alternative, to conventional autopsy in trauma patients. Postmortem CT scan adds educational value and improves the reporting of accurate information to major quality databases in a timely fashion.

Poster #64

PHYSIOLOGY OVER PHARMACOLOGY: EFFECT OF ANTICOAGULATION ON NONOPERATIVE MANAGEMENT OF SOLID ORGAN INJURIES

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Introduction: The risk of anticoagulation (AC) in the management of intraperitoneal solid organ injury (SOI) is not clearly defined. We hypothesize that preinjury anticoagulation will increase the failure of non-operative management (NOM) after blunt liver and/or spleen trauma.
Methods: We performed a retrospective review of adult blunt trauma patients with ≥ 1 liver or spleen injury that underwent initial non-operative management from January 2020 to August 2023. Patients were excluded if there was no initial CT, emergency department (ED) death, or planned operative management. Data collected included age, AC status, AC reversal, initial INR, Injury Severity Score (ISS), ED vitals, embolization status, operative intervention, and transfusion amounts. Using univariate and multivariate logistic regression analyses, we evaluated the relationship between pre-injury anticoagulation, excluding aspirin alone, and NOM failure.
Results: 1492 patients met inclusion criteria. There were 726 isolated splenic, 487 isolated liver, and 279 concomitant liver and spleen injuries. The patients were 64% male with a median age of 37 (IQR 25 - 58) and a median ISS of 22 (IQR 17 – 33). The NOM failure rate was 2.3% overall. 97 patients were on AC prior to injury of whom only two (2.1%) failed non-operative management. In our regression analysis, AC status did not correlate with NOM failure (aOR 0.67; p=0.618), but Grade IV/V injuries (aOR 6.12; p<0.001) and ED transfusion (aOR 1.10; p<0.001) did. AC patients receiving reversal received more blood in the ED (4.6u vs. 1.1u, p<0.001); however, they did not have a significantly different rate of failure of NOM (3.7% vs. 1.4%, p=0.480).
Conclusions: Pre-injury AC was not associated with NOM failure in our cohort. Our NOM success rates are higher than what has been previously reported, even in patients on pre-injury anticoagulation, suggesting that, with modern resuscitation practices, reversal of AC may not be necessary in all patients with intraperitoneal solid organ injury.

Poster #65

PNEUMOTHORAX DETECTION IN THE ED: HOCUS POCUS?

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Introduction: The incidence of pneumothorax (PTX) in polytrauma may be as high as 20%. Prior studies demonstrated have indicated rather variable sensitivity for both POCUS and supine CXR in PTX detection. The efficacy of both modalities in PTX detection at a major ED that serves an overwhelmingly blunt trauma population was assessed.
Methods: All full adult trauma activations admitted from 2019-2021, excluding traumatic arrests or those without POCUS exam, were included. A subset (19%) of POCUS exams were reviewed by the POCUS director.
Results:

Total patients	541
ISS	16 + 13
Pneumothorax (n, %)	76 (14%)
Chest tube for PTX (n)	52
CXR identified PTX (n)	30
CXR Sensitivity	39.4%
POCUS Sensitivity – overall	42%
POCUS Sensitivity – APP/PGY1	44%
POCUS Sensitivity – PGY 2/3	40%
POCUS Sensitivity – Fellow/Attending	45%
POCUS PPV	94%
POCUS FNR	30%

Conclusion: The incidence of PTX was 14%. A chest tube was placed in about 68%. The overall sensitivity of POCUS for PTX was 42%, with limited variation by level of training, with a false negative rate of 30%. Ultrasound image review by POCUS director indicated 97% concordance with the examining provider with regards to PTX presence/absence and location thereof. Further study of imaging process and outcomes is indicated.

Poster #66

SHOULD WE BE SCORING PAIN DIFFERENTLY FOR RIB FRACTURES? A COMPARISON OF TWO SCORING SYSTEMS

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Introduction: Following rib fractures uncontrolled pain leads to hypoventilation, impaired airway clearance, and in some patients, progression to respiratory failure and death. Pain assessment and control is the primary treatment for all patients with rib fractures. Pain is typically assessed at rest. A novel approach is to assess patients' pain with movement, as this may better capture pain that interferes with physical function. We hypothesized that movement pain scores (MPS) would be higher than resting pain scores (RPS) for patients admitted with rib fractures, and would correlate better with opioid administration.
Methods: A retrospective cohort of patients ≥18 years admitted at a Level 1 trauma center with isolated chest injury (non-chest AIS ≤ 2) were eligible. Patients unable to self-report pain scores were excluded. RPS and MPS scales range from 0-10, with 10 being most pain. RPS and MPS were compared during the first 10 days of admission.
Results: During the 3 month study period, 81 patients met inclusion criteria (median age 69 years [47-79]). The median number of rib fractures was 4 [2-6]. 423 hospital days with 1688 pain assessments were analyzed. MPS and RPS agreed only 39% of the time. When RPS and MPS differed, the average MPS was 2.3 points higher than RPS ($p < 0.01$). Days with higher average MPS had higher average opioid usage (42.7 MME vs. 21.5 MME, $p < 0.01$).
Conclusions: Pain scores with movement were higher than resting scores when measured simultaneously for patients admitted with rib fractures. Higher MPS were associated with increased opioid use. Using resting pain scores alone for rib fractures patients may underestimate pain and lead to worse pain control and outcomes for patients.

Poster #67

TRAUMA PNEUMONECTOMY: HAS SURVIVAL IMPROVED OVER TWO DECADES?

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Introduction: Trauma pneumonectomy, although infrequently performed, has a mortality exceeding 50% from exsanguination and acute right heart failure. The hypothesis of this study is that recent advances in mechanical cardiopulmonary support and operative management have improved survival over time.
Methods: Retrospective, single center, trauma registry study from January, 2003 to December, 2023 of all adult patients who underwent a pneumonectomy for trauma. Data collected included demographics, mechanism of injury, admission physiology, operative details, the use of veno-venous extracorporeal membrane oxygenation (VV-ECMO) and mortality, defined as early (within 24 hours of surgery) and late (> 24 hours after surgery). Outcomes were compared by decade, the first decade (2003-2010) and second decade (2011-2023), using t-tests, ANOVA, and chi-squared tests.
Results: Twenty patients met inclusion criteria, 9 in the first decade and 11 in the second decade. Fifteen (75%) sustained a penetrating injury (11 gunshot and 4 stab wounds), 2 (10%) sustained a blunt injury and 3 (15%) had incomplete data on mechanism. Comparing the decades, there were no differences in mean age (32.2 vs 25.8, p=0.16) or injury severity score (26.4 vs 34.3, p=0.23). However, those in the second decade had significantly lower mean admission pH (6.89 vs 7.14, p=0.01) and higher admission base deficit (19.3 vs 9.8, p=0.003). The use of thoracic damage control surgery significantly increased from 33% in the first decade to 100% in the second decade (p=0.002). VV-ECMO with lung rest ventilation increased from 22% in the first decade to 64% in the second decade (p=0.06). Mean time to cannulation was 1.6 days (± 2.2) with a mean VV-ECMO duration of 24.8 days (range 5 to 105 days); one patient with persistent hemodynamic instability was converted to veno-arterial ECMO. The overall mortality was 5 (55.6%) in the first decade compared to 5 (45.5%) in the second decade (p=0.65). Early mortality, all secondary to hemorrhagic shock and/or right heart failure, did not significantly change over the respective decades 1 (11%) vs 5 (45.5%), p=0.09. However, late mortality was significantly lower in the second decade compared to the first, 0% vs 50% (p=0.04).
Conclusion: Patients requiring a traumatic pneumonectomy are severely injured, in profound shock and physiologically compromised. Despite improved overall survival, early mortality from intractable hemorrhage and right heart failure, remains high. However, the combination of a thoracic damage control operative strategy and early initiation of VV-ECMO may contribute to the dramatic decrease in late mortality to 0% in the last decade.

Poster #68

SURGICAL STABILIZATION OF RIB FRACTURES – WHO GETS IT?

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Introduction: Clinical benefits of surgical stabilization of rib fractures (SSRF) for patients with severe multiple rib fractures (MRF) or flail chest (FC) have been reported in multiple studies. However, most patients with MRF or FC do not receive SSRF. Our study assessed rates and predictors of SSRF among patients with MRF or FC in the United States.
Methods: Patients with MRF or FC admitted in the inpatient setting were identified within the Premier Healthcare database. All patients had a chest Abbreviated Injury Scale (AIS) score > 1 and > 2 days inpatient stay. Patients were stratified by receiving SSRF anytime during index admission. Variables included patient demographic, comorbid and injury-related characteristics (e.g., injury severity score (ISS), specific lung injury types) and hospital characteristics (size, location, type). Logistic regression analyses were conducted to identify hospital or patient characteristics associated with SSRF. Separate models were built for MRF vs FC patients.
Results: 225,865 patients with MRF and 9,286 with FC were included, of which 2% (4,537) and 31.5% (2,923) received SSRF, respectively. In patients with FC, the two main predictors for SSRF were presence of pneumo- or hemo- or pneumohemo-thorax present on admission and requiring drainage (OR: 5.8 (95% confidence interval (CI): 5.2-6.5), $p < 0.001$) and hospital size > 500 beds (OR: 4.5 (95%CI: 2.3-8.7), $p < 0.001$). The same two predictors were identified for patients with MRF, however in this cohort, White race (vs Black) was also associated with increased odds for SSRF (1.31 (95% CI: 1.17-1.46), $p < 0.001$). Patients with Medicaid and Medicare as payer also had lower odds of SSRF vs patients with commercial insurance (Medicaid: 0.83 (95% CI: 0.75-0.92) – Medicare: 0.85 (95% CI: 0.78-0.92), $p < 0.001$ for both).
Conclusion: SSRF is still underutilized. In patients with FC, hospital size and pneumo- or hemo- or pneumohemo-thorax present on admission predict SSRF utilization. In patients with severe multiple rib fractures, socioeconomic factors such as race and payer are also associated with SSRF utilization.

Poster #69

QUANTIFYING FASTER HEMOSTASIS IN NONCOMPRESSIBLE TORSO HEMORRHAGE

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Introduction: Rapid surgical hemostasis is a critical component of trauma care and is associated with improved survival. However, little is known about the time spent in the various phases of care prior to achieving definitive hemostasis. We hypothesized that time to hemostasis varies based on different management strategies and prolonged hemostasis is associated with worse outcomes.
Methods: A prospective, observational study was performed at 6 level 1 trauma centers 2017-18. Adults with hemorrhage below the diaphragm requiring intervention within 60min were included. Patients were grouped by interventions required for hemostasis: interventional radiology only (IR), laparotomy and IR (Lap+IR), laparotomy only (Lap), REBOA and Lap (REBOA+Lap), and thoracotomy and Lap (Thor+Lap). Outcomes included time spent in 4 hospital segments, time to hemostasis, death, and complications. Univariate, multivariable, and Cox regression for time to hemostasis, censored for death, were performed.
Results: Of 398 included patients, hemostasis was obtained in 86%. Patients had a median age of 34 (IQR 25-50), and ISS of 26 (17-38). Death or complications occurred in 71% of patients, with a 24% mortality rate. The median time from ED arrival to definitive hemostasis was 117 mins (Figure 1). ED time was longer in the IR group than other groups ($p<0.001$) while procedural time was shorter in the Lap and Thor+Lap groups ($p<0.02$). On Cox regression, the Lap group had the shortest time to hemostasis (Figure 2). Above-average hemostasis time was associated with increased odds of death or complications (OR 1.8, IQR 1.1-2.9, $p=0.02$).
Conclusion: Time to hemostasis varied widely among severely injured patients with noncompressible torso hemorrhage requiring emergent intervention. Definitive hemostasis was obtained fastest in the Lap patients, after adjustment for death. Procedure start was nearly 60 minutes later in the IR group than others. Prolonged time to hemostasis was associated with worse outcomes. These detailed time data will allow targeted interventions to improve time to hemostasis.

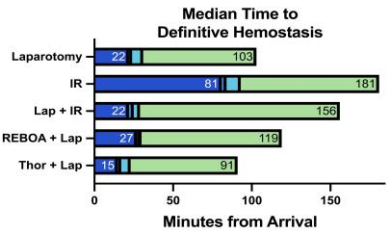

Figure 1

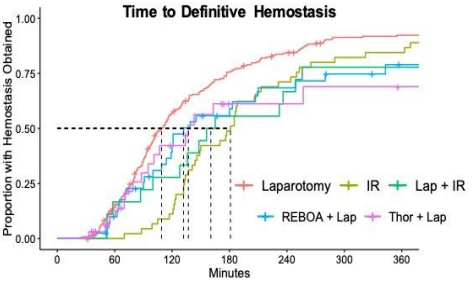

Figure 2

Poster #70

A NOVEL SILICON-BASED POLYMER- UNIVERSAL COMBAT MATRIX SUPPORTS LIVER VIABILITY OUT TO 72 HOURS IN PORCINE MODEL OF HEPATIC LACERATION

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Introduction: Hemorrhage is the leading cause of death in trauma and control of non-compressible parenchymal bleeding remains challenging. Many hemostatic agents have been evaluated to minimize blood loss and improve survival. We compared a novel silicon dioxide-based universal combat matrix (UCM) to the recently FDA-approved QuikClot® Control+® (QCC+) in a hepatic laceration porcine model.
Methods: A 6cm full thickness left liver laceration was made sharply in 12 anesthetized swine and treated with UCM (n=6) or QCC+ (n=6). As many gauze applications required for hemostasis were used, and manual pressure held until hemostasis achieved. The animal was monitored for 1 hour and recovered for a 3-day period. Animal survival and number of applications were analyzed. Labs were drawn at baseline, end of hemorrhage, end of monitoring period, and daily for 3 days. The animal was euthanized, and liver tissue collected for histology and blinded histopathological evaluation.
Results: All UCM and QCC+ animals survived the 3-day period. On average, UCM required 3.1 applications to achieve hemostasis and QCC+ 2.2 ($p=0.54$). There was no significant difference in liver function tests (AST $p=0.29$, ALT $p=0.99$), white blood cell count ($p=0.94$), platelets ($p=0.89$), creatinine ($p=0.97$), hemoglobin ($p=0.99$) or hematocrit ($p=0.99$), between groups over the 3-days. On gross liver inspection, UCM livers were well perfused without necrosis or ischemia, while QCC+ livers showed early necrosis and discoloration. Blinded histopathology scoring demonstrated QCC+ had significantly more hepatic neutrophilic inflammation ($p=0.02$) and panlobular necrosis ($p=0.001$) compared to UCM.
Conclusions: UCM demonstrated comparable hemostatic efficacy to QCC+, without evidence of significant liver or kidney injury, blood loss, leukocytosis, or electrolyte derangement. While QCC+ was used in this model against product instructions (which recommend removal within 48 hours) histology examination indicates that UCM may be left in place for extended periods of time without appreciable inflammation and necrosis. This may have implications for improved post-treatment hepatic function if using UCM as a hemostatic agent for traumatic injury. Ongoing efforts include examining this product out to 30-day survival in this model.

Poster #71

BARRIERS TO ADOPTION OF AN ARTIFICIAL INTELLIGENCE CLINICAL DECISION SUPPORT SYSTEM FOR TRAUMA

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Introduction: Clinical decision support systems (CDSSs) can help trauma clinicians identify high-risk patients after injury. An artificial intelligence (AI) model that predicts trauma-induced coagulopathy (TIC) has been developed, validated, and embedded within a CDSS. However, barriers to adopting or implementing the AI CDSS may impede its effect on clinician decision-making or patient outcomes. We aimed to evaluate the potential barriers and facilitators influencing adoption of an AI CDSS in trauma care.
Methods: This prospective study was approved by the UK Health Research Authority (22/HRA/2324). Participants (trauma clinicians) used a prototype AI CDSS in a simulated environment using clinical vignettes, completed a validated questionnaire and a semi-structured interview. The 'non-adoption, abandonment, scale-up, spread and sustainability' (NASSS) framework – developed to identify complexity in healthcare technology interventions – informed the questionnaire and interview. Thematic analysis of interview transcripts was conducted on NVivi v12, achieving theme saturation.
Results: Participants (n=22) had a median age of 39 years (IQR 31-48), 73% were male, 77% were doctors, 18% nurses and 5% paramedics, with a median of 13.5 years (IQR 6.3-19.8) experience. The main potential barriers to adoption/implementation of AI CDSS were: 1) heterogeneous TIC mechanisms and treatments; 2) duplication of input unless connected to electronic patient records; 3) limited benefit to the decision-making process without treatment thresholds; 4) uptake is dependent on clinicians' seniority, specialism, and resistance to change; 5) organizational cost, 6) data governance and security; and 7) evidence of patient benefit for regulatory approval. The main potential facilitators were the system's: 1) usability (accessibility, efficiency, learnability, and ease of use); 2) usefulness (for treatment decisions, real-time prediction, triage, and confidence); 3) credibility (endorsement by key individuals, demonstration of patient benefit, and reinforcement of decision-making); and 4) dissemination (enthusiastic early adopters, and ensuring clinician awareness of the tool).
Conclusion: Reducing complexity will aid the successful adoption of our AI CDSS. This work has informed the design of future feasibility and randomized studies evaluating its impact on clinicians and patient outcomes.

Poster #72

EXTRAVASCULAR FACTOR IX IN A RAT MODEL OF PENETRATING TRAUMA

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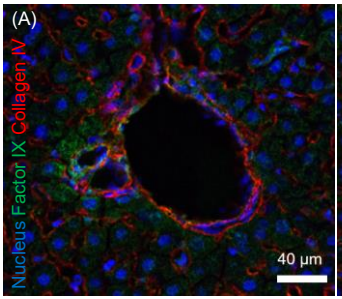
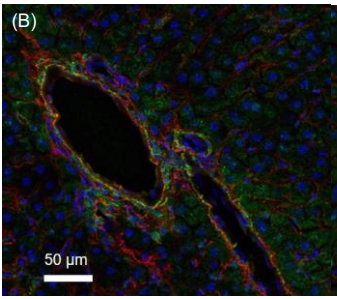
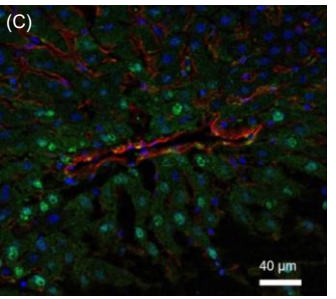
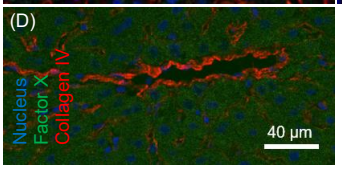
Introduction: Through its unique binding to collagen IV in the basement membrane of blood vessels, Factor IX forms a hemostatic reservoir outside of circulation that may be a target for augmentation or anticoagulation. Factor IX and collagen IV have never been studied in trauma.
Methods: Adult rats were anesthetized and subjected to laparotomy with penetrating injury to the liver. Injured and uninjured liver lobe specimens were fixed, frozen, and sectioned for confocal microscopy. Sections were stained with antibodies against Factor IX (variable), Factor X (control), and collagen IV (basement membrane protein). Confocal microscopy was used to colocalize Factors IX or X and the basement membrane, and to compare their spatial association with penetrating injury and the vasculature.
Results: Factor IX was associated with portal triad structures and colocalized with the basement membrane as evidenced by yellow overlap in merge images of uninjured and injured livers (A, B). Interestingly, cell nuclei around areas of injury but not in uninjured regions showed dense anti-Factor IX staining (C). Factor X had a more usual disseminated staining pattern consistent with known hepatocyte synthesis (D).
Conclusion: Unlike the prototype coagulation protein Factor X, Factor IX co-localizes with collagen IV in the basement membrane of liver tissue and has unique patterns of recruitment in the regions surrounding penetrating tissue injury. This extravascular reservoir makes Factor IX an exciting target for augmentation or anticoagulation in patients with penetrating injuries.









Poster #73

FINALLY, A USE FOR BALLOONS: AUTOMATED ENDOVASCULAR SUPPORT ENHANCES CLOSED LOOP DRUG AND FLUID DELIVERY IN A PORCINE MODEL OF SEVERE SHOCK

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Introduction: Endovascular Perfusion Augmentation for Critical Care (EPACC) is a method of dynamic aortic balloon catheter titration for precision hemodynamic support. EPACC has a potential role in augmenting hemodynamics in tandem with conventional resuscitation strategies. We have previously described that even short periods of EPACC in conjunction with an automated fluid and drug delivery system termed, Precision Automated Critical Care Management (PACC-MAN), can reduce resuscitation requirements over the first few hours after severe ischemia-reperfusion injury (IRI). We sought to understand if an initial 180 minutes of EPACC+PACC-MAN has sustained benefits over a 24-hr period compared to PACC-MAN alone in an established IRI model.
Methods: Twelve large swine underwent 30% hemorrhage, followed by 45 minutes of complete zone 1 aortic occlusion to induce IRI and a vasoplegic state. Animals were then transfused to euvolemia and randomized to a standardized critical care (SCC) algorithm with the PACC-MAN system, or EPACC+PACC-MAN (180 min of dynamic partial aortic balloon pressure augmentation that autonomously adjusted based on the animal's physiology). Fully autonomous, closed-loop resuscitation lasted for a total of 24 hrs in both groups. Primary outcomes included duration of hypotension (HYPO) (MAP <60mmHg) and hypertension (HTN) (MAP >70mmHg), and total crystalloid/norepinephrine (NE) volumes.
Results: Duration of HYPO for SCC vs EPACC [3.75% vs 3.10 % p=0.47) and HTN for SCC vs EPACC (5.58% vs 8.90% p=0.13) was equivalent. SCC required significantly more NE during the study period (1102.0 mcg/kg vs 210.77 mcg/kg p=0.045) than EPACC. Total volume trended higher for SCC vs EPACC (308.2 ml/kg vs 198.3 ml/kg p= 0.38).
Conclusion: Supporting hemodynamics with EPACC in the initial phases of resuscitation had a sustained effect on limiting overall vasopressor requirements in this 24-hour study without compromising physiologic or metabolic endpoints. Automation of endovascular devices may play an adjunctive role in the management of severe shock states and augment autonomous resuscitation system capabilities. Such systems may play an important role in resource-constrained care environments.

Poster #74

MICROBIAL NETWORKS, ANTIMICROBIAL RESISTANCE AND VIRULENCE FACTORS ARE ASSOCIATED WITH DIFFERENTIAL RECOVERY FOLLOWING ABDOMINAL INJURY

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Introduction: Alterations in microbiome diversity occur after injury, although the impact on clinical outcomes is unknown. We performed a pilot study to evaluate microbial features associated with complications after abdominal trauma.
Methods: Adult patients sustaining abdominal trauma (2014-2016) were clustered into four complication groups (Table). Genomic DNA was extracted from peritoneal lavage (PTL) specimens and sequenced. Sequences were classified via Centrifuge (NCBI nt database) and functionally annotated. Associations between complications and microbiome features were assessed via Multiple Correspondence Analysis (MCA).
Results: Eighty-five samples from 54 patients were analyzed. C4 samples had significantly lower Shannon entropy scores (microbial diversity) compared to C2 (Figure). Only C2 had increasing microbial diversity across days post-injury. C4 specimens had higher abundance of Bacteroides and Enterobacter species, and enrichment of tetracycline resistance genes compared to C2. MCA revealed correspondence of high Bacteroides bioburden with complications such as severe sepsis.
Conclusion: The highest bacterial burden, antimicrobial resistance, and morbidity was seen in patients with multiple systemic complications after abdominal injury. Such observations could facilitate the identification of microbial metagenomic determinants predictive of patient outcomes.

Cluster	Cluster description	no. of samples	no. of patients
1	Wound & infectious complications, organ dysfunction, escalation of care	10	5
2	No complications	29	25
3	Cardiovascular complications, organ dysfunction, escalation of care	14	8
4	Multiple complications	32	16

Table 1. Cluster descriptions for the patient cohort.

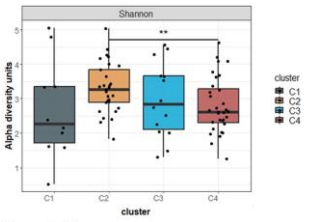

Figure 1. Shannon entropy scores across complication clusters (Wilcoxon test: **, p≤0.01).

Poster #75

PLASMA LIPIDOMICS IN BURN PATIENTS REVEAL ALTERATIONS IN OCTANOYL CARNITINE LEVELS

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Introduction: Severe burn patients demonstrate a pathological stress response characterized by a hypermetabolic state, which may produce alterations in the plasma lipid profile. Alterations in lipid metabolites may cause dysregulation in fatty acid oxidation (FAO) as the body attempts to meet increased energy requirements. We hypothesized that the plasma lipid metabolite profile would differ between burn patients and healthy subjects.
Methods: Plasma samples were collected from 8 patients who were admitted to an ABA-verified hospital for burn injuries and matched with 8 healthy individuals. Samples were collected using Telimmune DUO Plasma Separation Cards. Lipids were extracted with the 8:4:3 (CHCl3:MeOH:H2O) Folch ratio. Mass spectrometry was performed on each sample and used for quantification of each lipid species. Lipid profiles of burn and healthy subjects were analyzed pairwise using the Limma empirical Bayes t-statistics to detect differences in lipid levels between the two groups. Significantly different lipid species ($p<0.05$) were identified and matched by mass to known lipids catalogued in the LIPID MAPS® database.
Results: Mean age was 41.8 ± 16.0 years in the burn patients and 43.8 ± 12.1 years in the healthy subjects ($p=0.39$). The mean BMI was 26.1 ± 7.3 kg/m2 in the burn patients and 27.5 ± 6.7 kg/m2 in the healthy subjects ($p=0.34$). Of the burn patients, 88% were male, and of the healthy subjects, 63% were male ($p=0.25$). The mean percent of burned total body surface area (TBSA) was 12.7 ± 10.0% in the burn group. A total of 1008 peaks were identified by mass spectrometry in the plasma samples. Significant differences in plasma levels of 41 peaks were found between burn patients and healthy subjects. Of those peaks, 27 were identified as lipid species using the LIPID MAPS® database. Of interest, significantly decreased plasma levels of the fatty ester, O-octanoylcarnitine, were found in burn patients compared to healthy subjects ($p=0.03$).
Conclusion: L-carnitine transports fatty acids into the mitochondria for FAO. Therefore, downregulation of octanoyl carnitine in the plasma of burn patients may provide a mechanism behind the dysregulation of FAO in severe burns. Larger studies examining the relationship between octanoyl carnitine downregulation and burn injury are warranted.

Poster #76

QUANTUM ELECTROCHEMICAL SPECTROSCOPY (QES) ALLOWS FOR CLASSIFICATION OF TRAUMA PATIENT PHENOTYPES

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Introduction: Trauma patients have a complex milieu of circulating proteins and metabolites that contribute to thromboinflammation and consequential outcomes. Traditional assays such as mass spectrometry require complex parallel sample preparations and lengthy runtimes. Quantum electrochemical spectroscopy (QES) is a novel technique that allows for the measurement of numerous and diverse biomolecules in 30 minutes using only 2μL of plasma without reagents or sample preparation. The multidimensional data produced by QES is then processed with machine learning (ML) algorithms to allow for classification of samples into phenotypic cohorts. The aim of this study was to assess the ability of QES technology to discriminate clinically relevant phenotypes after trauma.
Methods: Plasma samples were collected from injured patients meeting trauma activation criteria on day of admission during two separate study protocols at two Level 1 trauma centers. Minimal injury (MI) was injury severity score (ISS) <15 and base deficit (BD) <6. Serious injury (SI) was ISS ≥15 and BD ≥6. Plasma samples were run in triplicate through QES. ML algorithm was trained and verified with 70% of data; the remaining 30% was then used for blinded classifier testing. Bootstrap resampling was implemented to enhance model robustness. Area under receiver operating characteristic (AUROC) curve was used to assess performance.
Results: There were 16 MI and 15 SI patients. The ML classifier demonstrated robust discrimination between MI and SI groups with a mean AUROC of 0.83 (max 0.95, min 0.72). The algorithm also effectively distinguished between cohorts from the two independent study locations with a mean AUROC of 0.78 (max 1.0, min 0.70).
Conclusion: QES allows for accurate classification of trauma patient phenotypes utilizing small sample volumes and one-step operation. Next steps will include improving the prediction model with more patient samples and quantifying relevant biomolecules from the multidimensional data. Future directions will also include expanding the classification methodology using the quantum signatures to predict complications such as respiratory failure, venous thromboembolism, and mortality. This will allow for targeted clinical care of the trauma patient.

Poster #77

POTENTIAL INVOLVEMENT OF PI-3 KINASE SIGNALING IN PERITONEAL MESOTHELIAL CELLS EXPOSED TO REACTIVE ASCITES: IMPLICATIONS FOR ADHESION FORMATION

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Introduction: Previous abdominal surgery (PAS) increases risk of abdominal adhesions that may cause small bowel obstruction (SBO). Trauma and peritoneal inflammation, e.g., acute appendicitis (AA), causes formation of peritoneal reactive ascites (rA) and activates peritoneum surface mesothelial cells (MCs) to form adhesions. MCs treated with reactive ascites (rA) collected during appendectomy (appy) or adhesiolysis for SBO may form adhesion-like fibers (FIB) and glycocalyx (GCX).
Methods: This is an ongoing prospective observational IRB-approved study at four level 1 trauma centers where rA is collected prior to surgical intervention for non-perforated AA or SBO. 44 appy and 10 SBO rA patient fluids were categorized into 6 groups by history of PAS (PAS/naïve) and by formation of FIB (high/no) and GCX (high/low/no) by rA-treated MCs. 71 cytokines/chemokines and 14 soluble receptors were quantified in rA and analyzed by Dunn's tests; adjusted $P<0.05$ was considered significant. Log2 fold-changes were calculated for each group compared to the PAS-highFIB-highGCX group and were analyzed by Ingenuity Pathway Analysis (IPA).
Results: PAS-FIB-GCX groups showed differences in the median concentration of 33 cytokines. IPA analysis showed that the naïve-noFIB-noGCX group was predicted to mobilize neutrophils, prime for activation phagocytes and myeloid cells, and increase epithelial tissue formation. Upstream analysis predicted that LY294002, a phosphoinositide 3-kinase inhibitor, would inhibit proteins of these associated pathways.
Conclusions: rA fluids collected from patients with naïve abdomens, which do not induce FIB or GCX formation in treated MCs, show predicted activation of pathways critical to the formation of abdominal adhesions. Future testing of PI-3 kinase inhibitors on MC formation of adhesion-like fibers and GCX is warranted.

Poster #78

THE STUDY OF EDUCATIONAL EFFECTS: 2D VS. VR RANDOMIZED CONTROLLED TRIAL

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Introduction: Virtual reality (VR) has potential for effective learning in medical education. There are increasing reports of simulation and procedures education using VR. Compared to conventional two-dimensional (2D) videos, however, the effects of VR in medical education are not clear. This study aims to compare VR and 2D videos on distance learning of live-action Focused Assessment with Sonography for Trauma (FAST) in initial trauma care and to examine psychological learning effects such as self-efficacy and comprehension.
Methods: We conducted a randomized controlled trial using distance learning. Eligible participants for inclusion were fourth- to sixth-year medical students and first- and second-year residents in five medical schools and university hospitals. We conducted stratified randomization by institution and participants were assigned to 2D and VR groups. Participants attended approximately 30 minutes of remote lectures on initial trauma care and watched live-action FAST practices in the emergency room in 2D or VR. Primary outcomes were self-efficacy, intrinsic value and emotional engagement to assess learning effectiveness. Multiple regression analysis was used to evaluate the association between VR use and outcomes.
Results: Sixty-four participants were eligible for analysis (2D, n = 33; VR, n = 31). There were no significant differences in participant characteristics; however, the median pre-test score for measuring medical knowledge differed by two points (2D, 20.0; VR, 18.0). In multiple regression analysis to evaluate the association between VR and outcomes, all outcomes showed no significant association (B, -0.62, 0.44, 0.98; 95% CI, -5.62 to 4.38, -2.72 to 3.59, -2.12, 4.08; p-value, 0.80, 0.78, 0.53, self-efficacy, endogenous value and emotional engagement, respectively).
Conclusion: We evaluated VR use and psychological learning effects in distance learning of FAST in initial trauma care. In this study, using VR was not significantly associated with learning effectiveness.

Poster #79

20 YEARS OF ACUTE TRAUMATIC COAGULOPATHY

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Introduction: The term "Acute Traumatic Coagulopathy" (ATC) to describe post injury coagulation dysfunction was first published in 2003. Treatment of ATC has fundamentally changed in the last two decades with Major Hemorrhage Protocols – balanced resuscitation, pre-hospital transfusions and empiric tranexamic acid. However, the impact of contemporary trauma care on the incidence of ATC and associated outcomes has not been fully described. Our objective was to determine current rates of ATC and their relationship to ISS and clinical outcomes, for comparison with seminal data published 20 years earlier.
Methods: Retrospective study of adult patients at a Level 1 UK trauma centre (2012-21). Data was extracted from the trauma registry for all patients ISS and admission INR (excluded if no INR result; ATC INR>1.2) and compared with 2003 published data of 1088 HEMS trauma patients (57% ISS>15) admitted to the same centre (ATC = abnormal PT, aPTT or Thrombin Time). Multivariate analysis was performed to examine relationship of ATC and ISS with mortality.
Results: 19,025 patients (2012-21) were analyzed. Median age 36 years, 78% male, 26% penetrating injury, median ISS 9 (1-16) with 25% ISS>15. Overall ATC incidence was 9% and for ISS>15 ATC ranged from 11-21% (with no trend over time 2012-21) vs 33% (2003), $p<0.05$. Overall mortality was 4.8%, and for ATC was significantly lower compared to 2003: 23% vs 46%, $p<0.05$ (Figures 1A & 1B). For ISS>15, ATC was significantly associated with increased mortality x4 (2012-21) vs x3 (2003) and after adjusting for ISS in the 2012-21 cohort, ATC had OR 5.3 (4.5-6.3) for death ($p<0.05$). x
Conclusion: Contemporary trauma care has improved outcomes from ATC over the last 20 years with lower overall admission rates. Risk of death in ATC remains high despite modern empirical approaches to pre-hospital transfusion and antifibrinolytics. Further opportunities for improvement require more targeted and precision therapy for ATC.

Poster #80

WITHDRAWN

Poster #81

EARLY LIQUID PLASMA IS A SAFE ALTERNATIVE FOR BALANCED TRANSFUSION

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Introduction: Bleeding trauma patients benefit from early plasma administration with balanced transfusion ratios. Availability of plasma in the ED has been limited by the time needed to thaw fresh frozen plasma (FFP). Our institution adopted a liquid plasma (LQP) protocol to facilitate early plasma administration upon patient arrival. This study compares our pre- and post-protocol implementation transfusion outcomes.
Methods: This was a retrospective study evaluating a LQP protocol implementation one year pre- and post-implementation at a Level 1 trauma center. Patients 16 years or older who received blood in the ED were included. Patients with systolic BP <90mmHg received transfusions. Pre-LQP resuscitation protocol was transfusion of 2 units pRBCs, post-LQP protocol was 1U pRBC and 1U LQP, each could be repeated once before MTP initiation. The primary outcome was total blood products transfused in 24 hours. Secondary outcomes included death from exsanguination in 24 hours, 30-day mortality, and transfusion related complications (TRALI, ARDS, VTE). A subgroup analysis was performed for the primary outcome for patients who received massive transfusion, or >10 units in 24 hours. A negative binomial generalized linear model was used to assess the outcomes.
Results: 552 total patients were included in the study, 275 in the pre-LQP period (January 2018 to July 9th 2019) and 277 in the post-LQP period (July 11th 2019 to January 2020). There were no major differences in demographics across groups. Median ISS was 22 with primarily blunt injury (75%). There was no effect of LQP protocol on number of blood products transfused in first 24 hours in either the full (p=0.45) or MTP subgroup (p=0.91), and no differences in any secondary mortality outcomes or transfusion-related complications.
Conclusion: Early LQP had no impact on 24-hour blood product usage but is safe to use with no higher rates of mortality, VTE, TRALI or ARDS. LQP may be a more rapid, balanced transfusion alternative to FFP for centers without access to whole blood.

Poster #82

FLOW RATE OF 1:1:1 TRANSFUSION HAS A MODULATING AFFECT ON INFLAMMATORY RESPONSE FOLLOWING INJURY

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Introduction: Past research has shown that transfusion flow rate of PRBCs alone impacts the expression of multi-functional cytokines (IL-6, IL-8, IL-1ra, IL-10, IP 10, MIP1b, MCP-1 and RANTES) independent of injury burden. PRBC transfusion rarely happens in isolation in acute injury and FFP, platelets and cryo may also modulate the inflammatory response. The purpose of this study was to assess the flow rate of matched ratio transfusion strategies and their effect on the inflammatory response to trauma.
Methods: This study utilized severely injured patients from the PROPPR dataset. Volumes of PRBC, FFP, platelets and cryo were calculated for time increments over the first 24 hours after injury. Using linear growth models controlling for aspects of severe injury (mechanism, demographics, measures of injury and shock), key cytokines were modeled against incremental transfusion volumes /time (flow rate) of combined blood products.
Results: 538 patient were included. Expression of IL-6, IL-1ra, IP-10, MCP-1, MIP-1b, RANTES and PDGF were affected by transfusion flow rate (Table). Other cytokines were not affected.
Conclusion: The flow rate of multiple blood products, delivered in a matched fashion, modulates the immune response. This impact was particularly notable with pro-inflammatory IL 6 and chemokines. Though transfusion patterns may not be amenable to manipulation, awareness of the impact of such transfusion strategies on inflammatory response may allow opportunities to modulate the inflammatory response and impact patient care.

Cytokine	PRBC (SE)	FFP (SE)	Platelets (SE)	Cryo (SE)
Pro-Inflammatory				
IL 6	**1.47 (1.21, 1.79) p=0.0485**	**0.75 (0.67, 0.83) p=0.0073**	**2.42 (1.57, 3.71) p=0.0399**	1.11 (0.75, 1.64) p=0.7927
Anti-Inflammatory				
IL 1ra	**1.55 (1.29, 1.87) p=0.0160**	0.91 (0.82, 1.01) p=0.3450	**2.58 (1.75, 3.82) p=0.0155**	0.76 (0.53, 1.10) p=0.4609
Chemokines				
IP 10	0.89 (0.79, 1.02) p=0.3906	0.96 (0.89, 1.03) p=0.5593	**2.29 (1.72, 3.04) p=0.0037**	0.94 (0.73, 1.22) p=0.8160
MIP 1b	1.03 (0.90, 1.19) p=0.8180	1.00 (0.99, 1.01) p=0.9790	0.92 (0.70, 1.25) p=0.7968	**1.76 (1.32, 2.34) p=0.0473**
MCP 1	**1.41 (1.21, 1.65) p=0.0259**	0.90 (0.82, 0.98) p=0.1993	1.43 (1.02, 2.00) p=0.2899	1.45 (1.07, 1.97) p=0.2267
RANTES	**0.66 (0.57, 0.76) p=0.0037**	**1.18 (1.09, 1.28) p=0.0371**	0.77 (0.56, 1.06) p=0.4149	**0.51 (0.38, 0.67) p=0.0167**
Growth Factor				
PDGF	**0.57 (0.46, 0.71) p=0.0093**	1.09 (0.97, 1.22) p=0.4718	1.54 (0.98, 2.40) p=0.3385	0.49 (0.32, 0.75) p=0.0939

Poster #83

IMPACT OF EARLY WHOLE BLOOD VERSUS COMPONENT BLOOD RESUSCITATION ON OUTCOMES AND RESOURCE UTILIZATION IN PATIENTS WITH TRAUMATIC SHOCK

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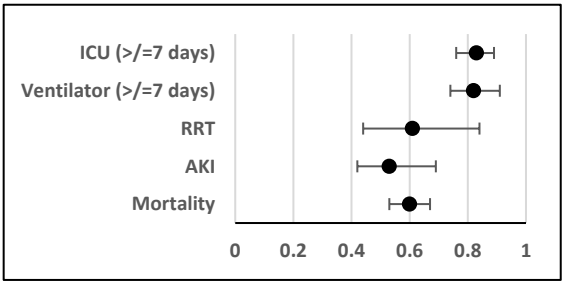
Introduction: Recent military experience has led to a renewed interest in Whole Blood (WB) vs. Component Blood (CB) resuscitation for traumatic shock. Results of civilian studies examining mortality are mixed and there is paucity of studies evaluating morbidity and resource utilization. The current study compares in-hospital mortality, morbidity, and resource utilization for WB vs. CB resuscitation in patients with traumatic shock.

Methods: The National Trauma Data Bank (NTDB: 2020-21) was queried for adult patients receiving early (<4 hours) blood-based resuscitation. Only patients who received either WB or CB exclusively were included and compared by univariate and multivariate regression analysis. Outcomes of interest were in-hospital mortality, morbidity, and resource utilization.

Results: 89,676 patients met inclusion (WB: 6,101; CB: 83,575). WB patients had lower mortality, blood resuscitation volume, acute kidney injury (AKI), and resource utilization [need for Renal Replacement Therapy (RRT), ventilator, ICU, and hospital days – all p<0.05: Table). On multivariate regression analysis, controlling for group differences, WB resuscitation was independently associated with decreased odds of mortality, AKI, RRT need, ventilator, and ICU days (Figure).

Table	WB	CB	p
Mean Age (years)	44.2	46.3	<0.05
Median ISS	17	20	<0.05
RTS	7.1	7.6	>0.05
Mortality (%)	10.7	17.8	<0.05
Blood Res. Vol. (ml)	912	2204	<0.05
AKI (%)	1.5	3.1	<0.05
RRT need (%)	1.0	1.7	<0.05
Ventilator days	6.3	6.7	<0.05
ICU days	7.4	8.0	<0.05
Hospital days	12.1	12.9	<0.05



Conclusion: Early resuscitation with WB exclusively vs CB results in lower mortality, morbidity and resource utilization in patients with traumatic shock.

Poster #84

MIASURVIVEMTP: MACHINE LEARNING FOR IMMEDIATE ASSESSMENT AND SURVIVAL PREDICTION AFTER MASSIVE TRANSFUSION PROTOCOL

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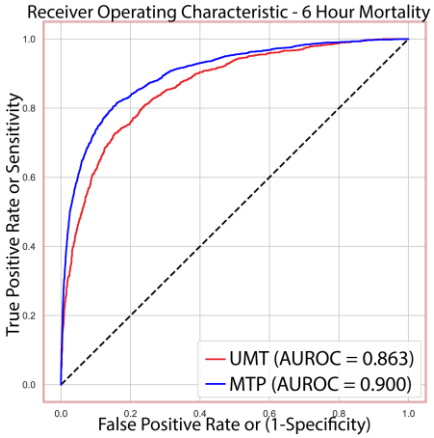
Introduction: Trauma patients requiring massive transfusion (MTP) face high likelihood of mortality. Early identification of patient's chances of survival may help limit futile blood product administration in cases of exsanguinating hemorrhage and may assist in appropriate triaging of these patients.
Methods: Patients from the American College of Surgeons Trauma Quality Improvement Project database (TQIP) who received more than 5 units of red blood cells and/or whole blood within the first four hours of arrival were identified as MTP patients. Those receiving 10 or more units were identified as ultramassive transfusion (UMT) patients. Database variables that were not available immediately or within seconds of arrival were excluded. Machine learning (ML) models were created to predict 6-hour mortality. Models were trained and optimized using fivefold cross validation and a holdout testing set.



Results: Of 5,481,046 patients in TQIP from 2017 to 2021, 47,744 received MTP and 20,337 of these received UMT. 6-hour mortality was 21.9% in the MTP group and 29.9% in the UMT group. A gradient-boosted decision tree model performed best in both the MTP and UMT groups with area under the receiver-operator curve of 0.900 [95% CI 0.892-0.908] and 0.863 [95% CI 0.850-0.875] respectively (Figure 1), and an area under the precision recall curve of 0.76/0.75 respectively.
Conclusions: ML models reliably predict mortality in both MTP and UMT patients with data available immediately upon trauma center arrival. This is the most accurate ML MTP prediction model trained with the largest training data set described to date. This model is designed to be further improved over time as more patients are added to this national registry. Such an approach can help improve patient selection in MTP/UMT scenarios and optimize the distribution of this limited resource.

Poster #85

OCCULT HYPOPERFUSION IN TRAUMA PATIENTS: A SYSTEMATIC REVIEW ON AGE-SPECIFIC CLINICAL OUTCOME

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Introduction: Occult hypoperfusion (OH) is defined as normal vital signs and inadequate tissue oxygenation. OH is associated with poor outcome after trauma. However, the effect of age is unclear. The aim of this study is to determine the impact of OH on outcome in polytrauma in both middle-aged and geriatric patients.
Methods: Adult polytrauma patients (ISS >16) were extracted from our prospectively maintained trauma database. Two groups were composed and compared: a group of MIDdle-aged people (30-59yrs) and OLDer adults (60+yrs). We further distinguished between cases of OH: Lactate > 2 mmol/l plus SBP > 90 mmHg and PR < 120 bpm, shock-cases (SBP < 90 or PR > 120) and regular cases (all other patients). We analyzed the impact of hemodynamic status on outcome in both groups (MIDdle aged vs. OLDer adults). Outcomes included: Intensive Care Unit (ICU)-stay, length of stay (LOS), complication rates and mortality.
Results: A total of 1,782 patients were included. The group MID. Included 1,067 patients, whereas 715 individuals were selected for the OLD-group. In the MIDdle-aged study group, ICU-stay (P=0.43), LOS (P=0.80) did not differ between shock and OH patients. As anticipated, highest mortality rates were found in the shock patients (39%). Mortality was also significantly higher in the OH-group than in normal patients (20 vs. 8%, P >0.05). In the OLD-group mortality and hospitalization times were significantly higher higher upon shock than in the groups. However, no differences were observed between OH-patients and normal trauma patients.
Conclusion: This study shows that occult hypoperfusion is associated with increased mortality in middleaged patients. In older patients (>60yrs), however, no difference in morbidity nor mortality was found between OH and non-OH trauma patients. These findings contradict the literature. It is tempting to hypothesize that in the case of severe polytrauma, OH is an important risk factor for impaired outcome in middle-aged patients, but not in older patients. The role of OH in different age groups should be investigated in future prospective studies of severely injured trauma patients.

Poster #86

THE EFFECT OF PARTIAL REBOA CATHETERS ON HEMORRHAGE-RELATED DEATH: AN ANALYSIS OF THE AAST AORTA REGISTRY

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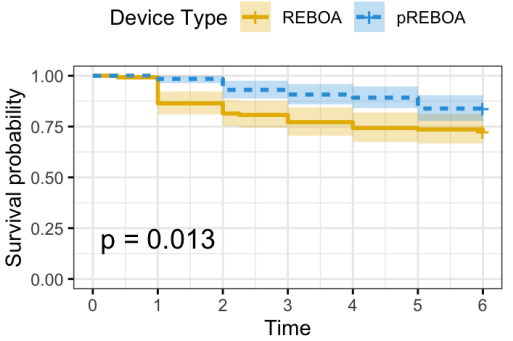
Introduction: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is a resuscitative adjunct used to temporize non-compressible hemorrhage. Partial aortic occlusion is a strategy used to mitigate ischemic complications by titrating flow across the aortic balloon. Next generation partial REBOA (pREBOA) catheters are designed to accurately titrate complete or partial aortic occlusion, and have been used across North American centers of excellence. This study evaluates whether the choice of catheter is associated with hemorrhage-related mortality, defined as death within 6 hours.
Methods: The AORTA registry was queried to identify all adult trauma patients undergoing successful endovascular aortic occlusion (AO) in the emergency department or operating room from Jan 2020 to Jan 2024. Patients identified as dead-on-arrival or with a shock index <0.6 were excluded. Primary outcome was 6-hour mortality. Multi-level cox regression was used, adjusting for institution, year, shock index, ISS, mechanism, and zone of AO.
Results: 273 cases across 26 institutions were included (n=142 REBOA vs. 131 pREBOA). There were no differences in sex, age, ISS (33 IQR 22-42), AO zone (65% zone 1), or time to AO (29 mins IQR 20-50). The use of pREBOA catheters increased by year and was associated with longer durations of AO (median 45 IQR 30-78 vs. 36 mins IQR 18-60, p=0.026), partial AO accounting for a substantial proportion of AO time (median 31 mins IQR12-65). Mortality at 6-hours was 22% (REBOA 28% vs. pREBOA catheters 16%, p=0.02). pREBOA catheters were independently associated with a 70% decreased risk-adjusted hazards of 6-hour mortality (HR 0.30, 95%CI 0.15-0.60).
Conclusion: The use of pREBOA catheters was associated with a decreased hazards of death from hemorrhage. These findings support the ongoing prospective study of pREBOA as a resuscitative strategy for select patients with hemorrhagic shock.



HR 0.30, 95%CI 0.15-0.60. Adjusted for institution, year, shock index, ISS, mechanism, and zone of aortic occlusion

Poster #87

TIME MATTERS: THE EFFECT OF PREHOSPITAL TXA AND TRANSPORT TIME ON MORTALITY

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Introduction: Current data on tranexamic acid (TXA) supports early use in hemorrhagic shock, yet the ideal population for pre-hospital TXA has not been elucidated. While timing of TXA administration has been thoroughly examined, the effect of total transport time (TTT) has not been studied in those that receive pre-hospital TXA. Therefore, we sought to evaluate the effect of pre-hospital TXA in patients with a long TTT.
Methods: The trauma registry at a large, mixed-catchment, level I trauma center was queried for patients who did and did not receive pre-hospital TXA over a 3.5 year period. Demographics, TTT, transfusions, complications, and mortality were evaluated. Univariate and multinomial analyses were utilized to evaluate predictors of mortality.
Results: During the study period, 8,352 patients were included with 5,833 having a short (≤1 hour) and 2,519 a long (>1 hour) TTT. Patients were primarily male (64%), with a blunt mechanism (85%), had a median TTT of 50 min, a median ISS of 9, and a mortality rate of 6%. There was no significant difference in transfusions, ISS, or mortality between patients with short or long TTTs. Multinomial logistic regressions were performed on groups with short and long TTTs with the primary outcome of mortality. Pre-hospital TXA in short TTT patients was not associated with a difference in mortality. However, pre-hospital TXA administration in those with a long TTT was associated with decreased mortality in patients receiving blood and who were severely injured (table).
Conclusion: In patients requiring transfusions and those that are severely injured with a TTT >1 hr, the use of pre-hospital TXA is associated with improved outcomes. TXA should be considered in bleeding or severely injured patients with a longer TTT, but may not provide benefit in those with quicker access to definitive care.

Impact of TXA on Mortality in Long TTT Patients			
	aOR	95% CI	P-Value
All Patients (N=2,519)	3.429	[0.907, 12.958]	0.069
Transfused Patients (N=358)	5.46	[1.158, 25.749]	0.032
ISS > 15 (N=757)	6.553	[1.266, 33.929]	0.025

Poster #88

WHOLE BLOOD TRAUMA RESUSCITATION IN CHILDBEARING AGE FEMALES: PRACTICE PATTERNS AND TRENDS

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Introduction: The use of low titer group O whole blood (LTOWB) in bleeding trauma patients is increasingly common. However, some centers do not administer RhD-positive LTOWB to females <50 due to concerns about RhD-negative patients becoming D-alloimmunized. This study examined practices related to LTOWB transfusion as they pertain to age and sex using a large prospectively collected database.

Methods: This was a secondary analysis of the Shock, Whole blood, and Assessment of TBI (SWAT) trial: a prospective, multicenter observational cohort study where outcomes following transfusion to 1046 injured patients were analyzed at 7 level 1 trauma centers between 2018-2021. The proportion of patients who received LTOWB or exclusively conventional components (CT) was examined over the course of the original study and stratified by age and sex. We characterized the RhD-types of females <50 and surveyed the RhD-blood product selection practices for trauma patients at these centers.

Results: A total of 1046 patients were evaluated; 130 females <50, 77 females ≥50; 661 males <50, and 178 males ≥50. Of females <50 13/128 (10.2%) were RhD-negative. Of females <50, 34/130 (26.2%) received LTOWB including 4/33 (12.1%) who were RhD-negative. In contrast, 587/916 (64%) of all other recipients received LTOWB. RhD blood product selection practices varied considerably between institutions, e.g., only 1/7 centers stocks RhD-negative LTOWB, and 1/7 centers does not transfuse RhD-positive LTOWB to adult females <50. Multiple strategies for deciding which patients should receive RhD-positive or negative LTOWB and CT in initial resuscitation as well as the use of D-alloimmunization prophylaxis for RhD-negative females <50 after receipt of RhD-positive blood were reported. Over the study period, the percentages of females <50 who received LTOWB between 2018-2021 were 0%, 28.3%, 35.1% and 25.0%.

Conclusion: There were fewer than the expected 15% of RhD-negative females <50 in this cohort of patients. Most institutions transfused LTOWB to females <50 but these patients were less likely to receive LTOWB than other recipients. As the understanding of safety of RhD-positive products in females <50 improves, the reasons why a lower proportion of females <50 compared to other patient groups received LTOWB need to be elucidated.

Poster #89

THE INCREASING NATIONAL BURDEN OF POTENTIALLY PREVENTABLE DEATHS DUE TO HEMORRHAGE

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Introduction: The use of low titer group O whole blood (LTOWB) in bleeding trauma patients is increasingly common. However, some centers do not administer RhD-positive LTOWB to females <50 due to concerns about RhD-negative patients becoming D-alloimmunized. This study examined practices related to LTOWB transfusion as they pertain to age and sex using a large prospectively collected database.
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Conclusion: There were fewer than the expected 15% of RhD-negative females <50 in this cohort of patients. Most institutions transfused LTOWB to females <50 but these patients were less likely to receive LTOWB than other recipients. As the understanding of safety of RhD-positive products in females <50 improves, the reasons why a lower proportion of females <50 compared to other patient groups received LTOWB need to be elucidated.

Poster #90

THE UTILITY OF ADDING DELTA SHOCK INDEX TO STANDARD TRAUMA TRIAGE CRITERIA: A NTDB ANALYSIS

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Introduction: Shock index (SI) and delta shock index (ΔSI) have shown utility identifying severe injury. Despite this, trauma team activation criteria (TTAC) do not include either. Using the National Trauma Data Bank, we aim to evaluate the effect of integrating ΔSI and SI in standard TTAC.
Methods: Retrospective cohort study using the NTDB database 2017-2020. Patients with missing vital sign data were excluded. Subjects in the dataset were queried for standard TTAC and positive need for trauma intervention (NFTI) defined as appropriately classified. SI was calculated as heart rate divided by systolic blood pressure. ΔSI was calculated as the change from prehospital SI to arrival SI. The accuracy for NFTI was determined from SI and ΔSI in conjunction with standard TTAC. To optimize this approach a classification tree using a recursive partitioning algorithm was utilized to identify optimal cutoffs for SI and ΔSI in TTAC.
Results: Over 911,000 patients were available for analysis. Using standard TTAC 69.5% were classified correctly, with the addition of SI or ΔSI we found no improvement in classification accuracy. Utilizing the classification tree (Figure 1) and focusing on patients without mechanistic or anatomic TTAC (n >759,000), the NFTI accuracy is 71.7%. This approximates to approximately 23,000 additional trauma team activations with over 13,000 correctly triaged.
Conclusion: The use of both SI and ΔSI in conjunction should be considered for addition to TTAC. Individually neither value adds significant value as a TTAC. While the NTDB does have limitations in the number of vital sign values available, this study demonstrates that combining measurements of SI and ΔSI can achieve improvements in trauma triage. These findings call for additional study with more granular EMS datasets.

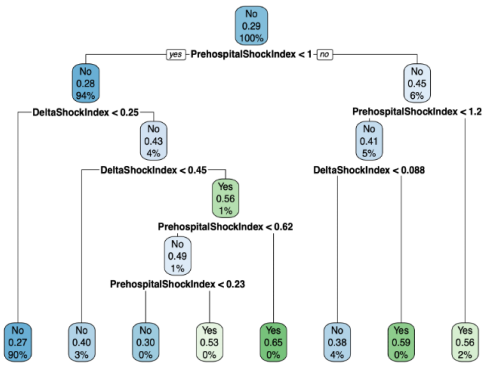

Figure 1. Classification tree
Nodes on left side of rule are in agreement

Poster #91

TOURNIQUET APPLICATION BY BYSTANDERS: MORE WORK TO DO

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Introduction: Civilian prehospital tourniquet placement (TP) has increased over time. Studies have shown that prehospital TP may be associated with decreased hemorrhagic shock and improved survival, however tourniquets may be placed incorrectly or without clear indication. Additionally, no national study has evaluated outcomes of bystander TP. This study sought to compare outcomes of prehospital TP by emergency medical services providers (EMS) or first responders (police, fire) versus civilian bystanders, hypothesizing civilian TP would have less acuity improvement than EMS TP.

Methods: The 2017-2020 National Emergency Medical Systems Information Systems (NEMSIS) database was queried for TP for patients of all ages. Acuity was reported in the database, and improvement was defined as change from critical to emergent or lower acuity. Descriptive statistics for demographics, TP and improvement were completed. A multivariable analysis was also performed to determine associated improvement in acuity.

Results: 3,003 patients had prehospital TP, 85% of which were applied by EMS. There was a lower success rate of TP by bystanders (90% vs 97%, $p<0.001$) compared to EMS and first responders. When combining all groups, there was a higher rate of improved acuity for TP after EMS arrival on site compared to before (65% vs 58%, $p=0.002$). Placement of tourniquet by bystander was not associated with improvement in acuity (OR 1.1 95% CI 0.97-1.25, $p=0.12$). However, TP by first responders was associated with improved acuity (OR 1.22 95% CI 1.01-1.44, $p=0.02$).

Conclusion: Tourniquets are life-saving tools. First responders seemed to be trained adequately and EMS are critical for tourniquet success. While bystander TP appears to be less efficacious, bystanders are successfully using tourniquets. Trauma programs should consider outreach programs in their communities with respect to tourniquet application to save lives.

Poster #92

AN ALARMING TURNING POINT IN BALTIMORE HOMICIDE TRENDS: ANALYSIS OF 6500 VIOLENT DEATHS

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Introduction: Freddie Gray's death in Baltimore police custody on April 19th, 2015 was followed by civil unrest and a sustained, citywide surge in interpersonal violence. Anecdotally, clinicians also observed a heighted pace with which patients presented with multiple–and more often lethal–injuries. This study thus quantified the temporal association between Gray's death and indicators of Baltimore homicide incidence and violence intensity.
Methods: Autopsy data was obtained for all homicides committed from 2005-2017 in Maryland. Decedents were grouped by mechanism of injury: gunshot wound (GSW), stab wound (SW), or other. The number of distinct GSW or SW sustained was collected for each victim of penetrating trauma. The primary outcome was the overall homicide rate. The secondary outcome was the 90th percentile of total wounds sustained by GSW and SW victims, which we defined as the high violence intensity threshold (HVIT). Difference-in-differences regressions analyzed trends in homicide rates and HVIT by fiscal quarter; comparisons were made between trends from before and after the death of Freddie Gray. We separately evaluated trends in Baltimore and the rest of MD, the latter serving as an ecological control.
Results: Autopsy reports for 6508 homicides were evaluated (Baltimore City, 42%; rest of MD, 58%). Statewide, most deaths were due to gun violence (74%). Homicides from GSW were more common in Baltimore (79% vs. 70%), while homicides due to SW were more common in the rest of MD (16% vs. 11%). Following Gray's death, firearm-related homicides composed an increased proportion of city totals (77% of pre-event vs. 86% of post-event Baltimore homicides). This event was also associated with an increase in Baltimore homicide incidence by 13.1 per 100,000 persons (95% CI: 8.9-19.6; $p<0.001$). Accounting for trends in the rest of MD, the HVIT for GSW homicides increased from 8 to 10 after the event ($p=.02$). There was no temporal change in the HVIT for SW homicides ($p=.47$).
Conclusions: After the death of Freddy Gray, the homicide rate grew significantly in Baltimore relative to the rest of MD. This was accompanied by a significant rise in violence intensity observed among firearm homicide victims in Baltimore. These findings coincided with increased prevalence of firearm-related injuries in Baltimore's homicide victim pool, suggesting that a surge in firearm violence may have precipitated the trends observed.

Poster #93

BEDSIDE BRILLIANCE: USE OF BMAT SCORE TO REDUCE ACUTE PHYSICAL AND OCCUPATIONAL THERAPY REFERRALS IN TRAUMA PATIENTS

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Omar Hejazi, MD; Collin Stewart, MD, FACS;
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Introduction: Banner Mobility Assessment Tool (BMAT) for nurses is a tool to identify the mobility status of patients admitted to hospitals. However, there is limited data on the role of BMAT in identifying the trauma patients who might benefit most from physical or occupational therapy (PT/OT) services. This study aims to assess the association between BMAT scores and the true need for PT/OT and outcomes in trauma patients.
Methods: We performed a retrospective review of adult (≥18 years) trauma patients who were admitted to our level I trauma center and were consulted for PT/OT services in 2021. We excluded patients who died during the admission. Patients were stratified based on BMAT score: 1 (maximal assistance), 2-3 (moderate assistance), and 4 (minimal assistance). The primary outcome was the rates of acceptance and deferral of acute skilled PT/OT by therapists. The secondary outcome was discharge disposition. Multivariable logistic regression analyses were performed to identify the independent association between BMAT scores and outcomes.
Results: We identified a total of 320 patients who met the inclusion criteria (BMAT 1: 70, BMAT 2-3: 225, BMAT 4: 25). The mean age was 55 years and 53% were male. The median ISS was 8. Patients in the lower BMAT score categories received higher rates of acute skilled PT/OT services (BMAT 1: 100% vs BMAT 2-3: 89% vs BMAT 4: 20%, $p < 0.001$) and were more likely to be discharged to rehabilitation or skilled nursing facilities (BMAT 1: 79% vs BMAT 2-3: 53% vs BMAT 4: 0%, $p < 0.001$). On regression analyses, increasing BMAT scores were independently associated with reduced odds of receiving acute PT/OT services (aOR = 0.19, 95%CI = 0.12 – 0.33, $p < 0.001$ and discharge to rehabilitation or skilled nursing facilities (aOR = 0.25, 95%CI = 0.15 – 0.43, $p < 0.001$). All BMAT 4 patients who received acute PT/OT services (20%) were advised home discharge with outpatient PT/OT follow-up and the rest (80%) were deferred as they were independent with activities of daily life with no acute skilled OT/PT services required.
Conclusion: BMAT accurately predicts the need for acute PT/OT consultation. With increased burden and limited availability of PT/OT services, BMAT can be used to avoid potentially unnecessary PT/OT referrals to reduce healthcare resource utilization.

Poster #94

CELL PHONE MEASURED POPULATION MOBILITY AND INTERACTIONS AS A PREDICTOR OF TRAUMA VOLUME AND TRAUMA CENTER NEED

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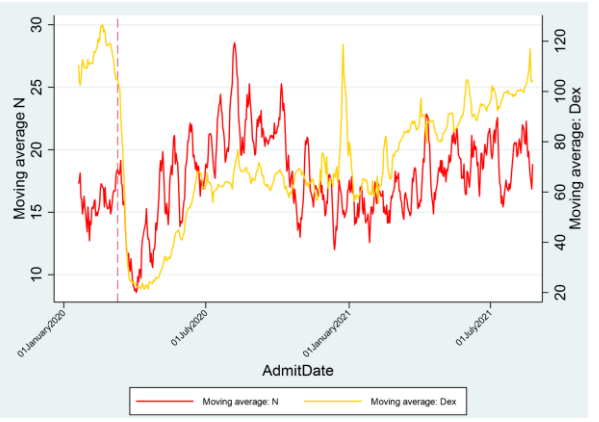
Introduction: Predicting the need for trauma centers is based primarily on population. Population activity measured through cell phone tracking used for commercial marketing purposes may improve the prediction accuracy. Changing activity during the COVID-19 pandemic created a natural experiment to compare trauma admissions and cellular phone mobility.
Methods: Trauma admissions (TA) from all level I trauma centers in one state, January 2020 to August 2021, were aggregated and compared to the Device Exposure Index (DEX) which provides a standardized measure of cellular device interactions per day in a given county. Both were smoothed with a 7-day moving average. Correlation coefficients were calculated, and linear regression adjusted for autocorrelation and seasonality.
Results: The DEX and TAs declined sharply after pandemic lockdowns were implemented, with DEX and TAs following similar patterns across the participating centers (Figure). TAs and the DEX were correlated, Spearman's rho=0.2 ($p < 0.05$). In regression, DEX was associated with TAs ($p=0.034$). Half of low admission days (TA<15) occurred when the DEX was less than 50, whereas only a quarter of all high admission days (TA>=20) occurred when the DEX was less than 50.
Conclusion: Shifting TA patterns at the onset of the COVID-19 pandemic, correlated with DEX suggesting this may be a valuable measure for long-term trauma center planning. Daily DEX may also help predict short-term TAs.



Poster #95

FIVE YEAR, POST-IMPLEMENTATION ANALYSIS OF AN AIR EMS AUTO-LAUNCH SYSTEM FOR SEVERLY INJURED TRAUMA PATIENTS

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Introduction: Prolonged transport times and double transfers have the potential to worsen trauma mortality by delaying time to definitive hemorrhage control. The Air EMS Auto-Launch System (AALS) was developed to expedite care of severely injured trauma patients by prompting air EMS agencies to the scene of injury. This is the five-year analysis post-implementation of the AALS.
Methods: This study is a retrospective analysis at a Level 1 trauma center following the implantation of the AALS in 2018. Adult trauma patients from January 2015- September 2023 with ISS >15 were included. Transport origin, transport time, initial vital signs, and blood product administration data were collected. Mortalities on arrival, within 4, and 24 hours were compared before and after implementation. Preliminary analysis was completed with standard student t-test and Chi-Square test.
Results: A total of 695 patients met the inclusion criteria for the study. Following initiation of the system, there were significantly more patients that came directly from the scene compared to a referring hospital, X^2 (2, N=693) = 8.7, $p < 0.05$. The ISS scores of presenting patients were similar compared between before and after the implantation of the system, (27.90 ± 11.95 vs 28.42 ± 11.30, $p = 0.603$). Patients dead on arrival and 4-hour mortality remained similar through 2023. Mortality at 24-hours was significantly lower in 2023, the fifth year after AALS implementation, X^2 (2, N=249) = 5.046, $p < 0.05$.
Conclusion: The AALS system decreased trauma transfers, promoting the opportunity to expedite hemorrhage control and improve mortality within 5 years of implementation. These results highlight the importance of rapid, definitive management and justify the ongoing use of the AALS system for severely injured trauma patients.

Poster #96

GREAT DISPARITIES EXIST IN PREHOSPITAL TRANSFUSION RESOURCES

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Baylor Scott and White

Introduction: Hemorrhage remains the most common preventable cause of mortality in critically injured patients. While early transfusion improves survival in military & civilian settings, few institutions have implemented Low Titer O-Whole Blood (LTOWB) into their prehospital transfusion algorithms. We planned a survey to determine the variation in prehospital transfusion resources for trauma centers in the Southwestern US.
Method: Multicenter trials committee conducted an anonymous 26-question survey of prehospital blood transfusion resources. The survey included: trauma center demographics and location, number of Helicopter Emergency Medical Service (HEMS) and Ground EMS agencies, and types of blood products available. A single survey was filled out per center in coordination with the center's trauma medical director or trauma program manager. Descriptive statistics were utilized to determine variance.
Results: 36 trauma centers across 14 US states responded to the survey. The majority were level 1 trauma centers (30/36) in urban settings (20/36). Four trauma centers were rural. All centers received critical hemorrhaging trauma patients from both HEMS and EMS. 22 centers received critical patients from ≥3 HEMS agencies, and 13 centers have ≥ 10 EMS agencies transporting critical patients. EMS was the predominate mode of transportation for critically injured patients. Prehospital blood availability was more likely on HEMS (25/35) than EMS (9/35) as was LTOWB (18/35 vs 5/35). HEMS (16/35) was more likely to have plasma than EMS (1/35). 10 centers did not have any prehospital blood available by HEMS or EMS. Most critical, the four rural trauma centers had only 2 of 4 HEMS carry LTOWB and no EMS vehicles carried any blood products.
Conclusion: Our survey demonstrates significant discrepancies in prehospital blood availability and concerns that Ground EMS agencies are under-resourced for life sustaining therapies. While the majority of HEMS carried blood, ground EMS was the primary mode of transport for hemorrhaging trauma patients at most centers. Most significant, rural trauma centers, with the longest transport times, had the least access to prehospital blood. Further work is needed to better understand limitations in prehospital blood supply and how to make it available for all trauma centers.

Poster #97

HAS NOTHING CHANGED? EVALUATING A DECADE OF EMERGENCY RESUSCITATIVE THORACOTOMY

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Introduction: The 2015 EAST guidelines have attempted to establish clear indications for Emergency Resuscitative Thoracotomy (ERT) to optimize procedural outcomes. The impact of the updated guidelines on current clinical practice and patient survival remains unknown. In this nationwide analysis, we aim to analyze changes in ERT utilization and survival patterns in trauma patients over the last decade.

Methods: The ACS-TQIP 2010-2020 was used to identify all patients ≥15 years old who underwent ERT within the first hour of hospital admission. ERT was defined using ICD-9 and ICD-10-PCS codes and ERT rates were calculated for every 100,000 trauma patients. Joinpoint Regression analysis was employed to identify any changes in procedure and survival rates. Patients were stratified based on the mechanism of injury - blunt vs. penetrating- and trauma center verification level to assess whether the performance of the ERT and survival rate trends varied through the years.

Results: 4,899 patients underwent ERT, with 3,464 (71%) for penetrating trauma. The average survival rate was 21.07% for penetrating trauma and 8.85% for blunt trauma. ERT was performed in level I trauma centers in 55% of cases, in level II in 14%, and in level III centers in 31% of cases. Following Joinpoint regression analysis, we noticed a significant decrease in ERT performance from 2010 to 2017, and an increase in ERT following 2017 in all trauma centers, even when stratifying the institutions based on ACS verification level. Following 2017, there has been a significant increase in ERT performance for penetrating trauma. ERT following blunt trauma has decreased from 2010 to 2020, albeit not significantly. However, no significant differences in survival were seen following the implementation of the 2015 guidelines regardless of the mechanism of injury or trauma center level.

Conclusion: Since 2017 there has been a nationwide increase in ERT performance for penetrating trauma compared to blunt trauma. However, despite nationally published guidelines intended to improve patient selection and outcomes, survival following ERT has not changed significantly in the past decade regardless of the mechanism of injury or trauma center level. These findings warrant further studies aimed at identifying if barriers exist to nationwide adherence to current clinical guidelines.

Poster #98

NOVEL STRATEGIES FOR RCTS FOR TRAUMA CARE: HARNESSING THE POWER OF CNTR, TQIP AND THE STEPPED WEDGE DESIGN

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Introduction: Clinical research in the trauma population faces enrollment challenges associated with high acuity settings and difficulty obtaining surrogate consent. Passive data collection through the American College of Surgeons (ACS) Trauma Quality Improvement Program (TQIP) provides an opportunity to test the effect of minimal-risk, team-based interventions in a large cohort of seriously injured patients. The objective of this project was to design a randomized clinical trial (RCT) at high volume trauma centers, leveraging TQIP and the Coalition for National Trauma Research (CNTR), that could feasibly produce strong enrollment of trauma patients with judicious use of resources and provide a study design model that others might adopt for future research.
Methods: With support from CNTR and TQIP, we surveyed level 1 trauma centers to determine the number of eligible patients at US centers that were willing to participate. We calculated study size using estimates of eligible family and clinicians for survey completion and the TQIP variable for ICU length of stay (LOS). We identified covariates and other outcomes of interest in the ACS National Trauma Data Standard (NTDS) Data Dictionary and worked with TQIP to collect two additional patient outcomes (vital status at six months and quality assurance for ICU LOS).
Results: We designed an RCT with an estimated enrollment of 4,500 patients at eight trauma centers, funded by the NIH and approved by the IRB. The intervention, Best Case/Worst Case-ICU, is a team-based communication tool. We use a stepped wedge design to allow time for implementation at each study site and reduce confounding for temporal trends. For this study, consent is not required for intervention or patient data extraction, as the intervention and TQIP qualify as quality improvement efforts. TQIP developed an incremental data collection platform to capture additional patient outcome variables.
Conclusion: Leveraging CNTR and TQIP offers an ideal approach for overcoming the difficult barriers of enrolling trauma patients in clinical trials. This study design can be emulated for interventions implemented at the site level to generate important knowledge to advance the care of trauma patients.