Quick Shots Session I

Quick Shot #1
January 19, 2023
8:45 am

RURAL TRAUMA TEAM DEVELOPMENT COURSE POSITIVELY IMPACTS ITS DESIRED OBJECTIVES: A PROSPECTIVE, OBSERVATIONAL STUDY

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Presenter: Zachary M. Bauman, DO, MHA

Objectives: The Rural Trauma Team Development Course (RTTDC) is designed to help rural hospitals better organize and manage trauma patients with their limited resources in a timely fashion. Although RTTDC is a well-established course, limited literature exists regarding improvement in the overall objectives for which the course was designed. The aim of this study was to analyze the goals of RTTDC, hypothesizing improvements in course objectives after the course was provided.

Methods: This was a prospective, observational study from 2015 to present. All hospitals completing the RTTDC led by our Level 1, academic trauma hospital were included. Our institutional database was queried for individual patient data. Cohorts were delineated before and after RTTDC was provided to the rural hospital. Basic demographics were obtained. Outcomes of interest included: ED dwell time, time to decision to transfer, number of images obtained, and number of CT scans obtained. Chi square and non-parametric median test were used for analysis. Significance was set at $p<0.05$.

Results: 16 rural hospitals were included with a total of 472 patients transferred (240 before and 232 after). Patient demographics were similar before and after RTTDC with blunt trauma the main mechanism of injury. Outcomes of interest are seen in the table.

Conclusions: The execution of RTTDC demonstrated improvements in ED dwell time, decision time to transfer, transfer time and number of images obtained. Although times were still longer than preferred, RTTDC positively impacts its desired objectives.

Demographics	**Before RTTDC**	**After RTTDC**	***P***
Age, mean (SD)	57.9 (23.9)	53.4 (24.8)	0.712
Gender, female (%)	172 (36.4)	97(40.2)	0.073
ISS, median (IQR)	9 (4, 14)	9 (4.5, 13)	0.912
ICU Days, median (IQR)	2 (2, 4)	2 (2, 4)	0.916
Ventilator Days, median (IQR)	2 (2, 4.75)	2 (4.5)	0.611
Outcomes			
ED Dwell Time (min), mean (SD)	195.9 (322.1)	132 (77.1)	0.003
Decision to Transfer (min), mean (SD)	142.9 (317.5)	81.1 (65.4)	0.004
Total # Images Obtained, mean (SD)	2.8 (1.9)	2.2 (1.5)	0.000
Total # CT Scans Obtained, mean (SD)	1.6 (1.5)	1.2 (1.2)	0.002

Demographics and Outcomes (SD = Standard Deviation; IQR = Interquartile Range; CT = Computed Tomography)

Quick Shots Session I

Quick Shot #2
January 19, 2023
8:51 am

USING TRAUMA VIDEO REVIEW TO FIND THE GOLDILOCKS PRE-ACTIVATION TIME

Daniel Jafari, MD, MPH*, Ella Rastegar, BS, EMT-B, Manuel Beltran del Rio, PhD,
Cristy Meyer, RN, MSN, CEN, Daniel Rolston, MD, Eric N Klein, MD*,
Matthew Bank, MD*, Maria Sfakianos, MD, Daniel Jafari, MD, MPH*
North Shore University Hospital

Presenter: Ella Rastegar, BS, EMT-B

Objectives: We sought to determine the optimal time prior to patient arrival for trauma team activation which resulted in the greatest team efficiency. The time to complete critical events (TCCE) during resuscitation was used as a surrogate for trauma team efficiency. We hypothesized that there exists a time window for trauma team pre-activation which minimizes TCCE.

Methods: This is a retrospective analysis of all video recorded traumas at our level 1 trauma center from 1/1/2018 through 2/28/2022 who received the highest level of trauma team activation and had a prearrival notification. The trauma video review is an integrated quality improvement process that allows experienced personnel to identify the TCCEs for all patients. A total of 11 critical events were selected (listed in the Figure 1 legend), and TCCEs were determined using video timestamps. To be able to compare TCCEs from the different events listed in the Figure 1 legend, a normalized TCCE (nTCCE) was calculated by dividing each TCCE by its mean time for that event among all patients. Pre-activation times were categorized into 1-minute intervals and nTCCEs for each category were compared individually using one-sided Mann-Whitney U test.

Results: A total of 460 trauma pre-activations were included, which bore 1734 TCCEs. The majority (91%) of pre-activations occurred within 8 minutes of patient arrival. As depicted in Figure 1, pre-activation times in the 4 to 6 minute range yielded the most consistently efficient trauma teams, with no TCCE taking more than 15 minutes. Additionally, Mann-Whitney U tests revealed that nTCCEs corresponding to pre-activation times between 4 and 7 minutes were significantly shorter than those of <4 ($p < 0.05$), and those in the >7 category were larger than those in the minute 7 group ($p<0.01$) (Figure 2).

Conclusions: A pre-activation time of 4 to 7 minutes is associated with the best team efficiency, as evidenced by the shortest nTCCEs. This timeframe may be an optimal window for trauma team activations.

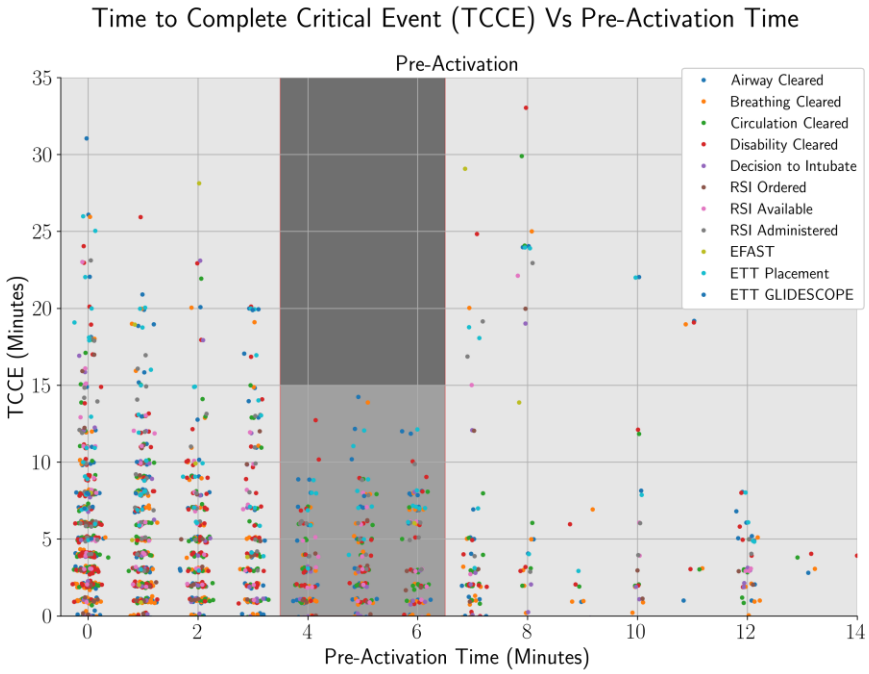

Fig-1 Time to Complete Critical events Vs Pre-activation times. Different types of events are shown in different colors. A slight jitter has been applied to show density. Shaded region indicates apparent concentration of shorter Time to Complete Critical Events.

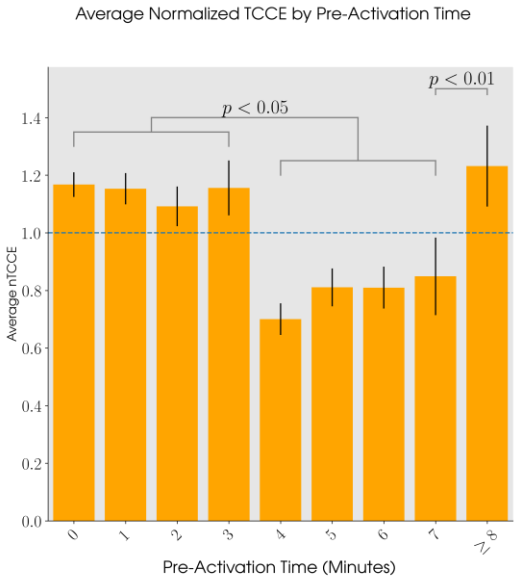

Fig-2 Average normalized Time to Complete Critical Events Vs Pre-activation time. Values under 1 indicate above-average performance. Black vertical lines are Standard Error of Means. P-value brackets indicate individual comparisons between elements in either group.

Quick Shots Session I

Quick Shot #3
January 19, 2023
8:57 am

CONTEMPORARY MANAGEMENT AND OUTCOMES OF PENETRATING COLON INJURIES USING THE 2020 AAST ORGAN INJURY SCALE

Ahmad Zeineddin, MD*, Mariana Almeida, BS, Kevin M. Schuster, MD, MPH*,
Ghassan Jawad, MD, Baila Maqbool, MD*, Abby Sheffield, DO,
Marie L. Crandall, MD, MPH, FACS*, Navpreet K. Dhillon, MD*, Brandon Radow, MD*,
Matthew L. Moorman, MD, MBA, FACS, FAWM, FCCM*, Niels D. Martin, MD*,
Christina Jacovides, MD*, Debra M. Lowry, MD, FACS *, Krista L. Kaups, MD, MSc, FACS*,
Chelsea Horwood, MD*, Nicole L. Werner, MD, MS*, Jefferson Proaño-Zamudio, MD,
Haytham Kaafarani, MD, MPH*, William A Marshall, MD, Laura N. Godat, MD, FACS *,
Gail Tominaga, MD, Kathryn Schaffer, MPH, Kristan Staudenmayer, MD, MS*,
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Presenter: Ahmad Zeineddin, MD

Objectives: The AAST OIS colon scoring system was updated in 2020 and for the first time included penetrating colon injuries. While the original OIS described anatomic injury, updated OISs are used to guide treatment. We sought to validate the 2020 OIS system for isolated penetrating colon injures in a large multicenter study.

Methods: This was a retrospective study of patients presenting to 12 Level 1 trauma centers with penetrating colon injuries and AIS<3 in other body regions from 2016-2020. Primary outcomes were surgical management and complications; secondary outcome was association of operative OIS with preoperative imaging. Bivariate analysis was done with chi-square, ANOVA, and Kruskal Wallis, where appropriate. Multivariable models were constructed in a stepwise selection fashion.

Results: We identified 576 patients with penetrating colon injuries. Patients were young and predominantly male with moderate-severe injuries [Table 1]. OIS grade was 1 (12%), 2 (32%), 3 (29%), 4 (13%), or 5 (15%). Higher OIS (Grades 3-5) was associated with a lower likelihood of primary repair and higher likelihood of resection with anastomosis or diversion, need for damage control, abscess, wound infection, leak, acute kidney injury (AKI), and lung injury. After adjusting for confounders on multivariable regression, higher OIS remained associated with lower chance of primary repair and a higher incidence of leak, wound infection, and AKI [Table 2]. Pre-operative imaging was done in 173 (30%) cases with a low-moderate correlation (Spearman Coeff. 0.45).

Conclusions: This is the largest study of penetrating colon injuries and the first multicenter validation of the new OIS specific to these injuries. While imaging criteria alone lacked strong prediction value, AAST OIS colon grade strongly predicted type of intervention and correlated with infectious and non-infectious outcomes.

	Total (n=576)	Grade 1 (n=71)	Grade 2 (n=185)	Grade 3 (n=142)	Grade 4 (n=54)	Grade 5 (n=61)	p-value*
Age	32±13	34±14	32±12	30±12	34±14	34±13	0.29
Male	88%	89%	86%	91%	85%	89%	0.7
ISS	12±7	8±5	10±5	14±9	13±6	15±7	<0.01
Hypotension	18%	6%	15%	17%	29%	27%	<0.01
Primary Repair	35%	92%	49%	24%	13%	11%	<0.01
Resection & Anastomosis	36%	6.3%	28%	43%	49%	47%	<0.01
Ileostomy/Colostomy	29%	2.1%	23%	33%	38%	42%	<0.01
Damage Control Laparotomy	32%	15%	20%	42%	36%	50%	<0.01
Total Blood Products (units)	1 [0-4]	0 [0-2]	0 [0-2]	0 [0-3]	3 [0-7]	2 [0-6]	<0.01
Intra-abdominal abscess	26%	0	20%	32%	39%	38%	<0.01
Wound infection	13%	5.6%	11%	9%	23%	20%	<0.01
Anastomotic leak	5.4%	0	2.2%	7.2%	11%	8.5%	<0.01
Acute Kidney Injury	19%	10%	14%	18%	36%	25%	<0.01
ARDS	4.7%	1.4%	2.2%	4.2%	8.8%	11%	<0.01

Table 1. Patient demographics, injury characteristics, operative intervention, and clinical outcomes per AAST grade

AAST Grade	1	2	3	4	5	ROC
Primary repair	Ref.	0.6 [0.34-1.07]	0.34* [0.18-0.64]	0.11* [0.04-0.29]	0.12* [0.05-0.32]	0.72
Resection & Anastomosis	Ref.	4.9* [1.8-12.9]	12* [4.5-32]	17.6* [6.1-51]	15* [5.3-43]	0.76
Ileostomy/Colostomy	Ref.	19* [2.5-144]	24* [3.2-179]	33* [4.2-262]	27* [3.5-213]	0.77
Intra-abdominal abscess	-	Ref.	1.2 [0.66-2]	1.6 [0.78-3.1]	1.3 [0.64-26]	0.78
Wound infection	Ref.	2.1 [0.67-6.8]	1.1 [0.3-4]	3.7* [1.02-13.4]	2.2 [0.6-8.4]	0.7
Anastomotic leak	-	Ref.	4.1* [1.3-13.1]	5.7* [1.6-20]	4.4* [1.2-15.6]	0.73
Acute Kidney Injury	Ref.	1.65 [0.61-4.5]	1.4 [0.5-3.9]	3.1* [1.1-9.2]	1.9 [0.63-5.8]	0.82
Acute Respiratory Distress Syndrome	Ref.	1.57 [0.17-15]	3 [0.33-27]	6.2 [0.68-56]	6 [0.67-54]	0.9

Ref. : Reference, *statistically significant

Adjusted for age, ISS, hypotension, total blood products, EBL, degree of contamination/spillage, and damage control in a stepwise selection model

Table 2. Adjusted odds ratio and 95% confidence intervals of operative intervention and clinical outcomes per AAST grade

Quick Shots Session I

Quick Shot #4
January 19, 2023
9:03 am

DANGEROUS PASSAGE: THE UTILITY AND ACCURACY OF MODERN CHEST COMPUTED TOMOGRAPHY IN PENETRATING INJURIES WITH POTENTIAL TRANSMEDIASTINAL TRAJECTORY

Marco Sozzi, MD, Kenji Inaba, MD, Brian Williams, MD, Morgan Schellenberg, MD, MPH*, Kazuhide Matsushima, MD*, Matthew J. Martin, MD, FACS, FASMBS*
LAC+USC Medical Center

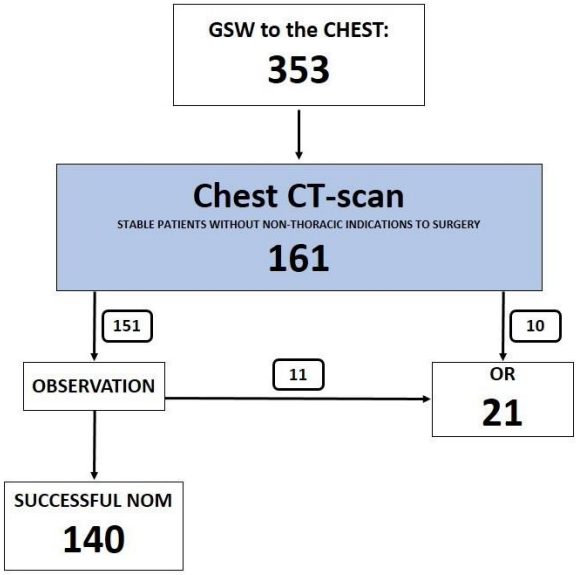
Presenter: Marco Sozzi, MD

Objectives: Evaluation of transmediastinal penetrating injuries often includes multiple studies as CT, endoscopy, esophagography and angiography. No large series have evaluated utility and reliability of chest CT as a standalone screening modality.

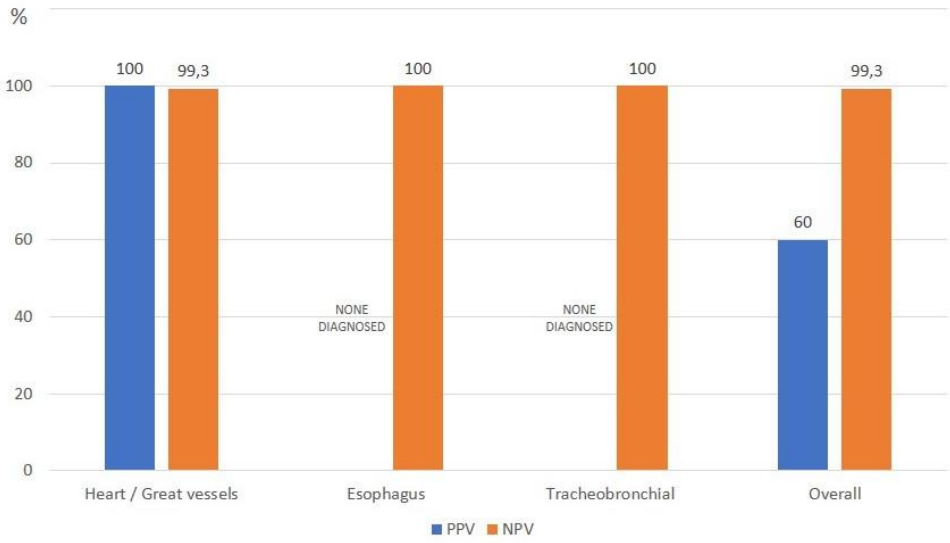
Methods: All patients with thoracic GSWs over a 5-year period were identified. Unstable patients requiring immediate surgery were excluded and remaining underwent chest CT with intravenous contrast. Sensitivity and specificity for clinically significant injuries were tested against an aggregate gold standard of discharge diagnosis including imaging, operative and clinical findings.

Results: Among 353 penetrating chest patients, 161 met inclusion criteria and underwent chest CT. After imaging, 10 (6.3%) had indication for immediate surgery (7 large hemothorax, 1 pericardial bleeding, 2 great vessel pseudoaneurysms) while 151 (94%) were selected for nonoperative management (NOM). 11 (6.8%) required a delayed thoracic operation, none due to injuries missed on CT. The remaining 140 (87%) underwent successful NOM (Figure 1). Only 7% required additional imaging [esophageal studies (5.6%) or bronchoscopy (1.2%)], all negative. Figure 2 shows the performance metrics for chest CT. In 3 cases CT identified a cardiac injury confirmed by surgery, while one thoracic IVC injury missed on CT was found intraoperatively (accuracy 99.4%, NPV 99.3%). 2 patients had CT suspicious for esophageal injury, ruled out intraoperatively or by EGD (accuracy 98.8%, NPV 100%). No CT diagnosed tracheal injuries (accuracy 100%, NPV 100%). There was one death in the total cohort, none in the NOM group.

Conclusions: Modern high-quality CT provides highly accurate and reliable screening modality for penetrating chest and mediastinal injuries and can be used as a standalone study in most patients or to guide further tests. Chest CT facilitated successful NOM.



Management of chest GSW patients included in the study population.



Positive and Negative Predictive Values of chest CT-scan in diagnosis of thoracic injuries.

Quick Shots Session I

Quick Shot #5
January 19, 2023
9:09 am

TRAUMA QUALITY OF LIFE FOLLOW UP CLINIC FOR GUN VIOLENCE SURVIVORS: A MULITDISCIPLINARY ONE-STOP SHOP

Colleen M. Trevino, NP, PhD*, Amber Brandolino, MS, Monet Woolfolk,
Nalani Wakinekona, Rachel S. Morris, MD*, David J. Milia, MD*,
Marc A. de Moya, MD*, Terri deRoon-Cassini, PhD
Medical College of Wisconsin

Presenter: Colleen M. Trevino, NP, PhD

Objectives: Gun violence survivors experience poor global physical and mental health. To date, trauma follow-up care lacks a comprehensive multidisciplinary approach to treat firearm injury. A post discharge clinic for firearm injured patients was developed to provide comprehensive care. We hypothesized that a collaborative multidisciplinary clinic would show attendance and utilization of resources above the benchmark for post-discharge follow up of 60%.

Methods: This is an observational study of a Trauma Quality of Life Clinic (TQOL) designed to focus on physical, mental, and social recovery. Appointments included collaborative care between the patient, nurse practitioner, psychologist, physical therapist (PT), social worker (SW), and hospital-based violence interrupter (HBVI) within 3-10 days post hospital discharge. Demographic characteristics and screening for Post-Traumatic Stress Disorder (PTSD), chronic pain, and depression were completed during the first post-hospital follow up visit. Interventions completed by the HBVI were documented.

Results: There were 163 unique referrals to TQOL between 11/2020-12/2021 with an overall attendance rate of 78%. Other medical specialists involved in the management of injury that required follow up appointments, also had an 88% attendance rate. Those who initially no-showed to TQOL were rescheduled and 90% attended that appointment. Screenings in clinic found 78% risk positive for PTSD, 48% risk positive for depression, and 78% risk positive for chronic pain that moderately interfered with daily living. Retaliation, financial insecurity, and family support were addressed by HBVI and SW in clinic.

Conclusions: A comprehensive multidisciplinary follow up clinic for gun violence survivors showed high engagement and increased access to follow up care in a population at extreme risk for the development of poor long term mental health outcomes and chronic pain.

Top Categories of HBVI Interventions	
1	Retaliation
2	Financial
3	Family Support

Quick Shots Session I

Quick Shot #6
January 19, 2023
9:15 am

HYPOFIBRINOGENEMIA FOLLOWING INJURY IN 186 CHILDREN AND ADOLESCENTS: PATIENT CHARACTERISTICS, TRANSFUSION PATTERNS, AND OUTCOMES

Justin Gerard, MD*, Christian Gage, Michael Van Gent, Jessica Cardenas,
Charles E. Wade, PhD, David E Meyer, MD, MS*, Charles Cox, Bryan A. Cotton, MD, MPH
University of Texas Health Science Center at Houston

Presenter: Justin Gerard, MD

Objectives: We set out to evaluate presentation characteristics of hypofibrinogenemia and whether fibrinogen replacement should remain an “on-demand” product in pediatric trauma or if it should be incorporated into existing massive transfusion protocols.

Methods: We queried our registry of all patients <16 years of age presenting to an ACS-verified pediatric level-1 trauma center and receiving emergency-release blood products. Patients admitted between 11/17-4/21 were included. We defined patients as hypofibrinogenemic (HYPOFIB) if admission fibrinogen r-TEG angle <60 degrees or NORMAL if 60 or greater. Univariate and multivariate analyses were then conducted to define risk factors for presenting with HYPOFIB, the impact on outcomes, and whether early fibrinogen replacement improved mortality. All data was run using STATA 17.0. Statistical significance was set at $p<0.05$.

Results: 186 patients met inclusion; 18 (10%) were HYPOFIB. HYPOFIB patients were younger, had lower field and arrival GCS, higher head AIS, arrived with worse global coagulopathy, and died from brain injury (TABLE). NORMAL were more likely to have positive FAST (40 vs 14%, $p<0.05$), severe abdominal injuries, and died from hemorrhage. The 12% of patients who received early cryoprecipitate (0-2 hours) had higher mortality by univariate analysis (55 vs 31%, $p=0.045$) and no difference on multivariate analysis (OR 0.36, 95% C.I. 0.07-1.81, $p=0.221$). Those receiving early cryoprecipitate who survived to PICU had lower median PICU fibrinogen (133 vs. 210) and r-TEG angle values (56 vs. 68) than those who did not receive cryoprecipitate.

Conclusions: In pediatric trauma, HYPOFIB patients are more likely to be younger and have severe brain injury, with an associated mortality of over 80%. Given the absence of bleeding-related deaths in HYPOFIB pediatric patients, on-demand correction of hypofibrinogenemia appears warranted.

	HYPOFIB (n=18)	NORMAL (n=168)	p-value
Median age	11 (2.7, 14)	14 (8.8, 16)	0.058
Median weight (kg)	32.5 (24.5, 63.1)	59.0 (34.0, 70.0)	0.037
Male sex	68%	65%	0.781
Blunt mechanism	69%	68%	0.954
Head AIS	5 (5, 5)	3 (0, 5)	0.001
Chest AIS	2 (0, 3)	3 (0, 3)	0.753
Abd AIS	0 (0, 2)	3 (0, 4)	0.029
ISS	30 (27, 38)	28 (17, 38)	0.038
ED SBP	91 (75, 108)	106 (82, 122)	0.301
ED HR	118 (102, 146)	120 (94, 138)	0.508
ED GCS	3 (3, 3)	3 (3, 15)	0.029
ED r-TEG ACT	183 (156, 206)	113 (105, 121)	<0.001
ED r-TEG angle	47 (36, 52)	72 (66, 75)	<0.001
ED Lactate	6.5 (4.0, 10.3)	3.9 (2,5, 6.0)	0.004
24-hr Total Blood (cc/kg)	128 (105, 184)	40 (16, 83)	<0.001
30-day mortality	82%	28%	<0.001
Cause of death, TBI	79%	62%	0.083
Cause of death, Hemorrhage	0%	18%	0.049
Time to death, hours	36 (31, 47)	12 (0.2, 35)	0.014

Comparison of pediatric patients presenting with and without hypofibrinogenemia

Quick Shots Session I

Quick Shot #7
January 19, 2023
9:21 am

EMERGENCY GENERAL SURGERY IN THE ELDERLY: FACTORS ASSOCIATED WITH FRAGMENTED CARE

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Joep J. J. Ouwerkerk, BSc, Anne-Sophie Romijn, MD, Alice Gervasini, PhD, RN,
Charudutt N. Paranjape, MD, George Velmahos, MD, PhD, MSEd,
Haytham Kaafarani, MD, MPH*, John O. Hwabejire, MD, MPH*
Massachusetts General Hospital

Presenter: Jefferson Proaño-Zamudio, MD

Objectives: Care fragmentation (CF) has been shown to lead to increased morbidity and mortality in elderly surgical patients. However, determinants of CF are less defined. This study aims to examine factors related to CF after hospital discharge in geriatric emergency general surgery (EGS) patients.

Methods: We designed a retrospective study of the nationwide readmissions database (NRD) 2019. We included patients ≥65 years old admitted with a diagnosis within the American Association for the Surgery of Trauma EGS definition who were discharged alive from the index admission. The primary outcome was 90-day CF, as defined by unplanned readmission to a different hospital from the one that initially discharged the patient. Univariable analysis and multivariable logistic regression were performed, adjusting for patient and hospital characteristics.

Results: A total of 783,799 elderly EGS patients were included, the main diagnostic category was colorectal (22.6%), and 78.2% of patients underwent non-operative management during the index hospitalization. By 90 days post discharge, 189,622 (24.2%) had an unplanned readmission. The readmitted patients' mean (SD) age was 77.5(7.8) years, and 54.9% were female. Of those readmitted, 20.9% had CF (Figure 1). Predictors of CF were living in a noncore county (Odds-ratio [OR]=1.76,95% confidence interval [CI]:1.57-1.97, p<0.001), discharge to SNF (OR=1.29,95%CI:1.24-1.34), initial non-operative management (OR=1.18,95%CI:1.12-1.23, p<0.001), leaving AMA (OR=2.60,95%CI:2.29-2.95, p<0.001), being discharged from a private investor-owned hospital, and living in a low-median income ZIP code (Figure 2).

Conclusions: Elderly patients who survive an EGS admission frequently experience care fragmentation. The burden of unplanned readmissions in these patients is therefore currently underestimated. Factors associated with access to care are paramount to maintain care continuity.

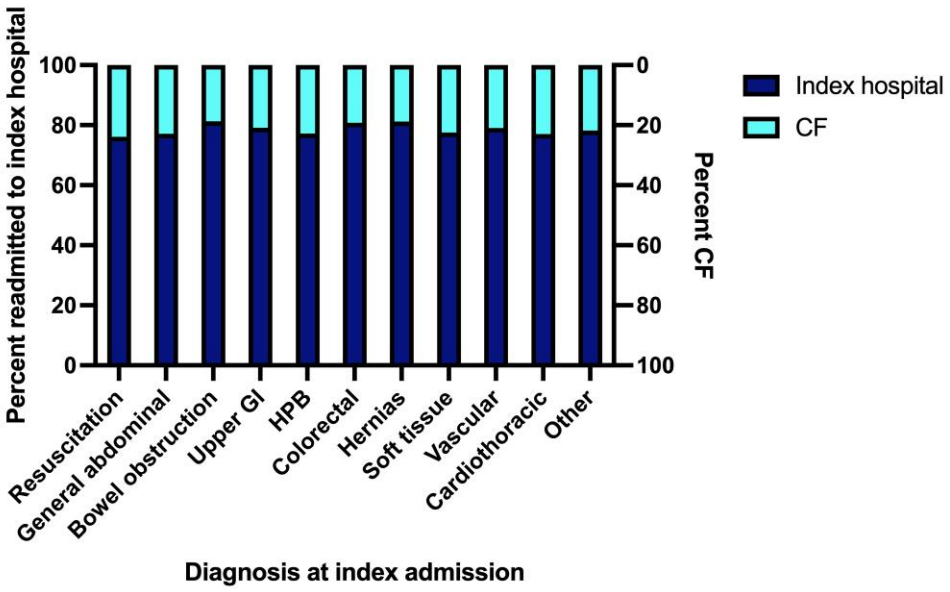


Figure 1. Proportion of care fragmentation at readmission

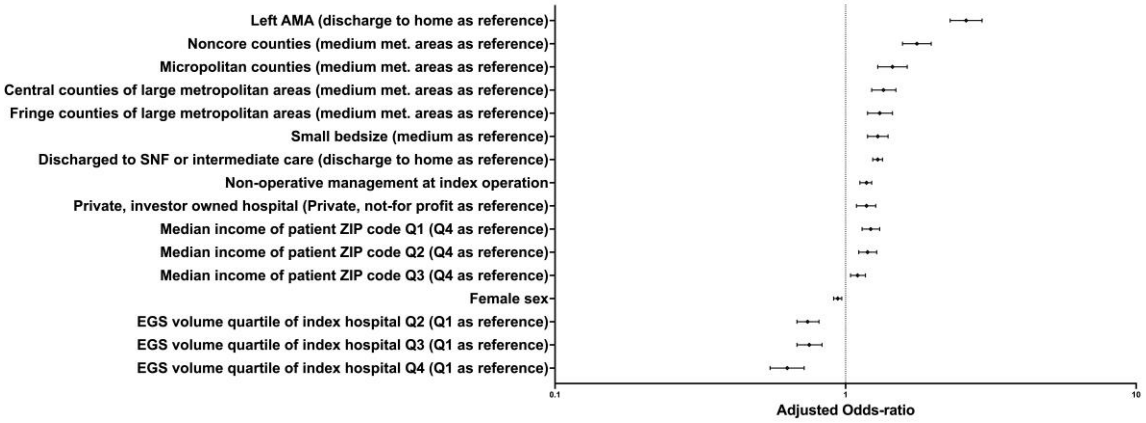


Figure 2. Predictors of care fragmentation

Quick Shots Session I

Quick Shot #8
January 19, 2023
9:27 am

UP AND OVER: CONSEQUENCES OF RAISING THE US-MEXICO BORDER WALL HEIGHT

William A. Marshall, MD, Vishal Bansal, MD, Andrea Krzyzaniak, Laura N. Godat, MD, FACS *,
Allison E. Berndtson, MD, FACS*, Romeo Ignacio, MD,
Benjamin Keller, MD, Jay Doucet, MD, Todd Costantini, MD
University of California San Diego

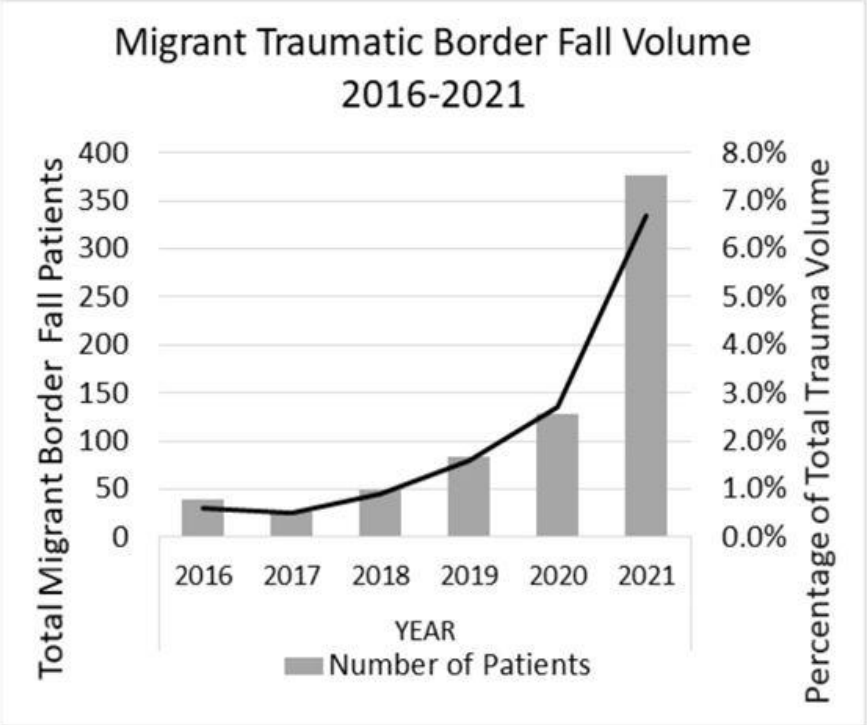
Presenter: William A. Marshall, MD

Objectives: Metropolitan San Diego's geographic location lends a unique demographic of migrant patients injured by falls at the US-Mexico border. For years, the number of patients injured from border wall falls remained static. In an effort to prevent migrant crossings, a 2017 Executive Order increased the southern California border wall height to 30 feet. We hypothesized that elevated border wall height is associated with increased major trauma, resource utilization, and healthcare costs.

Methods: We combined trauma registry data of two southern California level 1 trauma centers equally responsible for treating injured border wall patients from 2016-2021. Patient demographics, operative interventions, length of stay (LOS), discharge disposition, and hospital charges were assessed.

Results: Injuries from border wall falls grew 967% from 2016 to 2021 (39 vs. 377 patients; Figure). Operating room utilization (19 vs. 235 total operations) and median hospital charges per patient ($68,663 vs. $177,251) have risen dramatically over the same time period. The majority (76%) of these patients are under-insured at admission with charges largely government subsidized (57%) or unfunded (19%). Inpatient resources are utilized until safe for discharge with a median LOS of 5 days (IQR [2, 11]).

Conclusions: The increased height of the US-Mexico border wall has resulted in record numbers of injured migrant patients. Despite this increase in wall height, border crossings are surging, placing novel financial and resource burdens on already stressed trauma systems. To address this public health crisis, legislators and healthcare providers must conduct collaborative, apolitical discussions regarding the border wall's efficacy as a means of deterrence as well as its impact on traumatic injury and disability.



Migrant Border Fall Volume by Year, 2016-2021.

Quick Shots Session I

Quick Shot #9
January 19, 2023
9:33 am

EVALUATION OF A TRAUMA-FOCUSED MEDICAL SCHOOL COURSE

Marshall W. Wallace, BS*, Jeffery Chen, BS, Eric Mace, MD, Shayan Rakhit, MD, Raeanna Adams, MD*, Mayur B. Patel, MD, MPH, FACS*, Shannon Eastham, MD*
Vanderbilt University Medical Center

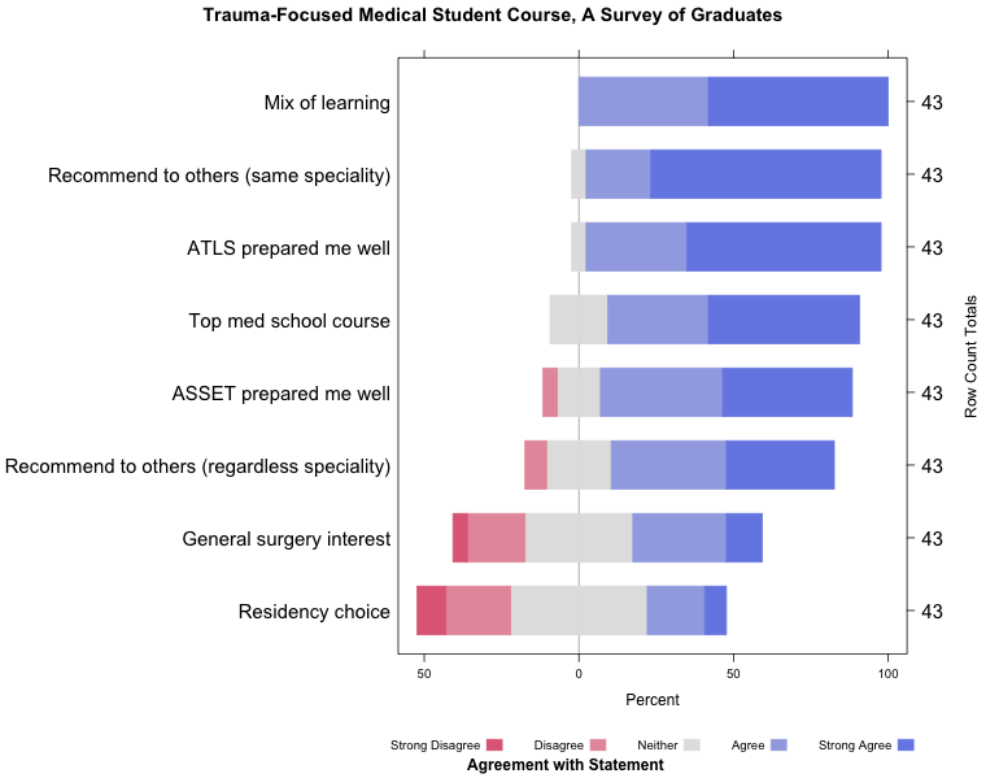
Presenter: Marshall W. Wallace, BS

Objectives: Standardized trauma courses such as ATLS and ASSET have improved physician competency in caring for trauma patients. However, medical student trauma education varies between institutions and is often limited to absent. We hypothesized that our institution's trauma-focused medical student course would improve graduates' future confidence in caring for injured patients.

Methods: We distributed a 19-question Likert scale survey over 2 months to past participants of our month-long trauma-focused medical school course offered quarterly from 2015-2020, who had finished at least one year of residency. We assessed specialty, training year, and how the course prepared them for managing trauma patients, among other questions assessing confidence in trauma care. For context, this course delivered ATLS (9^{th} & 10^{th} editions) and ASSET (audit) courses, alongside foundational basic science and clinical skills across domains of injury, repair, and rehabilitation.

Results: In total, 43 of 84 graduates (51%) responded (see Figure). Of 43 respondents, 4 (9%) were attending physicians, 2 (5%) were fellows, and 37 (86%) were residents. General Surgery (26%), Orthopedic Surgery (23%), and Emergency Medicine (19%) were the most common specialties. Of respondents, 18 (42%) agreed that the course increased their interest in a trauma-related career. The majority agreed that ATLS and ASSET [35 (81%) and 41 (95%), respectively] helped prepare them to care for trauma patients as a resident, and 37 (86%) perceived more confidence caring for trauma patients than their co-residents. Only 4 (9.3%) of respondent graduates were required to retake ATLS as residents; all others' medical student ATLS training were honored.

Conclusions: This trauma-focused medical student course positively influenced future provider confidence. Similar to basic and advanced life support courses, it may be appropriate to promulgate physician-level trauma courses like ATLS to medical student learners.



Stacked bar chart presenting the distribution of Likert-scale responses for 43 respondents to eight key questions. All respondents found the mix of learning opportunities beneficial. A vast majority would recommend the course to other students, felt that ATLS and ASSET helped prepare them to care for trauma patients, and felt that this was in the top 10% of medical school courses they took.

Quick Shots Session I

Quick Shot #10
January 19, 2023
9:39 am

VARIATION IN CT IMAGING OF PREGNANT TRAUMA PATIENTS ACROSS SOUTHERN CALIFORNIA TRAUMA CENTERS

Alexa Lucas, MD, MBA, Sigrid Burruss, MD FACS, Walter L. Biffl, MD*, Diane Wintz, MD*, Jarrett Santorelli, MD*, Morgan Schellenberg, MD, MPH*, Kenji Inaba, MD, Thomas K. Duncan, DO, FACS, FICS*, Navpreet K. Dhillon, MD*, Jeffry Nahmias, MD, MHPE, FACS, FCCM*, Erika Tay, MD, Danielle Zezoff, MD, MBA, Katharine Kirby, MS, Alden Dahan, BS, Arianne Johnson, PhD, William Ganske, MD, Dunya Bayat, MPH, Matthew Castelo, BS, Dennis Zheng, MD, Areti Tillou, MD, Raul Coimbra, MD, PhD, Rahul Tuli, BS, Brent Emigh, MD, Graal Diaz, PhD, Nicole Fierro, MD, Eric Ley, MD
University of California, Irvine

Presenter: Alexa Lucas, MD, MBA

Objectives: Evaluate computed tomography (CT) imaging practices for pregnant trauma patients (PTPs) hypothesizing significant variability between trauma centers, suggesting the need to develop PTP CT imaging guidelines.

Methods: A multicenter retrospective study (2016-2021) was performed at 12 Level-I/II trauma centers. All adult (≥18 years old) PTPs involved in motor vehicle collisions (MVCs) were included with no patients excluded. The primary outcome was incidence of CT imaging of the head, cervical spine, chest, and abdomen/pelvis at each center. Patient demographics, injury profile, and outcomes were compared. Chi-square tests were used to compare the distributions of categorical variables across centers. ANOVA was used to compare the means of normally distributed continuous variables.

Results: 729 PTPs sustained MVCs (73% high speed, defined as ≥25 mph). There was no difference in mean age or Glasgow Coma Scale score between centers (both $p>0.05$). Across centers, patients were mildly injured; however, there was a significant difference in injury severity score (range: 1.1-4.6, $p<0.001$) between centers. There was also variation in imaging rates of CT head (range: 11.8%-62.5%, $p<0.001$), cervical spine (11.8%-75%, $p<0.001$), chest (4.4%-50.2%, $p<0.001$), and abdomen/pelvis (0%-57.3%, $p<0.001$). Similarly, in high speed MVCs there was significant variation for CT head (12.5%-64.3%, $p<0.001$), cervical spine (16.7%-75%, $p<0.001$), chest (5.9%-83.3%, $p<0.001$), and abdomen/pelvis (0%-60%, $p<0.001$). There was a difference in mortality (0%-2.9%, $p=0.04$); however, no center had more than one death.

Conclusions: There was significant variability in CT imaging for the assessment of PTPs after MVCs across 12 trauma centers, including within a subset of high-speed MVCs. This supports the need for standardization of CT imaging for PTPs to minimize radiation exposure while ensuring optimal injury identification and outcomes.

Table 1: Pregnant trauma patients involved in motor vehicle collisions at Southern California Trauma Centers (TCs)

Total N=729	TC- A	TC-B	TC-C	TC-D	TC-E	TC-F	TC-G	TC-H	TC-I	TC-J	TC-K	TC-L	Total	p-value
Age (years)	30.9	30.7	27.2	27.3	29.6	27.6	28.2	28.1	26.7	28.1	27.4	28.0	28.0	0.1
ISS	2.8	--	3.8	1.0	3.9	1.6	0.8	3.2	2.1	2.1	2.5	2.4	2.0	**<0.001**
CT head	33.3%	23.3%	33.9%	62.5%	11.8%	11.9%	26.1%	41.4%	28.1%	32.3%	30.9%	62.5%	28.7%	**<0.001**
CT C-spine	33.3%	23.3%	37.3%	75.0%	11.8%	20.9%	46.2%	41.4%	32.8%	42.9%	36.8%	58.3%	38.2%	**<0.001**
CT chest	25.0%	13.3%	28.8%	12.5%	5.8%	4.5%	50.3%	48.2%	21.9%	6.02%	29.4%	29.2%	26.6%	**<0.001**
CT abd/pelvis	16.7%	23.3%	28.8%	0.0%	14.7%	4.5%	57.3%	55.2%	28.1%	8.3%	45.6%	16.7%	31.4%	**<0.001**
Length of stay (days)	3	1.1	3.9	1.9	1.6	1.2	2.7	4.6	1.2	1.3	3.3	1.3	2.2	**<0.001**
In-hospital mortality	0.0%	0.0%	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	**0.04**

MVC= motor vehicle collision ISS=injury severity score; abd/pelvis= abdomen/pelvis

Pregnant trauma patients involved in motor vehicle collisions at Southern California Trauma Centers (TCs)

Table 2: Pregnant trauma patients involved in high-speed (>25mph) motor vehicle collisions at SoCal trauma centers (TCs)

N=480	TC- A	TC- B	TC- C	TC- D	TC- E	TC- F	TC- G	TC- H	TC- I	TC- J	TC- K	TC- L	Total	p-value
Age (years)	-	-	27.1	27.3	29.8	27.2	28.2	28.6	26.0	28.3	26.5	27.6	27.6	0.20
ISS	-	-	3.9	1.0	4.7	1.7	1.1	4.1	2.4	2.5	2.9	1.9	2.4	**<0.001**
CT-head	-	-	35.7%	62.5%	12.5%	15.7%	29.5%	45.0%	31.4%	47.9%	35.7%	64.3%	33.8%	**<0.001**
CT C-spine	-	-	30.4%	12.5%	83.3%	5.9%	54.3%	55.0%	25.5%	7.0%	35.7%	35.7%	35.7%	**<0.001**
CT-chest	-	-	39.3%	75.0%	16.7%	27.5%	47.3%	45.0%	35.3%	54.8%	39.3%	64.3%	42.5%	**<0.01**
CT abd/pelvis	-	-	30.4%	0.0%	20.8%	5.9%	59.7%	60.0%	33.3%	11.3%	50.0%	14.3%	35.2%	**<0.001**
Length of stay (days)	-	-	3.4	1.9	1.8	1.3	3.1	5.7	1.1	1.5	3.5	1.4	2.5	0.03
In-hospital mortality	-	-	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.14

MVC= motor vehicle collision; ISS=injury severity score; abd/pelvis= abdomen/pelvis

Table 2: Pregnant trauma patients involved in high-speed (>25mph) motor vehicle collisions at SoCal trauma centers (TCs)

Quick Shots Session II

Quick Shot #11
January 19, 2023
8:45 am

ASSOCIATION OF ON-SCENE ADVANCED LIFE SUPPORT INTERVENTIONS WITH RETURN OF SPONTANEOUS CIRCULATION FOLLOWING TRAUMATIC OUT-OF-HOSPITAL CARDIAC ARREST

Tanner Smida, BS, NREMT-A, Brad Price, PhD, James Scheidler, MD,
Alison M. Wilson, MD, FACS*, James M. Bardes, MD*
West Virginia University

Presenter: Tanner Smida, BS, NREMT-A

Objectives: Traumatic out-of-hospital cardiac arrest (tOHCA) has a mortality rate over 95%. Many current protocols dictate rapid intra-arrest transport of these patients. We hypothesized that on-scene ALS would increase the odds of arriving at the emergency department with ROSC in comparison to performance of no ALS or ALS en route.

Methods: We utilized the 2018-2021 ESO Research Collaborative public use datasets for this study, which contain patient care records from ~2,000 EMS agencies across the US. All OHCA patients with an etiology of “trauma” or “exsanguination” were screened (n=15,691). The time of advanced airway management (AAM), vascular access (VA), and chest decompression (CD) was determined for each patient. Multivariable logistic regression using Utstein variables was used to evaluate the association of ALS intervention and time to intervention with ROSC at ED.

Results: 5,088 patients met inclusion criteria. 778 (15.3%) of all patients had ROSC at ED. In comparison to no VA, scene VA was associated with a 117% increase in the odds of having ROSC at ED (aOR: 2.17 [1.33,3.52]). The odds of ROSC at ED decreased by 3.1% (aOR: 0.969 [0.943, 0.996]) for every 1-minute increase in time to VA and by 4.7% (aOR: 0.953 [0.932, 0.975]) for every 1-minute increase in time to epinephrine. When modeled continuously, timing of AAM and CD were not associated with ROSC at ED. Blunt mechanism, initial PEA, time to VA, time to epinephrine, IV access (vs. IO), scene time, and fluid resuscitation (>250 mL vs. <250 mL non-blood product fluid) were significantly associated with ROSC at ED.

Conclusions: On-scene ALS interventions were associated with increased ROSC at ED in our study. These data suggest that initiating ALS prior to rapid transport to definitive care in the setting of tOHCA may increase the number of patients with a palpable pulse at ED arrival.

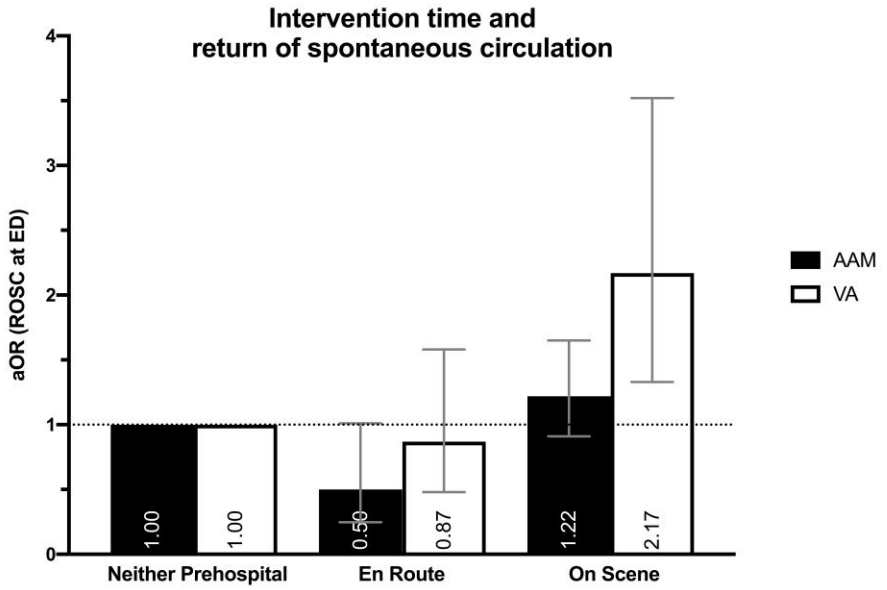


Figure 1. ALS intervention interval vs. ROSC at ED.

On scene VA is associated with increased adjusted odds of having ROSC at ED arrival in comparison to en route VA and no prehospital VA. Error bars indicate upper and lower bounds of 95% confidence intervals.

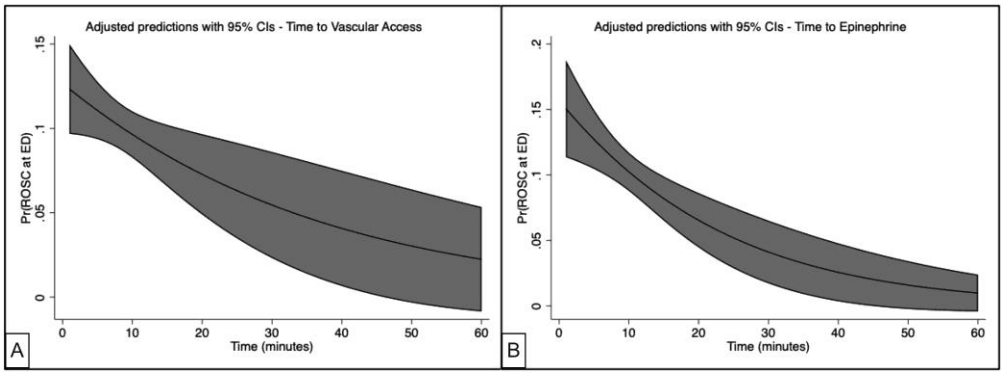


Figure 2. Time to VA and time to epinephrine vs. ROSC at ED.

Increased time to VA (panel A) and time to 1 milligram epinephrine administration (panel B) were significantly associated with decreased odds of having ROSC at ED arrival in our multivariable logistic regression model. The shaded regions represent 95% confidence intervals.

Quick Shots Session II

Quick Shot #12
January 19, 2023
8:51 am

SEE NONE, DO THREE: REPETITIVE INTENTIONAL TRAINING ON HIGH FIDELITY CADAVERIC SIMULATION RAPIDLY IMPROVES CHEST TUBE PROCEDURAL PERFORMANCE IN EARLY SURGICAL RESIDENTS

Hahn Soe-Lin, MD, MS*, Kayla Gray, MS, CCRP, Brooke McGill, BS, Nicole Kaley, BS, Mikaela Mahrer, BS, Ceili Olney, BS, Jim Mankin, MD, Suhail Zeineddin, MD, James N. Bogert, MD*, Kristina Chapple, PhD., Jordan A. Weinberg, MD*
Creighton University School of Medicine - Phoenix Campus

Presenter: Hahn Soe-Lin, MD, MS

Objectives: Tube thoracostomy is often a time sensitive procedure. Interns on trauma services struggle with early proficiency at emergent chest tubes due to patient acuity and sporadic opportunity. Complication rates specific to general surgery resident placed chest tubes approach 7%. We previously demonstrated that high-fidelity whole body donors (WBD) allowed medical students to gain proficiency with chest tubes with clustered training. In this study, we aim to validate whether intentional repetitive training can rapidly improve performance in incoming surgical interns.

Methods: Fifteen surgical interns at a University affiliated level I trauma center performed three chest tubes each as part of their orientation. 3 WBDs were used in a simulated operating room. An attending trauma surgeon proctored all chest tubes. Interns were measured on critical steps of the procedure and times measured from prep to securing tube with suture. Pre and post training surveys were collected.

Results: 45 chest tubes were placed. Mean times in minutes rapidly improved over three repetitions (4.3, 3.3, 2.4, $P<0.001$) and standard deviation rapidly narrowed (Fig. 1). By the third attempt, all interns passed the critical steps of the procedure and aggregate performance exceeded PGY-2 and PGY-3 residents measured previously on the same platform (median 2.8 minutes). Intern survey feedback overwhelmingly demonstrated improved procedural confidence.

Conclusions: Incorporating WBDs early in training accelerates confidence and competence with no patient safety risk. Interns gain proficiency rapidly with clustered repetitive training. After only a few repetitions performance exceeds residents with one to two years of additional experience. This platform may serve as a model for training other high acuity trauma and general surgical operations and procedures.

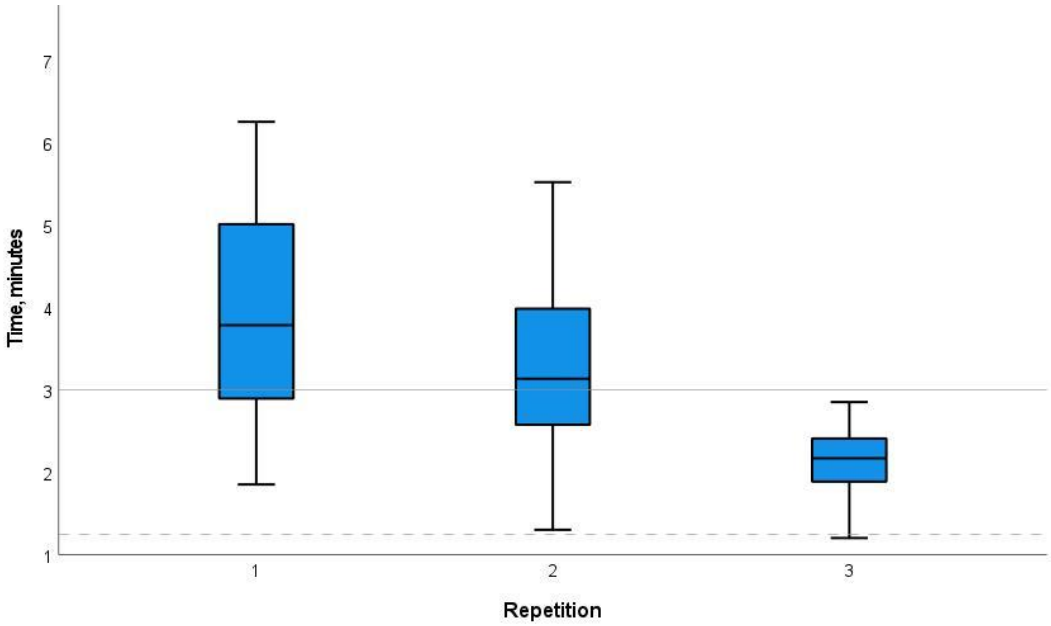


Figure 1. Distribution of time to complete chest tube placement

Quick Shots Session II

Quick Shot #13
January 19, 2023
8:57 am

AUTOMATED PARTIAL REBOA REDUCES HEMORRHAGE AND HYPOTENSION IN A LETHAL PORCINE LIVER INJURY

Gabriel Cambronero, MD, Lucas Neff, MD, Nathan Patel, MD, Aravindh Ganapathy, MD, Magan Lane, BS, Aidan Wiley, BS, Jacob Neibler, BS, Guillaume Horeau, DVD, PhD, Joseph J. DuBose, MD*, Austin Johnson, MD, PhD, Timothy Williams, MD
Wake Forest University Medical School

Presenter: Gabriel Cambronero, MD

Objectives: Partial and intermittent resuscitative endovascular balloon occlusion of the aorta (pREBOA/iREBOA) are techniques to extend therapeutic duration, mitigate ischemia, and bridge patients to definitive hemorrhage control. We hypothesized that automating pREBOA balloon titration would reduce blood loss and hypotensive episodes over 90-min intervention without increasing ischemic burden compared to iREBOA in an uncontrolled liver hemorrhage swine model.

Methods: Fourteen pigs underwent uncontrolled hemorrhage by liver transection and were randomized to automated pREBOA (N=4), iREBOA (N=5), or control (N=5). Once in hemorrhagic shock, controls had the catheter removed and received blood products only. The REBOA groups received 10min of complete REBOA followed by 80min of pREBOA or iREBOA with automated blood transfusion. At T90, surgical hemostasis was obtained, hemorrhage volume was quantified, and animals were transfused to euvolemia with 1.5hrs of automated critical care.

Results: Liver injury was highly lethal (3/5 control animals dying in <15min). All REBOA animals survived to the end of study. iREBOA animals spent greater time at full occlusion (38±17%) vs pREBOA (19±6%), p=0.02. From T0-90, mean transfusion requirements trended higher for iREBOA (12.9±7.0ml/kg) vs pREBOA (8.78±2.5ml/kg), p=0.10. At surgical hemostasis, iREBOA trended towards a greater percentage of blood volume lost (75.8±20.5%) vs pREBOA (46.6±12.4%), p=0.06. iREBOA had more time at hypotension MAP<60mmHg (59±6%) than pREBOA (11±7%), p=0.02. Peak lactate was higher for iREBOA (p=0.03).

Conclusions: Compared with iREBOA, automated pREBOA reduced hypotension, time at complete REBOA, and peak lactate without increasing total blood loss or transfusion requirements. Both techniques prevented immediate death compared to control. Further refinement of automated pREBOA and the addition of automated transfusion may enhance endovascular resuscitation.

Automated REBOA catheter is capable of complete, partial and intermittent modes of operation.

Quick Shots Session II

Quick Shot #14
January 19, 2023
9:03 am

THE RACE TO TAMPONADE JUNCTIONAL NON-COMPRESSIBLE HEMORRHAGE AND SUSTAIN HEMOSTASIS FOR 72-HOUR PROLONGED FIELD CARE

Adam J. Kishman, DSc, MPAS, PA-C, LT, MSC, USN, Gilbert A. Pratt III, MS,
Cecilia Castro, BS, Alejandra L. Lorenzen, BS, Leslie E. Neidert, PhD,
Clifford G. Morgan, PhD, Sylvain Cardin, PhD
Naval Medical Research Unit San Antonio

Presenter: Adam J. Kishman, DSc, MPAS, PA-C, LT, MSC, USN

Objectives: Hemorrhage control in prolonged field care (PFC) presents unique challenges requiring personnel to maintain patient stability beyond the Golden Hour. Operations in austere environments, battlefield resource depletion, and area access denial for MEDEVAC drive the need for enhanced point of injury treatment capabilities. To address hemorrhage control in PFC, we evaluated Combat Gauze (CG) and XSTAT for speed of deployment and monitored hemostatic efficacy.

Methods: The left subclavian artery and subscapular vein were isolated in male Yorkshire swine (70-85 kg) and injured by a 50% transection; followed by 30-seconds of hemorrhage. CG (n=4) or XSTAT (n=4) was administered until bleeding stopped and remained within subjects for 72-hours; with Surgical Shams (n=3) as control. Results were analyzed using unpaired two-tailed t-test, and Two-way ANOVA with Tukey's post-hoc analysis. Data is represented as mean±standard deviation with significance as $p<0.05$.

Results: Similar outcomes were seen in hemorrhage volume and total blood loss between experimental groups, though XSTAT sponges absorbed significantly more blood than CG (Fig 1A-1C), was significantly faster to administer (Fig 1D), and required similar number of devices as CG (Fig 1E). There were no significant differences between groups in prothrombin time, International Normalized Ratio or activated clot time (Fig 2A-C). All subjects displayed benign serosanguineous drainage with no indications of sanguineous, hemorrhagic or purulent exudate.

Conclusions: While CG and XSTAT demonstrated equivalent hemostatic ability through 72-hours, XSTAT offered significantly faster administration and the ability to absorb more blood. Taken together, XSTAT may be superior to CG for junctional non-compressible hemorrhage control in operational PFC environments.

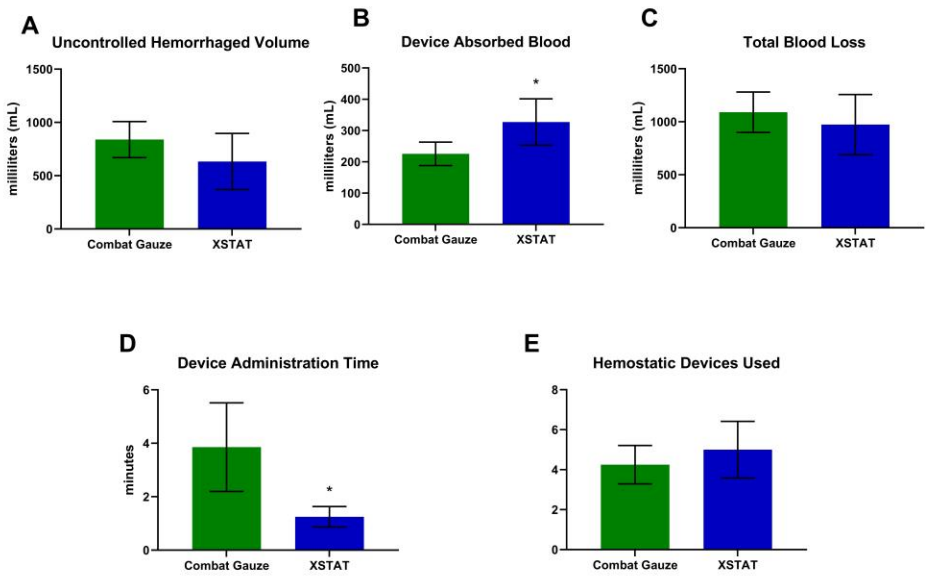


Figure 1. Intervention Performance Assessment. Combat Gauze (Green) and XSTAT (Blue) were evaluated for hemorrhage volume (A), absorbed blood volume in device (B), and combined total volume (C). Device application was assessed for application time (D) and device count to achieve hemostasis (E). Significant difference in XSTAT compared to Combat Gauze denoted via *.

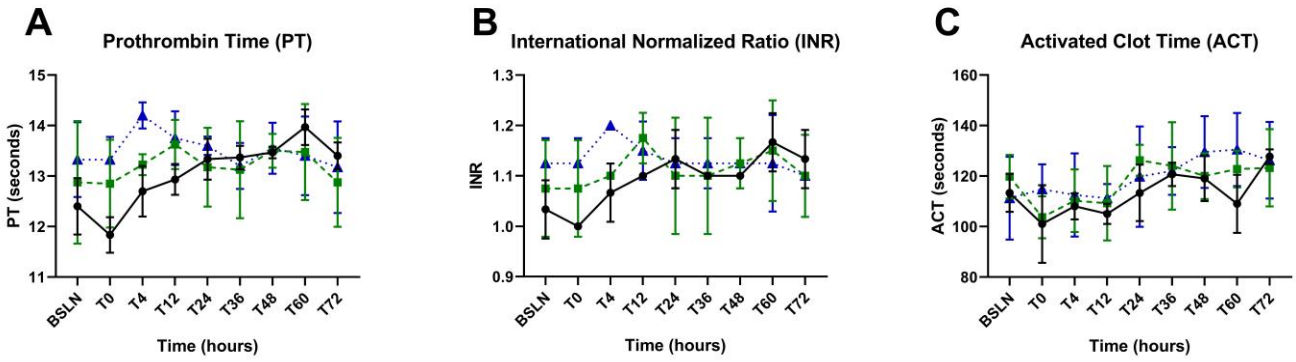


Figure 2. Coagulation Function. Combat Gauze (Green) and XSTAT (Blue) were compared against each other and a Surgical Sham (Black) at designated time points following hemostasis (T0), for changes in Prothrombin Time (A), International Normalized Ratio (B), and Activated Clot Time (C). No significant group effect was identified for each of these parameters.

Quick Shots Session II

Quick Shot #15
January 19, 2023
9:09 am

A SIMPLE ENGINEERING ALTERATION TO IO ACCESS DEVICE ELECTRONICS CAN LEAD TO IMPROVED PLACEMENT ACCURACY CONFIRMATION

Rohan Vemu, Tshepo Yane, BA, Patrick Paglia, BA, Gregory Glova, BA, Kaiser Okyan, BA, David Meaney, Kristen Chreiman, MSN, Lewis J. Kaplan, MD, FACS, FCCM, FCCP*, Jose L. Pascual, MD, PhD, FRCS(C), FACS, FCCM*
Perlman School of Medicine, School of Engineering, University of Pennsylvania

Presenter: Rohan Vemu

Objectives: Intraosseous (IO) catheterization is the ideal emergency access for patients when intravenous cannulation fails. Optimal IO fluid delivery requires placement in cancellous bone which can be challenging in pediatric, muscular, and obese patients. We hypothesized that commercial Arrow® EZ-IO (EZIO) device electronics can be readily altered to provide confirmation of appropriate cancellous bone placement, thereby removing IO placement subjectivity.

Methods: After deconstructing the casing and contents of an EZIO, we reorganized the battery compartment and added a Raspberry Pi microcontroller and LED light indicator discriminating changes in normal rotational force (Newtons, N) and drill bit rotations per minute (RPMs) (Fig 2). The LED was programmed to illuminate only when the needle tip passed from high to low RPMs and low to high force readings. Using USB connection of the microcontroller to an external monitor we verified drill force and RPM readings in IO placement in fresh goat tibia bones (n=25) and commercial bone models (n=50) wrapped in bovine muscle. Mean ± SEM readings obtained while directly visualizing cross section drill tip entry from soft tissue to cortical bone, to cancellous bone were compared with Tukey-Kramer testing. Correlation of LED illumination with needle entry into cancellous bone was assessed with direct observation.

Results: Both RPM and force varied significantly with penetration of different tissues in models and goat bones (Fig. 1, *$p<0.05$ vs cortical, respectively). Insertion accuracy (LED lighting) in model and goat bones were 94.0% (47/50) & 92.0% (23/25), respectively.

Conclusions: A readily deployable engineering modification of commercial IO devices reproducibly signals cancellous bone access using integrated changes in drill RPM and force. Such modifications may be incorporated in future IO devices to improve insertion accuracy and safety.

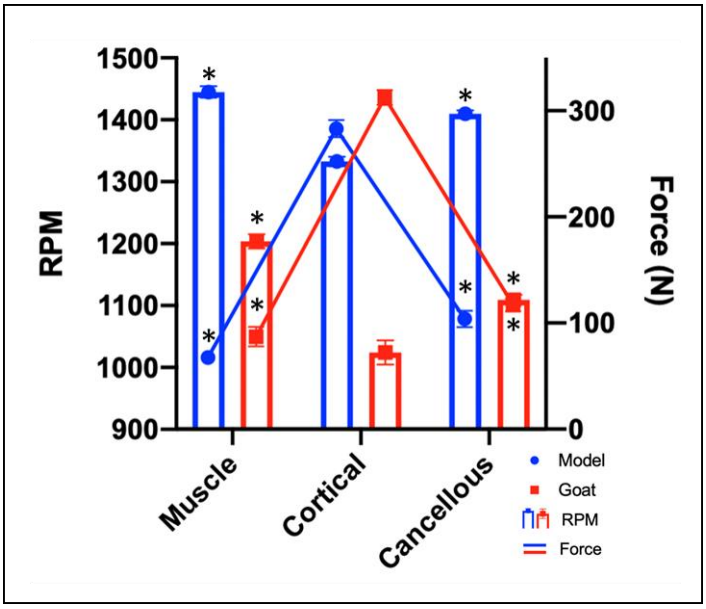


Figure 1: Cortical bone (Cortical) in both commercial model and goat bones consistently demonstrated less drill revolutions per minute (RPM) and more force (Newtons, N) than both muscle and cancellous bone. (*p<0.05 vs cortical bone in respective parameter comparisons)

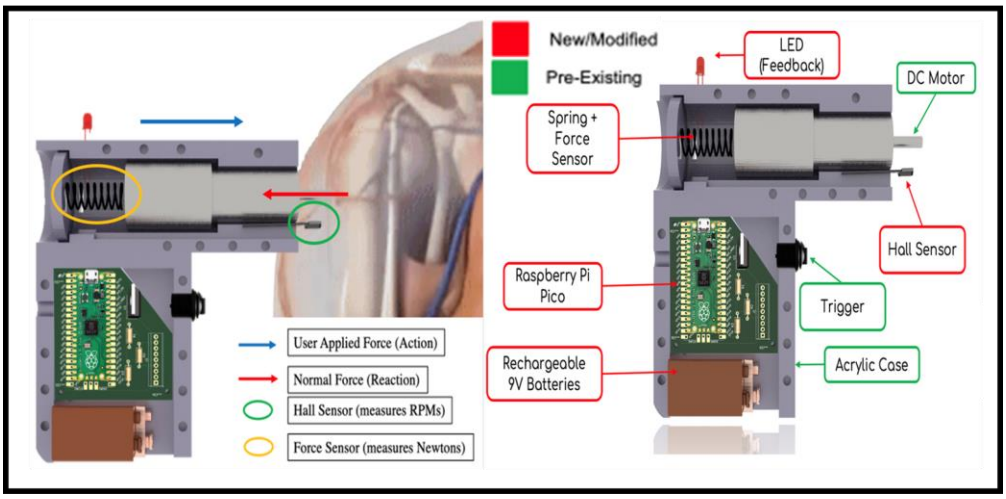


Figure 2: Modified casing and contents of the the adapted EZIO access device indicating computerized method to obtain drill force and RPMs to indicate when cancellous bone has been reached by the tip of the drill needle. parts labeled in green boxes are preexisting and in red boxes are new or modified.

Quick Shots Session II

Quick Shot #16
January 19, 2023
9:15 am

ASSOCIATION OF EARLY RIB PLATING ON CLINICAL AND FINANCIAL OUTCOMES: A NATIONAL ANALYSIS

Zachary K. Tran, MD*, Nicole DePolo, MD, Nam Yong Cho, BS, Shayan Ebrahimian, BS, Kaushik Mukherjee, MD, MSCI, FACS*, Peyman Benharash, MD, Sigrid Burruss, MD, FACS
Loma Linda University Medical Center

Presenter: Kaushik Mukherjee, MD, MSCI, FACS

Objectives: With reported improvements in patient outcomes, surgical stabilization of rib fractures (SSRF) has been increasingly adopted. While institutional series have sought to define the role of early SSRF, large scale analysis remains lacking. The present study evaluated clinical and financial outcomes of SSRF in a nationally-representative cohort.

Methods: Patients (≥16 years) who underwent SSRF within 7 days following trauma-related admission were identified using the 2016-2019 National Inpatient Sample. Those transferred in or with spinal, cranial or intraabdominal injuries were excluded. Patients who underwent SSRF within 2 days of hospitalization were classified as *Expedited*. Multivariable regressions were used to evaluate the impact of timing for SSRF on outcomes of interest. The primary endpoint was prolonged mechanical ventilation (>96 hours) while mortality, in-hospital complications, home discharge and resource utilization were secondarily considered.

Results: Of an estimated 4,375 patients, 2,470 (56.4%) were considered *Expedited.* Distributions of age, race, chronic lung disease and flail chest were similar between *Expedited* and others. However, *Expedited* patients had greater rates of hemothorax but lower rates of concomitant lung injury. After adjustment, *Expedited* had lower odds of prolonged ventilation, tracheostomy and ICU admission but similar risk of mortality, respiratory failure and pneumonia (Figure). *Expedited* was associated with a decrement in hospitalization duration (β: -3.5 days, 95% CI: -4.3- -2.7) as well as costs (β: -$10.0K, 95% CI: -14.5- -5.5) and were more likely to be discharged to home (AOR: 1.54, 95% CI: 1.06-2.23).

Conclusions: Early SSRF appears to reduce likelihood of prolonged ventilation and tracheostomy. While patient selection criteria may limit our findings, expeditious SSRF may limit morbidity while enhancing value of care.

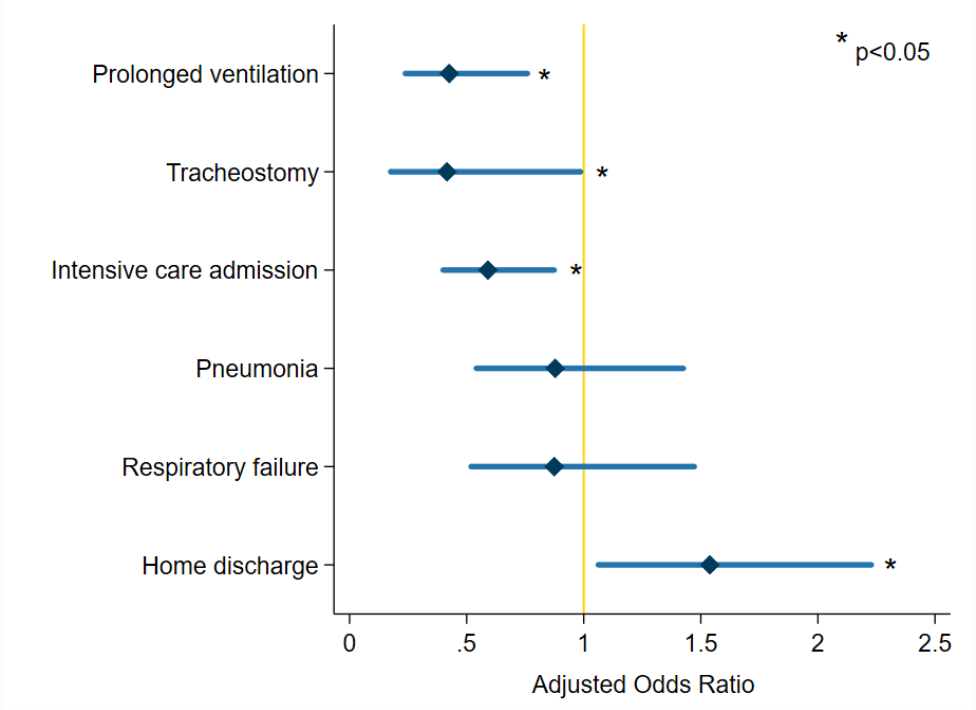


Figure. Risk-adjusted outcomes for *Expedited* on several acute endpoints with others as reference.

Quick Shots Session II

Quick Shot #17
January 19, 2023
9:21 am

DAMAGE CONTROL THORACOTOMY: TRENDS, TECHNIQUES, AND OUTCOMES: AN EAST MULTICENTER TRIAL

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Presenter: Anthony D. Douglas, MD

Objectives: The trends in utilization, techniques of closure, and outcomes of Damage control thoracotomy (DCT) in injured patients remain unclear. This EAST multi-center trial aimed to examine DCT usage over the last decade, evaluate types of temporary closure, and assess associated outcomes.

Methods: An international retrospective cohort study of thoracotomies from 2008-2019 at 26 centers was performed. Patients age ³ 16 undergoing thoracotomy within 24 hours of admission who survived to ICU/floor admission were included. Mixed logistic regression was used to assess complications associated with closure type, trends in DCT utilization, and mortality. Competing risk regression model was used to determine trends in ICU free days for DCT over time.

Results: 926 thoracotomy operations were performed, of those 406 (44%) were DCT. Most injuries were penetrating (n=609,66%) and the most common mechanism was gunshot wound. DCT patients were significantly more injured and ill on presentation (Table 1). 54% of DCT began in the emergency department. Most common temporary closure types included skin only (n=103,25%), commercial vacuum device (n=123,30%), and adhesive dressing (n=129,32%). Frequent complications following DCT were pneumonia (n=57,14%), acute renal failure (n=53,13%), and sepsis (n =41,10%). Mortality rate in the DCT group was 61%, versus 17% for definitive thoracotomy (n<0.001). Utilization of DCT has increased in a linear fashion during the study period, as well as ICU-free days out of 30 (OR:1.66 95%CI [1.18,2.33]); however, mortality has not changed over time (OR:0.61, 95%CI [0.22,1.98]. After mixed logistic regression, there was no difference in complications based on closure type (Table 2).

Conclusions: The use of DCT is increasing over-time with improved ICU-free days, but without improved mortality. Mechanism of temporary closure should be determined based on operator's experience, and institutional resources.

Quick Shots Session II

Quick Shot #18
January 19, 2023
9:27 am

ANGIOEMBOLIZATION FOR HIGH-GRADE BLUNT SPLENIC INJURIES WITH HEMODYNAMIC INSTABILITY: WHERE IS THE SWEET SPOT?

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Presenter: Makoto Aoki, MD, PhD

Objectives: Our aim was to compare splenic angioembolization (SAE) with splenectomy in unstable high-grade blunt splenic injury (BSI) patients and identify potential candidates for SAE in this patient cohort.

Methods: The ACS-TQIP database was searched between 2013–2019 to identify patients (age ³16 years) with isolated high-grade BSI (Grade 3–5) and hemodynamic instability. Hemodynamic instability was defined as a systolic blood pressure (SBP) at admission of <90 mmHg, heart rate (HR) >120 bpm, or lowest SBP <90 mmHg within 1 h after admission, and ³1 unit of blood transfusion. In-hospital mortality in SAE and splenectomy groups was compared using 1:2 propensity-score (PS) matching. The characteristics of PS-unmatched and PS-matched splenectomy patients were also compared.

Results: A total of 493 patients were included (147 SAE/346 splenectomy). After PS matching, 84 SAE and 168 splenectomy patients were compared (**Figure**). Approximately 80% of PS-matched patients sustained Grade 3 or 4 BSI and often presented with normal SBP and HR before becoming hemodynamically unstable. The median time to intervention (splenectomy or SAE) was 139 min (interquartile range: 96-183). No significant difference in in-hospital mortality between SAE and splenectomy groups was observed (4.8% vs. 6.5%, $p = 0.779$). More than half of 178 PS-unmatched splenectomy patients sustained Grade 5 BSI and 65.2% of those presented to hospital with SBP <90 mmHg and/or HR >120 bpm (**Table**). The median time to splenectomy in these patients was significantly shorter than in PS-matched splenectomy patients (66 vs. 137 min, $p < 0.001$).

Conclusions: Our results suggest early SAE (within 2-3 h) as a feasible adjunct to non-operative management for Grade 3 or 4 BSI with hemodynamic instability. Splenectomy remains the mainstay of treatment for Grade V BSI presenting with SBP <90 mmHg and/or HR >120 bpm.

Variable	PS-matched Patients			PS-unmatched Patients	
	Splenectomy (n=168)	SAE (n=84)	*P*-value	Splenectomy (n=178)	*P*-value*
Demographics					
Age, y	52 (33-62)	56 (32-65)	0.422	42 (30-59)	0.008
Sex, male	102 (60.7)	52 (61.9)	0.892	107 (60.1)	0.842
Vital signs at hospital arrival					
SBP	102 (84-125)	100 (85-131)	0.856	90 (77-110)	<0.001
HR	95 (77-111)	95 (78-111)	0.800	101 (83-123)	0.023
GCS	15 (15-15)	15 (15-15)	0.510	15 (14-15)	<0.001
Lowest sBP	77 (67-85)	79 (69-86)	0.440	75 (65-84)	0.100
Splenic Injury Grades			0.504		<0.001
OIS=3	71 (42.3)	30 (35.7)		19 (10.7)	
OIS=4	69 (41.1)	41 (48.8)		59 (33.1)	
OIS=5	28 (16.7)	13 (15.5)		100 (56.2)	
ISS	17 (13-21)	17 (14-22)	0.712	25 (19-29)	<0.001
Time to intervention	137 (92-188)	144 (100-176)	0.532	66 (47-98)	<0.001

*PS-matched splenectomy and SAE versus PS-unmatched splenectomy

Table. Characteristics of propensity-score matched and unmatched patients

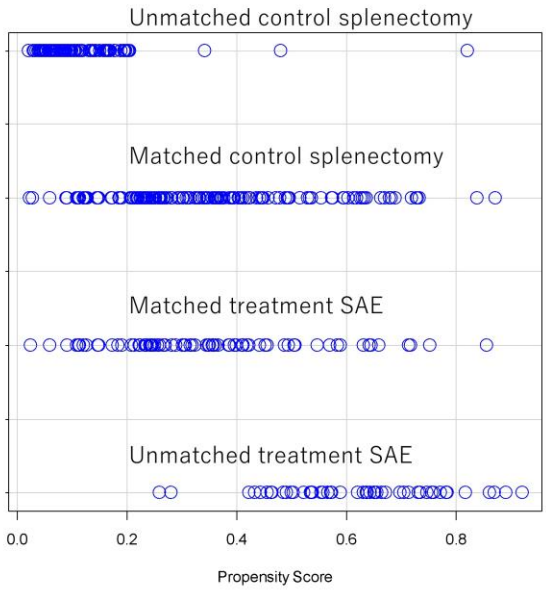

Figure. Distribution of propensity scores

Quick Shots Session II

Quick Shot #19
January 19, 2023
9:33 am

RISK FACTORS FOR ANASTOMOTIC LEAK FOLLOWING PRIMARY ANASTOMOSIS OF BLUNT-TRAUMA ASSOCIATED BUCKET HANDLE INTESTINAL INJURIES: A MULTI-CENTER STUDY

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Presenter: Erin Morris, BS

Objectives: Risk factors for an anastomotic leak (AL) after resection & primary anastomosis for traumatic bucket handle injury (BHI) have not been previously defined; this multi-center study was conducted to address this knowledge gap.

Methods: A multi-center retrospective study on the small intestine and colonic BHI from blunt trauma between 2010—2021. Baseline patient characteristics, presence of shock & transfusion, operative details, and clinical outcomes were compared, & pertinent risk factors were explored using R.

Results: Data on 395 subjects were submitted by 12 trauma centers, of whom 33 (8.1%) patients developed AL. Baseline details were similar, except a higher proportion of patients in the AL group had medical comorbidities such as diabetes, hypertension, and obesity (60.6% vs. 37.3%, p=0.015). AL had higher rates of surgical site (13.4% vs. 5.3%, p=0.004) & organ space infections (65.2% vs. 11.7%, p <0.001), along with higher readmission and reoperation rates (48.4% vs. 9.1%, p<0.001 & 39.4% vs 11.6% p<0.001, respectively). There was no difference in ICU length of stay or mortality (p>0.05).

More patients with AL were discharged with an ostomy (69.7% vs. 7.3%, p<0.001), & mean duration until ostomy reversal was 5.85±3 months (range 2-12.4 months).

The risk for AL significantly increased when the initial operation was a damage control procedure, after adjusting for age, sex, injury severity, presence of ≥ 1 comorbidities, shock, transfusion of >6 packed red blood cells, & site of injury (adjusted RR=2.32 [1.13, 5.17]), none of which were independent risk factors in themselves.

Conclusions: Patients with AL after BHI do significantly worse on post-operative infection, reoperation, and readmission, and have a nearly 10-fold increase in ostomy upon discharge. Damage control surgery appears to double the risk of AL.

Table 1. Patient presentation and outcome of the whole cohort

Variable	Anastomotic leak (n = 33) mean ± SD/ n (%)	No leak (n = 372) mean ± SD/ n (%)	p-value
Age	44.12 ± 15.18	39.08 ± 16.11	0.077
Sex (males)	25 (75.8)	260 (69.9)	0.611
BMI	29.15 ± 7.44	27.93 ± 5.55	0.363
ISS	26.21 ± 11.84	22.85 ± 11.86	0.127
≥ 1 comorbidity	20 (60.6)	135 (37.3)	**0.015**
Site of Injury* Small Intestine only	15 (6.4)	220 (93.6)	0.136
Colonic Injury	11 (13.4)	71 (86.6)	
Small and Colonic Injuries	7 (8.3)	77 (91.7)	
Presented with Shock	15 (45.5)	130 (35.1)	0.320
WBC	15.66 ± 7.48	15.65 ± 7.21	0.994
Hb	11.96 ± 2.54	12.62 ± 2.19	0.175
BE	-3.96 ± 6.47	-4.74 ± 4.66	0.566
Lactate	4.4 ± 3.12	3.62 ± 2.19	0.273
Outcomes			
Transfusion of >6 packed red blood cells*	9 (27.27)	74 (20)	0.444
Technique of anastomosis (Staples)	20 (62.5)	246 (70.5)	0.459
Total number of abdominal surgeries†	2 (1)	1 (1)	0.581
SSI*	7 (13.0)	21 (5.3)	**0.004**
Organ space infection*	22 (65.2)	45 (11.7)	**< 0.001**
LOS†	12.5 (13.8)	11 (17)	0.512
ICU†	4 (8.02)	4 (11)	0.625
Ventilator days †	2 (4)	2 (6)	0.692
First surgery being a damage control surgery	24 (72.7)	168 (47.3)	0.009
Discharged with Ostomy	23 (69.7)	27 (7.3)	**< 0.001**
Ostomy reversed ‡	11 (47.8)	17 (63)	0.430
Readmission*	15 (48.4)	32 (9.1)	**< 0.001**
Reoperation	13 (39.4)	43 (11.6)	**< 0.001**
Mortality*	2 (6.1)	20 (5.4)	0.698

* Fisher's exact test; †Non-parametric Wilcoxon rank-sum test was used expressed with median

Table 1. Patient presentation and outcome of the whole cohort

Quick Shots Session II

Quick Shot #20
January 19, 2023
9:39 am

A WTA MULTICENTER COMPARISON OF MESH VERSUS NON-MESH REPAIR OF BLUNT TRAUMATIC ABDOMINAL WALL HERNIAS

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Presenter: Kevin N. Harrell, MD

Objectives: Blunt traumatic abdominal wall hernias (TAWH) occur in <1% of trauma patients but cause significant morbidity and mortality. Optimal repair techniques, such as mesh reinforcement, have not been studied in detail. We hypothesize that mesh use will be more common in larger TAWH and associated with increased surgical site infections (SSI).

Methods: A secondary analysis of the WTA TAWH multicenter study was performed. Patients who underwent TAWH repair during initial hospitalization (01/2012-12/2018) were included. Patients repaired after initial hospitalization were excluded. Mesh repair patients were compared to primary repair patients (non-mesh). A logistic regression was conducted to assess risk factors for SSI.

Results: 157 patients underwent TAWH repair during index hospitalization. Mesh was used in 51 (32.5%) patients, with 24 (45.3%) synthetic and 29 (54.7%) biologic placed. Flank hernias had a higher rate of mesh repair compared to rectus hernias (40.0% vs. 22.3%, p=0.038). 26 (16.6%) patients underwent mesh placement with bowel resection. Mesh patients were more commonly smokers (43.1% vs. 22.9%, p=0.016) and had a larger defect size (12.6 vs. 9.1 cm, p=0.016). Mesh repair patients less frequently had primary fascial closure (43.1% vs. 93.4%, p<0.001). Mesh patients had a higher rate of SSI (25.5% vs. 9.5%, p=0.016) compared to non-mesh patients, but had a similar rate of recurrence (13.7% vs. 10.5%, p=0.742), hospital length of stay (LOS), and mortality. Mesh use and higher ISS remained significant risk factors for SSI in a multivariable model.

Conclusions: Mesh was used more frequently in flank TAWH and those with a larger defect size. Mesh use was associated with a higher incidence of SSI and did not reduce the risk of hernia recurrence. When repairing TAWH mesh should be employed judiciously, and prospective randomized studies are needed to identify clear indications for mesh use in TAWH.

	Univariable			Multivariable		
Variable	OR	95% CI	p-value	OR	95% CI	p-value
Mesh use	3.250	1.313-8.043	**0.011**	1.056	1.011-1.104	**0.015**
Higher ISS	1.051	1.017-1.086	**0.003**	3.560	1.163-10.900	**0.026**
Larger defect size (cm)	1.061	1.003-1.121	**0.039**	1.824	0.550-6.054	0.326
Bowel resection	3.321	1.278-8.626	**0.014**	1.009	0.942-1.080	0.805

OR: odds ratio, CI: confidence interval, ISS: injury severity score

Univariable and multivariable binary logistic regression for risk factors influencing SSI in TAWH repair