Quick Shots Session I

Quick Shot #1
January 13, 2022
9:00 am

SOCIAL DETERMINANTS OF HEALTH SCREENING AMONG ADULTS WITH TRAUMATIC INJURIES: A PILOT QUALITY IMPROVEMENT INITIATIVE

Laura Baumann, MD, Laura Barthold, BA, Philip Barbato, MSW, James Nicholson, RN, John Mecchella, DO, MPH, Alexandra Briggs, MD*
Dartmouth-Hitchcock Medical Center

Presenter: Laura Baumann, MD

Objectives: Social determinants of health (SDOH) have been demonstrated to correlate with clinical outcomes, but to date screening has not been widely implemented. The purpose of this project is to assess feasibility of SDOH screening for adults after injury and identify common SDOH needs in the trauma population at our institution.

Methods: A pilot initiative to implement SDOH screening among adults (age ≥18) with traumatic injuries admitted to floor or stepdown units was conducted at our rural level I trauma center. An internal screening questionnaire consisting of 19 validated questions across 10 different domains, already utilized in our outpatient medicine clinic, was administered. Patients with positive screens were offered social work consultation for help with available resources.

Results: Over an 8 week trial period, 75 of 81 (92.5%) eligible patients were screened, with 5 unable due to mental status and 1 refusal. The average age for screened patients was 59.2 ± 20.8, and 47 (58.0%) were male. 29 patients (38.7%) screened positive for at least one domain. Finance (41.4%), food insecurity (37.9%), social isolation (34.5%), and transportation (31.0%) domains were indicated as the most common areas of concern (Figure 1). Of those who screened positive, 9 (31.0%) requested a social work consult, 13 (44.8%) reported they already had help and 7 (24.1%) declined. Mean survey administration time was 8.4 minutes. Of 57 patients asked, 28 (49.1%) reported that they had never been asked any of the screening questions before.

Conclusions: Over a third of adults admitted to our rural academic trauma center screened positive for at least one SDOH domain. The screening was easy to administer, and the majority of patients felt comfortable participating. While the majority of patients screening positive already had support, we did identify patients who could benefit from available resources.

	All Positive Screens (n=29)	18-64 years (n= 21)	≥ 65 years (n= 8)
Domains			
Finance	12 (41.4%)	9 (42.8%)	3 (37.5%)
Food Insecurity	11 (37.9%)	7 (33.3%)	4 (50.0%)
Housing Instability	8 (27.6%)	7(33.3%)	1 (12.5%)
Literacy	7 (24.1%)	4 (19.1%)	3 (37.5%)
Social Isolation	10 (34.5%)	7 (33.3%)	3 (37.5%)
Legal	3 (10.3%)	2 (9.5%)	1 (12.5%)
Transportation	9 (31.0%)	7 (33.3%)	2 (25.0%)
Relationship Safety	3 (10.3%)	2 (9.5%)	1 (12.5%)
Employment	4 (13.8%)	4 (19.1%)	-
Phone Access	0 (0.0%)	-	-
Internet Access	8 (27.6%)	6 (28.6%)	2 (25.0%)
Social Work Consultation			
Help Requested	9 (31.0%)	7 (33.3%)	2 (25.0%)
Already Have Help	13 (44.8%)	8 (38.1%)	5 (62.5%)
Declined	7 (24.1%)	6 (28.6%)	1 (12.5%)

This figure displays the social determinant of health domains most commonly indicated as areas of concern among adults with traumatic injuries who screened positive.

Quick Shots Session I

Quick Shot #2
January 13, 2022
9:06 am

LIMITED ENGLISH PROFICIENCY AND MORBIDITY AND MORTALITY AFTER TRAUMA

Maria Castro, BS, Maria Castro, BS, Hope Schwartz, BS, Sophia Hernandez,
Rebecca Menza, MS, ACNP, Deborah M. Stein, MD, MPH, FACS, FCCM*,
Robert Mackersie, MD, Alicia Fernández, MD, Tasce Bongiovanni, MD, MPP, MHS*
University of California San Francisco

Presenter: Maria Castro, BS

Objectives: Limited English Proficiency (LEP) is associated with worse health outcomes in several disease processes. However, the relationship between LEP and morbidity and mortality in trauma is poorly understood. We aimed to describe the association of LEP and health outcomes after trauma.

Methods: This retrospective cross-sectional study included all adult patients admitted to an urban Level-1 trauma center from 2012-2018. Data was abstracted from the Trauma Registry. Chi-squared tests were used to evaluate the relationship of LEP to morbidity (length of stay (LOS), ICU admission, ICU LOS, and discharge destination) and in-hospital mortality. We used univariate and multivariate logistic regression controlling for patient demographics (age, gender, race/ethnicity, insurance) and injury characteristics (mechanism, activation level (emergent, urgent, no activation), emergency department Glasgow Coma Scale, injury severity score, traumatic brain injury) to determine the association between LEP and morbidity and mortality.

Results: 13,104 trauma patients were included, 2,144 (16%) LEP and 10,960 (84%) English-proficient (EP). Languages included Mandarin or Cantonese (44%), Spanish (38%), and Other (18%). For LEP patients, mortality (p=<0.0001), median LOS (p=<0.0001), and ICU admission (p=0.0279) were higher (Table 1). LEP patients were also more likely to be discharged to skilled nursing facilities (SNF) (p=<0.0001) or home with home health services (p=<0.0001), and less likely to be discharged home (p=<0.0001) or transferred to acute care facilities (p=<0.0001). Controlling for covariates, LEP was associated with increased likelihood of discharge to SNF (OR=1.24, p=0.0063) but not with mortality or other morbidities.

Conclusions: In a trauma population, LEP patients exhibited increased mortality, hospital LOS, ICU admission, and discharge to SNF. More work is needed to understand and address the mechanisms which underlie these differences.

Table 1: Morbidity and mortality by LEP status

	All	*LEP*	*EP*	*p-value*
Mortality n (%)	585 (4.5%)	149 (7.0%)	436 (4.0%)	**<0.0001**
Median hospital length of stay, days (range)	3 (1 – 336)	4 (1 – 232)	3 (1 – 336)	**0.0002**
Admitted to ICU n (%)	4835 (37%)	836 (39%)	3999 (36%)	**0.0279**
Median ICU length of stay, days (range)	3 (0 – 109)	3 (1 – 69)	3 (0 – 109)	0.3740
Discharge destination n (%)				
Acute care transfer	1202 (9.2%)	120 (5.6%)	1082 (9.9%)	**<0.0001**
Home	7608 (58%)	1087 (51%)	6521 (59%)	**<0.0001**
Home with home health services	1190 (9.1%)	242 (11%)	948 (8.7%)	**<0.0001**
Skilled nursing facility	1749 (13%)	458 (21%)	1291 (12%)	**<0.0001**
Other or Unknown	1355 (10%)	237 (11%)	1118 (10%)	0.2353

Quick Shots Session I

Quick Shot #3
January 13, 2022
9:12 am

CENTER FOR TRAUMA SURVIVORSHIP IMPROVES POST-DISCHARGE FOLLOW-UP AND RETENTION

Carma Goldstein, MD, Amy V. Gore, MD, Susan La Bagnara, MSN, Ilona Jacniacka-Soto, BSN, Derrick Sieck, MPH, Peter Yonclas, MD, David H. Livingston, MD*
Rutgers-New Jersey Medical School

Presenter: Carma Goldstein, MD

Objectives: Although the need for high-level care persists post-discharge, severely injured trauma survivors have historically poor adherence to follow-up. We hypothesized that a dedicated Center for Trauma Survivorship (CTS) improves follow-up and facilitates post-discharge specialty care.

Methods: Retrospective study of "CTS eligible" trauma patients before (Jan – Dec 2017) and after (Jan – Dec 2019) creation of the CTS. Patients with an ICU stay ≥ 2 days or a New Injury Severity Score ≥ 16 are CTS eligible. The pre-CTS (Pre) cohort was followed through Dec 2018 and the CTS cohort through Dec 2020. Primary outcome was follow-up within the hospital system exclusive of mental health and rehabilitative therapy appointments. Secondary outcomes include post-discharge surgical procedures and specialty-specific follow-up. P-values < 0.05 were significant.

Results: There were no significant differences in demographics between the Pre (n=177) and CTS (n=119) cohorts (Table 1). In the Pre cohort, only 39% were seen by the trauma service following discharge compared to 62% in the CTS group ($p<0.001$; Table 2). CTS patients also had increased follow-up with other providers (80% vs 65%; $p=0.006$). Notably, 33% of CTS patients had additional surgery compared to only 20% in the Pre group ($p=0.011$). CTS patients had 20% more outpatient visits (1,043 vs 867 visits).

Conclusions: Despite the follow-up period for the CTS cohort occurring during the peak of the COVID-19 pandemic, limiting availability of outpatient services, the CTS significantly improved follow-up with trauma providers, as well as with other specialties. The CTS patients also underwent significantly more secondary operations. These data demonstrate that creation of a CTS can improve the post-discharge care of severely injured trauma survivors, allowing for care coordination within the healthcare system, retaining patients, generating revenue and providing needed follow-up care.

TABLE 1: Demographics	Pre Cohort (n = 177)	CTS Cohort (n = 119)	P-Value
Age, mean ± SD (years)	45 ± 18	45 ± 18	0.816
Sex, no. (%)			0.140
Male	154 (87)	96 (81)	
Female	23 (13)	23 (19)	
Race, no. (%)			0.691
Black	83 (47)	57 (48)	
White	28 (16)	23 (19)	
Other	60 (34)	37 (31)	
Unknown	6 (3)	2 (2)	
Ethnicity, no. (%)			
Hispanic	48 (27)	35 (29)	0.071
Non-Hispanic	118 (67)	83 (70)	
Unknown	11 (6)	1 (1)	
Mechanism of Injury, no. (%)			0.288
Blunt	140 (79)	100 (84)	
Penetrating	37 (21)	19 (16)	
ICU Length of Stay, mean ± SD (days)	14 ± 12	15 ± 13	0.515
Hospital Length of Stay, mean ± SD (days)	27 ± 35	28 ±20	0.718
Discharge Destination, no. (%)			0.016
Home	90 (51)	41 (34)	
Acute Rehab	57 (32)	49 (41)	
Subacute Rehab	22 (12)	26 (22)	
Long Term Care	5 (3)	3 (3)	
Other	3 (2)	0 (0)	
SD: Standard Deviation, no.: Number of Patients			

Table 1: Demographics

TABLE 2: Follow-Up	Pre Cohort (n = 177)	CTS Cohort (n = 119)	P-Value
Trauma Clinic/CTS Follow-Up, no. (%)	69 (39)	74 (62)	<0.001
Total Number of Trauma Clinic/CTS Visits	139	237	
Outpatient Providers Other than Trauma Clinic/CTS Follow-Up, no. (%)	115 (65)	95 (80)	0.006
Total Number of All Outpatient Visits	867	1043	
Surgical Subspecialty Providers Outpatient Follow-Up, no. (%)	105 (59)	91 (76)	0.002
Post-Discharge Surgery, no. (%)	35 (20)	39 (33)	0.011
Medical Providers Outpatient Follow-Up, no. (%)	48 (27)	39 (33)	0.295

Table 2: Follow-Up

Quick Shots Session I

Quick Shot #4
January 13, 2022
9:18 am

"WE'RE PLAYING ON THE SAME TEAM": DISCONNECTIONS AND CONNECTIONS OF COMMUNICATION BETWEEN TRAUMA PATIENTS AND SURGICAL RESIDENTS

Anna K. Huang, BA, Henry Olivera Perez, BS, Kristen Chalmers, BA, Stephanie Washington, BA, Anase Asom, BS, Paige-Ashley S Campbell, B.S, Itzel Lopez Hinojosa, BA, Frazer Tessema, BA, Nikhil Umesh, BS, Joseph Richardson, PhD, Elizabeth Tung, MD, MS, Doriane Miller, MD, Zinzi Bailey, ScD, MSPH, Mihir Chaudhary, MD*, Tanya L. Zakrison, MD, MPH, FRCSC, FACS*
University of Chicago

Presenter: Anna K. Huang, BA

Objectives: Patient-provider communication is key to better clinical outcomes and patient well-being. Communication between trauma patients and their providers remains relatively unexplored. Therefore, we assessed the communication experiences of patients and surgical residents at a high-volume urban Level I trauma center.

Methods: A qualitative, grounded theory approach was used to explore communication strengths and challenges for patients and residents. Patients previously admitted to the trauma service were randomly recruited during their trauma clinic appointments. Surgical residents were recruited via email. Anonymous, semi-structured interviews were conducted until thematic saturation was reached. Each interview was coded by 2 separate evaluators for thematic analysis and hypothesis generation.

Results: 25 interviews with patients and residents were conducted. Major themes from patient interviews were feeling ignored; feeling misunderstood; inadequate communication from providers. Residents cited lack of time, differences in health literacy, and differences in cultural and structural background as barriers to effective communication with their patients. Patients and residents reported similar understandings of patients' stressors and needs, similar emotional experiences regarding patient and provider trauma, and a desire to communicate in greater depth both inside and outside of the hospital.

Conclusions: Trauma patients and residents can feel disconnected due to the lack of time for thorough communication, differences in health literacy, and differences in background; however, they share similar perspectives, experiences, and a desire for increased patient-provider communication. Leveraging these shared values to guide interventions such as patient-centered, trauma-informed teaching or a resident curriculum may help bridge their disconnects and improve their communication.

Quick Shots Session I

Quick Shot #5
January 13, 2022
9:24 am

VIRTUAL HYBRID MODEL OF HOSPITAL-BASED VIOLENCE PREVENTION PROGRAM AS EFFECTIVE AS IN-PERSON MODEL

Charity Evans, MD, MS*, Ashley Farrens, MSN, MBA, RN, Jennifer Burt, PhD, Tyrone Greenaway, Gaylene Armstrong, PhD, Mark Foxall, PhD, Ashley Raposo-Hadley, MPH, BA
University of Nebraska Medical Center

Presenter: Charity Evans, MD, MS

Objectives: The aim of this study was to examine the effectiveness of hospital-based violence prevention program (HBVP) delivered in a virtual hybrid method to detained youth compared to an in-person method delivered in the hospital setting.

Methods: Dusk to Dawn is a HBVP program intended to improve youth's recognition of high-risk situations, discuss violence overtly, and teach conflict resolution skills. Between October 2018 and June 2021, 213 youth between 12-18 years old participated in person at the hospital. A hybrid virtual model using a video to recreate the hospital setting with discussion facilitated by one in-person credible messenger was utilized with 261 youth detained at a local youth detention center during the same time period. Youth completed a pre and post survey immediately before and after the virtual or in-person program collecting demographics, involvement in risk-related activities, 15-matched attitudes about violence items, and 5 open ended satisfaction items. T-test for independent groups was used for continuous variables and chi-square test used for categorical variables. Mean scores of matched items were compared using the Wilcoxon Signed Rank test for dependent ordinal data.

Results: The detained youth receiving the virtual hybrid model were on average older ($p<.000$), a larger proportion were African American/Black ($p<.000$) and responded yes more often to every risk related survey item ($p<.000$). Mean scores for agreement on items related to attitudes about violence were significantly lower after the intervention for both the in-person class and virtual hybrid model ($Z =-2.591$, $p<.05$; $Z=-5.360$, $p<.000$).

Conclusions: A virtual hybrid model of Dusk to Dawn can be utilized effectively to reach at risk youth who are unable to attend the HBVP program in person due to involvement in the justice system.

	In-person method, n=213	Virtual Hybrid method, n =261	p-value
Age, mean (SD)	14.10 (1.73)	15.96 (1.22)	<.000
Gender, %			
Male	59.20	86.20	<.000
Female	40.40	13.40	
Race/Ethnicity, %			
African American/Black	39.40	52.50	<.05
Latino/ Hispanic/ Chicano	21.60	23.40	
Caucasian/White	15.50	9.20	
Asian	1.40	1.90	
Native American	4.20	3.80	
Biracial	10.30	4.60	
Other	6.60	4.60	
Been to a detention center	21.50	91.90	<.000
Been on probation	20.20	80.50	<.000
Been arrested	24.40	93.10	<.000
Previous injury related to violence	14.90	33.60	<.000
Lost a friend or family to violence	49.50	77.40	<.000
Identify as a gang member	7.20	40.90	<.000
Spend time with gang members	31.30	69.90	<.000

Baseline demographic characteristics for in-person and virtual hybrid groups

	Mean presurvey score (SD)	Mean postsurvey score (SD)	Mean difference (SD)	Z-score	p-value
In-person method	2.71 (0.66)	2.66 (0.69)	0.05 (0.61)	-2.591	<.05
Virtual Hybrid method	3.18 (0.66)	3.00 (0.63)	0.18 (0.58)	-5.360	<.000

Attitudes towards violence survey results for in-person and virtual hybrid groups

Quick Shots Session I

Quick Shot #6
January 13, 2022
9:30 am

THE VALUE OF COMPASSION: HEALTHCARE SAVINGS OF PALLIATIVE CARE CONSULTS IN TRAUMA

Audrey L. Spencer, MD*, Andrew Nunn, MD*, Preston R. Miller III, MD*, Gregory Russell, MS, Samuel P Carmichael , MD, MS*, Kristina Neri, MS, Buddy Marterre, MD, MDiv
Wake Forest Baptist Medical Center

Presenter: Audrey L. Spencer, MD

Objectives: To evaluate the effects of palliative care consultation on patient charges and hospitalization metrics in adult trauma patients.

Methods: We interrogated databases from our Level I academic trauma center over a 26-month period for patients age ≥18 admitted to the trauma service. Patients undergoing palliative care (PC) consult were matched using propensity scoring to those without PC consultation. Matching was performed based on age, admission Glasgow Coma Scale score, Injury Severity Score and Head Abbreviated Injury Scale. Total charges per day, total charges per ICU day, hospital length of stay (LOS), ICU LOS, intubation days, and discharge disposition were compared.

Results: Between 1/1/19 and 3/31/21, 140 unique patients underwent PC consultation. These were matched to a group not receiving PC consult over the same time frame. Mean charges per day in the PC cohort were $17,743 compared to $26,269 in the control cohort ($p<0.01$). Mean charges per ICU day in the PC cohort were $40,089 compared to $64,311 ($p<0.01$). Hospital LOS (15.7 vs 7 days), ICU LOS (7.9 vs 2.9 days), and ventilator days (5.1 vs 1.5) were significantly higher in the PC cohort (all $p<0.01$). Patients were more likely to discharge to hospice if they received a PC consult (33.6 vs 2.1%, $p<0.01$). Mean time to PC consult was 7.2 days (range 1 hour to 45 days). LOS correlated positively with time to PC consultation ($r=0.72$, $p<0.01$).

Conclusions: Expert PC services are known to alleviate patient suffering and avert goal-incongruent care. While severely injured patients demand significant resources during acute hospitalization, PC consultation offered in tandem with life-sustaining interventions is clearly associated with savings to patients and the healthcare system. Given the correlation between LOS and time to PC consult, these savings may be amplified by earlier PC consultation in appropriately identified patients.

Matched Patient Demographics

Variable	PC Cohort (n = 140)	Control Cohort (n = 140)	P-Value
Age, mean (IQR)	71.5 (64.5 - 84)	70.3 (63.5 - 83)	0.61
ISS	19.6 (10 - 25)	18.6 (9 - 25.5)	0.49
Head AIS	2.3 (0 - 4)	2.2 (0 - 4)	0.72
Admission GCS	11.5 (7 - 15)	11.7 (7.5 - 15)	0.67

Table 1. Patient characteristics in palliative care study cohort compared to matched control cohort

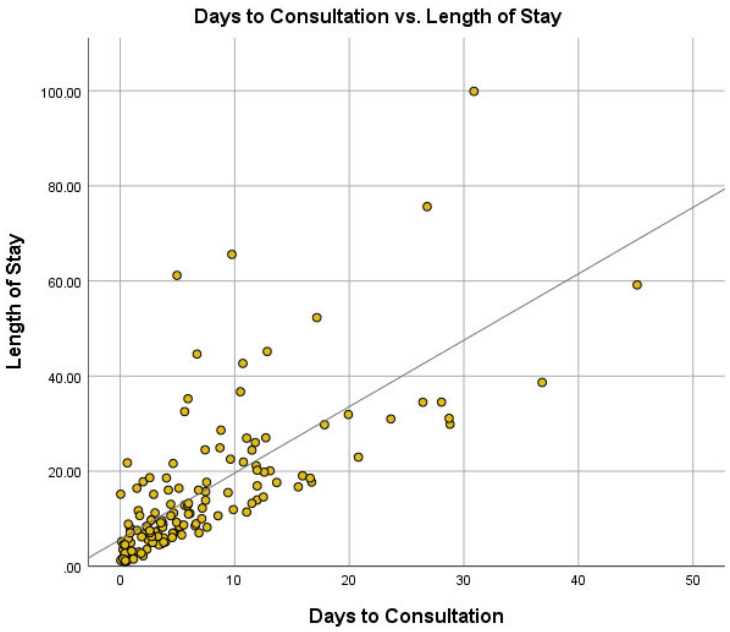


Figure 1. Relationship between days to palliative care consultation and total hospital length of stay (r = 0.72)

Quick Shots Session I

Quick Shot #7
January 13, 2022
9:36 am

NFTI IS THRIFTY: NEED FOR TRAUMA INTERVENTION (NFTI) CRITERIA ARE SUPERIOR TQIP MODELING FOR POST-INJURY OUTCOMES

David M. Rosenberg, MS, Charles DiMaggio, PhD, Leandra Krowsoski, MD*, Michael J. Klein, MD*, Manish Tandon, MD, Cherisse Berry, MD, FACS*, Margaret Ewen, PA-C, Spiros Frangos, MD, Marko Bukur, MD, FACS*
New York University

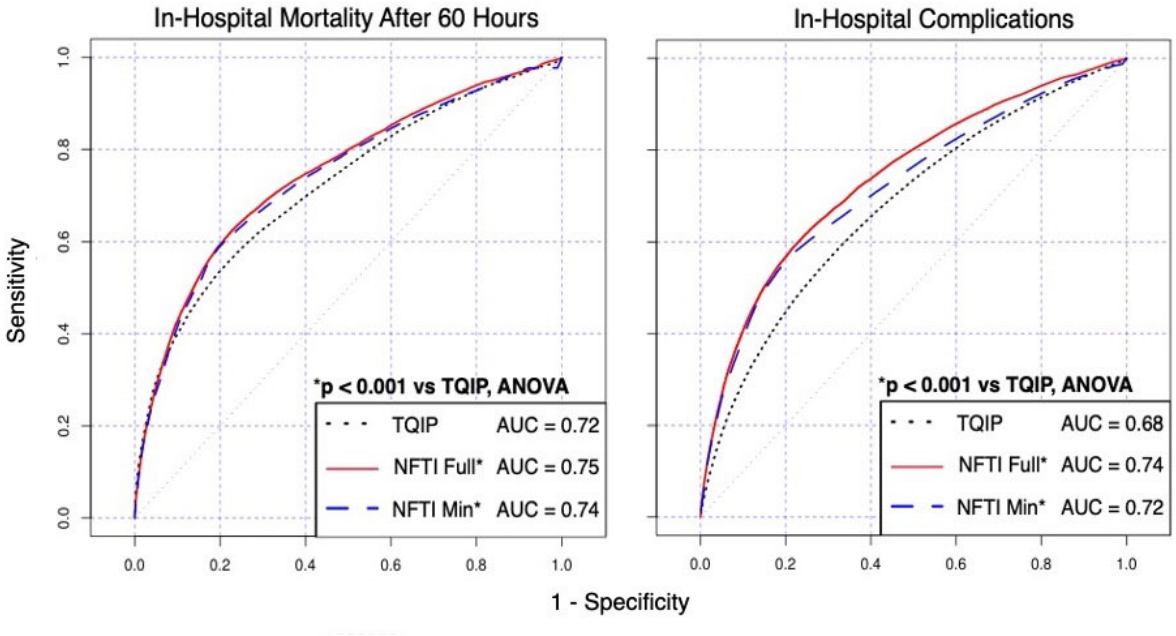
Presenter: David M. Rosenberg, MS

Objectives: The American College of Surgeons Trauma Quality Improvement Program (TQIP) provides risk-adjusted outcomes to benchmark institutional trauma performance. TQIP adjusts for 19 variables, which can be limited by missing or erroneous data. Need For Trauma Intervention (NFTI) has emerged as a reliable triage tool that accurately reflects severity of injury. The objective of this study was to assess whether a model utilizing NFTI criteria is superior to TQIP for predicting post-injury outcomes.

Methods: We modeled in-hospital mortality and complications using TQIP data from 2016 and 2017 (> 1.2 million cases). We developed three logistic regression models: one with TQIP variables; a “NFTI Full Model” based on all NFTI criteria except death within 60 hours, plus comorbidity and demographic data; and a “NFTI Minimal Model” with the same NFTI criteria plus demographic data but excluding comorbidities. Statistical comparisons were based on predictive accuracy using area-under-the-curve (AUC) and ANOVA Likelihood Ratio Tests for statistical comparison.

Results: For mortality > 60 hours, NFTI models were superior compared to the TQIP model (AUC 0.75 for NFTI Full and 0.74 for NFTI Minimal versus 0.72, $p < 0.001$). The NFTI models also outperformed TQIP for predicting hospital complications (AUC = 0.74 and 0.72 for NFTI Full and NFTI Minimal, versus 0.68 for TQIP, $p < 0.001$).

Conclusions: A risk adjustment model using NFTI is a more clinically meaningful alternative to conventional TQIP methodology. Further investigation utilizing NFTI as a benchmarking tool is warranted.



Receiver-operator curves (ROCs) with area-under-the-curve (AUC) metrics of traditional TQIP, "NFTI Full," and "NFTI Min" models for predicting in-hospital mortality after 60 hours of hospital admission (left) and in-hospital complications (right). NFTI Min and NFTI Full models have superior performance compared to TQIP (ANOVA, $p < 0.001$).

Quick Shots Session I

Quick Shot #8
January 13, 2022
9:42 am

CORRELATION OF RELATIVE VALUE UNIT REIMBURSEMENT WITH HOSPITAL LENGTH OF STAY IN TRAUMA SURGERY

Eden K. Hunt, MD, Matelin Crosen, MD, Rovinder S. Sandhu, MD*, Joseph Stirparo, MD*
Lehigh Valley Health Network

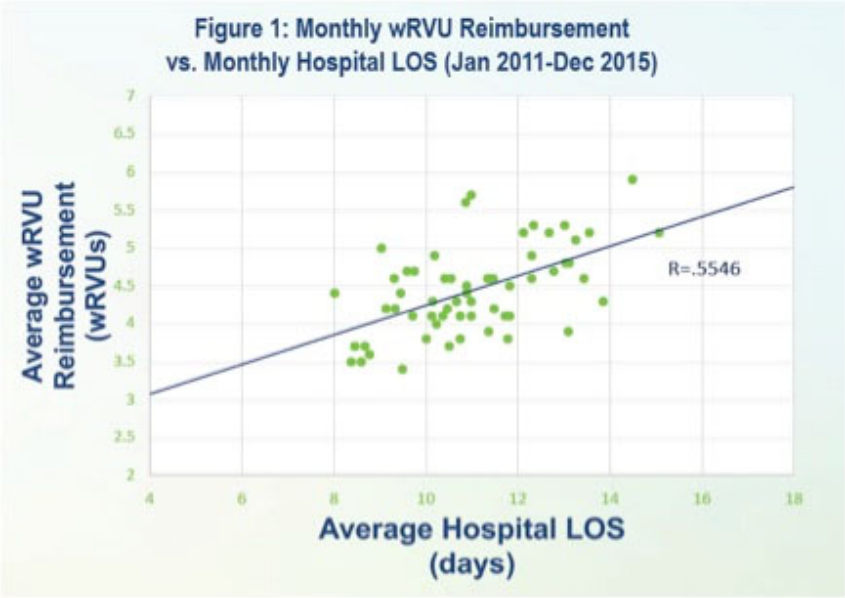
Presenter: Eden K. Hunt, MD

Objectives: Determine if a correlation exists between work relative value unit (wRVU) generation and hospital length-of-stay (LOS) in trauma patients, and furthermore to ascertain if hospital LOS reduction initiatives have an impact on wRVU generation for trauma surgeons

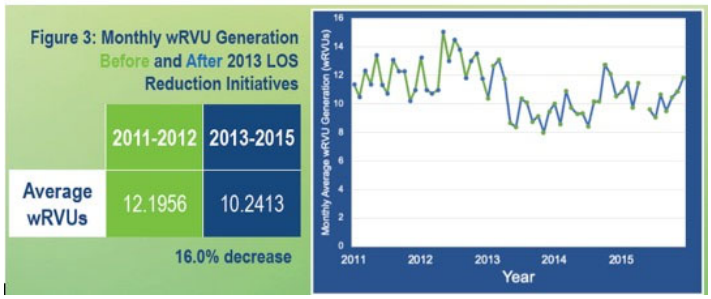
Methods: We conducted a retrospective chart review of 25,000 patients admitted to the trauma service between 2011-2015 to evaluate hospital LOS and wRVU generation. Bivariate analysis using a scatter plot and Pearson Correlation Coefficient assessed for correlation between LOS and wRVU generation. Included dates contain the implementation of LOS reduction initiatives in 2013. The patients were divided into pre- and post- implementation groups (2011-12 and 2013-15, respectively) to evaluate changes in average monthly LOS and wRVU reimbursement.

Results: A positive correlation between average monthly hospital LOS and wRVU generation (R = 0.55) was observed. Data was analyzed pre- (2011-12) and post- (2013-15) implementation of LOS reduction initiatives. The average LOS decreased by 6.2% in the post-implementation period as compared to the pre-implementation period (4.33 vs 4.61 days, respectively). Average monthly wRVU generation decreased 16.0% in the post-implementation time period, compared to pre-implementation period (10.24 vs 12.20 wRVUs, respectively).

Conclusions: Our study demonstrates a positive correlation (R=0.55) between monthly LOS and wRVU generation for trauma patients, as well as decreased average LOS and RVU generation following implementation of 2013 LOS reduction initiatives. These findings support the hypothesis that reduction in trauma patient LOS may contribute to reduced wRVU generation. Trauma surgeon reimbursement through wRVU pay scales may be adversely affected by length of stay initiatives. Review and alteration of CMS criteria for RVU reimbursement in trauma care may incentivize increased productivity.



Bivariate Analysis of Monthly wRVU Reimbursement vs. Monthly Hospital LOS using Scatter Plot and Pearson Correlation Coefficient



Graphic Representation of Average Monthly wRVU Generation and Monthly Hospital LOS pre- and post-implementation of LOS Reduction Initiatives

Quick Shots Session I

Quick Shot #9
January 13, 2022
9:48 am

A MULTICENTER EVALUATION ON THE IMPACT OF NON-THERAPEUTIC TRANSFER IN RURAL TRAUMA

James M. Bardes, MD*, Daniel J. Grabo, MD, FACS*, Aimee LaRiccia, DO*,
M. Chance Spalding, DO, PhD, FACS*, Zachary D Warriner, MD*,
Andrew C. Bernard, MD, FACS*, Scott B. Armen, MD, FACS, FCCM*,
Melissa B. Linskey Dougherty, MD*, Conley Stout, MD, Alison M. Wilson, MD, FACS*
West Virginia University

Presenter: James M. Bardes, MD

Objectives: Trauma transfers are a common occurrence in rural areas, where critical access and lower level trauma centers routinely transfer to tertiary care centers. Transfers can be non-therapeutic when no specialist intervention occurs, leading to transfer that were futile (FT) or secondary overtriage (SOT). This study aimed to evaluate the prevalence of FT and SOT among trauma centers providing tertiary care to rural Appalachia.

Methods: Retrospective database review was performed at four ACS verified Level 1 trauma centers. All adult trauma patients transferred during 2018 were included. Transfers were considered futile if in <72 hours the patient died or was discharged to hospice, without operative intervention. SOT transfers were discharged in <48 hours, without major intervention, with an ISS< 15.

Results: 4,189 patients were transferred during the study. 2,268 (54%) had a length of stay <72 hours. 121 (3%) met criteria for futility. Futile patients had a median ISS of 25 (IQR 11.5), and 51% had an AIS head ≥4. This was significantly greater ($p<0.001$) than non-futile transfers, median ISS 5 (IQR 6), 3% severe head injury. SOT occurred in 1371 (33%), with a median ISS of 5, and lower AIS scores by region. 13% of FT+SOT were admitted to the ICU. Only 22% of FT+SOT came from a trauma center. 68% were transported by ALS and 13% transported by air transport. FT+SOT traveled a mean of 70 miles, and 76 minutes to receive tertiary care. This equates to over 20,000 staff hours for EMS.

Conclusions: Non-therapeutic transfers account for more than 1/3 of transfers to four rural tertiary care centers. This represented a significant use of both ground or air transport, and a significant number of resources at the tertiary care center. The utility of these transfers should be questioned. With the recent increases in telehealth there is an opportunity for trauma systems to improve regional care and decrease transfers for futile cases.

Quick Shots Session I

Quick Shot #10
January 13, 2022
9:54 am

A MULTICENTER VALIDATION OF THE MODIFIED BRAIN INJURY GUIDELINES: ARE THEY SAFE AND EFFECTIVE?

Abid Khan, MD*, Janet Lee, MD, Kevin Galicia, MD, Joshua Billings, MD,
Vishal Dobaria, BS, Purvi P. Patel, MD*, Robert C. McIntyre, MD,
Richard P. Gonzalez, MD*, Thomas J. Schroeppel, MD*
University of Colorado Health-Memorial Hospital

Presenter: Abid Khan, MD

Objectives: The modified Brain Injury Guidelines (mBIG) are an algorithm for treating patients with traumatic brain injury (TBI) and intracranial hemorrhage (ICH) by which selected patients do not require a repeat head CT, a neurosurgery consult, or even an admission. The mBIG altered the original Brain Injury Guidelines (BIG) to improve safety and reproducibility. The purpose of this study is to assess safety and resource utilization with mBIG implementation.

Methods: The mBIG were implemented at three level-1 trauma centers in 8/2017. A multicenter retrospective review of prospectively collected data was performed on adult mBIG 1 and 2 patients. The post mBIG implementation period (8/2017-2/2021) was compared to a previous BIG retrospective evaluation (1/2014-12/2016).

Results: There were 764 patients in the two study periods. No differences were identified in demographics, ISS, or admission GCS. Fewer CT scans (2 [1,2] vs 2 [2,3], $p<0.0001$) and neurosurgery (NSGY) consults (61.9% vs 95.9%, $p<0.0001$) were obtained post mBIG implementation. Both the hospital (2 [1,4] vs 2 [2,4], $p=0.013$) and ICU (0 [0,1] vs 1 [1,2], $p<0.0001$) length of stay were shorter after mBIG implementation. No difference was seen in the rate of clinical or radiographic progression, NSGY operative intervention, or mortality between the two groups.

Post mBIG implementation, 8 patients (1.6%) worsened clinically. Six patients that clinically progressed were discharged with a GCS of 15 and without needing NSGY intervention. One patient had clinical and radiographic decompensation and required craniotomy. Another patient worsened clinically and radiographically, but due to metastatic cancer, elected to pursue comfort measures and died.

Conclusions: This prospective validation shows the mBIG are safe, pragmatic, and can dramatically improve resource utilization when implemented in the management of TBI with ICH.

	Total Study n=764	Pre mBIG implementation n=268	Post mBIG implementation n=496	*P*
Age	53.7 (±20.9)	54.7 (±20.2)	59.1 (±15.5)	0.544
Female	44.0% (336)	44.4% (119)	56.3% (279	0.086
BIG 1/mBIG 1	42.2% (322)	36.9% (99)	45.0% (223)	0.032
BIG 2/mBIG 2	57.9% (442)	63.1% (169)	55.0% (273)	0.032
ISS	12.1 (±6.7)	11.9 (±6.8)	12.2 (±6.7)	0.630
Admit GCS	15 (15,15)	15 (15,15)	15 (14.5,15)	0.746
SDH	52.5% (263)	51.5% (138)	53.0% (263)	0.686
SAH	51.1% (390)	51.5% (138)	50.8% (252)	0.856
EDH	0.9% (7)	2.6% (7)	0	0.0006
IPH	16.0% (122)	17.2% (46)	15.3% (76)	0.507
Midline Shift	2.1% (16)	3.0% (8)	1.6% (8)	0.206
Skull Fracture	18.2% (139)	21.6% (58)	16.3% (81)	0.069
Total CT	2 (1,2)	2 (2,3)	2 (1,2)	<0.0001
NSGY Consult	73.8% (564)	95.9% (257)	61.9% (307)	<0.0001
NSGY Operations	0.5% (3)	1.1% (3)	0.2% (1)	0.127
Clinical Progression	1.2% (9)	1 (0.4%)	1.6% (8)	0.172
Radiographic Progression	12.6% (71)	11.9% (30)	13.2% (41)	0.650
ICU LOS	0 (0,2)	1 (0,2)	0 (0,1)	<0.0001
LOS	2 (1,4)	2 (2,4)	2 (1,4)	0.013
Discharge GCS	15 (15,15)	15 (15,15)	15 (15,15)	0.510
Mortality	0.1% (1)	0	0.2% (1)	0.999

Table 1. Comparison of patient characteristics and outcomes before and after mBIG implementation

Quick Shots Session II

Quick Shot #11
January 13, 2022
9:00 am

RECOMBINANT COAGULATION FACTOR SYNTHESIS VIA CRISPR-CAS9 TARGETED GENE OVEREXPRESSION

Daniel T. Lammers, MD, Colby Feser, BS, Jason Bingham, MD,
Matthew J. Eckert, MD*, Mark Osborn, PhD
Madigan Army Medical Center

Presenter: Daniel T. Lammers, MD

Objectives: Fresh frozen plasma (FFP) and prothrombin complex concentrate (PCC) are frequently used to reverse coagulopathies associated with traumatic injuries, inherited bleeding disorders, and prescription anticoagulant use. These whole blood-derived products remain at risk for supply chain issues highlighting a critical need for more sustainable and scalable recombinant coagulation factor production systems. We aimed to utilize genome engineering strategies to optimize a CRISPR-Cas9 based gene activation platform in order to drive the simultaneous overexpression of the coagulation factors II, VII, IX, and X to yield a four-factor product capable of replacing or augmenting pooled donor-derived FFP and PCC.

Methods: Guide RNA candidates were designed and evaluated for their ability to target the factor II, VII, IX, and X genes. CRISPR-Cas9 gene activation elements were introduced and gene expression levels were assessed using quantitative real-time polymerase chain reaction 72 hours following transfection (Figure 1).

Results: Multiplexed CRISPR-Cas9 based targeted activation dramatically increased gene expression of coagulation factors II, VII, IX, and X in human cells. At 72 hours all four factors displayed at least a 1,000-fold increase from their basal cellular production, with the activation of coagulation factor VII revealing the most robust response demonstrating a 10,000-fold increase in expression patterns (Figure 2).

Conclusions: CRISPR-Cas9 based gene activation shows promise for recombinant peptide production to address engineering and therapeutic gaps in the field of coagulation therapy. By using an in vitro cellular platform that can be easily scaled, our approach provides a stable, cost effective alternative that diminishes donor reliance and the need for plasma sourced products that require pooling, isolation, and stringent pathogen screening.

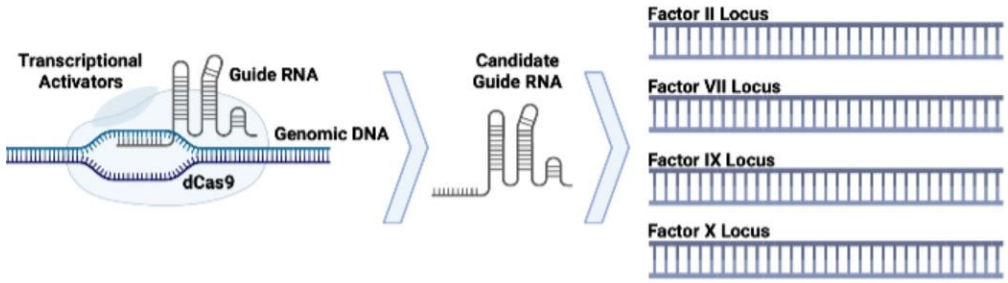


Figure 1: CRISPR-Cas9 Overexpression System. The components of the gene activation system are shown and utilize a catalytically inactive CRISPR-Cas9 complex that targets a user defined sequence to drive gene upregulation.

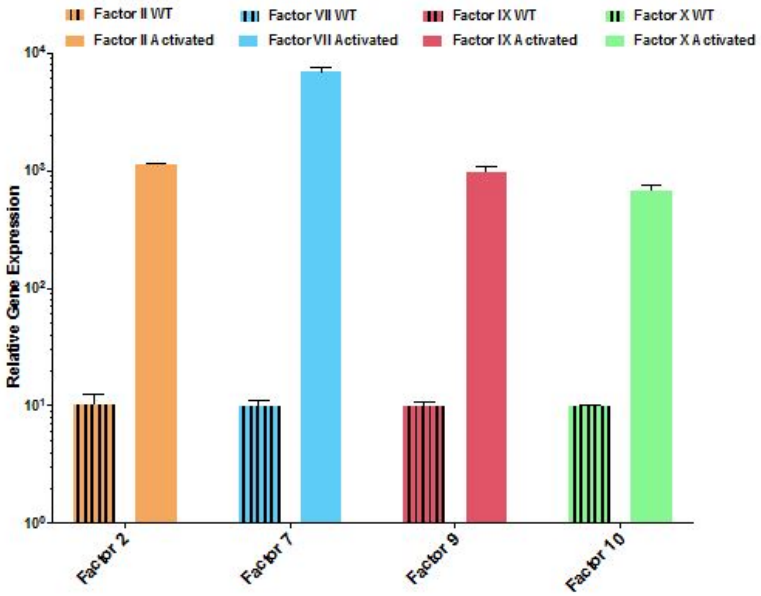


Figure 2: Coagulation Factor Gene Overexpression Analysis. Optimized guide RNAs were transiently transfected into a human cell line along with Cas9 activator. After 72 hours gene expression was analyzed by quantitative real-time PCR to compare baseline to activated gene expression in the candidate cell line.

Quick Shots Session II

Quick Shot #12
January 13, 2022
9:06 am

THE MOUSE POLYTRAUMA MODEL REPLICATES PHENOTYPE OF HYPERCOAGULABILITY AFTER TRAUMA

Mark Hoofnagle, MD, PhD*
Washington University in St Louis

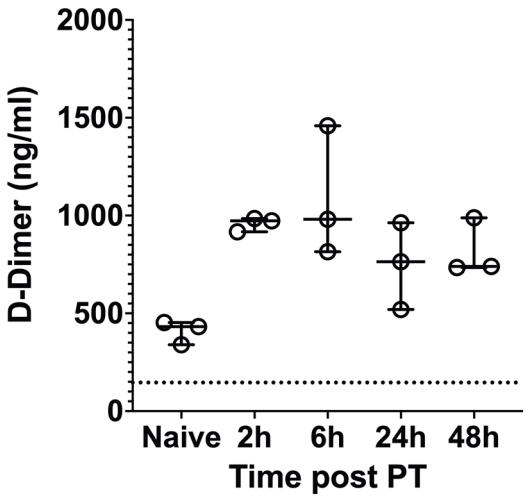
Presenter: Mark Hoofnagle, MD, PhD

Objectives: Trauma induces a hypercoagulable state resulting in increased risk of deep vein thrombosis (DVT). Developing therapies to rebalance coagulation after trauma requires a mechanistic understanding of the effects of injury on the vascular endothelium and plasma clotting factors however, existing animal models of DVT are non-physiologic, requiring direct injury to the endothelium or artificial vascular stasis to generate DVT. We describe a novel a model of trauma induced hypercoagulation (Thrombin Clotting Assay, TCA) which recapitulates the clinical scenario of DVT.

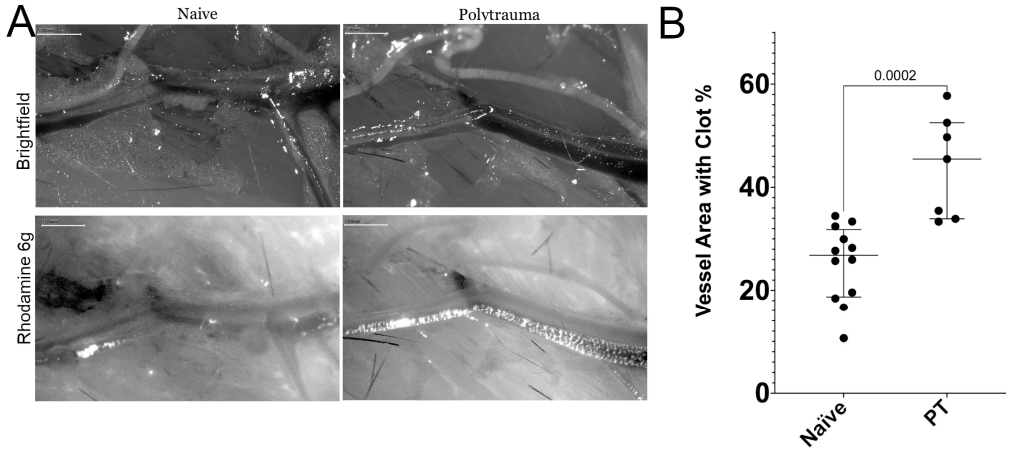
Methods: Mice were subjected to polytrauma (PT) - liver crush injury, lower extremity pseudofracture and 15% hemorrhage. TCA: 24 hours after injury, saphenous vein was exposed, rhodamine injected retroorbitally, and thrombin was applied to induce clotting. This was visualized via *in vivo* IF microscopy and quantified as the percent vessel area clotted. Circulating d-dimer was quantified at 2, 6, 24, and 48 hours by ELISA. Bivariate comparisons were done by Mann-Whitney U Test, frequencies compared by Chi-Square.

Results: Polytrauma results in 2-fold increased d-dimer, consistent with formation of clot related to injury, fibrinolysis and/or microthrombosis (Fig. 1). 24 hours after injury, TCA demonstrated significantly increased clot area in PT as compared to uninjured mice (Fig 2A). Quantitation of clot area demonstrated a 2 fold increase in clot burden in injured vs. uninjured mice (45% vs 27% $p = 0.0002$; Fig. 2B).

Conclusions: The PT/TCA model of hypercoagulation does not require direct restriction of venous flow or injury to vascular endothelium. The model recapitulates the procoagulant phenotype with increased clot formation in uninjured blood vessels. This model will allow study of the mechanisms of injury-induced hypercoagulation and identification of novel therapeutic pathways for intervention or prophylaxis.



Ddimer assay in post PT animals shows 2-fold elevation of d-dimer consistent with formation of clot related to injury, fibrinolysis and/or microthrombosis.



TCA demonstrated significantly increased clot area in PT as compared to uninjured mice. Quantitation of clot area demonstrated a 2 fold increase in clot burden in injured vs. uninjured mice (45% vs 27% p = 0.0002)

Quick Shots Session II

Quick Shot #13
January 13, 2022
9:12 am

THE IMPACT OF PRE-HOSPITAL WHOLE BLOOD ON HEMORRHAGING TRAUMA PATIENTS: A MULTI-CENTER RETROSPECTIVE STUDY

Maxwell A. Braverman, DO*, Steven Schauer, DO, MS, Alison A. Smith, MD, PhD*, Lauran Barry, Erika Brigmon, MD, James Bynum, PhD, Andrew Cap, MD, PhD, Hannah Corral, Eric Epley, Rachelle B. Jonas, RN, BSN, Michael Shiels, RN, Elizabeth Waltman, MBA, Christopher Winckler, MD, LP, Brian J. Eastridge, MD*, Ronald M. Stewart, MD, FACS*, Susannah Nicholson, MD, MS, FACS*, Donald H. Jenkins, MD, FACS*
University of Texas Health Science Center, San Antonio, TX

Presenter: Maxwell A. Braverman, DO

Objectives: Whole blood (WB) use has become more common in trauma centers across the United States for both in-hospital and pre-hospital resuscitation. Our objective was to determine the impact of our regional pre-hospital whole blood (pWB) program on hemorrhaging trauma patients admitted to level I trauma centers.

Methods: The trauma registries of both the civilian and militarylevel I trauma centers in our regional trauma service area were queried for all patients who underwent transfusion upon arrival to the trauma bay from 2015-2019. Patients who were dead on arrival or had isolated head injuries were excluded. Demographics, injury and shock characteristics, transfusion requirements including MTP (>10U in 24 hours) and rapid transfusion (CAT3+) and outcomes were compared between pWB and non-pWB patients. Chi squared test was used to compare categorical variables while non-normally distributed continuous variables were compared using Mann-Whitney U test with $p<0.05$ as the cutoff for significance.

Results: A total of 171 pWB and 1391 non-pWB patients met inclusion criteria. Demographics are outlined in Table 1. pWB patients had a lower median ISS (17 vs. 21, $p<0.001$) but higher pre-hospital shock index (SI) showing greater physiologic derangement. pWB was associated with improved SI (-0.04 vs 0.05, $p=0.002$). Mortality and LOS were similar at all time points. pWB patients received fewer pRBC, FFP and PLT units across their LOS but total units and total transfusion volumes were similar (Table 2). pWB patients had fewer MTPs (22.6% vs. 32.4%, $p=0.01$) despite a similar requirement of CAT3+ transfusion on arrival.

Conclusions: pWB administration is associated with an improvement in SI and a reduction in MTP. Although mortality is statistically similar between groups, this study is under powered. Prospective randomized controlled trials will be required to determine the true impact of pWB on trauma patients.

	pWB (n=171)	No-pWB (n=1391)	p-value
%Male (n)	83.0 (142)	74.4 (1035)	0.13
%Penetrating (n)	52.6 (90)	32.7 (455)	***<0.001***
Median Age (IQR)	32 (24-46)	39 (26-57)	***<0.001***
Median ISS (IQR)	17 (8-26)	21 (11-29)	***<0.001***
Median AIS Abdomen (IQR)	3 (2-4)	3 (2-3)	0.28
Median AIS Thorax (IQR)	2 (2-4)	3 (2-4)	0.79
Median Scene SBP, mmHg (IQR)	98 (78-117)	107 (84-132)	***0.003***
Median Scene HR, mmHg (IQR)	108 (80-128)	101 (80-122)	0.33
Median Scene SI (IQR)	1.06 (0.79-1.36)	0.93 (0.72-1.23)	***0.003***
Median Arrival SBP, mmHg (IQR)	104 (88-124)	104 (88-130)	0.78
Median Arrival HR, mmHg (IQR)	106 (86-122)	106 (86-126)	0.67
Median Arrival Shock Index (IQR)	0.99 (0.74-1.34)	0.96 (0.76 - 1.27)	0.8
Median Delta Shock Index (IQR)	-0.04 (-0.37-0.22)	0.05 (-0.18-0.27)	***0.002***

Patient Demographics, Injury Characteristics and Vital Signs (IQR = Interquartile Range)

Death in ED, % (n)	2.3 (4)	4.5% (63)	0.18
Death in 24 hours, % (n)	12.9 (22)	16.1 (224)	0.27
Hospital Death, % (n)	18.7 (32)	23.7 (330)	0.14
Median LOS pRBC Units, n (IQR)	2 (0-5)	3 (2-6)	***<0.001***
Median LOS FFP Units, n (IQR)	0 (0-2)	2 (0-4)	***<0.001***
Median LOS PLT Units, n (IQR)	0 (0-1)	0 (0-2)	***0.005***
Median LOS WB Units, n (IQR)	2 (1-5)	0 (0-1)	***<0.001***
Median Total LOS Units, n (IQR)	5 (2-12)	6 (3-12)	0.06
Median Total LOS Volume Transfused, mL (IQR)	2300 (700-4912)	2000 (1000-4250)	0.99
HLOS, d (IQR)	7 (1-17)	9 (2-19)	0.2
Ventilator Free Days, d (IQR)	5 (0-12)	6 (1-14)	0.06
ICU Free Days, d (IQR)	4 (1-9)	4 (1-10)	0.83
MTP, % (n)	22.6 (37)	32.4 (451)	***0.01***
CAT3+ Transfusion Requirement, % (n)	51.6 (83)	48.2 (670)	0.42

Patient Outcomes and Transfusion Requirements (IQR = Interquartile Range)

Quick Shots Session II

Quick Shot #14
January 13, 2022
9:18 am

PLASMA THROMBIN GENERATION KINETICS IN TRAUMA PATIENTS ACROSS THE AGE SPECTRUM

Julie Goswami, MD, Taleen MacArthur, MD, Joseph Immerman, CCRP, Michael Ferrara, Denise Klinkner, MD, M.Ed, Beth Ballinger, MD, FACS*, Rosemary A. Kozar, MD, PhD*, Jing-Fei Dong, MD, PhD, Matthew Auton, PhD, Grant Spears, Kent Bailey, PhD, Myung Park, MD, MS*
Mayo Clinic

Presenter: Julie Goswami, MD

Objectives: Trauma-induced coagulopathy (TIC) is a significant source of morbidity. We previously showed that adult trauma patients exhibit early changes in plasma thrombin generation kinetics, and that accelerated thrombin generation kinetics are an independent predictor of venous thromboembolism (VTE). This study aimed to better understand TIC in pediatric and geriatric populations by characterizing plasma thrombin generation kinetics in trauma patients across the age spectrum.

Methods: Plasma samples were prospectively collected from 130 trauma patients on arrival. Thrombin generation kinetics were assessed using Calibrated Automated Thrombogram (CAT). The following parameters were obtained: lag time (LT), peak height (PH), time to peak (ttPeak), and endogenous thrombin potential (ETP). Kruskal-Wallis, Wilcoxon, and Chi-squared tests were performed for significance among groups, with $p < 0.05$ significant. Data presented as median and interquartile range [IQR].

Results: Age groups, demographics, and clinical characteristics of the patients are described in **Figure 1**. Plasma thrombin generation kinetics by age are depicted in **Figure 2**. LT was shortest for pediatric patients as compared to both adult and geriatric patients respectively (2.67 min [2.52-3.0]; 3.35 min [2.92-4.56]; 3.27 min [2.87-4.05], $p<0.001$ among groups). Similarly, ttPeak was shortest in the pediatric patients as compared to both adult and geriatric patients respectively (5.00 min [4.67-5.78]; 6.49 min [5.64-8.0]; 6.21 min [5.53-7.0], $p<0.001$ among groups). Differences in LT and ttPeak were significant between pediatric and adult trauma patients, but not between adult and geriatric groups.

Conclusions: Pediatric trauma patients have a distinct pattern of accelerated thrombin generation kinetics as compared to adult and geriatric patients. This finding may elucidate future preventative and therapeutic options for TIC management in this unique population.

	Pediatric (n = 36)	Adult (n = 34)	Geriatric (n = 60)	p-value
Age (median [range])	17 [12-18]	36 [20-62]	76 [65-97]	**< 0.001**
Male (%)	26 (72%)	27 (79%)	42 (70%)	0.608
Mechanism				0.132
Blunt (%)	30 (88%)	31 (88%)	59 (98%)	
Penetrating (%)	4 (12%)	3 (12%)	1 (2%)	
ISS (median [IQR])	14 [5-21]	12 [6-22]	17 [11-26]	0.122
Transfusion in first 24h (%)	7 (19%)	4 (12%)	24 (40%)	**0.006**
ICU (%)	14 (39%)	13 (38%)	45 (75%)	**< 0.001**
Disposition				**< 0.001**
Home or Rehab (%)	34 (94%)	31 (91%)	24 (40%)	
SNF or LTAC (%)	1 (3%)	2 (6%)	30 (50%)	
90-day VTE (%)	1 (3%)	2 (6%)	2 (3%)	0.765
Mortality (%)	1 (3%)	1 (3%)	6 (10%)	0.204

Figure 1: Demographic and Clinical Characteristics of the Trauma Patients

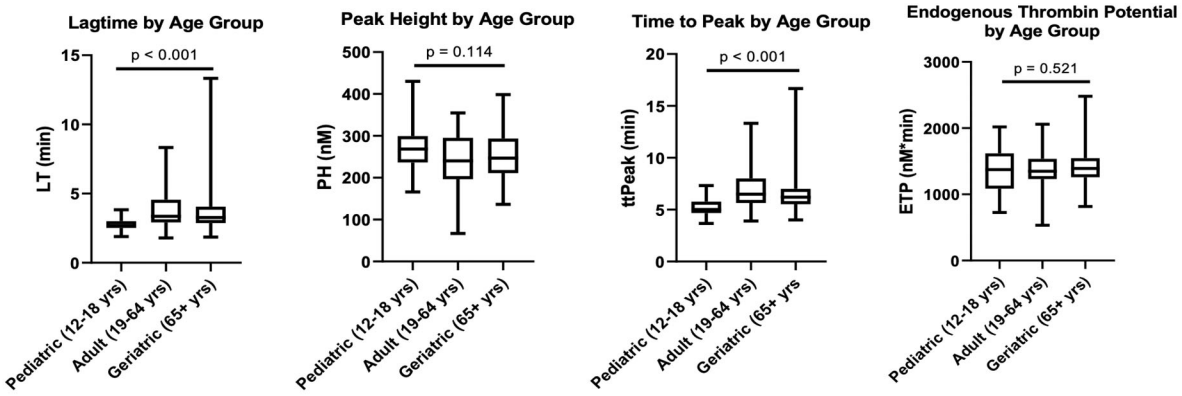


Figure 2: Thrombin Generation by Age Group

Quick Shots Session II

Quick Shot #15
January 13, 2022
9:24 am

TRANEXAMIC ACID IS NOT ASSOCIATED WITH ADVERSE EVENTS IN PATIENTS WITH SUSPECTED TBI AND INITIAL NORMAL HEAD CT

Jordan W. Harmer, BS, Elizabeth Dewey, MS, Eric Meier, MS,
Susan E. Rowell, MD, MCR*, Martin A. Schreiber, MD, FACS*
Oregon Health and Science University

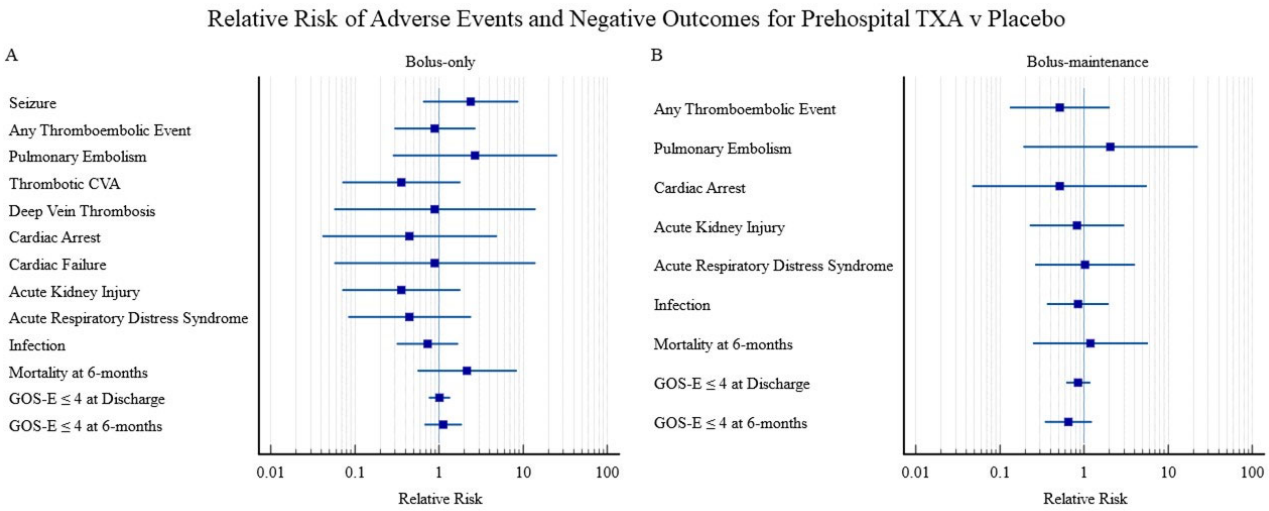
Presenter: Jordan W. Harmer, BS

Objectives: To investigate whether prehospital tranexamic acid (TXA) use is associated with adverse events or negative outcomes in patients with suspected traumatic brain injury (TBI) when intracranial hemorrhage (ICH) is absent on initial CT.

Methods: This retrospective study utilized data from a 2015-2017, multicenter, randomized trial studying the effect of the following TXA doses on moderate to severe TBI: 2g TXA bolus, 1g TXA bolus + 1g TXA infusion over 8-hours, or placebo. Of the 966 participants enrolled, 395 with an initial CT negative for ICH were included in the analysis. Fifteen adverse events (28-day incidence) were studied: MI, DVT, seizure, pulmonary embolism, ARDS, cardiac failure, liver failure, renal failure, CVA, cardiac arrest, cerebral vasospasm, “any thromboembolic event”, hypernatremia, AKI, and infection. Other negative outcomes analyzed include mortality at 28 days & 6-months, GOS-E ≤4 at discharge & 6-months, ICU-free days, ventilator-free days, hospital-free days, and combined negative outcomes. In both study drug groups, the incidence of dichotomous outcomes and quantity of ordinal outcomes were compared to placebo. Significance was defined as $p \leq 0.0022$ (Bonferroni correction: 0.05/23). Demographics and injury scores were not statistically different between either study drug group and placebo.

Results: No association was observed between any of the adverse events and either TXA dosing regimen. Additionally, there was no association between TXA and any of the studied negative outcomes.

Conclusions: Administration of either a 2-gram TXA bolus or a 1-gram TXA bolus + 1-gram TXA 8-hour infusion to patients without intracranial hemorrhage is not associated with an increase in adverse events or negative outcomes. This has important implications for prehospital protocols and supports the safety of administration of TXA to patients suspected of having TBI prior to imaging.



Relative risk with 95% CIs for AEs and negative outcomes in suspected TBI patients (without ICH) receiving TXA compared to placebo (1g bolus + 1g infusion over 8-hours): **A.** bolus-only (2-gram TXA bolus). **B.** bolus-maintenance (1g TXA bolus + 1g infusion over 8-hours). Not all 19 dichotomous outcomes studied are represented as RR as there were some outcome incidences of zero in each studied group.

Quick Shots Session II

Quick Shot #16
January 13, 2022
9:30 am

NON-STEROIDAL ANTI-INFLAMMATORY DRUGS AND UPPER GASTROINTESTINAL BLEEDING IN TRAUMA PATIENTS: A SECONDARY ANALYSIS OF A RANDOMIZED CLINICAL TRIAL

James Klugh, MD, Antoine Marc, MD, Deepanjli Donthula, BSA*, Michelle McNutt, MD*,
Lillian Kao, MD MS, Charles E. Wade, PhD, John A. Harvin, MD*
University of Texas Health Sciences Center

Presenter: James Klugh, MD

Objectives: Non-steroidal anti-inflammatory drugs (NSAIDs) effectively treat acute pain after injury. One potential complication of NSAID use is upper gastrointestinal bleeding (UGIB). We hypothesize that NSAID use would not be associated with UGIB in injured patients.

Methods: The population was drawn from the Multi-modal Analgesic Strategies in Trauma (MAST) trial, in which 1,561 patients were randomized to our original MMPR (which included 48 hours of celecoxib followed by naproxen) or the MAST MMPR (which included naproxen). Ketorolac was given, if not contraindicated, in both arms. Individual NSAIDs, doses given, and overall NSAID equivalents were recorded. Four models were created to estimate the effect of NSAID equivalents, naproxen doses, ketorolac doses, and celecoxib doses on UGIB. Continuous data were presented as: median (IQR).

Results: 31 (2%) patients had an UGIB. Despite patients randomized to the MAST MMPR receiving more NSAID equivalents (MAST 12 [4, 26] v original 10 [3, 23], p=0.005) there was no difference in the rate of UGIB between the two MMPR groups. Patients who experienced an UGIB had a higher Injury Severity Score (ISS) (UGIB 27 [13, 34] v No UGIB 14 [9, 22], p<0.001) and were more likely to have received ketorolac (UGIB 29% v No UGIB 22%, p=0.016), but had no difference in celecoxib doses, naproxen doses, or overall NSAID equivalents. On multivariate analysis, ISS and ketorolac doses were associated with an increased risk of UGIB while age, NSAID equivalents, celecoxib doses, and naproxen doses were not (Table 1).

Conclusions: In this study, the risk of UGIB was increased 4% with each point increase in ISS and 15% with each dose of ketorolac while naproxen, celecoxib, and overall NSAID equivalents did not increase the risk. The well-known analgesic benefits of short-term NSAID use, excluding ketorolac, outweigh the theoretical harm of UGIB.

	Relative Risk	95% Confidence Interval	p-value
NSAID Equivalent Model			
Age	1.01	0.99, 1.03	0.252
Injury Severity Score	1.04	1.03, 1.06	<0.001
NSAID Equivalents	1.00	0.99, 1.01	0.567
Naproxen Doses Model			
Age	1.01	0.99, 1.03	0.265
Injury Severity Score	1.04	1.03, 1.06	<0.001
Naproxen doses	1.00	0.98, 1.02	0.690
Celecoxib Doses Model			
Age	1.01	0.99, 1.04	0.298
Injury Severity Score	1.04	1.03, 1.06	<0.001
Celecoxib doses	0.97	0.86, 1.10	0.657
Ketorolac Doses Model			
Age	1.01	0.99, 1.03	0.158
Injury Severity Score	1.05	1.03, 1.06	<0.001
Ketorolac doses	1.15	1.07, 1.24	<0.001

Table 1

Quick Shots Session II

Quick Shot #17
January 13, 2022
9:36 am

READMISSIONS AFTER EMERGENT VENTRAL HERNIA REPAIR: A RETROSPECTIVE REVIEW OF THE NATIONWIDE READMISSIONS DATABASE

Caroline A. Ricard, MD, Jeffrey J Aalberg, MPH, Nikolay Bugaev, MD*
Tufts Medical Center

Presenter: Caroline A. Ricard, MD

Objectives: Emergent ventral hernia repair (eVHR) is associated with significant morbidity, yet optimal surgical management is unknown. We hypothesized that eVHR with synthetic mesh would have a higher readmission rate compared to primary eVHR or biologic mesh repair.

Methods: Retrospective analysis of the Nationwide Readmissions Database (NRD) 2016-2018. Adult patients who underwent eVHR defined by ICD-10 procedure codes were included. Patient demographics, comorbidities, and surgical techniques were compared between readmitted and non-readmitted patients. Readmission characteristics and diagnoses were evaluated 0-30-days, 31-90-days, and 91-180-days post discharge. Predictors of readmission were assessed using multivariate analysis and propensity weighting for various eVHR techniques. Secondary outcomes included length of stay, disposition, and mortality. Alpha levels were set at 0.05.

Results: 43,819 patients underwent eVHR, of which 10,249 (23.3%) were readmitted within 6 months. The majority of readmissions, regardless of eVHR technique, occurred within the first 30 days (51.9%). eVHR with synthetic mesh resulted in the lowest readmission rates, regardless of time interval (Table 1). The most common readmission diagnoses were not related to surgical complications (56.6%, $p<0.0001$). The most common surgical readmission diagnoses were superficial surgical site infection (48.4%, $p<0.0001$) and bowel obstruction/ileus (29.3%, $p<0.0001$) (Table 2). Predictors of readmission included use of biologic mesh (OR 1.30, 95% CI 1.1-1.5) and need for concomitant colon resection (OR 1.2, 95% CI 1.1-1.6).

Conclusions: eVHR is associated with high rates of readmission. Repair with synthetic mesh had favorable readmission rates and lower risk of surgical complications. Given the inherent limitations of the NRD, further institutional prospective studies are required to confirm these findings.

Table 1: Readmissions after eVHR based on repair technique

Repair Technique	Total	Non-Readmitted	Readmitted 0-30 Days	Readmitted 31-90 days	Readmitted 91-180 Days	p-value
Laparoscopic repair	9,916 (22.6%)	8,157 (82.3%)	819 (8.3%)	400 (4.0%)	540 (5.5%)	<0.0001
Hernia repair with Bowel resection	2,312 (5.3%)	1,564 (67.7%)	424 (18.3%)	174 (7.5%)	150 (6.5%)	<0.0001
Repair Type						<0.0001
Primary	14,114 (32.3%)	10,520 (74.5%)	1,833 (13.0%)	833 (5.9%)	928 (6.6%)	
Biologic	1,066 (2.4%)	726 (68.1%)	178 (16.7%)	82 (7.7%)	80 (7.5%)	
Synthetic	28,639 (65.4%)	22,324 (78.0%)	3,308 (11.6%)	1,431 (5.0%)	1,576 (5.5%)	

Readmission after eVHR based on repair technique

Table 2: Patient characteristics, readmission diagnoses, and outcomes based on eVHR technique

	Overall (n= 43,819)	Biologic Repair 1,066 (2.43%)	Primary Repair 14,144 (32.21%)	Synthetic Repair 28,639 (65.36%)	p-value
Demographics					
Age* years	62 (52-71)	61 (52-69)	63 (52-73)	61 (52-70)	<0.0001
Female	29,154 (66.5%)	689 (64.3%)	9,700 (68.7%)	18,7565 (65.5%)	<0.0001
Elixhauser Comorbidity Index					
Overall score*	3 (1-4)	3 (2-4)	3 (2-4)	3 (1-4)	<0.0001
Readmission Score*	8 (0-19)	9 (1-23)	10 (1-23)	7 (0-17)	<0.0001
Readmission Diagnoses					
Nonsurgical	5,688 (56.7%)	3,361 (54.6%)	2,150 (60.8%)	163 (49.7%)	<0.0001
Total Surgical:	4,343 (43.3%)	2,794 (45.4%)	1,384 (39.2%)	165 (50.3%)	<0.0001
Superficial Site Infection	2,102 (48.4%)	1,442 (51.6%)	565 (40.8%)	95 (57.6%)	
Deep Site Infection	282 (6.5%)	217 (7.8%)	50 (3.6%)	15 (9.1%)	
Bowel obstruction/ ileus	1,274 (29.3%)	737 (26.4%)	499 (36.1%)	38 (23.0%)	
Mesh failure/ recurrent hernia	481 (11.1%)	246 (8.8%)	227 (16.4%)	8 (4.9%)	
Hemorrhage	157 (3.6%)	115 (4.1%)	33 (2.4%)	9 (5.5%)	
Postoperative pain	47 (1.1%)	37 (1.3%)	10 (0.7%)	0 (0%)	
Outcomes					
LOS* days	4 (3-7)	6 (4-10)	5 (3-9)	4 (2-7)	<0.0001
Disposition					<0.0001
Home	31,254 (71.3%)	636 (59.7%)	9,663 (68.5%)	20,955 (73.2%)	
Short-Term Hospital	158 (0.4%)	4 (0.4%)	74 (0.5%)	80 (0.3%)	
Skill Nursing Facility	4,866 (11.1%)	156 (14.6%)	1,954 (13.8%)	2,756 (9.6%)	
Home Health	7,541 (17.2%)	270 (25.3%)	2,423 (17.2%)	4,848 (16.9%)	
Mortality	635 (1.4%)	13 (1.2%)	350 (2.4%)	272 (0.9%)	<0.0001

Patient characteristics, readmission diagnoses, and outcomes based on eVHR technique

Quick Shots Session II

Quick Shot #18
January 13, 2022
9:42 am

GIVE ME SIRTUINS OR GIVE ME DEATH: SIRT1 DELETION INCREASES MORTALITY IN SEPSIS

Hanna E. Labiner, MD, Kelli Sas, PhD, Joseph Baur, PhD, Carrie A. Sims, MD*
The Ohio State University

Presenter: Hanna E. Labiner, MD

Objectives: Sepsis is a hyperinflammatory response to infection that leads to multiorgan failure and eventually death. Often, this multiorgan failure is heralded by renal dysfunction. Sirtuin 1 (SIRT1) promotes resistance to cellular stress by inhibiting inflammation and promoting mitochondrial function. We hypothesize that SIRT1 plays an important role in mediating inflammatory response and organ failure in sepsis, predominantly via expression in macrophages.

Methods: We performed CLP on C57BL/6J, whole body SIRT1 KO (S1KO), and macrophage specific SIRT1 KO (S1LysM) mice. Serum IL6 was quantified by ELISA. Renal mitochondrial complex activity was measured using Oroboros Oxygraph-2k. BUN was measured from serum. Mouse survival was observed for up to 5 days.

Results: IL6 levels were elevated in S1KO mice (99.9 ng/mL vs 64.7 ng/mL, p=0.09) and S1LysM mice (35.5 ng/mL vs 23.1 ng/mL, p=0.03) compared to WT at 12 hours after CLP. After CLP, S1KO mice have decreased renal mitochondrial complex I and II activity compared to WT (259.5 mmolO_2/mg/min vs 409.5 mmolO_2/mg/min, p=0.02; 906.3 mmolO_2/mg/min vs 1153 mmolO_2/mg/min, p=0.02), as well as decreased FAO (180.3 mmolO_2/mg/min vs 301.5 mmolO_2/mg/min, p=0.03). S1KO mice also had increased BUN (40.8 mg/dL vs 19.0 mg/dL, p=0.03). S1KO mice had decreased 5d survival compared to WT (33.3% vs 85.7%, p=0.012), as did S1LysM mice (60% vs 100%, p=0.049).

Conclusions: SIRT1 deletion increases systemic inflammation in sepsis. Renal mitochondrial dysfunction, kidney injury, and mortality following CLP were also exacerbated by SIRT1 deletion. Similar effects on inflammation and survival are seen following macrophage-specific SIRT1 deletion, indicating macrophage SIRT1 expression may be a predominant factor in the systemic effects of SIRT1 in sepsis.

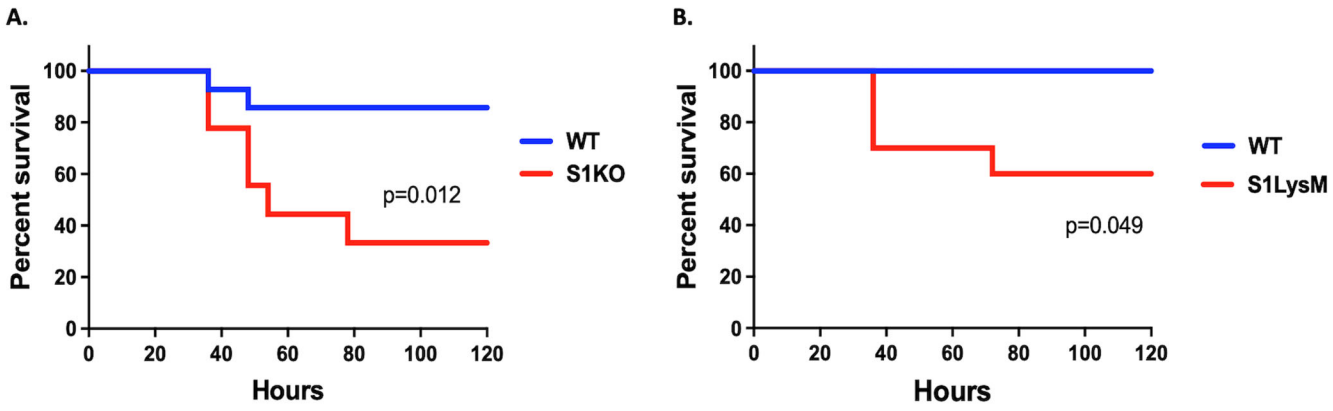


Figure 1. A) 5-day survival in S1KO mice vs WT mice. B) 5-day survival in macrophage-specific SIRT1 KO mice vs WT mice

Quick Shots Session II

Quick Shot #19
January 13, 2022
9:48 am

IMPLEMENTATION OF A GASTROGRAFIN ORDERSET FOR SMALL BOWEL OBSTRUCTION ACROSS A HEALTH SYSTEM

Jason McCartt, MD*, Lauren Paton, MD, Kyle Thompson, PhD,
Brent Matthews, MD, Kyle Cunningham, MD, MPH, FACS*,
Samuel Wade Ross, MD, MPH*, Caroline E Reinke, MD, MSHP*
Carolinas Medical Center

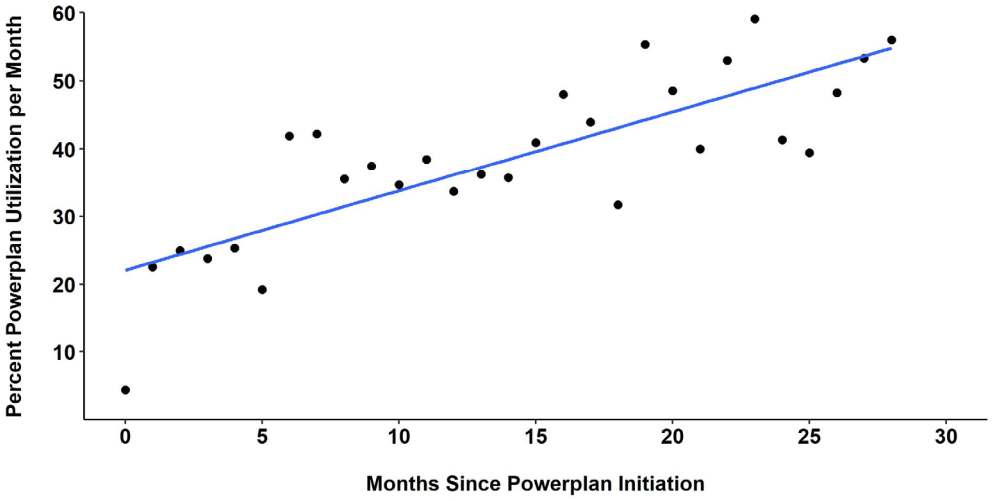
Presenter: Jason McCartt, MD

Objectives: We hypothesized that the utilization of a gastrografin orderset in patients with adhesive small bowel obstructions (SBO) would result in decreased time to operation and decreased length of hospitalization (LOS) for non-operative patients.

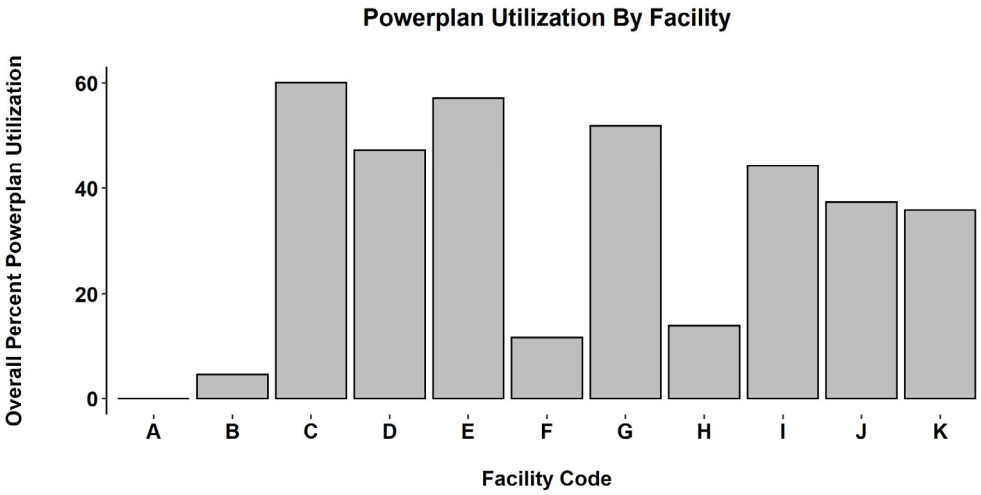
Methods: This is a retrospective cohort study of patients with SBO diagnosis prior to implementation (PRE) from Jan 2017 to Jan 2019 and following implementation (POST) from Jan 2019 to May 2021 of a GG challenge orderset that was available across 9 hospitals within a healthcare system. Primary outcome was time to surgery and secondary outcomes were rate of surgery and non-operative length of stay. Standard descriptive, univariate, and multivariate regression analysis were performed.

Results: PRE cohort had 1889 patients and POST had 1746. There was an increase in patients who underwent surgical intervention following implementation (13.9% vs 16.4%, p=0.04). The LOS was significantly decreased following implementation for non-operative patients (65.6 vs 59.9 hours, $p < 0.001$). The utilization of gastrografin increased from 14% to 50% following implementation. There was improved utilization of the orderset over time (Fig 1); however, significant variability of utilization based on hospital was observed (Fig 2). For patients in the POST group, multivariable linear regression showed significant reduction in log-transformed non-operative length of stay (-23.1 hours, $p < 0.001$) but no significant difference in time to surgery (-19.6 hours, $p = 0.08$).

Conclusions: The implementation of a gastrografin orderset was associated with decreased length of stay in non-operative patients. There was an increased percentage of patients who underwent surgery. Time to surgery was not significantly different, and utilization was variable. Understanding barriers to utilization in different hospital setting may improve gastrografin utilization for SBO.



Utilization of Orderset Following Implementation



Powerplan Utilization By Facility

Quick Shots Session II

Quick Shot #20
January 13, 2022
9:54 am

FEATURES INFLUENCING THE DECISION TO PERFORM TEMPORARY ABDOMINAL CLOSURE IN EMERGENCY GENERAL SURGERY

Rebecca Zhu, MD, Matthew C. Hernandez, MD, Jose J. Diaz, MD*,
Thomas J. Schroeppel, MD*, Thomas Shoultz, MD*, Stephen L. Barnes, MD*,
Robert Sawyer, MD*, Addison K. May, MD, MBA*, Amanda M Chipman, MD,
Lindsay O'Meara, CRNP*, Roumen Vesselinov, PhD,
Joseph A Kufera, MA, Martin D. Zielinski, MD, FACS*
Mayo Clinic

Presenter: Rebecca Zhu, MD

Objectives: Clinical parameters to perform temporary abdominal closure (TAC) in trauma patients exist, but the same decision for emergency general surgery (EGS) patients is based on anecdote, not evidence. We aim to determine the clinical parameters that surgeons use to perform TAC in EGS patients.

Methods: AAST-sponsored prospective, observational, multi-institutional (21 sites) study was performed in adult patients with intra-abdominal sepsis undergoing laparotomy. To control for centers' heterogeneity we used multivariable Generalized Linear Mixed Model (GLMM, ROC=0.94).

Results: Of 766 patients, 44% were managed with TAC. Mean age 59.8 years, 56% male. The most common operations included colon resection (n=312), small bowel resection (n=294), appendectomy (n=146), and small bowel anastomosis (n=126). Bivariate analysis showed that patients managed with TAC presented with higher ASA scores (3.6 vs 2.7, $p<0.001$), Charlson Comorbidity Index (3.5 vs 2.2, $p<0.001$), lactate (4.0 vs 1.96, $p<0.001$), INR (1.7 vs 1.3, $p=0.008$), vasopressor use (81% vs 19%, $p<0.001$), and mortality (34.2% vs 4.7%, $p<0.001$). Multivariable GLMM showed the strongest effect of the interaction factor comprised of ASA score, incomplete source control, and elevated INR ≥1.4 (OR 4.3, 95% CI 1.6-11.8, all 3 features). Other predictors in GLMM were vasopressor use (OR 2.4, 95% CI 1.2-5.1) and systemic sepsis on presentation (OR 1.6, 95% CI 1.1-2.5).

Conclusions: The most relevant features associated with surgeons' decision to perform TAC were pre-operative coagulopathy, vasopressor use, and incomplete source control at index operation. These features can serve as a decision-making tool for TAC use in EGS patients.

Quick Shots Session III

Quick Shot #21
January 13, 2022
12:30 pm

TRAUMATIC BRAIN INJURY INHIBITS INTESTINAL TRANSIT RESULTING IN MICROBIAL DYSBIOSIS

Abigail R. Cannon, PhD, Lillian Anderson, MD, Xiaoling Li,
Mashkoor Choudhry, PhD, Richard P. Gonzalez, MD*
Loyola University Medical Center

Presenter: Abigail R. Cannon, PhD

Objectives: Traumatic brain injury (TBI) is a major cause of morbidity and mortality in the United States. Following initial TBI, secondary injury can occur leading to dysregulation of peripheral systems, specifically gastrointestinal (GI) dysfunction. GI transit is critical as decreases in transit can produce niches for opportunistic pathogens. Enterobacteriaceae penetrates the intestinal mucus layer producing pro-inflammatory endotoxin, while *Lactobacillus* promotes intestinal health and checks the growth of Enterobacteriaceae. Therefore, we assessed the feces of TBI patients and TBI mice for changes in Enterobacteriaceae and *Lactobacillus*. Further, we examined intestinal transit in TBI mice to determine whether decreased intestinal transit correlated with increased microbial dysbiosis.

Methods: Trauma patients were categorized into TBI or non-TBI patients based on evidence of a head CT scan. Healthy control stool was obtained from a healthy control biobank. Analysis of fecal levels of Enterobacteriaceae and *Lactobacillus* were performed with human stool samples collected at three post-admission time periods: 24hrs, 3-5 days, and 7-10 days and on mouse stool samples 24hrs and 3 days post TBI. Intestinal transit in mice was assessed by FITC-dextran gavage 24hrs post TBI.

Results: There was an increase in the copy number of Enterobacteriaceae and decrease in *Lactobacillus* in the feces of TBI patients. We were also able to observe these changes in feces of mice who received a TBI compared to Control. Intestinal transit was inhibited following TBI ($p<0.001$) as FITC accumulated in the small intestine of mice that received TBI.

Conclusions: These findings suggest that decreases in intestinal transit following TBI favor Enterobacteriaceae growth and decreased *Lactobacillus*. This, in turn, could drive post TBI injury progression in the gut, and also potentiate secondary complications associated with TBI. T32 GM008750, T32AA013527.

Quick Shots Session III

Quick Shot #22
January 13, 2022
12:36 pm

TBI-PRO: A NOVEL MODEL TO PREDICT LONG TERM QUALITY OF LIFE AFTER TRAUMATIC BRAIN INJURY

Juan F. Figueroa, MD, Jason Barber, M.D, Nancy Temkin, PhD., Basil S. Karam, MD, Courtney J. Pokrzywa, MD, Carisa Bergner, M.A, Patrick B Murphy, MD, MPH, MSc*, Lindsay Nelson, PhD, Prakash Laud, PhD., Zara Cooper, MD, MSc*, Marc A. de Moya, MD*, Colleen M Trevino, NP, PhD*, Christopher J Tignanelli, MD*, Terri deRoon-Cassini, PhD, MS, Rachel S. Morris, MD*
Medical College of Wisconsin

Presenter: Juan F. Figueroa, MD

Objectives: Traumatic brain injuries (TBIs) are a common cause of disabilities affecting long-term quality of life. Currently, real-time quality of life prediction models are limited. The aim of this study was to develop a predictive model for a TBI-specific quality of life measure that could be used in hospitalized adults with readily available data early in the hospitalization.

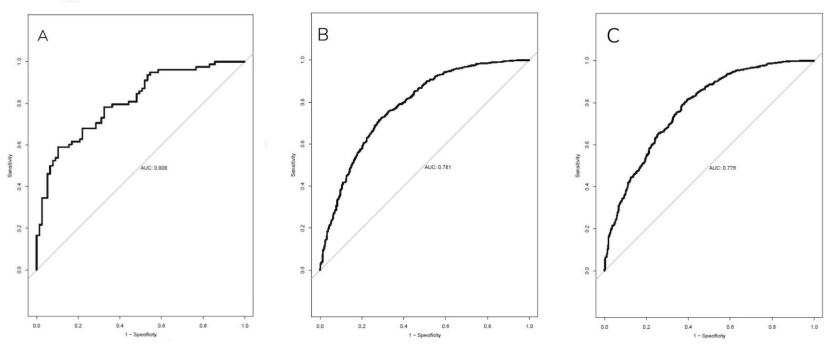
Methods: The Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI) databank was used to identify adult patients with TBI from 2014-2018. 90% of the admissions were used for a training dataset and the remaining 10% for a validation dataset. 62 variables were assessed to predict favorable versus unfavorable Quality of Life after Brain Injury-Overall Scale (QOLIBRI-OS) score. Multiple models including random forest and logistic regression were tested.

Results: 1,549 patients were included. 57% had a favorable QOLIBRI-OS score in the training group. Patients with favorable scores more likely had private insurance, higher GCS scores on admission, and lower number of comorbidities (**Table 1**). A 24-hour model (TBI-PRO) for 3, 6, and 12-month QOLIBRI score was created using different independent predictors and logistic regression. Discrimination was assessed in the validation set. The AUROCs for predicting 3, 6 and 12-months favorable QOLIBRI scores were 0.81 (95% [CI:0.74-0.88]), 0.79 (95% [CI:0.71-0.86]), and 0.76 (95% [CI:0.68-0.84]), respectively (**Table 2**).

Conclusions: We developed and temporally validated a user-friendly model (TBI-PRO) to predict long term quality of life early in the hospital course for adults with TBI. This score is useful as a tool in shared decision-making conversations in traumatic brain injury patients.

Variables	QOLIBRI Favorable Outcome n=873	QOLIBRI Unfavorable Outcome n=676	p-value
Age, years, median (IQR)	36.5 (25.5, 54.5)	45.5 (28.5, 58.5)	0.001
Female gender (%)	240 (27.5)	213 (31.5)	0.068
White race (%)	702 (80.4)	522 (77.2)	0.001
ISS, median (IQR)	11.0 (5.0, 17.0)	17.0 (9.0, 26.0)	0.001
Private Insurance (%)	733 (84.0)	486 (71.9)	0.001
Physiologic			
BMI, Kg/m2, median (IQR)	26.3 (23.4, 29.9)	26.8 (23.4, 30.3)	0.076
SBP, mmHg, mean (SD) (lowest on day 0)	114.8 (±13.3)	113 (±15.2)	0.014
Heart Rate, bpm, mean (SD) (highest on day 0)	90 (±15.8)	94 (±18.4)	0.001
GCS, mean (SD) (highest on day 0)	13.4 (±3.3)	10.6 (±5)	0.001
Pre-injury Anticoagulant Use	97 (11.1)	95 (14.1)	0.081
Past Medical History (%)			
Hypertension	122 (14)	155 (22.9)	0.001
COPD	3 (0.30)	16 (2.4)	0.001
Cancer	28 (3.2)	33 (4.9)	0.093
Neurologic	90 (10.3)	118 (17.5)	0.001
Psychiatric	160 (18.3)	204 (30.2)	0.001
Developmental	69 (7.9)	41 (6.1)	0.16
Eye, Ear, Nose & Throat	121 (13.9)	91 (13.5)	0.821
Cardiovascular	172 (19.7)	183 (27.1)	0.001
Pulmonary	88 (10.1)	97 (14.3)	0.01
Gastrointestinal	107 (12.3)	122 (18)	0.001
Hepatic	8 (0.9)	28 (4.1)	0.001
Endocrine	137 (15.7)	159 (23.5)	0.001
Hematologic	30 (3.4)	32 (4.7)	0.196
Musculoskeletal	159 (18.2)	139 (20.6)	0.245
Spinal	31 (3.6)	37 (5.5)	0.067

Demographics of patients with favorable and unfavorable QOLIBRI-OS outcomes.



Area Under the Receiving Operating Curve for predicting QOLIBRI-OS: A) 3 months, B) 6 months, C) 12 months.

Quick Shots Session III

Quick Shot #23
January 13, 2022
12:42 pm

PREHOSPITAL NEEDLE DECOMPRESSION: A LIFE SAVING INTERVENTION

Daniel Muchnok, NRP, Heather Phelos, MPH, Allison Vargo, BS, Andrew-Paul Deeb, MD, Frank Guyette, MD, MPH, Joshua B Brown, MD, MSc*
University of Pittsburgh Medical Center

Presenter: Daniel Muchnok, NRP

Objectives: Prehospital needle decompression (PHND) is debated as a life saving intervention. It is rarely performed, making prior studies small and difficult to compare outcomes. We aimed to determine the impact of PHND on early mortality in patients requiring early chest decompression.

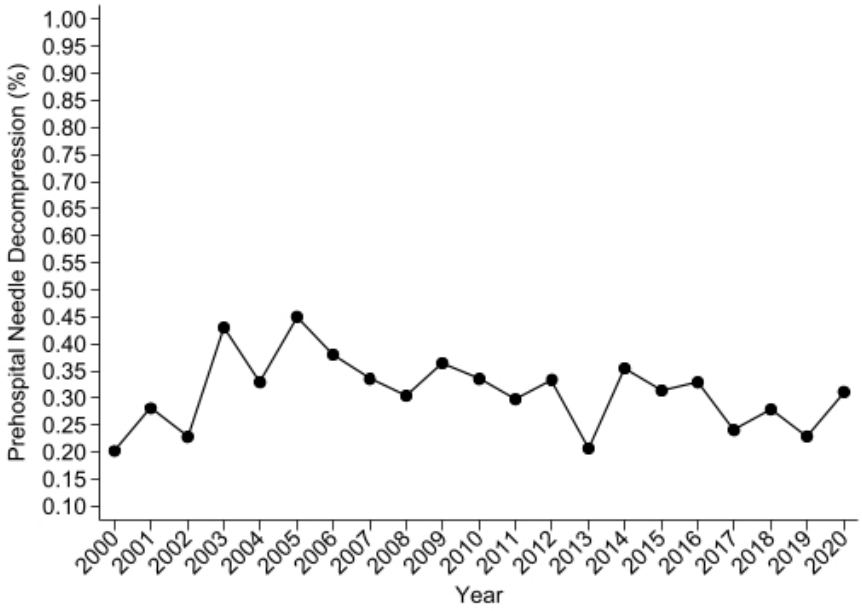
Methods: We included scene patients age>15 from the PTOS registry 2000-2020, excluding DOA patients. Patients without PHND but undergoing chest tube within 15min of trauma center arrival were the comparison group that may have benefitted from PHND. Mixed-effect logistic regression determined the association between 24h mortality and PHND controlling for demographics, ISS, prehospital time and provider level, transport mode, vital signs, resuscitation, urgent surgery, and head/abd/chest AIS with random effects for study year and center. We also performed propensity score 1:1 matching to account for selection bias.

Results: 8469 patients were included with 1337 (11%) PHND patients (Table). PHND rates were stable over time (Fig). Patient factors accounted for 12% of variation in PHND rates, while EMS agency accounted for 88% of PHND variation. PHND was associated with 25% decrease in odds of 24h mortality (OR 0.75; 95%CI 0.61-0.94, p=0.01). We found similar results in patients that survived their ED stay (OR 0.68; 95%CI 0.52-0.89, p<0.01) and excluding severe TBI (OR 0.65; 95%CI 0.45-0.95, p=0.03). PHND was also associated with lower 24h mortality after matching (OR 0.79; 95%CI 0.62-0.98, p=0.04), and when restricting matches to the same EMS agency (OR 0.74; 95%CI 0.56-0.99, p=0.04). PHND was not associated with mortality vs patients undergoing ED chest tube>15min from arrival (p=0.63).

Conclusions: PHND is associated with lower 24h mortality compared to urgent trauma center chest tube placement in scene trauma patients. Although performed rarely, PHND can be a life saving intervention and should be reinforced in EMS education for appropriately selected trauma patients.

Table 1. Characteristics of treatment groups

	Urgent ED Chest Tube	PHND	p value
N	7132	1337	-
Age, median (IQR)	32 (23, 48)	37 (25, 52)	<0.001
Sex, N (%)			0.002
Female	1048 (14.7%)	241 (18.0%)	
Male	6083 (85.3%)	1096 (82.0%)	
Mechanism, N (%)			<0.001
Blunt	3272 (45.9%)	956 (71.5%)	
Penetrating	3856 (54.1%)	381 (28.5%)	
ISS, median (IQR)	25 (14, 35)	26 (14, 38)	0.008
Prehospital time, median (IQR)	33 (23, 50)	46 (31, 61)	<0.001
Prehospital SBP, median (IQR)	102 (75, 128)	110 (80, 137)	<0.001
Prehospital HR, median (IQR)	94 (66, 117)	99 (72, 120)	<0.001
Prehospital RR, median (IQR)	16 (6, 23)	16 (4, 24)	0.30
Prehospital GCS, median (IQR)	8 (3, 15)	3 (3, 15)	<0.001
Prehospital intubation, N (%)	1285 (18.0%)	512 (38.3%)	<0.001
Admission SBP, median (IQR)	90 (0, 125)	110 (67, 138)	<0.001
Admission HR, median (IQR)	88 (0, 115)	94 (57, 118)	<0.001
Admission RR, median (IQR)	14 (0, 22)	14 (0, 22)	0.53
Admission GCS, median (IQR)	3 (3, 15)	3 (3, 14)	<0.001
PRBC in ED, median (IQR)	0 (0, 2)	0 (0, 2)	<0.001
Prehospital Blood Transfusion, N (%)	120 (1.7%)	57 (4.3%)	<0.001
Transport Mode, N (%)			<0.001
Helicopter	1479 (26.1%)	705 (52.8%)	
Ground	4181 (73.9%)	629 (47.2%)	
Prehospital Provider Level of Care, N (%)			<0.001
BLS	151 (2.7%)	4 (0.3%)	
ALS	5446 (97.3%)	1325 (99.7%)	
Head AIS, median (IQR)	3 (2, 4)	3 (2, 5)	<0.001
Chest AIS, median (IQR)	3 (3, 4)	3 (3, 4)	0.12
Abdomen AIS, median (IQR)	2 (2, 4)	2 (1, 4)	0.001



Quick Shots Session III

Quick Shot #24
January 13, 2022
12:48 pm

NONOPERATIVE MANAGEMENT OF BLUNT ABDOMINAL SOLID ORGAN INJURY: ARE WE PAYING ENOUGH ATTENTION TO PATIENTS ON PREINJURY ANTICOAGULATION?

Omar Obaid, MD, Molly J Douglas, MD*, Raul Reina, MD, Letitia Bible, MD*,
Lourdes Castanon, MD*, Michael Ditillo, DO, FACS*, Tanya Anand, MD, MPH*,
Adam C Nelson, MD*, Bellal Joseph, MD, FACS*
The University of Arizona

Presenter: Raul Reina, MD

Objectives: Nonoperative management (NOM) of blunt abdominal solid organ injury (SOI) has become the standard of care. Preinjury anticoagulant use is becoming more prevalent in trauma patients. The aim of our study was to assess the impact of preinjury anticoagulant use on outcomes of isolated blunt abdominal SOI patients who underwent NOM.

Methods: We performed an analysis of TQIP 2017. We included all adult trauma patients (≥18yrs) with isolated blunt abdominal SOI (Spleen, Liver, or Kidney AIS ≥ 1 and other body regions AIS ≤ 3) who underwent NOM (no operative procedure performed <6hrs of admission). Patients with bleeding disorders, chronic liver disease, or cancer were excluded. Patients were stratified into two groups based on preinjury anticoagulant use (AC, preinjury anticoagulant use; No-AC, no preinjury anticoagulant use). Propensity score matching (1:2) was performed. Outcome measures were rates of failure of NOM, in-hospital major complications, in-hospital and ICU lengths of stay (LOS), and mortality.

Results: A matched cohort of 2,709 patients (AC, 903; No-AC, 1,806) was analyzed. Mean age was 70±13yrs and median ISS was 9[5-13]. The AC and No-AC groups were similar in terms of demographics, admission vitals, injury parameters, comorbidities, trauma center verification level, and type and timing of in-hospital thromboprophylaxis used. Compared to the No-AC group, the AC group had higher rates of failure of NOM (2.6% vs. 4.5%), cardiac arrest (1.2% vs. 3.1%), AKI (2.4% vs. 4.2%), myocardial infarction (0.6% vs. 1.4%), and mortality (5.1% vs. 7.6%), and longer hospital LOS (17 vs. 18 days) and ICU LOS (11 vs. 12 days).

Conclusions: Among nonoperatively managed blunt abdominal SOI patients, preinjury use of anticoagulants negatively impacts outcomes. Extra surveillance is required while managing patients with blunt abdominal SOI on preinjury anticoagulants.

Quick Shots Session III

Quick Shot #25
January 13, 2022
12:54 pm

THE GERIATRIC NUTRITIONAL RISK INDEX (GNRI) AS A PREDICTOR OF COMPLICATIONS IN GERIATRIC TRAUMA PATIENTS

Heather R. Kregel, MD, Patrick B. Murphy, MD, MPH, MSc*, Mina Attia, David Meyer, MD, MS*, Rachel S. Morris, MD*, Ezenwa Onyema, MD, Sasha Adams, MD*, Charles E. Wade, PhD, John A. Harvin, MD*, Lillian Kao, MD MS, Thaddeus J. Puzio, MD*
University of Texas Health Science Center at Houston

Presenter: Heather R. Kregel, MD

Objectives: Malnutrition is associated with increased morbidity and mortality after trauma. The Geriatric Nutritional Risk Index (GNRI) is a validated scoring system utilized to predict the risk of complications related to malnutrition. We hypothesized that GNRI is predictive of worsened outcomes in geriatric trauma patients.

Methods: This was a single center retrospective study of trauma patients age ≥65 admitted in 2019. GNRI was calculated based on admission albumin level and ratio of actual body weight to ideal body weight. Groups were defined as Major Risk (GNRI<82), Moderate Risk (GNRI 82-91), Low Risk (GNRI 92-98), and No Risk (GNRI>98). The primary outcome was mortality. Secondary outcomes included ventilator days, ICU length of stay (LOS), hospital LOS, discharge home, sepsis, pneumonia, and ARDS. Bivariate and multivariable logistic regression analyses were performed to determine the association between GNRI risk category and outcomes.

Results: 513 patients were identified for analysis. Median age was 78 (71-86); 24 patients (4.7%) were identified as Major Risk, 66 (12.9%) as Moderate Risk, 72 (14%) as Low Risk, and 351 (68.4%) as No Risk. Injury severity scores and Charlson comorbidity indexes were similar between all groups. Patients in the No Risk group had decreased infectious complications including sepsis and pneumonia (P <0.001). Additionally, the No Risk group had shorter hospital LOS and were more likely to be discharged home (Table). After adjusting for injury severity score, age, and Charlson comorbidity index, the No Risk group had decreased odds of death (OR 0.13, 95% CI 0.04-0.41) compared to the Major Risk group.

Conclusions: Major GNRI risk is associated with increased mortality and infectious complications in geriatric trauma patients. Further studies should target interventional strategies for those at highest risk based on GNRI.

	Major Risk (GNRI:<82)	Moderate Risk (GNRI: 82 to <92)	Low Risk (GNRI: 92 to ≤98)	No Risk (GNRI: >98)	p-value
N	24 (4.7)	66 (12.9)	72 (14.0)	351 (68.4)	
Hospital Length of Stay	16 (24.0)	7 (9.0)	6 (10.0)	5 (7.0)	<0.001
Discharge Home	5 (20.8)	27 (40.9)	26 (36.1)	152 (43.3)	0.14
Pneumonia	2 (8.3)	0 (0.0)	1 (1.4)	3 (0.9)	0.01
Sepsis	3 (12.5)	0 (0.0)	1 (1.4)	5 (1.4)	<0.001
Death	6 (25.0)	8 (12.1)	7 (9.7)	16 (4.6)	<0.001

Table: Patient Outcomes by Geriatric Nutrition Risk Index (GNRI) Category. Categorical data are presented as n (%), continuous data as median (IQR).

Quick Shots Session III

Quick Shot #26
January 13, 2022
1:00 pm

DELAYED SPLENIC PSEUDOANEURYSM IDENTIFICATION WITH SURVEILLANCE IMAGING

Taylor Wallen, MD*, Katherine Clark, Jennifer Lemmink,
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Presenter: Taylor Wallen, MD

Objectives: Recent studies have shown that non-operative management of patients with splenic injury has up to a 90% success rate. However, delayed hemorrhage secondary to splenic artery pseudoaneurysm occurs in 5-6% of patients with up to 27% of patients developing a pseudoaneurysm on delayed imaging. The goal of our study was to evaluate the safety and utility of delayed CT imaging for blunt splenic injury patients.

Methods: A retrospective evaluation of all traumatic splenic injuries from 2018 to 2020 at a single level 1 trauma center was undertaken. Patients were sub-divided into 4 groups based on the extent of splenic injury: Grades 1-2, Grade 3, Grade 4, and Grade 5. Patient injury characteristics along with hospital length of stay, imaging, procedures, and presence/absence of pseudoaneurysm were documented.

Results: 588 trauma patients were included for evaluation. 321 patients sustained Grades 1-2, 140 Grade 3, 68 Grade 4, and 59 Grade 5 splenic injuries. 140 patients (23.8%) underwent an emergent splenectomy (11 Grade 1-2, 38 Grade 3, 40 Grade 4, 51 Grade 5), 28 patients received either delayed (>6 hours) splenectomy or splenorrhaphy. Of the patients who were treated non-operatively, 68% of Grade 3, 86% of Grade 4, and 100% of Grade 5 splenic injury patients underwent follow up CT imaging. The mean time from admission to follow-up abdominal CT scan was 4.9 ± 4 days. 33 pseudoaneurysms were identified in 15/87 Grade 3, 10/22 Grade 4, and 2/5 Grade 5; of these patients 33% Grade 3 and 30% Grade 4 required splenectomy.

Conclusions: Routine follow up CT imaging after high grade splenic injury identifies splenic artery pseudoaneurysm in a significant proportion of patients. Standardized surveillance imaging for high grade splenic trauma promotes prospective identification of pseudoaneurysms, allowing for interventions to maximize splenic preservation.

Quick Shots Session III

Quick Shot #27
January 13, 2022
1:06 pm

IS COMMON FEMORAL ACCESS A CRITICAL JUNCTURE IN TRAUMA RESUSCITATION? SINGLE CENTER, PROSPECTIVE ANALYSIS TO IDENTIFY OPTIMAL TECHNIQUES, OUTCOMES AND COMPLICATIONS

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Grant Medical Center

Presenter: M. Chance Spalding, DO, PhD, FACS

Objectives: Common femoral artery (CFA) access is the rate-limiting step in some resuscitative interventions. Previous studies of CFA access have investigated techniques and outcomes, however few occurred in the trauma bay. We hypothesize that CFA access in the trauma bay is safe and stands alone as a clinically important juncture in the resuscitation of trauma patients.

Methods: We report the results of a prospective study at an urban level 1 trauma center of 4 FR CFA access placed according to a consensus guideline (SBP<90, transient response to resuscitation, refractory shock, or pre-hospital CPR with ROSC). Resuscitation video and CT angiography (CTA) review was performed on each CFA access to collect procedural and outcomes data using an IRB approved protocol.

Results: Access was attempted in 706 patients over 4 years, who were a typical adult trauma population (72% males, ISS 23.8 ±17, 81% blunt). Providers used ultrasound (58%), landmarks (42%), with only 18% placed by attendings and the rest by residents (42%) and advanced providers (40%). Success and complications were not different between US vs. landmarks (p= 0.17) or provider type (p= 0.23). CTA confirmed CFA and (83%) SFA or PFA (17%) placement without complications requiring intervention. The patient's clinical trajectory was confirmed after CFA placement by the aline reading 74% and altered 26% of the time. There was no difference in time to OR between those with early CFA access versus those without (p=0.35).

Conclusions: We implemented a proactive CFA access program enabling improved diagnostic information with few complications. We demonstrated that Trauma Surgeons can lead an early access program to improve situational awareness, alter the clinical trajectory in an important trauma population, and enable intervention without significant delay.

Quick Shots Session III

Quick Shot #28
January 13, 2022
1:12 pm

PULMONARY CONTUSION VOLUME COMPUTATION USING COMPUTER VISION

Jeff Choi, MD MSc*, Katherine Mavrommati, BSc, Yanzhe Li, BSc, Karen Chan,
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Stanford University

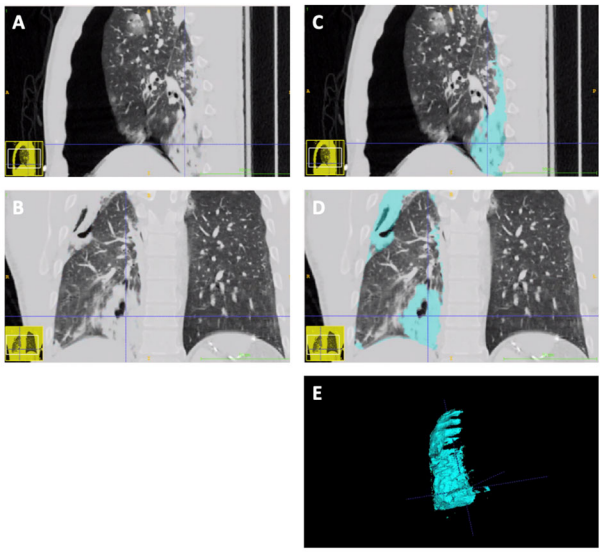
Presenter: Jeff Choi, MD MSc

Objectives: Pulmonary contusion volume exists along a spectrum, yet pulmonary contusion is frequently classified as present or absent. A tool to compute percent pulmonary contusion is urgently needed to better prognosticate injury outcomes. We aimed to develop a CT computer vision algorithm that quantifies percent pulmonary contusion. We hypothesized greater contusion volumes would be associated with increased odds of pulmonary complications and longer hospitalization.

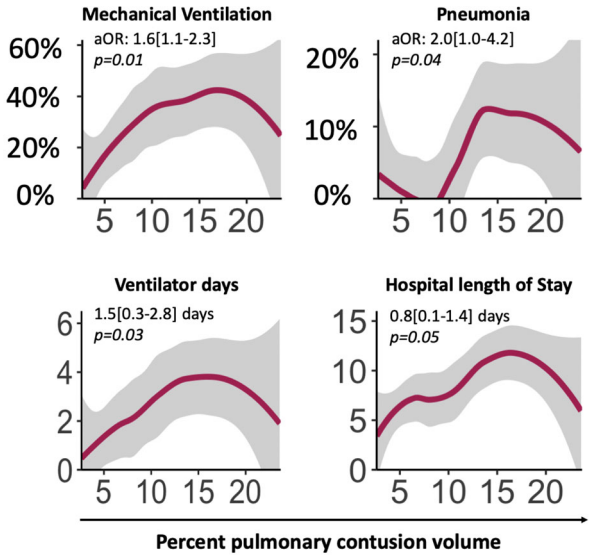
Methods: We evaluated adults admitted to a level I trauma center with traumatic rib fractures and pulmonary contusions (2010-2020). Using a trained UNET lung segmentation model, we filtered pulmonary vessels and segmented contused lung volumes. Our outcomes were pneumonia, mechanical ventilation need, ventilator days, and hospital length-of-stay(HLOS). Regression models adjusting for age and injury severity delineated associations between contusion volume (5% increments) and outcomes. We bootstrapped confidence intervals and present locally-weighted scatterplot smoothing curves. Statistical significant threshold was $\alpha<0.05$.

Results: Interim analysis comprised 149 patients (median[range] contusion volume: 8[3-24]%). Our algorithm accurately computed contusion volumes on various CTs including CTs with concurrent hemo/pneumothoraces or enlarged pulmonary vessels (Fig.1). We found statistically significant associations between contusion volume and increased odds of pneumonia (2.0[1.0-4.2]) and mechanical ventilation (1.6[1.1-2.3]), and longer HLOS (1.5[0.3-2.8] days) and ventilator days (0.8[0.1-1.4] days; Fig.2).

Conclusions: We developed a computer vision algorithm that accurately computes percent pulmonary contusion volume. Interim analysis found greater contusion volumes are associated with worse clinical outcomes, yet sample size limited certainty of estimates. Complete cohort analysis will assess how contusion volume computation can be integrated within clinical decision-making.



Pulmonary contusion segmentation model. A, B: CT without contusion segmentation. C,D: CT with contusion segmentation highlighted in cyan. E: 3D-rendering of contusion volume segmentation



Locally-weighted scatterplot smoothing curves delineating association between percent pulmonary contusion volume and clinical outcomes.

Shaded regions indicate 95% confidence intervals (sample size limits certainty of estimates beyond 15% contusion volume).

Odds ratios and effect sizes, adjusted for age (< or ≥65 years) and injury severity score (< or ≥15), are presented with bootstrapped 95% confidence intervals.

Quick Shots Session III

Quick Shot #29
January 13, 2022
1:18 pm

SURGICAL STABILIZATION OF RIB FRACTURES INCREASES HOSPITAL STAY AND OPIOID USE IN NON-FLAIL SEVERE CHEST WALL INJURIES

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Presenter: Anne R. Jeckovich, BS

Objectives: Randomized trials have shown a benefit for surgical stabilization of rib fractures (SSRF) in clinical flail chest injuries. The effect of SSRF on severe chest wall injuries without clinical flail is unknown. We hypothesized that SSRF would decrease opioid use and hospital length of stay (LOS) in these patients.

Methods: Two-year analysis (2018-19) of trauma patients admitted with a severe chest wall injury (>5 consecutive rib fractures or radiographic flail segment) without clinical flail chest. Negative binomial generalized linear models (GLM) were used to model the effect of SSRF on opioid use (in morphine milligram equivalents [MME]) and LOS. Propensity scores were used to perform an inverse propensity weighted (IPW) analysis. Bayesian GLMs with neutral priors were used to calculate posterior median distributions and the probability of benefit or harm from SSRF.

Results: Of 661 patients with a non-flail severe chest wall injury, 579 survived >24h. 66 (11%) underwent SSRF and 513 received USUAL CARE. Age, sex, ISS, and mortality were similar between groups. Controlling for injury and fracture severity, SSRF was associated with increased opioid use (RR 1.26, 95%CI 0.96-1.68) and longer LOS (RR 1.29, 95%CI 1.05-1.60). Results from the IPW analysis also showed increased opioid use (RR 1.16, 95%CI 0.95-1.41) and longer LOS (RR 1.28, 95%CI 1.06-1.56) (TABLE and FIGURE). Bayesian analysis showed a 95% probability of any increase in MME and 99% probability of any increase in LOS (TABLE).

Conclusions: Contrary to our hypothesis, patients with a non-flail severe chest wall injury who underwent SSRF used more opioids and stayed in the hospital longer than their usual care counterparts. Although advanced statistical methods can reduce bias from unknown confounders, residual confounding may exist. A randomized trial with longer term outcomes, including patient-reported outcomes, is warranted.

	IPW Analysis		Bayesian Analysis			
	Mean MME	**95% CI**	**Mean MME**	**95% CI**	**Probability of any Increase**	**Probability of 10% Increase**
Usual Care	438	384-501	498	445-559	5%	1%
SSRF	507	445-578	629	477-809	95%	84%
	Mean LOS	**95% CI**	**Mean LOS**	**95% CI**	**Probability of any Increase**	**Probability of 10% Increase**
Usual Care	9	8-10	10	9-11	1%	<1%
SSRF	11	10-12	13	11-16	99%	93%

TABLE. Estimated marginal means for opioid use in morphine milligram equivalents (MME) (top) and hospital length of stay (LOS) in days (bottom) by treatment group. Means and 95% confidence/credible intervals from the inverse weighted propensity (IPW) analysis and Bayesian negative binomial generalized linear models are presented.

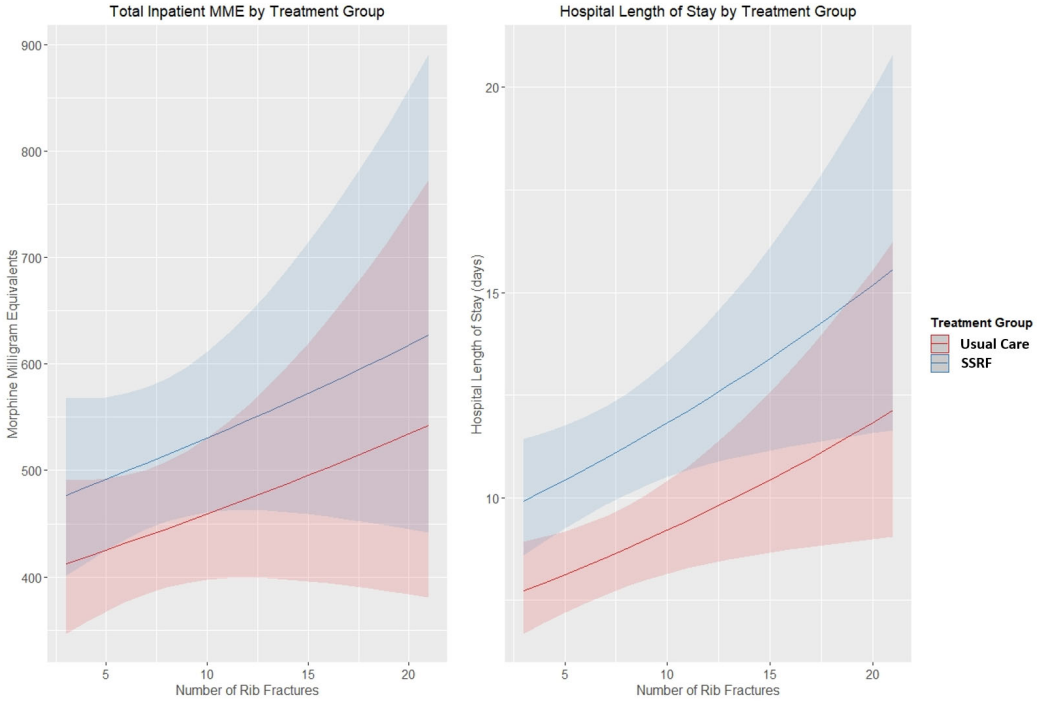

FIGURE. Total inpatient opioid use measured in morphine milligram equivalents (MME) (left) and hospital length of stay (LOS) (right) by treatment group. Means and 95% confidence/credible intervals are presented. SSRF = surgical stabilization of rib fractures.

Quick Shots Session III

Quick Shot #30
January 13, 2022
1:24 pm

CLINICAL OUTCOMES OF INTRATHORACIC VS EXTRATHORACIC PLATING IN RIB FRACTURE FIXATION

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Presenter: Erika Tay, MD

Objectives: Intrathoracic rib fixation allows for a less invasive approach to rib fracture repair. This approach offers less muscle disruption, which may improve patient recovery compared to traditional plating. We hypothesized that patients with intrathoracic plating required less pain medication and have a shorter length of stay compared with extrathoracic plating.

Methods: A prospective observational study was made from November 2017 until May 2021. Patients with an AIS ≥4 in any body part were excluded. Patients were divided into 2 groups: intrathoracic plating (ITP) and extrathoracic plating (ETP). A descriptive analysis was made and Pearson chi-square tests were used to compare categorical variables, a simple logistic regression was done to analyze the length of stay (LOS) between the two groups.

Results: A total of 99 patients were analyzed, 15 (62.5%) ITP vs 9 (37.5%) ETP were females. The most common mechanism of injury was motor vehicle accidents followed by falls and pedestrian vs auto. The ITP group had a shorter LOS (10 vs 8 p=0.05) compared with ETP. After adjusting for the effect of ISS and ventilator days there was an estimated 16% decrease in LOS for those in the ITP compared to those in the ETP, this decrease is statistically p =0.05. Pain medication was collected and standardized into morphine equivalents; the median used of morphine before surgery was 50mme in the ITP compared with 51.6mme in the ETP with a p = 0.99. On the other hand, the median used of morphine after surgery up to seven days was 120mme vs 158mme p=0.64 for ITP and ETP respectively.

Conclusions: Patients that underwent intrathoracic platting had a significant 16% decrease in length of stay after adjusting for ISS, there was no significant difference in morphine consumption. Intrathoracic rib fixation represents a novel approach for rib fixation, minimally invasive surgical techniques are opening to major avenues of future medical innovation.