

Quick Shots Parallel Session I

Quick Shot Paper #1
January 10, 2018
4:30 pm

EXCESS SODIUM IS DELETERIOUS TO ENDOTHELIAL AND GLYCOCALYX BARRIER FUNCTION: A MICROFLUIDIC STUDY

Jonathan Martin, MD, David Liberati, MS, Lawrence N. Diebel, MD*
Wayne State University

Presenter: Jonathan Martin, MD

Objectives: Preclinical studies suggest a role for the administration of hypertonic saline solutions (HSS) after traumatic injury with shock. However clinical trials of HSS have failed to demonstrate significant benefits of HSS for shock resuscitation; further it may result in hypocoagulopathy and hyperfibrinolysis. The mechanism is uncertain. Excess sodium has been found to be detrimental in other clinical entities, which may be due to enhanced inflammatory signaling and damage to the endothelial cell (EC) glycocalyx. The endotheliopathy of trauma (EOT) is an important component of the acute coagulopathy of trauma. Principal drivers include tissue hypoperfusion, sympathoadrenal activation, inflammation, and hyperfibrinolysis. The effect of hypernatremia on the EOT is uncertain. Microfluidic technology has been used to study coagulation and endothelial cell biology *in vitro* and was used to compare the effects of hypernatremia on the endothelium under flow conditions.

Methods: Microfluidic channels lined with human umbilical vein endothelial cells (HUVEC) were exposed to hypoxia/reoxygenation (H/R) and epinephrine (EPI) for 60 minutes. HUVEC were then treated with a perfusate with sodium concentration to simulate post HSS infusion values. Microfluidic perfusate was sampled for hyaluronic acid (HA) and syndecan-1 (glycocalyx degradation), soluble thrombomodulin (TM) (EC activation/injury); tPA (tissue-plasminogen activator) and PAI-1 (plasminogen activator inhibitor-1) (coagulation phenotype).

Results: See table

Conclusions: Sodium at concentrations consistent with post HSS resuscitation result in glycocalyx degradation, endothelial injury/activation and a profibrinolytic phenotype. This was apparent in control and HUVEC cells under "shock" conditions. However the resultant effects were more profound in the "shock" HUVEC group and suggest HSS may have deleterious effects in traumatic shock resuscitation.

Mean \pm SD, N = 5

	HA (ng/ml)	Syndecan-1 (ng/ml)	TM (pg/ml)	tPA (pg/ml)	PAI-1 (pg/ml)
HUVEC control (Na ⁺ 134 mEq)	11.6 \pm 1.5	26.1 \pm 4.8	26.1 \pm 2.5	1596 \pm 45.4	5948 \pm 103.8
150 mEq Na ⁺	37.8 \pm 3.8*	58.3 \pm 3.9*	64.4 \pm 3.4*	2740 \pm 56.1*	5456 \pm 47.9*
160 mEq Na ⁺	56.0 \pm 3.4*	67.4 \pm 2.9*	73.4 \pm 2.4*	2922 \pm 56.6*	5090 \pm 63.6*
HUVEC+HR+EPI	74.1 \pm 2.9*	94.6 \pm 7.1*	105.2 \pm 5.1*	3686 \pm 33.7*	4887 \pm 202.7*
HR+EPI+150 mEq Na ⁺	96.6 \pm 2.9*#	105.6 \pm 4.0*	168.7 \pm 1.7*#	3963 \pm 52.4*#	4620 \pm 90.6*
HR+EPI+160 mEq Na ⁺	120.9 \pm 2.7#	114.4 \pm 5.8*#	196.7 \pm 5.4*#	4418 \pm 184.4*#	4568 \pm 196.2*

*p < 0.01 vs. HUVEC control, #p < 0.01 vs. HUVEC + HR + EPI

Quick Shots Parallel Session I

Quick Shot Paper #2
January 10, 2018
4:36 pm

HYPOBARIA DURING LONG RANGE FLIGHT RESULTED IN SIGNIFICANTLY INCREASED HISTOPATHOLOGICAL EVIDENCE OF LUNG AND BRAIN DAMAGE IN A SWINE MODEL

Debra L. Malone, MD*, Ashraful Haque, Michelle Jefferson, Lam Thuy Vi Tran Ho, Saha Biswajit, Steve Chun, MD, Kirk Blackmoore, Neda Ilieva, Charles Auker, Richard McCarron, Anke H Scultetus, MD
Naval Medical Research Center

Presenter: Debra L. Malone, MD

Objectives: Precipitous aeromedical evacuation (AE) of combat casualties to definitive care is current practice. However, there is a dearth of knowledge about the effects of hypobaria during flight on injured patients. We investigated possible effects of hypobaria during AE on organ damage in a swine model. Data of a subgroup analysis of uninjured animals is presented here.

Methods: Anesthetized swine were instrumented for invasive neurological and physiological monitoring. A 4 hour AE flight was simulated in a hypobaric chamber with atmospheric pressure equivalent to an altitude of 8,000 ft. (HYPO, n=6). Control animals were kept at normobaric conditions (NORMO, n=6). Animals were then euthanized and histopathological analysis of lung, kidney and brain tissues stained with H&E was performed.

Results: There were no significant differences in physiological and neurological parameters between the groups over time. Organ damage was assessed by combined scores for hemorrhage, inflammation, edema, necrosis and microatelectasis (lungs only), and was significantly worse in HYPO animals compared to NORMO in lungs ($p < 0.0001$) and brain ($p = 0.0439$). There were no differences between groups in the kidneys.

Conclusions: This swine model of 4 hour simulated AE resulted in significant increase in histopathological damage to lungs and brain compared to normobaric controls. This suggests that hypobaria has an adverse effect on tissues specifically lung and brain, and therefore may complicate transport of combat casualties. The findings also indicate that healthy passengers may be affected by prolonged hypobaria. Further studies are indicated to elucidate these effects, simulate other AE scenarios and assess the effects of hypobaria on injured animals.

Quick Shots Parallel Session I

Quick Shot Paper #3
January 10, 2018
4:42 pm

LOCATION IS EVERYTHING: THE HEMODYNAMIC EFFECTS OF REBOA IN ZONE 1 VERSUS ZONE 3 OF THE AORTA

Emily M. Tibbits, MD, Guillaume Hoareau, Meryl Simon, Anders J. Davidson, MD, Erik DeSoucy,
Robert Faulconer, MBChB MRCS, Joseph J. DuBose, MD*, J. Kevin Grayson,
Timothy Williams, M. Austin Johnson, MD
David Grant Medical Center

Presenter: Emily M. Tibbits, MD

Objectives: Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) assists in augmenting proximal blood pressure during resuscitation of patients with non-compressible torso hemorrhage. The choice of aortic placement, zone 1 versus zone 3, depends upon injury patterns, but remains highly debated. We sought to compare proximal hemodynamic support provided by Zone 1 versus Zone 3 REBOA placement, and degree of hemodynamic instability upon reperfusion following it.

Methods: Eighteen anesthetized swine underwent controlled hemorrhage of 25% blood volume, followed by 45 minutes of Zone 1 REBOA, Zone 3 REBOA, or no intervention (control). They were then resuscitated with shed blood, balloons were deflated, and 5 hours of critical care ensued prior to euthanasia. Physiologic parameters were recorded continuously, and blood was drawn for analysis at specified intervals. Significance was defined as $p<0.05$.

Results: There were no differences in physiologic data at baseline or during the initial 30 minutes of hemorrhage. During the intervention, average proximal MAP was significantly higher in Zone 1 animals when compared to Zone 3 animals (127.9 ± 1.3 mmHg versus 53.4 ± 1.1 mmHg), and both were higher than control animals (42.9 ± 0.9 mmHg). In the hour after reperfusion, average pMAP was lower in Zone 1 animals than Zone 3 animals (57.3 ± 1.9 mmHg vs. 69.1 ± 0.3 mmHg). Both were lower than control (72.1 ± 0.4 mmHg). Peak lactate was higher in Zone 1 animals (9.6 ± 0.4 mmol/L) when compared to Zone 3 animals (5.1 ± 0.3 mmol/L) and control animals (4.2 ± 0.8 mmol/L).

Conclusions: In our model of hemorrhagic shock, Zone 3 REBOA provided hemodynamic support, but to a lesser degree than Zone 1, with less ischemic burden and instability on reperfusion. In cases of impending hemodynamic collapse, Zone 1 REBOA may be more efficacious regardless of injury pattern, while Zone 3 should be reserved for relatively stable patients with distal hemorrhage.

Quick Shots Parallel Session I

Quick Shot Paper #4
January 10, 2018
4:48 pm

INCREASE IN NEUTROPHIL/LYMPHOCYTE RATIO IS ASSOCIATED WITH EVOLUTION OF HEMORRHAGE AFTER TBI

Margo N. Carlin, DO, Alireza Daneshpajouh, DO, Joseph D. Catino, MD*,
Charles DiMaggio, Spiros Frangos, MD, Marko Bukur, MD*
Delray Medical Center, Delray Beach, Florida

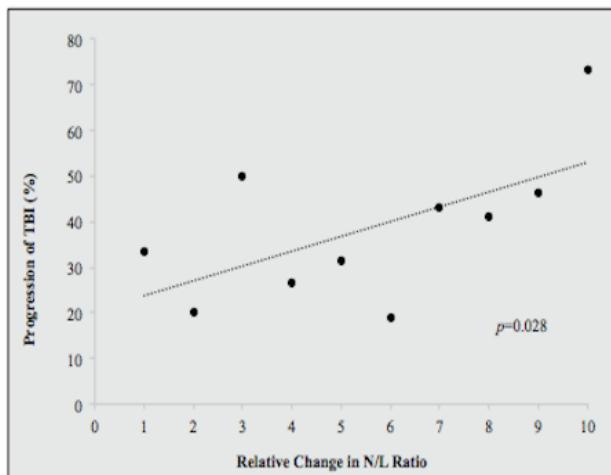
Presenter: Margo N. Carlin, DO

Objectives: The Neutrophil/Lymphocyte Ratio (NLR) is a marker of inflammation associated with adverse outcomes in the critically ill. Its impact in Traumatic Brain Injury (TBI) is unknown. We hypothesized increased NLR would predict progression of TBI on serial imaging. Secondary outcomes were effect of NLR on need for craniotomy and in-hospital mortality.

Methods: A retrospective study included isolated TBI patients admitted to a Level I Trauma Center from 2014-16 with sequential CT Head (CTH) imaging and blood work upon admission and day 1. Those with Head AIS of 6 or withdrawal of care within 24 hours were excluded. Worsening of TBI was determined by official radiology report. Patients were dichotomized by change in NLR; demographic, physiologic, intervention, and outcomes abstracted from the registry. Logistic regression determined effect of NLR on outcomes.

Results: 154 patients met inclusion criteria. 65.6% were Caucasian males over 65 injured by ground level falls. 53.9 % had increased NLR with mean N/L increase of 6.5 (SD 7.9) compared to patients exhibiting decreased or no change (Mean -4.9, SD 6.1; $p < 0.001$) in NLR. Patients with increased NLR had a higher ISS (Median 18 IQR [9,25] vs. 16 IQR [9,25], $p = 0.027$) and more subdural hematomas (80.7% vs. 66.2%, $p = 0.04$). Progression on CTH was noted in 44.6% with increased NLR (vs. 31.4% without positive change, $p = 0.09$), and decreased GCS in 48.2%. Adjusting for ISS, TBI, and GCS change, NLR was associated with a 5% increased risk for TBI progression per point increase in NLR (30% overall increased risk, $p = 0.028$). Craniotomy (42.2% vs. 29.6%, $p = 0.105$) and in-hospital mortality (26.5% vs. 16.9%, $p = 0.152$) were not different regardless of change in NLR.

Conclusions: Increased NLR is associated with TBI progression on sequential imaging. This ratio derived from routine labs may permit risk stratification of TBI patients and should be examined prospectively.



Relative Change in N/L Ratio vs Percent Progression of TBI

Quick Shots Parallel Session I

Quick Shot Paper #5
January 10, 2018
4:54 pm

FRAILTY SCREENING AND A FRAILTY PATHWAY DECREASE LENGTH OF STAY, LOSS OF INDEPENDENCE, AND 30-DAY READMISSION RATES IN FRAIL TRAUMA AND EMERGENCY GENERAL SURGERY PATIENTS

Kathryn E. Engelhardt, MD, Quentin Reuter, Jonathan Frederick Bean, M.D.*, Joliette Barnum, Michael B. Shapiro, MD*, Allison Ambre, Amanda Dunbar, Mara Markzon, Tara Reddy, Christing Schilling, Joseph Posluszny
Northwestern University

Presenter: Kathryn E. Engelhardt, MD

Objectives: Frail geriatric trauma and emergency general surgery (TEGS) patients have higher rates of complications, longer lengths of stay (LOS) and less frequent discharges to home when compared to non-frail geriatric patients. Despite this, there have been no studies reported that improve outcomes for frail TEGS patients. The objective of this quality improvement (QI) project was to develop a screening program, using the TEGS-Specific Frailty Index and implement a novel frailty pathway to reduce LOS, LOI and 30-day readmission rates.

Methods: This was a before-after study of a prospective cohort of all geriatric patients admitted to the TEGS service from 10/2016-5/2017. After 3 months of screening to obtain baseline outcome measures (pre-intervention), both frailty screening and implementation of the frailty pathway were implemented (*Fig 1*). Non-parametric statistical tests were used to assess significant differences in continuous variables; chi-squared and Fisher's exact were used for categorical variables, where appropriate.

Results: Of 153 geriatric TEGS patients screened, 47 (31%) were frail. All TEGS geriatric patients were screened within 24 hours of admission. Following frailty pathway implementation, median length of stay decreased from 8.5 to 6 days ($p=0.67$), readmissions decreased from 36.4% to 14.7% ($p=0.19$), and loss of independence decreased by 37%, (100% vs 63.6%; $p=0.02$; *Fig 2*). Outcomes for non-frail geriatric patients did not differ between cohorts.

Conclusions: Screening for frailty and a frailty pathway decreased LOS, LOI and 30 day readmission rates for frail TEGS patients. This pathway shifted available resources toward frail patients, without negatively affecting outcomes in other geriatric TEGS patients. Implementation of this pathway with larger patient cohorts and in varied settings is needed to confirm our findings.

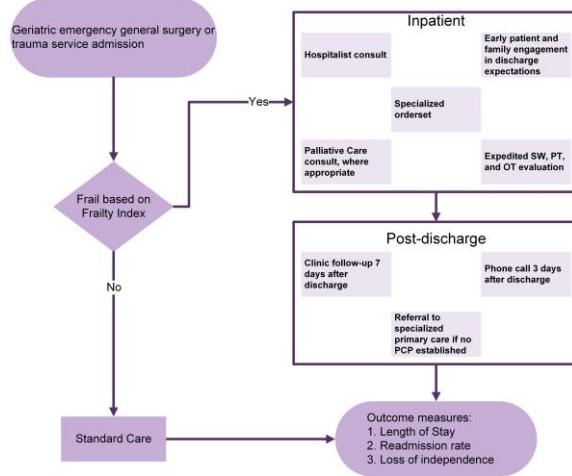


Figure 1: Novel, multidisciplinary clinical pathway for frail patients admitted to the emergency general surgery and trauma service

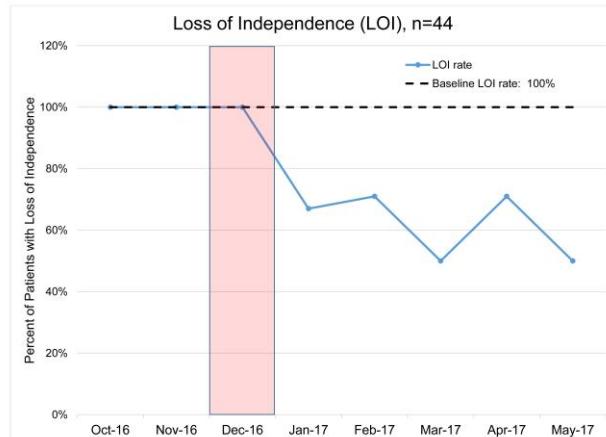


Figure 2: Run chart showing trend in loss of independence by month.
The intervention was implemented mid-December, 2016

Quick Shots Parallel Session I

Quick Shot Paper #6
January 10, 2018
5:00 pm

PIC SCORE: AN EFFECTIVE TOOL TO GUIDE MANAGEMENT OF BLUNT CHEST WALL INJURY (ANALYSIS OF THE FIRST TWO YEARS OF APPLICATION AT A LEVEL I TRAUMA CENTER)

Shawn M. Terry, MD, FACS*, Kimberly A. Shoff, BSN, RN, CCRN
WellSpan -- York Hospital

Presenter: Shawn M. Terry, MD, FACS

Objectives: Blunt chest wall injury patient outcomes were identified to be unsatisfactory based on trauma program process improvement review. A novel, comprehensive treatment plan involving a power plan protocol (PIC Protocol) and rating scale (PIC Score) was developed and deployed as a strategic intervention. We hypothesize that application of this protocol will improve outcomes from blunt chest wall injury at our institution.

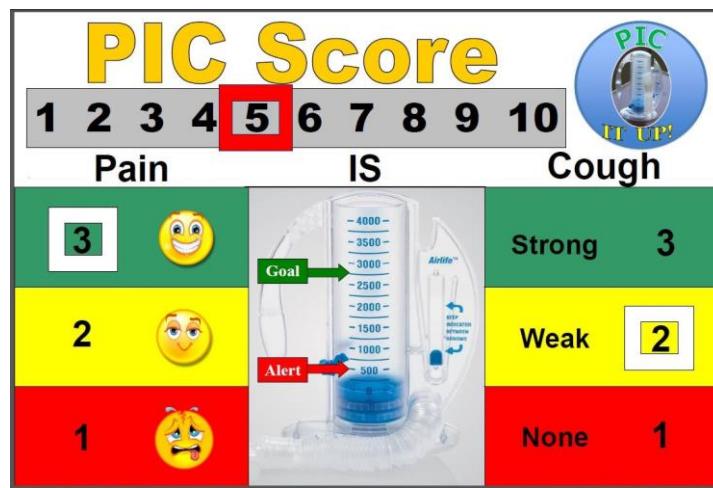
Methods: Retrospective trauma registry and electronic medical record queries at a Level I Trauma Center for 2 years following protocol initiation (2014-2015) for non-intubated chest wall injury patients were conducted and compared to outcomes recorded from 2 years prior to protocol development (2012-2013). Independent-sample t tests were performed to assess differences between groups for measurement variables. Chi Squares tests were performed to assess relationships between categorical variables of interest.

Results: Compliance with protocol was 100% (533/533 pts). Unanticipated transfer to higher level of care for respiratory decline was significantly reduced from 4% to 0.37% ($p=0.0022$). Patients requiring transfer to higher level of care were successfully predicted by an acute fall in PIC score of 2 points. No unpredicted patient care escalations related to declining pulmonary function occurred post PIC protocol (0/533) compared to prior study period (24/501). No significant increase in ICU or hospital length of stay was incurred.

Conclusions: Application of institution-developed PIC Protocol Chest Wall Injury Initiative improved patient outcomes for non-intubated chest wall injury patients without increasing time in the ICU or the hospital. The PIC Protocol Assessment Tool Score was demonstrated to have predictive value in assessment of declining respiratory function and need for patient transfer to higher level of care.

	PIC		P value
	No PIC Control Group	PIC Group	
	Mean	Mean	
Age	58.5	58	0.709
ISS	12.8	13.2	0.491
Time in ED	171.4	169.2	0.819
ICU LOS	1.2	1.4	0.365
Vent Days	0.8	0.8	0.958
LOS	5.2	5.2	0.803

Comparison data derived from pre- and post- PIC Protocol initiation for blunt chest wall injury patients.



Magnetized patient scoring, education, and communication tool board created for bedside use. Composite **PIC** score (range 3-10) derived from total for each column score:
Pain, Incentive Spirometer Volume achieved, Cough.

Quick Shots Parallel Session I

Quick Shot Paper #7
January 10, 2018
5:06 pm

HEALTH LITERACY AND QUALITY OF PHYSICIAN-TRAUMA PATIENT COMMUNICATION: OPPORTUNITY FOR IMPROVEMENT

Jonathan Dameworth, MD, Jordan V Jacobs, MD, Pamela Goslar, Terrell Thompson,
Dana Stout, Thomas Gillespie, Scott Petersen,
St. Joseph's Hospital and Medical Center

Presenter: Jonathan Dameworth, MD

Objectives: Although physician-patient communication and health literacy (HL) have been studied in diverse patient groups, little research has focused on trauma patients. The purpose of this study was to evaluate trauma patient ratings of the quality of physician-patient communication during hospitalization and how this varies by HL.

Methods: Level 1 trauma center patients were interviewed during hospitalization (Aug 2016-Jan2017). Short Assessment of Health Literacy (SAHL) tool was used to stratify subjects by deficient vs. adequate HL. Interpersonal Processes of Care (IPC) survey was administered to assess perception of physician-patient communication. This survey allowed patients to rate physician-patient interaction across 6 domains: "clarity," "elicited concerns," "explained results," "worked together (on decision making)," "compassion and respect," and "lack of discrimination by race/ethnicity." Each is scored on a 5-point scale. Frequencies of "top-box" (5/5) scores were compared for significance ($p<0.05$) between HL-deficient and HL-adequate patients.

Results: 199 patients participated. Average age was 42, 33% female, and median ISS 10. 49 patients (25%) had deficient HL. Comparison of patients with deficient vs. adequate HL with respect to IPC top-box scores is demonstrated in Figure 1. The majority of patients in both groups rated communication below 5/5 across most domains. HL-deficient patients were consistently less likely to give physicians top-box scores, most notably in the "elicited concerns" domain.

Conclusions: HL-deficient patients appear relatively less satisfied with physician communication, particularly with respect to perceiving that their concerns are being heard. Overall, however, the majority of patients in both groups were unlikely to score physician communication in the "top box." Efforts to improve physician-trauma patient communication are warranted, with attention directed toward meeting the needs of HL-deficient patients.

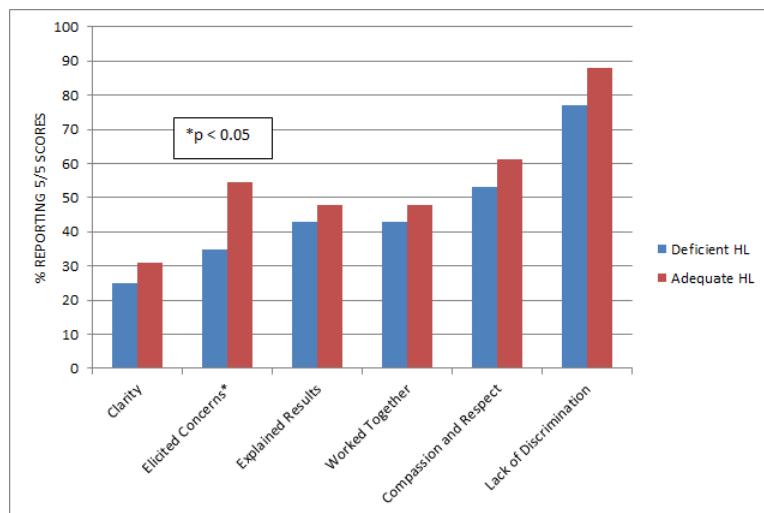


Figure 1. Proportion of "top box" scores across IPC survey domains, stratified by HL group.

Quick Shots Parallel Session I

Quick Shot Paper #8
January 10, 2018
5:12 pm

INCREASED TRAUMA ACTIVATION IS NOT EquALLY BENEFICIAL FOR ALL ELDERLY TRAUMA PATIENTS

Bryan Carr, MD, Peter M Hammer, MD*, Grace S. Rozynski, MD, MBA, FACS*,
David V. Feliciano, MD, FACS*, Jamie J. Coleman, MD, FACS*
Indiana University

Presenter: Bryan Carr, MD

Objectives: Physiologic changes in the elderly lead to higher morbidity and mortality after injury. Increasing the level of trauma activation for has been proposed to improve geriatric outcomes; but, the increased cost to the patient and stress to the hospital system are significant downsides. The purpose of this study was to identify the age at which an increase in activation status is beneficial.

Methods: A retrospective review of trauma patients = 70 years old from October 1, 2011, to October 1, 2016 was performed. On October 1, 2013, a policy change increased the activation criteria to the highest level for patients = 70 years of age with a significant mechanism of injury. Patients who presented prior to (PRE) were compared to those after the change (POST). Data collected included age, injury severity score (ISS), length of stay (LOS), complications and mortality. Primary outcome was mortality and secondary outcome was LOS. Multivariable regressions controlled for age, ISS, injury mechanism, and number of complications.

Results: 4363 patients were included in the study, 1921 in PRE (mean age 80.4, mean ISS 11.6) and 2442 in POST (mean age 81, mean ISS 12.5). After adjusting for injury mechanism, LOS and number of complications, there was no significant difference in age ($p=0.053$) or ISS ($p=0.820$) between PRE and POST. POST had more level 1 activations (712 vs. 221, $p<0.001$). After multivariable logistic regression analysis, a significant reduction in mortality occurred in the POST group = 77 of age (OR 0.53, 95% CI: 0.3-0.87), figure 1. LOS started to decrease significantly in the POST group at age 78 (regression coefficient -0.55, 95% CI: -1.09-0.01), figure 2.

Conclusions: This study suggests that geriatric trauma patients = 77 years benefit from the highest level of trauma activation with a shorter LOS and lower mortality. A focused approach to increasing activation level for elderly patients may decrease patient cost.

Figure 1:

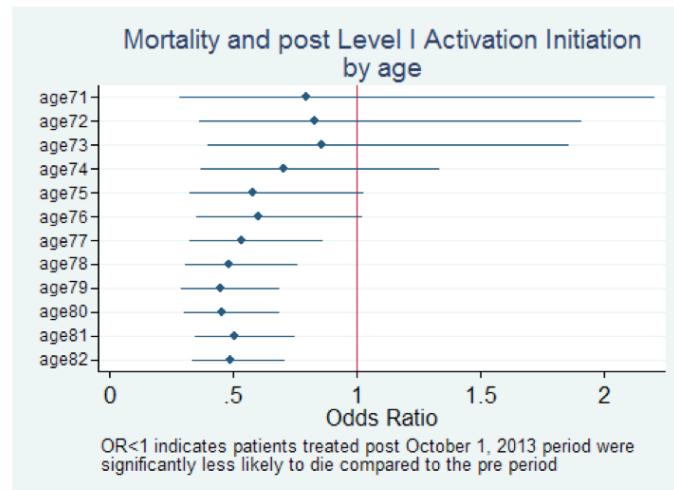
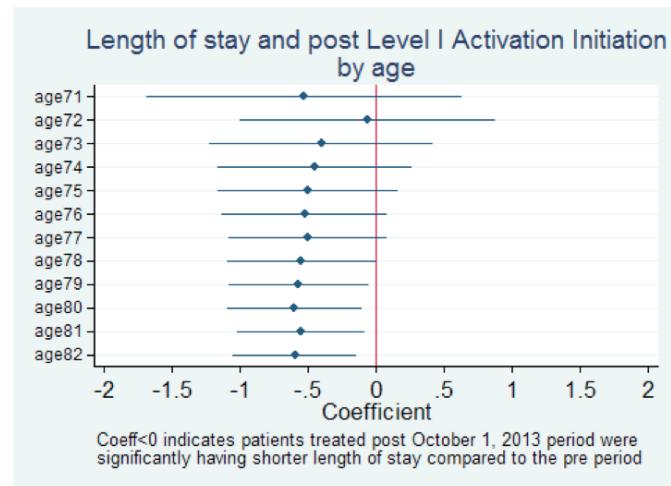


Figure 2:



Quick Shots Parallel Session I

Quick Shot Paper #9
January 10, 2018
5:18 pm

THE UTILITY OF ADDITIONAL IMAGING IN TRAUMA CONSULTS WITH MILD TO MODERATE INJURY AFTER INITIAL ED WORKUP

Andrew L. Plaster, BS, Bryan R. Collier, DO FACS*, Daniel Freeman, Daniel I. Lollar, MD*, Katie M. Love, MD*, Andrew Benson, Michael S Nussbaum, Mark E. Hamill, MD FACS FCCM*
Virginia Tech Carilion School of Medicine

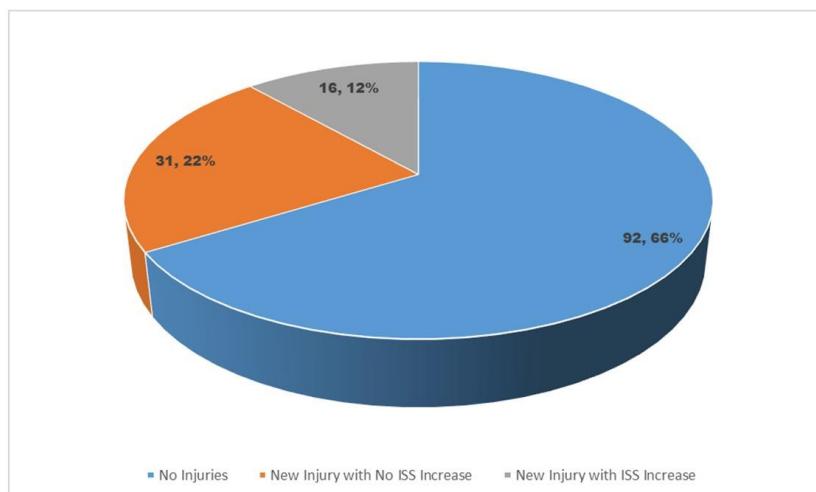
Presenter: Andrew L. Plaster, BS

Objectives: Limiting CT imaging in the ED has gained interest recently. However, following trauma consultation in the ED, additional CT imaging is frequently ordered. We sought to determine the benefits of additional imaging after initial workup by the ED. Hypothesis: Additional imaging in trauma patients results in the diagnosis of new significant injuries that will change the treatment plan and raise the Injury Severity Score (ISS).

Methods: The trauma registry at our level 1 trauma center was queried from November 2015 to November 2016 for trauma consults initially evaluated by ED physicians. Patients with mild to moderate injuries were included. Injury findings before and after additional imaging were determined by chart review and a pre and post imaging ISS was calculated for patients with new injuries. Blinded trauma surgeons reviewed the findings to assess for clinical significance and changes in treatment.

Results: 421 patients were evaluated, with 140 (33%) undergoing additional CT imaging. 47 (34%) had additional injuries found, with 16 (12%) increasing their ISS with a mean change of 0.536 (SD 1.658) - significant by Wilcoxon test ($N=16$, $W=136.0$). After physician review, 93% of cases resulted in at least one physician finding the new injuries clinically significant; however, agreement between the reviewers was low ($\kappa = 0.0948$). For 70%, at least one physician felt the findings resulted in a change in treatment plan ($\kappa = 0.4047$).

Conclusions: Attempts to minimize imaging for trauma consultations resulted in additional imaging for one third of our patient sample resulting in identification of a considerable number of new injuries. This suggests that current efforts to limit the use of CT imaging in trauma patients may result in significant injuries going undiscovered and under-treated. Further research is needed to determine the risk versus benefit of attempts to limit imaging in this population.



Frequency of new injuries and ISS increase after additional imaging

Quick Shots Parallel Session I

Quick Shot Paper #10
January 10, 2018
5:24 pm

BENCHMARKING EMERGENCY DEPARTMENT THORACOTOMY: USING TRAUMA VIDEO REVIEW TO GENERATE PROCEDURAL NORMS

Ryan P. Dumas, MD Kristen Chreiman, BSN, Matthew Goldshore, Mark J. Seamon, MD*,
Jeremy W. Cannon, MD, SM, FACS*, Patrick M. Reilly, MD*, Jason Christie, Daniel N. Holena, MD MSCE*
University of Pennsylvania

Presenter: Ryan P. Dumas, MD

Objectives: Emergency department thoracotomy (EDT) must be rapid and well-executed. Currently there are no defined benchmarks for EDT procedural milestones. We hypothesized that trauma video review (TVR) can be used to define the “normative EDT” and generate procedural benchmarks. As a secondary aim, we used these benchmarks to classify EDTs performed at our center.

Methods: We used high-definition, continuously recording video to review all EDTs from 4/2016-2/2017. Using skin incision as procedure start time, we defined four procedural milestones for EDT: 1.) time to chest entry (defined as completion of retractor deployment) 2.) time to right chest decompression 3.) time to pericardiotomy and 4.) time to aortic cross-clamp. A benchmark was defined as the 75th percentile of time from skin incision to each milestone. EDTs with any milestone time exceeding the 75th percentile were identified as outliers.

Results: 30 EDTs were performed during the study period. Patients had a median age of 31(IQR 29-49) and were predominantly African-American (96%) males (93%) with penetrating trauma (93%). From skin incision median times in seconds to milestones were as follows: left chest entry 66.5(IQR 58-105), right chest decompression 129(IQR 38-170), pericardiotomy 142.5(IQR 113-204.5), aortic cross-clamp 242.5(IQR 170-340). Procedural milestones can be seen in Figure 1. In total, 19/30 (63%) of EDTs were high outliers for one or more benchmarks.

Conclusions: Video review can be used to define normative times for the procedural milestones of EDT. Steps exceeding the 75th percentile of time were common, with over half of EDTs having at least one milestone as an outlier. Future work should seek to determine if minimizing procedural technical outliers improves patient outcomes.

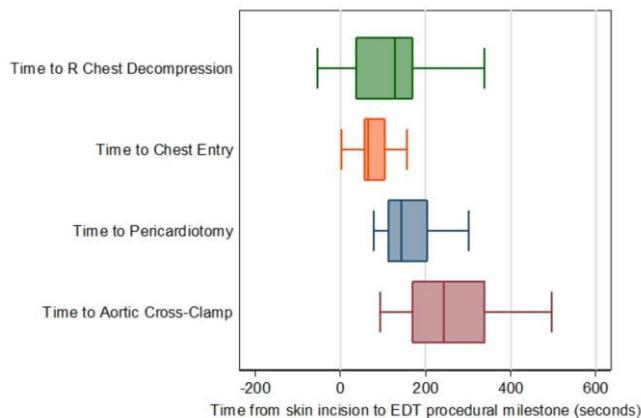


Figure 1

Quick Shots Parallel Session II
Quick Shot Paper #11
January 10, 2018
4:30 pm

EXPANDING TRAUMA FRAILTY STRATIFICATION: THE ARE-FIT SCORE

Margaret H. Lauerman, MD*, Maxwell Raithel, Joseph A. Kufera, MA,
Kathirkamanthan Shanmuganathan, Brandon Bruns, MD, FACS*,
Thomas M. Scalea, MD, FACS, FCCM*, Deborah M. Stein, MD, MPH, FACS, FCCM*,
R Adams Cowley Shock Trauma Center, University of Maryland School of Medicine

Presenter: Margaret H. Lauerman, MD

Objectives: Multiple clinical and computerized tomography (CT) frailty markers exist with unclear utility. Limitations include younger patients, who are often excluded from evaluation of frailty markers, and critically ill patients, who cannot participate in questionnaires or physical testing often required. Our objective was to develop a more singularly applicable marker of frailty than is currently available.

Methods: We reviewed restrained drivers with airbag deployment aged 40 years and greater over a 6 year period. Eight CT markers of frailty were measured, including variables novel to trauma patients. Outlying quartiles or terciles (depending on normality and breakpoints) were used to indicate "frail" status. A value of 1 was assigned for "frail" and 0 for "non-frail" for CT markers, with these 8 values summed to calculate the Advanced Radiographic Evaluation of Frailty in Trauma (ARE-FIT) score. The primary outcome was a composite variable of disposition, with "good" disposition to acute rehabilitation or home, and "poor" to all other locations.

Results: Overall 489 patients were included, with 49 having poor disposition (10.0%). Cerebral atrophy, cervical spine calcification, renal volume, sarcopenia, osteopenia, and sarcopenic obesity were normally distributed, and emphysema and vascular calcifications non-normal. Receiver operating characteristic (ROC) curve analysis had a Youden's Index of 0.26 and $p < 0.001$ at an ARE-FIT of 3. In multivariate logistic regression, ARE-FIT of 3 or greater ($p = 0.03$) was statistically associated with disposition following adjustment for GCS ($p = 0.003$), ISS ($p < 0.001$), sex ($p = 0.02$), and blood pressure ($p = 0.002$). Age 60 years and greater was not associated with disposition.

Conclusions: The ARE-FIT score can be used in critically ill and younger frail patients, and is a more universally applicable assessment of frailty in injured patients than currently used measures.

Quick Shots Parallel Session II

Quick Shot Paper #12
January 10, 2018
4:36 pm

OVERTRIAGE FROM PROXIMAL PENETRATING EXTREMITY INJURIES

Grace E. Martin, MD, Heng He, Amy Makley, MD*, Timothy A. Pritts, MD, PhD*, Joel B. Elterman, MD*, Jay A. Johannigman, MD*, Michael Goodman, MD*
University of Cincinnati

Presenter: Grace E. Martin, MD

Objectives: Penetrating injuries to the extremity proximal to the elbow or knee are anatomic criteria for full trauma team activation by ACS COT standards. This criterion lacks evidence-based support. Overtriage of trauma team activation may result in excessive costs and resource burden at trauma centers. We hypothesized that full trauma team activation for penetrating injuries to the proximal extremities by anatomic criteria alone may lead to significant overtriage.

Methods: We completed a 3-year retrospective review (2013-2015) of all patients evaluated at a Level I trauma center with isolated penetrating extremity injuries. Data included the number and criteria of trauma team activations, ISS, injury characteristics, and disposition. Overtriage was defined as full trauma team activation for an ISS = 15, with a goal rate <50%.

Results: We identified 6335 total trauma team activations with 809 isolated penetrating extremity injuries. Of the highest level activations, 388/488 (79.5%) were for injuries proximal to the joint. Within this subgroup, 81% of patients were discharged from the ED with a median ISS = 1 and no additional intervention. Only 6.7% underwent immediate and 10% underwent delayed operative intervention. Disposition to the OR was more common for upper extremity (14.4%) compared to lower extremity (7.7%, p< 0.05) full trauma activations. By comparison, 21% of all full and 5.8% of all limited trauma activations underwent immediate operative intervention during the 3 year period. Of the 388 full trauma activations, only one had an ISS 15, resulting in a 99.7% overtriage rate.

Conclusions: Penetrating injuries to the extremities are common in urban trauma centers. Highest level trauma team activation based on anatomic, rather than physiologic, criteria may lead to a significant overtriage rate. Further distinction in level of trauma team activation may be made based on upper vs. lower extremity injury or hard signs of neurovascular injury.

Quick Shots Parallel Session II

Quick Shot Paper #13
January 10, 2018
4:42 pm

THE MAGIC NUMBER: ARE IMPROVED OUTCOMES OBSERVED AT TRAUMA CENTERS WITH UNDERTRIAGE RATES BELOW 5 PERCENT?

Eric H. Bradburn, DO, MS, FACS*, Brian Gross, Alan D Cook, MD*, Madison Morgan, Danielle Von Nieda, Kameron Durante, John Paul Ellis, Frederick Rogers, MD, MS, FACS*
Lancaster General Health/Penn Medicine

Presenter: Eric H. Bradburn, DO, MS, FACS

Objectives: The American College of Surgeons Committee on Trauma (ACSCOT) advises trauma centers maintain less than 5 percent undertriage, however provides limited rationale for this guideline. We sought to determine whether patients managed at trauma centers with <5% undertriage had improved outcomes compared to centers with >5% undertriage. We hypothesized that similar adjusted mortality would be observed at centers in Pennsylvania regardless of their compliance with ACSCOT undertriage recommendation.

Methods: The Pennsylvania Trauma Outcome Study database was retrospectively queried for all patients managed at accredited trauma centers with a minimum of 350 admissions per year from 2003-2015. Patients missing Injury Severity Score (ISS) and/or Trauma Activation status data were excluded from analysis. Institutional undertriage rates were calculated for all trauma centers based on ACSCOT criteria (ISS≥15; no Trauma Activation) and were categorized into <5% or >5% subgroups. A multilevel mixed-effects logistic regression model assessed the adjusted impact of management at centers with <5% undertriage. Statistical significance was set at p<0.05.

Results: A total of 437,452 patients from 30 centers met inclusion criteria. Institutional undertriage rates ranged from 0.28% to 15.5%, with 15 centers exhibiting undertriage rates <5% and 15 centers >5%. No significant difference in unadjusted mortality rate was observed between subgroups (<5% undertriage: 4.67%; >5% undertriage: 3.85%; p=0.246). In adjusted analysis, no difference in mortality was found for patients managed at centers with <5% undertriage compared to those with >5% undertriage (AOR: 1.22; 95% CI: 0.99-1.50; p=0.060).

Conclusions: Achieving the <5% undertriage standard may have limited impact on overall institutional trauma patient outcome. Further research should seek to identify new triage criteria by which to hold trauma centers accountable.

Variable	Mortality	
	AOR (95% CI)	p
Undertriage <5%	1.22 (0.99-1.50)	0.060
Age	1.04 (1.04-1.04)	<0.001
Systolic Blood Pressure	0.97 (0.97-0.97)	<0.001
Injury Severity Score	1.10 (1.10-1.11)	<0.001
Injury Year	0.99 (0.99-1.00)	0.001
		AUROC: 0.89

Table 1. Adjusted odds ratios for mortality for centers with an undertriage rate <5% versus >5%

Quick Shots Parallel Session II

Quick Shot Paper #14
January 10, 2018
4:48 pm

THE COMBINED UTILITY OF EFAST AND CXR IN BLUNT THORACIC TRAUMA

Morgan Schellenberg, MD MPH, Kenji Inaba, MD, James M. Bardes, MD*, Nicholas Orozco, Jessica Chen, Caroline Park, Demetrios Demetriades LAC+USC Medical Center

Presenter: Morgan Schellenberg, MD MPH

Objectives: Portable chest xray (CXR) and Extended FAST (EFAST) screen patients for thoracic injury in the trauma bay. It is unclear if one test alone is sufficient or if the two investigations are complementary. The study objective was to define the diagnostic yield of EFAST and CXR among stable blunt thoracic trauma patients.

Methods: In this retrospective study, all blunt trauma patients ≥ 15 years admitted to our Level I trauma center in 2016 were screened. Only patients who underwent CT Thorax were included. Patients were excluded if they presented >24h after injury or were transferred. Demographics, physical exam (PEx) of the thorax, injury data, investigations, procedures, and outcomes were abstracted. EFAST, CXR, and PEx findings were compared to the gold standard of CT Thorax to calculate the diagnostic yield of each investigation and combinations thereof in the assessment for clinically significant thoracic injury (requiring chest tube, operative intervention, or endovascular procedure).

Results: 1724 patients were enrolled. Mean age was 44 years (range 15-100). Most common mechanisms of injury were motor vehicle collision (n=517,30%), auto vs pedestrian (n=484,28%), and fall (n=393,23%). Mean ISS was 11 (1-75), with mean AIS Chest 1.6 (1-6). 1355 (79%) underwent EFAST and 1344 (78%) underwent CXR. The diagnostic yields are shown in Table 1. Injuries missed using a combination of EFAST+CXR were pneumothoraces (n=37, 12% of all pneumothoraces), hemothoraces (n=20,20%), and aortic injuries (n=3,30%).

Conclusions: EFAST+CXR together have a sensitivity of only 58% and miss clinically significant pneumothoraces, hemothoraces, and aortic injuries. Even in conjunction with the physical exam, the sensitivity of EFAST+CXR is low. Therefore, the majority of blunt trauma patients who are admitted to hospital require CT scan for further evaluation of potential injury as EFAST,CXR, and PEx are insufficient to rule out clinically significant injuries.

	Sensitivity	Specificity	PPV	NPV
EFAST alone	0.42	0.99	0.74	0.97
CXR alone	0.88	0.81	0.24	0.99
EFAST+CXR	0.58	0.80	0.25	0.94
EFAST+CXR+PEx	0.76	0.67	0.17	0.97

Table 1. Diagnostic Yield of Tests for Thoracic Injury.

CXR, *chest xray*. EFAST, *Extended Focused Sonography for the Assessment of Trauma*. PEx, *physical exam of the thorax*. PPV, *positive predictive value*. NPV, *negative predictive value*.

Quick Shots Parallel Session II

Quick Shot Paper #15
January 10, 2018
4:54 pm

CAN TRAUMA SURGEONS KEEP UP? A COMPARISON OF OUTCOMES BETWEEN PATIENTS CARED FOR IN A TRAUMA-ICU VERSUS A DEDICATED NEURO-ICU

Derek Roberts, MD, PhD, Samuel Leonard, John R Taylor, III, MD, Deborah M. Stein, MD, MPH, FACS, FCCM*,
George Williams, Charles E. Wade, PhD, Bryan A. Cotton, MD, MPH
University of Texas Health Science Center at Houston

Presenter: Derek Roberts, MD, PhD

Objectives: To compare outcomes between severe TBI patients managed in a Trauma-ICU and those managed in a Neuro-ICU.

Methods: A prospective study was conducted on patients admitted directly to an ICU between 05/2015 and 12/2016. Blunt trauma patients with CT-evidence of brain injury who were 18 years of age and older were included. Patients were dichotomized by ICU to which they were admitted; Trauma-ICU or Neuro-ICU. The Trauma-ICU is staffed primarily by Trauma Surgeons also involved in ICU care, whereas Neuro-intensivist trained physicians staff the Neuro-ICU. Continuous values are expressed as median (IQR) and comparisons were performed using the Wilcoxon rank-sum test. Categorical values are expressed as proportions and were tested using chi-squared or Fisher's exact tests. Finally, a purposeful logistic regression model was developed to evaluate predictors of mortality.

Results: 548 patients were included (207 Trauma-ICU, 341 Neuro-ICU). While Trauma-ICU patients were younger (median age 44 vs. 57) and less likely to have comorbidities (13 vs. 22%), they were more likely to have high-speed mechanism (71 vs. 34%) and higher ISS (median 25 vs. 16) when compared to Neuro-ICU admissions; all p<0.05. On admission, Trauma-ICU patients were more likely to have fixed or unequal pupils, and lower GCS-motor exam (median 3 vs. 6); p<0.05. While the rate of pneumonia was higher in Trauma-ICU patients (17 vs. 11%; p=0.03), there were no differences in urinary tract infections, venous thromboembolic complications, or sepsis. Univariate analysis also noted that 30-day mortality was higher in the Trauma-ICU (22% vs 12%; p<0.001). However, multivariate regression demonstrated that Trauma-ICU admission was associated with a 70% reduction in mortality (TABLE).

Conclusions: Despite higher ISS and poorer initial neurologic exam, Trauma-ICU admission is associated with a 70% reduction in 30-day mortality.

	Odds ratio	95% C.I.	p-value
Admitted to Trauma-ICU	0.30	0.11-0.82	0.019
Age in years	1.01	0.98-1.03	0.268
Injury severity score (ISS)	1.12	1.07-1.18	<0.001
High-speed mechanism of injury	0.96	0.35-2.69	0.942
Field intubation	4.99	1.91-12.99	0.001
Fixed or unequal admission pupils	2.87	1.10-7.49	0.031

Multivariate regression model predicting 30-day mortality

Quick Shots Parallel Session II

Quick Shot Paper #16
January 10, 2018
5:00 pm

NATIONWIDE COMPARISON OF INFECTIOUS COMPLICATIONS AFTER BLUNT SPLENIC INJURY

Rishi Rattan, MD*, Joshua Parreco, MD*, Olubode A Olufajo, MD, MPH,
Reza Askari, MD*, Nicholas Namias, MBA, MD*
University of Miami Miller School of Medicine

Presenter: Rishi Rattan, MD

Objectives: As non-operative management (NOM) of blunt splenic injury (BSI) increases, understanding risks, especially infectious complications, becomes more important. Our previous work found that over 1 in 4 post-trauma readmissions in the US occur at a different hospital with infection the most common reason. No national BSI infectious outcomes studies tracking readmissions across hospitals exist. We sought to compare nationwide BSI outcomes by also capturing readmissions to different hospitals.

Methods: The Nationwide Readmissions Database for 2013-2014 was queried for patients 18-64 years old admitted non-electively with a primary diagnosis of BSI. Surgical site infections, pneumonia, urinary tract infections, and sepsis were identified in 3 groups: NOM, splenic artery embolization (SAE), and operative management (OM). Infection rates were quantified during admission, and 30-day and 1-year readmissions. Multivariable logistic regression was performed. Results were weighted for national estimates.

Results: Of the 15,140 patients admitted for BSI, 54% underwent NOM, 12% SAE, and 34% OM. SAE had higher rates of infectious complications compared to NOM, with 20% incidence at 1 year. OM had higher rates of infectious complications compared to NOM and SAE (Table 1). Predictors of infectious complications at 1 year included: hospital stay >4 days, not being discharged home, SAE, and Charlson Comorbidity Index >1. Protective factors included private insurance (OR 0.69 [0.61-0.79], p<0.01) (Table 2).

Conclusions: In the first national study of BSI outcomes capturing different hospital readmission, BSI treated with SAE is at increased risk of infectious complications. Despite splenic preservation, surgeons should be aware that SAE has a significant infectious complication rate when making treatment decisions. Post-splenectomy infections also remain a significant cause of morbidity after trauma and require aggressive preventive management.

Table 1. Incidence of infectious complications after blunt splenic injury, comparing splenic artery embolization (SAE) to nonoperative management (NOM) and operative management (OM) to both NOM and SAE.

Outcome (%)*	NOM	SAE	OM
Infection during index admission	5.3	15.0	18.9
Splenic abscess during index admission	0.7	1.4	1.7**
Sepsis during index admission	0.6	2.4	5.0
30-day readmission for infection	6.4	18.3	22.5
30-day readmission for splenic abscess	1.3	3.5	2.1
30-day readmission for sepsis	0.9	3.2	6.4
1-year infection	7.8	20.4	23.7
1-year readmission for splenic abscess	1.6	5.3	2.2
1-year readmission for sepsis	1.5	3.6	6.9

* - p < 0.01 except where noted

** - not significantly different from SAE incidence (p=0.03)

Table 1. Incidence of infectious complications after blunt splenic injury, comparing splenic artery embolization (SAE) to nonoperative management (NOM) and operative management (OM) to both NOM and SAE.

Characteristic	Within 30 d after injury			Within 1 y after injury		
	OR	95% CI	p	OR	95% CI	p
NOM						
SAE	1.65	1.38 - 1.96	<0.01	1.63	1.38 - 1.93	<0.01
OM	1.46	1.27 - 1.69	<0.01	1.37	1.20 - 1.57	<0.01
Age group	45-64	0.98	0.88 - 1.10	0.76	1.00	0.90 - 1.12
Female	1.37	1.22 - 1.54	<0.01	1.39	1.25 - 1.55	<0.01
Median household income national quartile for patient ZIP Code	\$1 - \$37,999 \$38,000 - \$47,999 \$48,000 - \$63,999 \$64,000 or more	0.79 0.92 0.92 0.83	0.68 - 0.91 0.80 - 1.07 0.80 - 1.07 0.70 - 0.98	<0.01 0.29 0.29 0.03	0.82 0.93 0.81 0.81	0.72 1.07 0.94 0.69
Insurance type	Public Private Self-pay Other	0.72 1.04 1.04 0.87	0.63 - 0.82 0.87 - 1.24 0.87 - 1.24 0.73 - 1.05	<0.01 0.68 0.68 0.16	0.69 1.00 0.85 0.82	0.79 1.18 0.99 0.68
Injury severity score	<9 9-15 16-24 >25	0.61 0.61 0.66 0.66	0.50 - 0.74 0.55 - 0.79 0.55 - 0.79 0.55 - 0.79	<0.01 <0.01 <0.01 <0.01	0.58 0.65 0.58 0.69	0.48 - 0.70 0.55 - 0.77 0.83 - 0.83 0.58 - 0.83
Injury grade	I/II III/IV V	0.97 1.08	0.83 - 1.13 0.87 - 1.34 0.87 - 1.34	0.69 0.49 0.49	0.80 0.85 0.85	0.70 - 0.92 1.04 0.69
Length of stay (days)	<4 4-7 >7	2.79 12.88	2.32 - 3.36 10.66 - 15.56 10.66 - 15.56	<0.01 <0.01 <0.01	2.33 10.53 8.88	1.97 - 2.74 12.50 12.50
Charlson comorbidity index >1		1.53	1.28 - 1.83	<0.01	1.81	1.53 - 2.15
Discharge disposition	Home SNF, ICF, Others Home Health AMA	2.74 1.58 2.17	2.36 - 3.19 1.32 - 1.89 1.41 - 3.33	<0.01 <0.01 <0.01	2.58 1.53 2.19	2.23 - 2.99 1.29 - 1.82 1.47 - 3.25

Table 2. Risk factors for infectious complications after blunt splenic injury. NOM: non-operative management. SAE: splenic artery embolization. OM: operative management.

Quick Shots Parallel Session II

Quick Shot Paper #17
January 10, 2018
5:06 pm

ARE TEG ASSAYS INTERCHANGEABLE? A COMPARISON OF RAPID AND KAOLIN THROMBELASTOGRAPHY IN MASSIVE TRANSFUSION PATIENTS

James Turbett, MBBS, BSc, John R. Taylor, III, MD, Jessica Cardenas, Charles E. Wade, PhD, William Beck, MD*, Bryan A. Cotton, MD, MPH
South Thames Hospital/University College London

Presenter: James Turbett, MBBS, BSc

Objectives: To compare the correlation of RapidTEG® (rTEG) and standard kaolin TEG (kTEG) values in injured patients receiving massive transfusion (MT). In addition, we set out to identify kTEG transfusion thresholds by cut-point analysis against published rTEG thresholds.

Methods: A prospective study was conducted on consecutive trauma patients predicted to receive MT. Both rTEG and kTEG were obtained on arrival. Pearson and Spearman's rank correlation coefficients, along with Bland-Altman plots, were determined for matching TEG parameters (rTEG ACT was compared to kTEG R-value). Area under the receiver operating characteristics curve (AUROC) of each kTEG parameter was assessed at published rTEG thresholds. Optimal kTEG cut-offs were determined by maximum Youden's index and minimum distance to the upper left of ROC space.

Results: 113 patients were included with median age 36, 58% white, 65% blunt, and 82% male. The median ISS was 29, with median ABC score of 2, and 24-hour and 30-day mortalities of 14% and 25%, respectively. There were strong linear correlations for MA (0.70) and LY30 (0.86), and moderate correlations for ACT/kTEG R-value (0.31), K-time (0.49) and alpha-angle (0.52); all p<0.001. kTEG AUROC ranged from 0.67 for R-value (at ACT ≥128s) to 0.86 for LY30 (at rTEG LY30 ≥5%). Optimal kTEG cut-points were: R ≥4.5min, K ≥2.1min, alpha ≤66.7°, MA ≤59.8mm and LY30 ≥5.2%.

Conclusions: Assessment of the discriminative performance of kTEG at published rTEG thresholds provides a more clinically relevant measure of assay interoperability than correlation strength. We have identified kTEG thresholds to accompany existing, evidence-based rTEG thresholds for goal-directed resuscitation of injured patients. Our results indicate that substitution of rTEG with kTEG is possible but undesirable, due to suboptimal agreement between the assays.

	Established rTEG cut-points	Proposed kTEG cut-points	Sensitivity	Specificity	AUROC
ACT/R-value	≥ 128 s	≥ 4.5 min	0.52	0.81	0.67
K-time	≥ 2.5 min	≥ 2.1 min	0.70	0.85	0.83
α-angle	≤ 60°	≤ 61.2°	0.73	0.83	0.82
	≤ 65°	≤ 66.7°	0.96	0.67	0.83
MA	≤ 55 mm	≤ 59.8 mm	0.86	0.73	0.83
LY-30	≥ 3 %	≥ 1.1 %	0.69	0.79	0.76
	≥ 5 %	≥ 5.2 %	0.71	0.93	0.86

Comparison of rTEG and kTEG cut-points

Quick Shots Parallel Session II

Quick Shot Paper #18
January 10, 2018
5:12 pm

CERVICAL SPINE FRACTURES IN GERIATRIC BLUNT TRAUMA: IS NEXUS ENOUGH?

Katelyn Young, BS, Christie Buonpane, James T. Dove, BA, Marie Hunsinger, Mohsen Shabahang, Joseph Blansfield, Denise Torres, James S. Gregory, MD*, Jeffrey Wild, MD*
Geisinger Medical Center

Presenter: Katelyn Young, BS

Objectives: The NEXUS criteria are the prevailing standard to identify potential cervical spine fracture (CF) in need of imaging in alert trauma patients. This guideline, however, relies exclusively on physical exam, lacking any consideration of patient age. This study characterizes NEXUS sensitivity for clinically significant CF in young (<65 years) and old patients (≥ 65 years).

Methods: This was a retrospective review of alert, stable blunt trauma patients (≥ 18 years, GCS 15) who presented to one Level I trauma center (1/1/2011 - 12/31/2016) with an acute CF. Significant CF was limited to injury requiring surgery or cervicothoracic orthosis, excluding bracing for comfort.

Results: In total, 999 patients had spine fracture with 413 sustaining CF. The studied population consisted of CF patients with complete NEXUS documentation (388 patients). From this population, 353 patients had significant CF, and 101 of those with significant injury (28.6%) presented without neck pain and denied tenderness to palpation (TTP).

Among the 353 patients with significant CF, 191 patients were young (<65 years). While 63 of these patients (33.0%) denied neck pain and TTP, only six failed to meet any of the remaining NEXUS criteria, revealing a sensitivity of 96.8% (95%CI: 94.4-99.5; Table 1).

The remaining 162 patients were old (≥ 65 years), and 38 (23.4%) were asymptomatic. Seventeen of these patients failed to meet any of the remaining NEXUS criteria, revealing a sensitivity of 89.5% (95%CI: 84.8–94.2). Thus, NEXUS sensitivity was significantly reduced in older compared to younger patients (89.5 vs 96.8%, $p < 0.01$).

Conclusions: Alarmingly, 28.6% of patients with significant CF had no subjective pain or tenderness on exam. NEXUS criteria had an appropriately high sensitivity with younger patients. In geriatric trauma, however, NEXUS sensitivity was significantly reduced and liberal imaging should therefore be utilized in this patient population.

	Young Patients (Age<65) N=6		Older Patients (Age≥65) N=17	
	n	%	n	%
Mechanism				
MVC	2	33.3%	2	11.8%
MVC with Ejection	1	16.7%	0	-
Unenclosed Vehicle	1	16.7%	1	5.9%
Fall, Height	1	16.7%	1	5.9%
Fall, Ground Level	0	-	13	76.5%
Crushed Torso	1	16.7%	0	-
Level^l				
C1	1	16.7%	6	35.3%
C2	0	-	2	11.8%
Odontoid Process	0	-	3	17.6%
C3	1	16.7%	1	5.9%
C4	2	33.3%	1	5.9%
C5	0	-	6	35.3%
C6	1	16.7%	3	17.6%
C7	3	50.0%	1	5.9%
Fracture^f				
Burst, Jefferson	0	-	2	11.8%
Odontoid, Type II	0	-	3	17.6%
Vertebral Body	3	50.0%	5	29.4%
Teardrop	0	-	4	23.5%
Facet	2	33.3%	3	17.6%
Lamina	0	-	1	5.9%
Transverse Process	0	-	1	5.9%
Spinous Process	3	50.0%	3	17.6%

^l Many patients had more than one fracture, sum of percentages exceeds 100%.

Table 1. Characteristics of NEXUS Negative Patients

Quick Shots Parallel Session II

Quick Shot Paper #19
January 10, 2018
5:18 pm

COMPENSATORY RESERVE INDEX AND PULSE CHARACTER: ENHANCED POTENTIAL TO PREDICT CASUALTY URGENCY AFTER INJURY

Michael C. Johnson, MD, Kevin Chung, Victor Convertino, Donald H. Jenkins, MD, FACS*,
Ronald M. Stewart, MD, FACS*, Brian J. Eastridge, MD*,
University of Texas Health Science Center, San Antonio, TX

Presenter: Michael C. Johnson, MD

Objectives: Field triage of trauma patients requires timely assessment of physiologic status to determine resuscitative needs. First responders assess hemodynamics by vital signs and rudimentary clinical assessments such as pulse character to guide decision making. The Compensatory Reserve Index (CRI) has demonstrated utility as an easily interpretable method of analyzing physiologic reserve. We hypothesized the combination of CRI and pulse character would enhance the identification of injured patients requiring life-saving intervention (LSI).

Methods: We performed a prospective observational study of 300 injured patients admitted to a level I trauma center. CRI was recorded continuously after device placement on arrival. Patient demographics, field and trauma resuscitation unit vitals signs, therapeutic interventions and outcomes were collected. A field SBP<100 mmHg was utilized as a surrogate for abnormal pulse character (PC) as previously validated. A CRI threshold value of <0.63 was considered abnormal. Data were analyzed to assess the capacity of CRI and pulse character to predict LSI defined as need for transfusion, intubation, tube thoracostomy, or operative/angiographic hemorrhage control.

Results: The study cohort consisted of 195 patients. Mean age of the population was 46 years and 64% were male. The majority (88%) of injuries were blunt with an average ISS of 9 (1-75). Logistic regression analyses were performed using the abnormal CRI and pulse character thresholds (Table 1). An incremental improvement in predictive capability for LSI was demonstrated over abnormal PC for abnormal CRI and more prominently for abnormal PC plus abnormal CRI.

Conclusions: Combining pulse character assessment with CRI has the potential to significantly enhance the recognition of injured patients requiring life-saving intervention thus providing valuable decision support information to prehospital providers.

	Odds Ratio	P-value
LSI		
Abnormal PC	3.8	0.01
Abnormal CRI	9.4	0.01
Abnormal CRI & PC	37.4	0.003
Need for Transfusion		
Abnormal PC	1.9	0.31
Abnormal CRI	12.3	0.004
Abnormal CRI & PC	48.7	0.002
Composite		
Abnormal PC	2.3	0.07
Abnormal CRI	10.1	0.01
Abnormal CRI & PC	22.8	0.01

Table 1. Logistic regression analyses with subsequent odds ratios. Threshold values: Abnormal Pulse Character (SBP <100 mm Hg) and Abnormal CRI (CRI < 0.63). LSI- life-saving intervention; PC- pulse character; SBP- systolic blood pressure; CRI- compensatory reserve index

Quick Shots Parallel Session II

Quick Shot Paper #20
January 10, 2018
5:24 pm

F.R.I.E.N.D. OR F.O.E.: A PROSPECTIVE EVALUATION OF RISK FACTORS FOR REINTUBATION IN SURGICAL AND TRAUMA PATIENTS

Christopher P. Michetti, MD*, Margaret M. Griffen, MD*, Erik Teicher, Jennifer Rodriguez, Hani M. Seoudi, MD*
Inova Fairfax Hospital

Presenter: Christopher P. Michetti, MD

Objectives: To investigate risk of unplanned reintubation (*Failure of Extubation*, FOE) using a *Form for Re-Intubation Evaluation by Nurses and Doctors* (FRIEND) that was completed prior to all ICU extubations after passing a breathing trial.

Methods: FRIENDs were prospectively collected from 1/1/16-05/31/17 on intubated adult trauma & nontrauma surgery patients (pts). Factors on the form were analyzed with multivariate logistic regression to determine odds ratios (OR) for FOE. Terminal extubations and tracheostomy pts were excluded.

Results: 437 pts with median age 51 years had 461 extubations. 46 (10%) had FOE (37/271 [14%] trauma, 9/190 [5%] surgery). Mean ICU days prior to 1st extubation were 3.4 for those without, and 6.4 for those with FOE. See Table.

Conclusions: Significant lung secretions, delirium, and use of enteral opioid medications at the time of extubation increased the odds of reintubation. Trauma patients had nearly triple the reintubation rate of nontrauma surgical patients. FOE risk can be assessed using a structured data form.

Variable	OR	95% CI	p-value
Age	1.015	(0.994, 1.037)	0.152
Male (vs. female)	0.92	(0.375, 2.257)	0.856
Trauma (vs. surgery) pts	2.636	(1.08 , 6.435)	0.033
Admission weight	0.961	(0.912, 1.013)	0.14
Extubation weight	1.051	(0.998, 1.106)	0.06
(+) total fluid balance	0.976	(0.229, 4.167)	0.974
(+) 24hr fluid balance	0.581	(0.22, 1.536)	0.274
ICU days before extubation	0.997	(0.847, 1.175)	0.974
Ventilator days	1.004	(0.847, 1.19)	0.964
RASS >0 vs. <0	0.796	(0.222, 2.848)	0.726
(+) Delirium (CAM-ICU)	3.061	(0.977 , 9.586)	0.055
GCS <11T	1.344	(0.406, 4.442)	0.628
Cough not strong vs. strong	0.788	(0.311, 1.998)	0.616
Moderate or high secretions	2.981	(1.188 , 7.479)	0.02
Sedative drip at extubation	1.276	(0.39, 4.173)	0.686
Opioid drip at extubation	0.558	(0.228, 1.365)	0.201
Enteral opioids at extubation	3.948	(1.555 , 10.024)	0.004
Trauma pts w/ vs. w/o rib fxs	1.219	(0.457, 3.250)	0.693

Quick Shots Parallel Session III

Quick Shot Paper #21
January 11, 2018
4:15 pm

LOGISTICS OF AIR MEDICAL TRANSPORT: WHEN & WHERE DOES HELICOPTER TRANSPORT REDUCE PREHOSPITAL TIME?

Joshua B. Brown, MD, MSc*, Mark L. Gestring, MD, FACS*, Matthew R. Rosengart, MD, MPH, FACS*,
Xilin Chen, Andrew B. Peitzman, MD*, Timothy Billiar, MD, Jason L. Sperry, MD, MPH*
University of Pittsburgh Medical Center

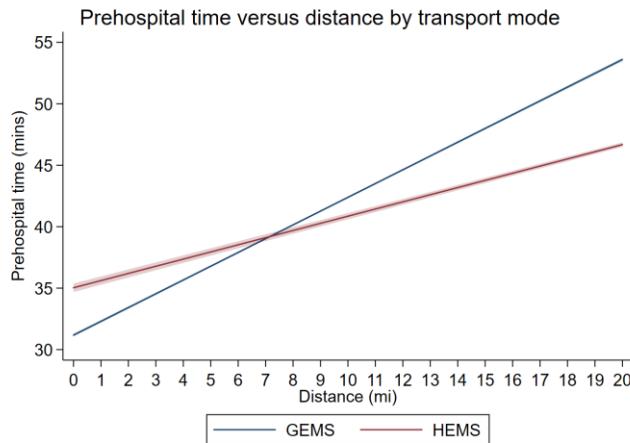
Presenter: Joshua B. Brown, MD, MSc

Objectives: Trauma is a time sensitive disease. Helicopter emergency medical services (HEMS) have shown benefits over ground EMS (GEMS), and may be partly due to reducing prehospital time. The distance at which this time benefit emerges depends on many factors that can vary across regions. Our objective was to determine the threshold distance at which HEMS has shorter prehospital time than GEMS under different conditions.

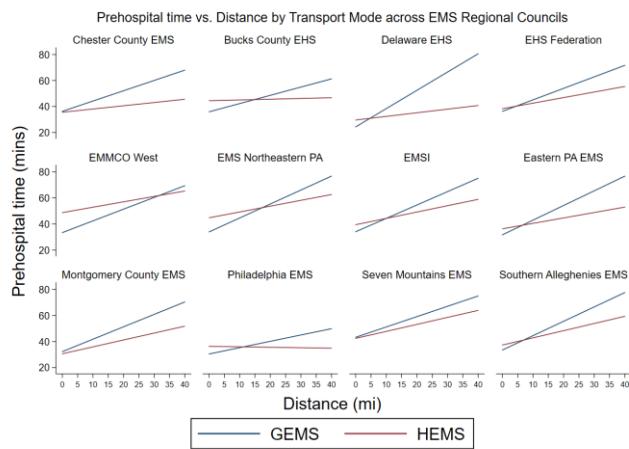
Methods: Patients in the PA trauma registry 2000-13 were included. Distance between zip centroid and trauma center was calculated using straight-line distance for HEMS and driving distance from GIS network analysis for GEMS. Contrast margins from linear regression identified the threshold distance at which HEMS had a significantly lower prehospital time than GEMS indicated by non-overlapping 95% confidence intervals. The effect of peak traffic times and adverse weather on the threshold distance was evaluated. Geographic effects across EMS regions were also evaluated.

Results: 144,741 patients were included with 19% transported by HEMS. Overall, HEMS became faster than GEMS at 7.7miles from the trauma center ($p<0.05$, FIG1). When evaluating traffic times, HEMS became faster at 6.5miles during peak traffic compared to 7.9miles during off-peak traffic ($p<0.05$). Adverse weather increased the distance at which HEMS was faster to 17.1miles from 7.3miles in clear weather ($p<0.05$). Significant variation occurred across EMS regions, with distances ranging from 4.4miles to 31.6miles (FIG2).

Conclusions: This is the first study to demonstrate that traffic, weather, and geographic region can significantly impact the threshold distance at which HEMS is faster than GEMS. HEMS was faster at shorter distances during peak traffic while adverse weather increased this distance. The threshold distance varied widely across geographic region. These factors must be considered to guide appropriate HEMS triage protocols.



Total prehospital time versus distance by transport mode from linear regression.
Shaded areas represent 95% confidence intervals.



Total prehospital time versus distance by transport mode from linear regression across Pennsylvania state EMS regional councils.

Quick Shots Parallel Session III

Quick Shot Paper #22
January 11, 2018
4:21 pm

COMPARISON OF UNCROSSMATCHED WHOLE BLOOD AND BLOOD COMPONENT THERAPY DURING TRAUMA RESUSCITATIONS IN A LEVEL 1 TRAUMA CENTER: A CASE MATCH CONTROLLED STUDY

Catherine M. Zatorski, BA, Justin Slotman, Charlene Bierl, John Porter, Joshua P. Hazelton, DO, FACS*
Cooper University Hospital

Presenter: Catherine M. Zatorski, BA

Objectives: The objective of this analysis is to compare outcomes after trauma resuscitation, using either uncrossmatched whole blood (UWB) or blood component therapy (BCT).

Methods: This is a retrospective, case-match study of patients who received UWB or BCT between September 2016 and February 2017. Criteria to receive UWB included age=18, male gender, any SBP<90 mm Hg, and identifiable source of hemorrhage. Patients undergoing prehospital CPR, CPR in the trauma bay, age<18 years, and female patients were excluded. Participants were matched by mechanism of injury, injury severity score (ISS), and age against any patient who received=1u of PRBCs in the trauma bay between 2013-2016. Exact or best match was used for analysis. Variables on demographics, blood product usage, mortality, and length of stay were collected. Comparisons were made using the independent t and Fisher exact test for significance. SPSS 24.0 (IBM Analytics) was used for all analyses. A p<0.05 was significant.

Results: 15 patients received UWB in the first 6 months of product availability with 1 retrospectively deemed inappropriate for UWB transfusion as he did not meet inclusion criteria. Of the 14 study patients, 3 died within 24-h of admission in contrast to the 6 who received BCT ($p=0.225$). UWB patients required fewer PRBC transfusions during the initial resuscitation when compared to BCT patients (9.43 ± 11 vs. 24.21 ± 22.2 , $p=0.03$). Mean ICU length of stay for those who received UWB was less than half when matched to BCT (2.82 ± 3 days in the ICU vs. 7 ± 6.4 , $p=0.121$). Mean ISS was nearly identical (34.36 ± 24 vs. 34.29 ± 24 , $p=0.99$).

Conclusions: Our data suggest that UWB decreases the need for additional blood product during a trauma resuscitation. Major limitations include sample size as well as the need to include females in the BCT group to obtain optimize matching.

		Uncrossmatched Whole Blood	Blood Component Therapy
N		14	14
Gender	Male	14	9
	Female	0	5*
Age		31.85±14.16	34.36±17.40
Race	Black	7	8
	White	3	5
	Hispanic	0	1
	Other	4	0
Injury severity score		34.36±24	34.29±24
Injury classification	Penetrating	10	10
	Blunt	4	4
Mechanism of injury	GSW	9	9
	KSW	1	1
	Fall	0	1
	MVC	2	3
	MCC	1	1

*significant (p<0.05)

Table 1: Patient characteristics

		Uncrossmatched Whole Blood	Blood Component Therapy
Blood product given	PRBCs	9.43±11*	24.21±22.2*
	Plasma	7.36±13.8	16.79±18
	Platelet	1.21±3.22	3.5±3.82
Need for extra blood during stay?	Yes	7	7
	No	7	7
24-hour mortality	Yes	3	6
	No	11	8
30-day mortality**	Yes	2	1
	No	6	3
	Lost to follow up	3	4
ICU Length of Stay**		2.82±3	7±6.4
Total Length of Stay**		14.55±13.59	19.75±10.38

*significant (p<0.05)

**excludes those that died within 24-hours of admission

Table 2: Patient outcomes

Quick Shots Parallel Session III

Quick Shot Paper #23
January 11, 2018
4:27 pm

A NOVEL PREHOSPITAL TRAUMA SMARTPHONE APP FOR IMPROVED EMS TO HOSPITAL COMMUNICATION

William M. Hallinan, RN, MSBA, Mark L. Gestring, MD, FACS*, Jeremy Cushman, Francis Manzo
University of Rochester Medical Center

Presenter: William M. Hallinan, RN, MSBA

Objectives: Prehospital reports informing trauma team activation require clear communication of information with timely transmission of data across a system that avoids degradation. The most common method is cellular voice communication which can compromise accurate trauma team activation by lacking complete or objective information, is not convenient for providing updates, and is prone to misinterpretation by background environmental noise. The objective of this project was to improve completeness of vital sign and mechanism information and increase timeliness of prehospital trauma notifications through the development of a smartphone application.

Methods: The Trauma and Prehospital Medicine Programs of a large academic Level 1 Trauma Center in collaboration with a local emergency response software vendor developed and tested an application designed to improve prehospital communication. The application provides a seamless flow of information from the 911 center, updates from responders, patient vital signs, common injury descriptors, GPS tracking, and scene imaging that can be securely transmitted to the emergency department. Using a comparison group of conventional communication (CC) cases, those using the application (AC) were compared for completeness of information and time from alert to hospital arrival.

Results: 780 patient transports resulted in an alert over a 6 month period. Fifty random trauma team activations using CC were compared to fifty using AC. The mean time from notification to arrival for CC was 5:55 while for AC it was 12:37 representing a 44% mean increase in prehospital notification time 84.3% of patients notified using AC had complete vital sign information compared to 46% using CC.

Conclusions: A smartphone application provides enhanced transmittal of trauma patient data in a more timely fashion and offers an innovative solution to prehospital communication.

Quick Shots Parallel Session III

Quick Shot Paper #24
January 11, 2018
4:33 pm

GERIATRIC INJURY INSTITUTE: THE VALUE OF A MULTIDISCIPLINARY, COORDINATED CARE MODEL FOCUSED ON THE NEEDS OF INJURED ELDERS.

Shea C. Gregg, MD*, Andrew Francis, Andrew Stone, Walter Cholewczynski, MD*, Alisa Savetamal, MD*, Roselle Crombie, Kristen Glasgow, Paul P. Possenti, PA-C*, Ann Dyke, Vivian Argento, Roseanne Prunty, Sheikh Hoq, Rockman Ferrigno, Nabil A. Atweh, MD*
Bridgeport Hospital-YaleNHH

Presenter: Shea C. Gregg, MD

Objectives: To determine if our Geriatric Injury Institute (GII) model which, uses a multidisciplinary approach involving coordinated pre-hospital, in-hospital and case management resources would reduce length of stay (LOS) and total hospital costs.

Methods: A retrospective review of our Level II trauma registry & medical records was performed on all trauma activations >age 65. The Geriatric Injury Institute (GII) was established in early July 2015. Patients presenting from July 1, 2014 to June 30, 2015 were grouped as pre-GII, while those presenting from July 1, 2015 to June 30th, 2016 were grouped as post-GII. Primary outcomes were length of stay (LOS) and hospital costs.

Results: A total of 663 patients met activation criteria, with 319 in the pre-GII group and 344 in the post-GII (8% increase). Of admitted patients, there was an 8% increase in trauma service admissions (173 pre-GII vs. 186 post-GII). Overall Pre vs. Post GII mean ages (82 ± 8 vs. 81 ± 9) and median ISS with interquartile ranges (8 (4-13) vs. 8 (1-14)) were not statistically different. In regards to LOS, discharges were more efficient in the post-GII cohort with LOS ≤ 2 days occurring in 40% of admissions, whereas only 25% had a LOS ≤ 2 days in the pre-GII cohort. This was observed despite the mean age and median ISS not being statistically different ($p>0.05$). Although the overall median LOS did not reach significance ($p=0.07$), overall median per-patient hospital costs were significantly less (\$1200) in the post-GII group (pre-GII: \$8808, IQR: \$5700-\$17500 vs. post-GII: \$7602, IQR: \$4700-\$13700; $p=0.04$).

Conclusions: Our philanthropy-supported, Geriatric Injury Institute has >50 care providers committed to maximizing care for our injured elders. This scalable model has contributed to increased patient volume and has demonstrated value through efficient discharge processes and significant reductions in hospital costs.

Quick Shots Parallel Session III

Quick Shot Paper #25
January 11, 2018
4:39 pm

DETERMINING SUICIDE RISK IN TRAUMA PATIENTS USING A SIMPLE UNIVERSAL SCREENING TOOL

Robyn Richmond, MD*, Jonathan Imran, MD, Tarik Madni, MD, Kimberly Roaten, Emily Huang, Audra Clark, Ali Mokdad, Michael W. Cripps, MD*, Kareem AbdelFattah, MD*, Alexander L. Eastman, MD, MPH, FACS*
University of Texas Southwestern Medical Center

Presenter: Robyn Richmond, MD

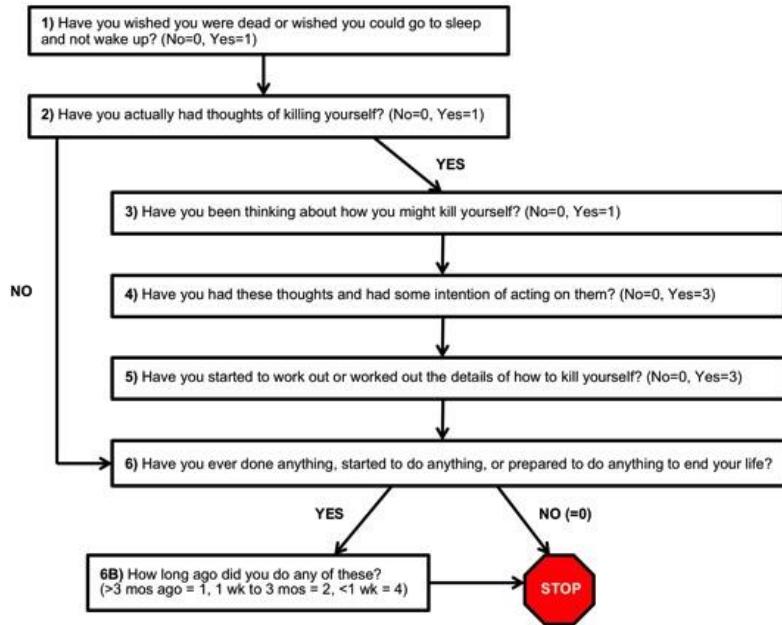
Objectives: Trauma patients may be at elevated risk for subsequent suicide; however, it is unclear whether patients at risk can be identified during their initial presentation following injury. The objective of this study was to evaluate the use of an easy-to-perform suicide risk assessment and the incidence of a positive suicide risk score in our trauma population.

Methods: A universal screening protocol was initiated at our level I trauma center and performed by our Trauma Nurse Clinicians on presentation to the hospital (Figure 1). Adult trauma patients who had a suicide risk assessment completed from February 2015 to November 2015 were evaluated retrospectively. Patients were divided into cohorts consisting of those with positive and negative screening assessments. Statistical analysis was performed using Student's *t* test, and a chi-squared test. Significance was set at *a* = 0.05.

Results: Overall, 3691 of 3780 patients (98%) had a suicide risk assessment screen completed during the study period. Those who went unscreened were not evaluated due to altered mental status/intubation (97%), death (1%), or an unwillingness to cooperate (2%). In 164 of 3691 patients (4%), the screening assessment score was =1, indicating a positive assessment. On univariate analysis, patients with a positive suicide risk assessment were more likely to be of non-Hispanic ethnicity (67% vs. 55%; *P* < 0.01), use English as their first language (91% vs. 73%; *P* < 0.01), have insurance coverage (47% vs. 29%; *P* < 0.01), and were more likely to be a low-level trauma activation (27% vs. 16%; *P* < 0.01) than those who had a negative screening assessment. There were no differences in mean age, race, gender, marital status, injury severity score, blunt vs. penetrating trauma, or hospital discharge disposition between the cohorts.

Conclusions: Universal suicide screening assessment identifies a previously missed at-risk subpopulation of trauma patients.

Figure 1. Parkland Algorithm for Suicide Screening using the C-SSRS, Screen Version, Recent



Parkland Hospital Algorithm for Suicide Screening

Quick Shots Parallel Session III

Quick Shot Paper #26
January 11, 2018
4:45 pm

A CALL TO FOLLOW UP; FOLLOW-UP PRACTICES OF THE MEMBERS OF THE EASTERN ASSOCIATION FOR THE SURGERY OF TRAUMA

James Cooros, MD, Samantha J. Chesney, Terri deRoon-Cassini, Colleen Trevino, David J. Milia, MD*
Medical College of Wisconsin

Presenter: James Cooros, MD

Objectives: To assess the current practice pattern regarding follow up of trauma patients among the members of the Eastern Association for the Surgery of Trauma (EAST).

Methods: Anonymous, online, multiple-choice survey of EAST members in 2016. Ten questions relating to the follow-up care of injured patients were presented to the Active, Senior and Associate members of EAST. Data were screened for quantitative anomalies and problematic response styles.

Results: Of the 1611 members surveyed, 289 participants responded. Approximately 52% of respondents stated that their institution has a dedicated trauma follow-up clinic where most injured patients are seen after discharge. Fewer than 20% reported that non-trauma, multidisciplinary providers are present in clinic. Most (89.5%) reported that follow-up is a single visit, unless a patient has longstanding issues. Only three respondents stated that patients are regularly seen greater than 3 months from injury, and a significant minority (17.7%) acknowledged no set follow-up timeline. Pain management was most commonly (43.3%) the responsibility of the trauma team exclusively. When asked about mental health treatment, most respondents indicated that psychiatry (26.6%) or a clinical psychologist separate from the trauma team (26.6%) were responsible. Only 3.6% of participants indicated that they have a psychologist embedded in the trauma team, and 11.5% reported that no system is currently in place to manage mental health.

Conclusions: Despite over 20 years of literature highlighting the long-term physical and mental health sequelae after trauma, and the improvement in outcomes with the identification and treatment of these sequelae; the results of our survey indicate there remains a lack of standardized and multidisciplinary follow up. Greater attention should be paid to functional recovery, social and psychological well-being and chronic pain.

Quick Shots Parallel Session III

Quick Shot Paper #27
January 11, 2018
4:51 pm

COMBAT NEUROSURGERY IN RECENT CONFLICTS: 2002-2016

Zsolt T. Stockinger, MD, FACS*, Caryn A Turner, MPH, Jennifer M. Gurney, MD*
DoD Joint Trauma System

Presenter: Zsolt T. Stockinger, MD, FACS

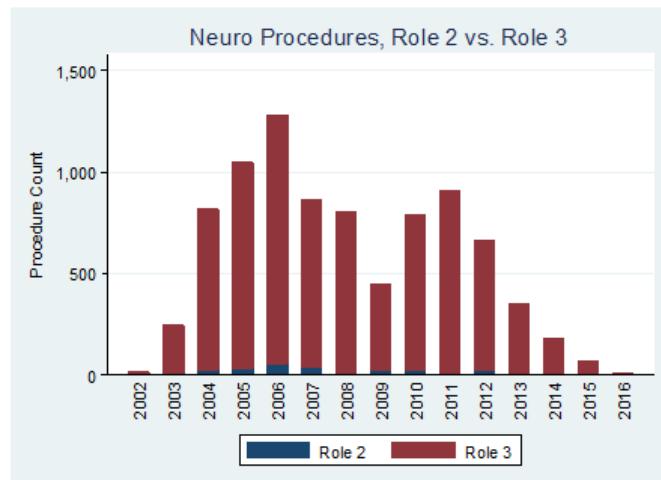
Objectives: Approximately 4.5% of surgical procedures performed at Role 2 and Role 3 MTFs are neurosurgical. These procedures are foreign to the routine daily practice of the military general surgeon. We examined the neurosurgical workload in Iraq and Afghanistan to identify surgical training gaps.

Methods: Retrospective analysis of the Department of Defense Trauma Registry (DoDTR) for all Role 2 (forward surgical) and Role 3 (theatre) military facilities, from January 2002 to May 2016. The 107 neurosurgical ICD-9-CM procedure codes identified were grouped by anatomic location. Select groups were further subdivided. Procedure grouping was determined by surgical subject matter experts. Data analysis used Stata Version 14 (College Station, Texas).

Results: A total of 8,488 neurosurgical procedures were identified. The majority (8,211, 97%) occurred at Role 3. Cranial was the most common procedure at both Role 2 (121, 43.7%) and Role 3 (4,484, 54.6%). Spine procedures were performed almost exclusively at Role 3, with 60% being fusions/stabilizations, and being spinal decompression alone. Neurosurgical caseload was variable over the 15 year study period, dropping to almost zero in 2016.

Conclusions: Neurosurgical procedures were performed primarily at larger Role 3 theatre hospitals where neurosurgeons are assigned if present in theatre; however, over 100 cranial procedures were performed at forward Role 2s where neurosurgeons are not deployed. Considering this, and that Role 3s arrive later in theatre or sometimes not at all, deploying surgeons should have familiarity with trauma neurosurgery.

	Role 2 N (%)	Role 3 N (%)	Total N (%)
Cranial	121 (43.7)	4,484 (54.6)	4,605 (54.3)
Craniotomy/-ectomy	90 (74.4)	2,332 (52)	2,422 (52.6)
Cranioplasty	3 (2.5)	292 (6.5)	295 (6.4)
Monitor	14 (11.6)	1,119 (25)	1,133 (24.6)
Ventriculoperitoneal Shunt	0 (0)	187 (4.2)	187 (4.06)
Lobectomy/ Resection	14 (11.6)	554 (12.36)	568 (12.3)
PNS	119 (43)	968 (11.8)	1,087 (12.8)
Spine	1 (0.4)	638 (7.8)	639 (7.5)
Decompression	0 (0)	170 (26.6)	170 (26.6)
Insertion of Prosthesis	0 (0)	2 (0.3)	2 (0.3)
Fusion	0 (0)	386 (60.5)	386 (60.4)
Cervical	0 (0)	41 (10.6)	41 (10.6)
Thoracolumbosacral	0 (0)	119 (30.8)	119 (30.8)
Unspecified	0 (0)	226 (58.5)	226 (58.5)
NOS	1 (100)	80 (12.5)	81 (12.7)
Other	36 (13)	2,121 (25.8)	2157 (25.4)
Total	277 (100)	8,211 (100)	8,488 (100)



Quick Shots Parallel Session III

Quick Shot Paper #28
January 11, 2018
4:57 pm

ASSOCIATION OF THE AFFORDABLE HEALTHCARE ACT WITH INSURANCE STATUS AT A LEVEL I TRAUMA CENTER IN A MEDICAID NON-EXPANSION STATE

Kyle Cunningham, MD, MPH*, Michael Nahouraii, Ronald F. Sing, DO*,
Kelly Sing, A. Britton Christmas, MD, FACS*
Carolinas Medical Center

Presenter: Kyle Cunningham, MD, MPH

Objectives: The intended purpose of the Patient Protection and Affordable Care Act (ACA) was to expand access to health care insurance for all Americans. Trauma centers, especially those in urban areas, historically faced the financial burden of uninsured and underinsured patients. In our study, we examine the association of the ACA with trauma patient insurance status at a Level I urban trauma center in a state that did not expand Medicaid coverage.

Methods: We retrospectively reviewed trauma patient admissions to our institution from 2008-2016, via the trauma registry (n=54,184). The patient population was compared for changes in selected variables and demographics following ACA implementation. Insurance assignments were consistent with 2016 National Trauma Data Bank nomenclature. Chi-square analysis was used to compare the association of the ACA, by three-year average (n=36,250), on payor mix. Students t-test and Mann-Whitney tests were used to compare secondary descriptive patient characteristics.

Results: The three-year mean uninsured patient rate increased following implementation of the ACA (25.4% vs 23.5%, p<0.001), as did the commercially insured patient rate (31.4% vs 21.0%, p<0.001). The rate of patients insured by Medicaid decreased (16.2% vs 24.0%, p<0.001). Patients were older (42.5yr vs 40.3yr, p<0.001), admitted longer (4.6d vs 4.2d, p<0.001), more injured (ISS 9.5 vs 8.8, p<0.001), and were charged more (median \$32,656 vs \$24,068, p<0.001).

Conclusions: Failure to adopt Medicaid expansion was associated with an increase in uninsured patient rates, however it was also associated with a greater increase in commercially insured patients. Moreover, patients were charged 36% more for care. Additional study of this relationship is warranted.

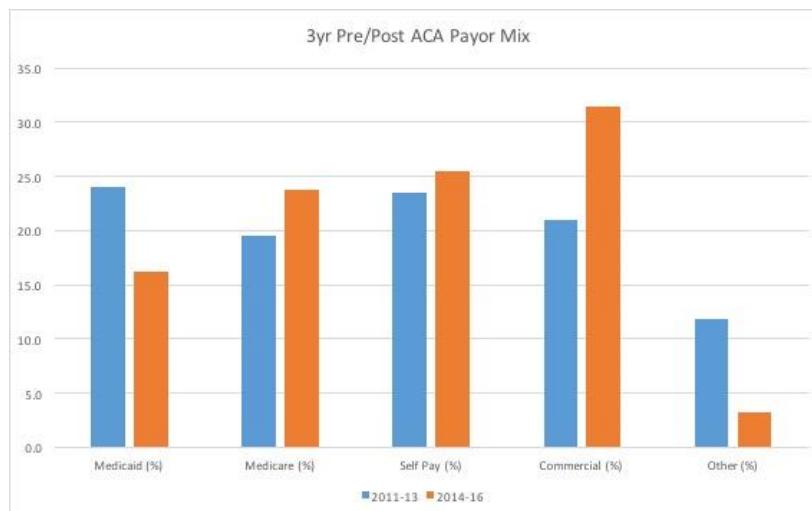


Figure 1. 3yr Mean Pre/Post ACA Payor Mix

Quick Shots Parallel Session III

Quick Shot Paper #29
January 11, 2018
5:03 pm

NATIONWIDE TRENDS IN MORTALITY FOLLOWING PENETRATING TRAUMA: ARE WE UP FOR THE CHALLENGE?

Joseph V. Sakran, MD, MPH, MPA, FACS*, Ambar Mehta, M.P.H., Avery B. Nathens, MD, PhD, MPH*, Bellal Joseph, MD*, Alistair Kent, MD, MPH*, Christian Jones, MD*, Elliott R. Haut, MD, PhD, FACS*, Raymond Fang, MD, FACS*, David T. Efron, MD*
Johns Hopkins School of Medicine

Presenter: Joseph V. Sakran, MD, MPH, MPA, FACS

Objectives: Despite a focus on improved pre-hospital care, penetrating injuries contribute substantially to trauma mortality in the U.S. We analyzed trends in pre-hospital mortality from penetrating trauma in the past decade.

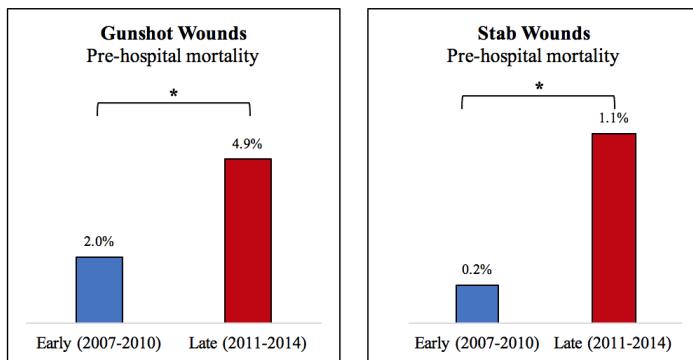
Methods: We identified patients suffering gunshot (GSW) and stab wounds (SW) in the NTDB database from 2007-2010 ("early period") and 2011-2014 ("late period") treated at hospitals recording dead-on-arrival statistics. Multivariable logistic regressions assessed differences in body locations of trauma, pre-hospital mortality, and in-hospital mortality between the early and late periods. Models accounted for hospital clusters and adjusted for age, pulse, hypotension, NISS, GCS, and number of injured body parts.

Results: There were 437,398 patients experiencing penetrating traumas from 2007-2014, with equal distributions of GSW and SW. The overall pre-hospital mortality rate was 2.1% (GSW: 3.5%, SW: 0.7%). After adjustment, patients in the late period relative to those in the early period were associated with significantly higher odds of pre-hospital death after both GSWs (aOR 4.41 [95%-CI 3.23-6.03]) and SWs (aOR 8.84 [5.26-14.86]) (Figure). Sensitivity analyses assessing GSWs and SWs by locations of body injury found similar results (Table). Additionally, patients in the late period were more likely to experience penetrating injuries to the spine (aOR 1.13 [1.08-1.18]) and face (aOR 1.06 [1.02-1.09]) but not neck (aOR 1.02 [0.98-1.06]). For patients arriving to the hospital alive, in-hospital mortality decreased from the early period to the late period (4.0% vs 3.6%, aOR 0.83 [0.78-0.88]).

Conclusions: In the U.S., the prevalence of penetrating traumas remains a nationwide burden and the odds of pre-hospital mortality in 2011-2014 relative to 2007-2010 has increased up to 9-fold. Examining violence intensity, improvements in hospital care, and data collection may explain these findings.

Figure: Increases in Pre-hospital Death After Penetrating Trauma During the Late Years

(2011-2014) Relative to the Early Years (2007-2010).



After adjustment, there were significantly higher odds of pre-hospital death in the late period (2011-2014) relative to the early period (2007-2010, reference) for both gunshot wounds and stab wounds. * $P<0.001$ for both GSW and SW. *Regressions accounted for correlations of outcomes within individual hospitals and adjusted for patient age, pulse, hypotension, the New Injury Severity Score, Glasgow Coma Scale, and number of injured body parts.*

Table: Increases in Pre-hospital Death for all Body Locations of Penetrating Trauma

	Gunshot Wounds	Stab Wounds
<i>*Adjusted Odds Ratio [95%-Confidence Interval]</i>		
Face	4.27 [2.64-6.90]	10.24 [5.31-19.77]
Head	3.54 [2.38-5.26]	10.73 [4.72-24.39]
Neck	5.06 [2.87-8.93]	6.54 [4.01-10.68]
Thorax	5.13 [3.57-7.38]	7.40 [4.89-11.22]
Abdomen and Pelvis	6.10 [4.17-8.93]	12.75 [6.67-24.38]
Spine	5.34 [3.28-8.70]	28.34 [4.43-181.54]
Upper Extremities	5.48 [3.59-8.38]	9.15 [5.48-15.29]
Lower Extremities	5.71 [3.69-8.85]	10.98 [5.44-22.15]
Overall	4.41 [3.23-6.03]	8.84 [5.26-14.86]

For all body locations of penetrating trauma, there were greater adjusted odds of pre-hospital death in the late period (2011-2014) relative to the early period (2007-2010, reference). * $P<0.001$ for both GSWs and SWs. *Regressions accounted for correlations of outcomes within individual hospitals and adjusted for patient age, pulse, hypotension, the New Injury Severity Score, Glasgow Coma Scale, and number of injured body parts.*

Quick Shots Parallel Session III

Quick Shot Paper #30
January 11, 2018
5:09 pm

HEALTHCARE UTILIZATION & COST OF POST-TRAUMATIC ARDS CARE

Anamaria J. Robles, MD, Lucy Z Kornblith, MD, Benjamin Howard, Amanda Conroy, Ryan Kunitake, Carolyn Hendrickson, Farzad Moazed, Carolyn Calfee, Mitchell J. Cohen, MD, FACS, Rachael Callcut, MD, MSPH, FACS*
University of California San Francisco

Presenter: Anamaria J. Robles, MD

Objectives: Acute respiratory distress syndrome (ARDS) after injury is associated with lengthy hospitalizations but the financial burden associated with increasing ARDS severity has not been studied. We examined cost differences of post-traumatic ARDS severity classified by Berlin criteria.

Methods: All adult highest level trauma activation patients enrolled in an ongoing prospective cohort study were included. For patients with PaO₂:FiO₂ ratio (P/F) <=300mgHg during the first 8 days of admission, two blinded physicians reviewed chest radiographs for ARDS adjudication by Berlin criteria. ARDS severity was classified according to degree of hypoxemia: mild (200<P/F<=300), moderate (100<P/F<=200), and severe (P/F<=100). Hospital charge data was used to perform standard costing analysis.

Results: Adjudicated ARDS was present in 13.1% (203/1552) of patients surviving >=6 hours. Those with ARDS were older (41 vs 35 years, p<0.01), had higher median ISS (30 vs 10, p<0.01), more likely to have chest injury (AIS>=3: 51% vs 21%, p<0.01), and blunt mechanism of injury (85% vs 53%, p<0.01). Of the ARDS patients, 33% had mild, 42% moderate and 25% had severe disease. A correlation between ARDS severity, higher ISS and mortality was observed. Compared to mild/moderate ARDS, patients with severe ARDS had increased multi-organ failure and mortality. Standardized total hospital charges were four-fold higher in those with ARDS (\$434K vs. \$96K, p<0.01), and highest charge per day was associated with severe ARDS (mild \$20,451; moderate \$23,994; severe \$33,316, p<0.01).

Conclusions: The development of ARDS after injury is associated with higher healthcare costs. Among trauma patients who develop ARDS, total hospital charges per day increase with worsening disease severity. Protective strategies to prevent or mitigate ARDS after trauma are essential to controlling health care costs and should be prioritized.

Demographics/Outcomes by ARDS severity	Mild ARDS (n=67)	Moderate ARDS (n=86)	Severe ARDS (n=50)	P
Percent intubated on admission day	93%	98%	98%	<0.01
Percent transfused within 24h	64%	76%	84%	0.05
Ventilator free days	10 (0-21)	3 (0-15)	0 (0-10)	0.03
Multi-organ failure	23%	45%	58%	<0.01
ICU days	14 (7-24)	14 (8-24)	10 (4-22)	0.14
Hospital days	24 (11-51)	21 (11-42)	14 (5-25)	0.01
Total hospital charge (\$)	462,417 (264,993- 920,018)	489,330 (254,829- 773,073)	311,017 (179,427- 802,498)	0.35
Charge per day (\$)	20,451 (13,398- 28,133)	23,994 (14,989- 32,768)	33,316 (17,175- 120,735)	<0.01
Standardized total hospital charge (\$)	579,528 (265,617- 123,497)	495,013 (265,617- 1,014,174)	338,058 (120,735- 603,675)	0.01
Mortality at 28 days	21%	33%	50%	<0.01
Mortality at discharge	24%	36%	52%	<0.01

* Data are mean +/- SD, median (inter-quartile range), or n (%) as indicated. Data for skewed variables reported as median with inter-quartile ranges. Ventilator free days are counted for the first 28 days of hospitalization. Subjects who expired received 0 ventilator free days

Quick Shots Parallel Session III

Quick Shot Paper #31
January 11, 2018
5:15 pm

30-DAY TRAUMA READMISSIONS: A CLINICAL ANALYSIS

Sarah K. West, MS, RN, ACNP-BC, Michael Shay O'Mara, MD, MBA, FACS*, M. Chance Spalding, DO, PhD*
Grant Medical Center

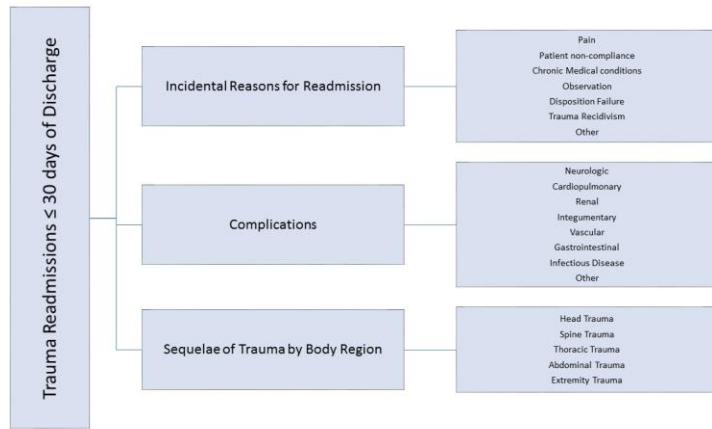
Presenter: Sarah K West, MS, RN, ACNP-BC

Objectives: We hypothesized that a structured methodology for abstraction of clinically meaningful variables describing 30-day trauma hospital readmissions will lead to identification of populations at risk and allow targeted process and quality improvement.

Methods: A three-year retrospective cohort study of 18,998 trauma patients at a level 1 trauma center. Excluded were initial hospitalization deaths, transfers, and isolated hip fractures. A systematic methodology was developed for conducting chart reviews. Identified were descriptive clinical variables associated with trauma readmission. The administrative data was also evaluated.

Results: Of 15,373 patients, 413 (2.7%) were readmitted. Readmissions were white males (71.2%), 16-44 years (56.7%), with ISS \geq 10 (68.3%). Mechanism of injury (MOI) was falls (27%), motor vehicle collisions (26%), and gunshot wounds (16%). Readmission rate was highest for gunshot wounds (11.0%) and motorcycle crashes (4.3%). There was no difference in time to readmission by MOI ($P= 0.39$). 24.2% were compliant with outpatient follow-up, the strongest predictor being discharge to a skilled nursing facility (85%, $P=0.002$). Clinically abstracted readmissions were for complications (41.0%) and incidental (35.1%). Infection was the leading complication on readmission (63.7%). The incidental reasons were observation (25%) and pain (24.4%). The difference between clinically abstracted and administrative data was significant ($P<0.0001$).

Conclusions: We showed a significant difference between the reasons for 30-day trauma readmission when comparing clinically abstracted and administrative data. Data obtained from this study has assisted in the structuring of process improvement, clinical guidelines, and early proactive follow-up. Further research into the development of predictive models using clinically abstracted data for trauma patient readmission will allow preventative intervention and allocation of resources prior to hospital discharge.



Structured methodology for 30-day trauma readmission reviews.

Data Comparison

Readmission Category	Clinically Abstracted Variables	Administrative Data Codes	Significance (P<0.05)	Percent of Administrative variables that agreed with clinically abstracted variables
Complications	182 (41%)	181 (39%)	0.61	134 (74%)
Incidentals	156 (35%)	36 (8%)	<0.0001	27 (75%)
Head Trauma	54 (12%)	80 (17%)	0.027	46 (58%)
Spine Trauma	3 (1%)	13 (3%)	0.014	3 (23%)
Thoracic Trauma	25 (6%)	39 (8%)	0.095	23 (60%)
Abdominal Trauma	12 (3%)	44 (10%)	<0.0001	8 (18%)
Extremity Trauma	12 (3%)	32 (7%)	0.003	7 (22%)
*Other	0 (0%)	35 (8%)	<0.0001	0 (0%)
*Other: Unable to categorize based upon the information provided				
P<0.0001 overall, chi-square test				

Comparison of clinically abstracted versus administrative readmission data.

Quick Shots Parallel Session III

Quick Shot Paper #32
January 11, 2018
5:21 pm

“THAT CAN’T BE!” PERCEPTIONS OF HIV AND HEPATITIS C SCREENING DURING ADMISSION TO AN ACS SERVICE

Alicia R. Privette, MD, FACS*, Pamela Ferguson, Jama Olsen, Sarah Gay, ACNP-BC*, Lauren Richey
Medical University of South Carolina

Presenter: Alicia R. Privette, MD, FACS

Objectives: A large number of patients live with undiagnosed HIV and/or Hepatitis C despite broadened national screening guidelines. European studies, however, suggest many patients falsely believe they have been screened during a prior hospitalization. This study aims to define current perceptions among trauma and emergency general surgery (EGS) patients regarding HIV and Hep C screening practices during current and prior admissions.

Methods: Prospective survey administered to adult (>18 yo) trauma and EGS patients at a Level 1 academic trauma center. Survey consisted of 13 multiple choice questions: demographics, whether admission tests included HIV and Hep C at index and prior hospital visits, whether receiving no result indicated a negative result, history of primary care screening. Response percentages calculated in standard fashion.

Results: 100 patients surveyed: 61 trauma, 39 EGS. Overall, 34% and 30% of patients believed they were screened for HIV and Hep C at admission with trauma patients more likely to believe they were screened. 69% of patients had a hospital visit within 10 yrs. Of these, 45% and 37% believed they had been screened for HIV and Hep C. More EGS patients believed they received Hep C screening while HIV was equivalent. Among patients who believed they had a prior screen and didn't receive any results, 73% (HIV) and 75% (Hep C) believed a lack of results meant they were negative. Only 26% and 21% of patients had ever been offered outpatient HIV and Hep C screening.

Conclusions: A large portion of patients believe they received admission or prior hospitalization HIV and/or Hep C screening and the majority interpreted a lack of results as a negative diagnosis. Due to these factors, routine screening of trauma/EGS patients should be considered to conform to patient expectations and national guidelines, increase diagnosis and referral for medical management, and decrease disease transmission.

Patients	Admit HIV screening test (n=100)	Admit Hep C screening test (n=100)	Prior HIV screening test (n= 56)	Prior Hep C screening test (n=56)
Trauma	39.3% (24)	32.8% (20)	53.1% (17)	39.4% (13)
ACS	25.6% (10)	25.6% (10)	50% (12)	47.8% (11)

Table. Percentage of patients by service who believe they received screening at index admission and prior admission.

Quick Shots Parallel Session IV

Quick Shot Paper #33
January 11, 2018
4:15 pm

EVALUATING SWALLOWING FUNCTION IN THE ELDERLY REQUIRING CERVICAL COLLARS: A NEW STANDARD OF CARE

Nicholas M. Sich, MD, Andrew Rogers, Andrew Shajari, Ryan Shadis, MD*
Abington-Jefferson Health

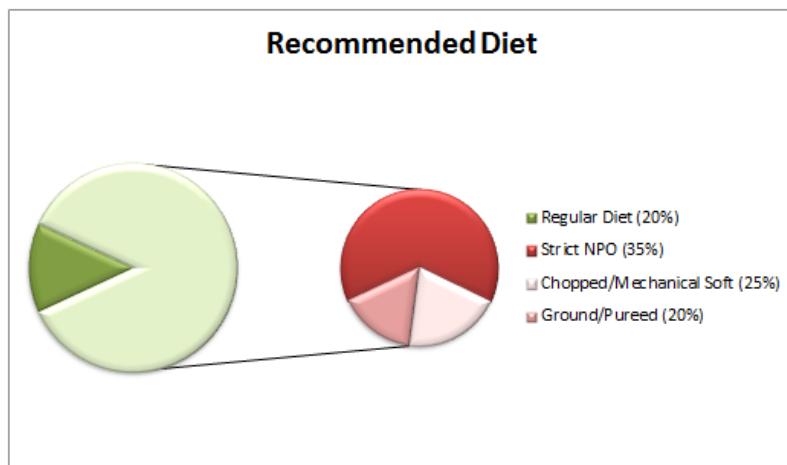
Presenter: Nicholas M. Sich, MD

Objectives: There is a high rate of aspiration events in the elderly with cervical collars. In 2008 our institution implemented a policy requiring speech and swallow evaluations (SSE) in any patient with age >65 requiring a hard cervical collar for their management. This study sought to determine if performing SSE in elderly patients requiring cervical collars for injury management should be a standard of care.

Methods: A retrospective chart review of all patients evaluated by the trauma service was performed starting in 2008. Inclusion criteria were patients with age >65, an image-confirmed cervical spine fracture, and treatment requiring hard cervical collar. Patients were further stratified into cohorts of those with documented SSE and those without. The SSE were then reviewed by investigators for diet recommendations.

Results: Three hundred eighty-eight patients were identified to have cervical spine fractures. Of these, 271 underwent documented SSE. Only 55 (20%) patients were cleared for a regular diet. For the remaining 238 (80%) patients: 69 (25%) were recommended chopped or mechanical soft diet, 52 (19%) ground/pureed diet, and 95 (35%) strict nil per os with either video-barium swallow for further evaluation or alternative feeding access (e.g. gastrostomy tube).

Conclusions: Due to a high rate of aspiration in our patients, our institution adopted a department policy requiring SSE in patients over 65 requiring hard cervical collar for management. Retrospective analysis of this management algorithm clearly demonstrates that the vast majority of patients (4 of 5) with cervical fractures requiring hard collar will have swallowing dysfunction. We recommend mandatory SSE for all patients over 65 requiring cervical collar as a standard of care.



Breakdown of diet recommendations following speech and swallow evaluation.

Quick Shots Parallel Session IV

Quick Shot Paper #34
January 11, 2018
4:21 pm

DOES IT WORK: A CRITICAL ASSESSMENT OF THE “STOP THE BLEED” EDUCATION PROGRAM

Brian L. Frank, MD*, Kathryn Bommer, Amanda Young, Patrick Wende, Charles Proctor, Claire LeGuen, Ryan Hessenius, Maddison Kane, Richard A. Lopez, DO*, John Mitchell
Geisinger - Community Medical Center

Presenter: Brian L. Frank, MD

Objectives: Since its inception, “Stop the Bleed” (STB) has trained participants to recognize and treat life-threatening hemorrhage. ACS members feel the course is appropriate to train the public, but its efficacy has not been assessed. We conducted a critical analysis of course effectiveness in improving comfort with, willingness to use, and knowledge about tourniquet use.

Methods: This is a prospective observational study utilizing pre- and post-course survey responses. Course participants over 18 years old were enrolled in classes through our trauma outreach office and informed about the study at the outset of the class. A pre-course survey was completed. Students then participated in the STB didactic and hands-on training followed by the post-course survey. Pre- and post-course comfort, willingness, and knowledge were compared using McNemar’s test and paired t-tests. Analysis was limited to completed surveys.

Results: A total of 367 participants were accrued from January through May 2017. They had backgrounds in law-enforcement (55%), pre-hospital medical care (17.2%), fire-fighting (14.4%), medicine (CRNP, MD, RN; 12.3%). Prior bleeding control training was reported in 41.2%. Specific tourniquet training was noted in 58%. Prior to training, 52.8% were “uncomfortable” or “neutral” with tourniquet use, but 79% were willing to use a tourniquet. After STB training, 76.2% of participants improved comfort ($p<0.0001$), 17.4% improved willingness ($p<0.0001$), and knowledge assessment scores improved in 83% ($p<0.0001$).

Conclusions: STB training is effective in training participants to recognize and treat life-threatening hemorrhage. The training improves comfort, willingness, and knowledge of tourniquet use. Efforts to support this outreach should continue with emphasis on interval follow-up to assess long-term knowledge retention.

	N	%	p-value
Currently comfortable with appropriate tourniquet use (n=357)			
Improved Comfort	272	76.2	<0.0001*
Same Comfort	77	21.6	
Still not Comfortable	8	2.2	
Missing	5		
Willingness to use a tourniquet (n=350)			
Improved Willingness	61	17.4	<0.0001**
Still Willing	284	81.2	
Not Willing/No Longer Willing	5	1.4	
Missing	12		
Knowledge assessment score (n=358)			
Improved Test Score	297	83.0	<0.0001*
Same Test Score	46	12.8	
Decreased Test Score	15	4.2	
Missing	4		

*Paired t-test

**McNemar’s Test

Change in Pre-Course and Post-Course Results

Quick Shots Parallel Session IV

Quick Shot Paper #35
January 11, 2018
4:27 pm

HEALTH LITERACY AND ITS IMPACT ON OUTCOMES IN TRAUMA PATIENTS: A PROSPECTIVE COHORT STUDY

Tianyi Swartz, BS, Faisal S. Jehan, MD, Andrew L. Tang, MD*, ElRasheed Zakaria, Narong Kulvatunyou, MD*, Arpana Jain, Lynn Gries, Terence O'Keeffe, MD, MSPH*, Bellal Joseph, MD*
The University of Arizona

Presenter: Tianyi Swartz, BS

Objectives: Health literacy (HL) is emerging as a focus of interest and is evolving as an important component of national health policy. Aim of our study is to assess prevalence of low-health literacy in trauma patients and its impact on outcomes after trauma.

Methods: 1-year prospective cohort study on all trauma patients age>18. The Short Assessment of Health Literacy (SAHL) score in English or Spanish to assess HL of patients. SAHL and trauma specific questionnaire were administered at discharge. LHL was defined as SAHL score <14. At 30-days post discharge, patients were surveyed about clinic follow-up details and recovery. Outcomes measures were prevalence of LHL and factors associated with it, readmission, follow-up, and time to recovery.

Results: We prospectively enrolled 105 patients. Mean age was 45+20 years, 59% were male and median ISS was 14[9-18]. Most common mechanism of injury was blunt 84% and 56% patients were White while 38% were Hispanics. Overall, 24% patients had LHL. LHL patients were more likely to be Hispanics (63%vs27%, $p=0.01$), have lower-socioeconomic status (90%vs51%, $p=0.02$), un-insured (45%vs18%, $p=0.01$) and less likely to have completed college (0%vs49%, $p=0.01$), compared to the HL patients. At discharge, both groups were satisfied with the time spent by physician to explain the condition; however, the LHL patients could not recall their injuries and details about the surgery (**Table1**). On regression analysis, patients with LHL were less likely to follow-up (OR0.7), took longer time (>4 weeks) to recover (OR1.2), however, there was no difference in the readmission rates. (**Table2**)

Conclusions: One in 5 trauma patients has LHL. LHL is associated with poor understanding of injuries and treatment provided to them, lack of follow-up and longer time to recovery. Identifying LHL in high risk patients and improving techniques of discussion with patients before discharge may help to improve outcomes.

Table 1. Health Literacy related trauma specific questionnaire

	LHL (n=25)	HL (n=80)	P
At discharge			
Satisfaction with time spent by physician	81.8%	80.9%	0.98
Recalled injuries	27.3%	56.3%	0.03
Knowledge about type of surgery performed or treatment	0%	43.8%	0.01
Understood the purpose of medications prescribed	18%	50.1%	0.03
Knowledge about when to follow-up	18%	60%	0.02

Table 1. Health Literacy related trauma specific questionnaire**Table 2. Survey at 30-days post-discharge. (Multivariate Regression analysis)**

Low health literacy (LHL)	OR	95% confidence interval	P
Follow-up	0.78	[0.66-0.89]	0.03
Time to recover > 4 weeks	1.23	[1.08-2.56]	0.04
Re-admission	0.97	[0.65-2.45]	0.64

Table 2. Survey at 30-days post-discharge. (Multivariate Regression analysis)

Quick Shots Parallel Session IV

Quick Shot Paper #36
January 11, 2018
4:33 pm

SEE ONE, DO ONE, BUT NEVER TEACH ONE? AN ACUTE CARE SURGERY MODEL WITH GRADUATED SUPERVISION SAFELY FACILITATES SENIOR RESIDENT AUTONOMY

Joshua P. Smith, DO, Donald Moe, John McClellan, Avery Walker, Vance Sohn,
Matthew J Eckert, MD*, Matthew J. Martin, MD*
Madigan Army Medical Center

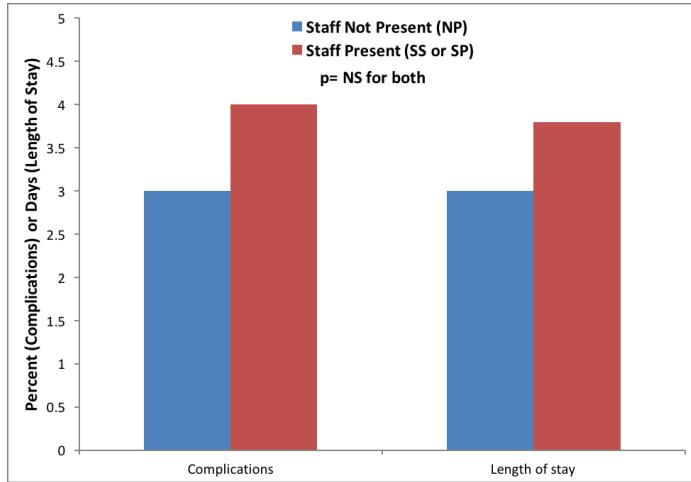
Presenter: Joshua P. Smith, DO

Objectives: Surgical training traditionally relied on gradually increasing levels of resident autonomy and independence, particularly on operative cases. However, this practice has become increasingly limited due to reimbursement, and patient safety concerns. We sought to analyze the outcomes of senior resident teaching assist (TA) cases performed under an acute care surgery model with a structured policy including varying levels of staff supervision.

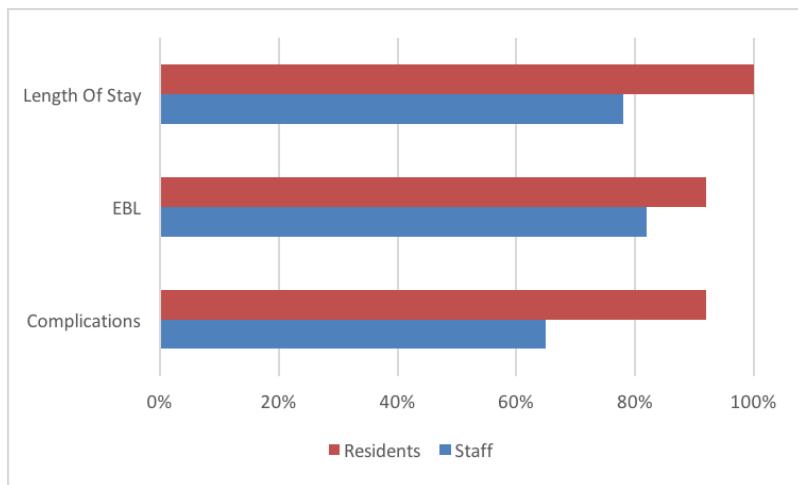
Methods: Retrospective review at a military academic medical center of senior resident TA cases from 2009-2014. Operative time, estimated blood loss, complications and length of stay were analyzed according to level of staff supervision (staff not present (NP), staff scrubbed (SS), and staff present but not scrubbed (SP). An anonymous survey of residents and staff at 6 military training programs regarding experience and opinions on TA cases was distributed.

Results: 389 TA cases were identified. The majority (52%) were performed as NP, while 48% were performed as SP or SS. Operative times were shorter for NP cases ($p < 0.05$). Overall complication rate and mean length of stay were not significantly different between groups ($p > 0.05$, Figure). Survey results demonstrated most staff (71%) and residents (91%) believed there was no increased risk of complications with the selective NP approach, with similar results for blood loss and length of stay (Figure 2). Staff and residents felt that allowing selective NP was critical for achieving resident competence.

Conclusions: In a structured program of allowing increasing senior resident autonomy on highly select TA cases, there was no identified adverse effects on major complications or patient outcomes. Staff and residents felt this practice was safe and is a critical component of graduating residents readiness for independent practice.



Comparison of overall complications and overall patient length of stay between NP and SP/SS.
 There is no statistical difference in either category between groups.



There is agreement amongst staff and residents on the impact of allowing teaching assist cases in terms of length of stay, estimated blood loss and overall complication rates.

Quick Shots Parallel Session IV

Quick Shot Paper #37
January 11, 2018
4:39 pm

EFFECT OF RELAXED LEGISLATION OF FIREWORKS-RELATED INJURIES IN DOUGLAS COUNTY, NEBRASKA

James Tiehen, MD, Jessica Summers, MD*, Brett Harden Waibel, MD*, Paul J. Schenarts, MD*
University of Nebraska Medical Center

Presenter: James Tiehen, MD

Objectives: In December 2010, Omaha, NE relaxed its fireworks ordinance to be more in line with the rest of the state by allowing a larger variety of fireworks to be legally used during the July 4th holiday. Prior to this change, fireworks were available in neighboring municipalities and injuries within Omaha were common despite the ban. Our purpose was to determine what effect the relaxation of a local fireworks ban had in an area surrounded by more liberal fireworks laws.

Methods: Discharge data from Douglas County hospitals was evaluated for a period before (2004-10) and after (2011-14) the ordinance change. The population of Omaha accounts for the vast majority of Douglas County, therefore, data collected in Douglas Co. was used as a surrogate for the trends in Omaha. The pre and post rates of firework-related injury (per 100,000 persons per year) were compared using the Wilcoxon-Mann-Whitney test.

Results: A total of 1,264 fireworks injuries were reported in Nebraska, 276 of those in Douglas County over a ten-year period from 2004 – 2014. Prior to the legislation in Douglas Co, there were 4.13 injuries per 100k population, with a 49.9% increase to 6.19 injuries per 100k after the ordinance change ($p=0.023$). In the state of Nebraska, the rates for the same time period were 5.96 and 6.96 per 100k respectively ($p=0.131$). Both of these rates are higher than the national average over the same time period of 3.09 per 100k (table).

Conclusions: This study demonstrates that despite the availability of fireworks just outside the city limits of Omaha prior to 2010, the rate of injuries increased by almost 50% after the sale of fireworks was allowed within the city limits. This data can be used to provide information to both state and city officials to advocate for stronger fireworks legislation in both the city of Omaha and the state of Nebraska.

	Rate	Stnd Dev	p	% Change Pre to Post	% Difference to National	% Difference to State
Douglas Co Pre	4.13	0.62	0.023	49.9%	35.9%	-30.8%
Douglas Co Post	6.19	1.56			94.4%	-11.1%
Douglas Co All Yrs	4.87	1.43			57.8%	-23.0%
Nebraska Pre	5.96	0.83	0.131	16.7%	96.5%	
Nebraska Post	6.96	0.87			118.7%	
Nebraska All Yrs	6.33	0.94			104.8%	
National Pre	3.03	0.43	0.706	4.9%		
National Post	3.18	0.35				
National All Yrs	3.09	0.39				

Quick Shots Parallel Session IV

Quick Shot Paper #38
January 11, 2018
4:45 pm

MISCONCEPTIONS - GUN VIOLENCE IN AMERICA

Matthew Benns, MD*, Keith Miller, MD*, Kimberly Denzik, Annabelle Pike,
Latasha White, Lindsey Kendrick, Shannon Cambron
University of Louisville

Presenter: Matthew Benns, MD

Objectives: The U.S. has the highest estimated number of gun owners per capita of any industrialized nation in the world. Firearm injuries are also common, with more than 100,000 occurring annually. Despite the prevalence of guns and gun violence in America, we hypothesized that there would be significant misconceptions related to gun violence among a surveyed population.

Methods: Students at an urban, liberal arts university were electronically surveyed regarding gun violence. Where applicable, responses were compared to the most recent 5-year annual average data from the Centers for Disease Control.

Results: 605 people were invited to participate; 168 completed the study (27.7%). Respondents were mostly female (79.76%) and diverse in terms of age (10.7% between 17-22 years, 19.6%: 23-29, 23.8%: 30-39, 18.4%: 40-49, 18.4%: 50-59, 8.9%: >60). 40% of respondents own a gun. 44% of respondents personally know someone who has been shot. All respondents believed suicide accounted for <50% of annual gun deaths (actual: 62%). 48% of respondents believed there were >75,000 annual gun deaths (actual: 33,880). 73% of respondents believed that >10% of gunshot deaths occurred as a result of accidents (actual: 1.6%). 46% of respondents believed that police shootings accounted for >10% of all firearm deaths (actual: 1.3%). 40.8% of respondents believed that mass shootings accounted for >6% gunshot deaths (actual: <0.5%). Only 35.5% of respondents considered suicide an act of gun violence.

Conclusions: Misconceptions related to gun violence were common amongst survey participants. Many respondents overestimated the total number of firearm injuries and the proportion of deaths related to mass shootings, police interventions, and accidents. The majority of respondents also indicated that they did not view suicide as an act of gun violence. Further characterization of misconceptions is essential to the development of successful injury prevention strategies.

Quick Shots Parallel Session IV

Quick Shot Paper #39
January 11, 2018
4:51 pm

THE USE OF ABC SCORE IN ACTIVATION OF MASSIVE TRANSFUSION: THE YIN AND THE YANG

Rebekah Hodge, BS, Amirreza Motameni, MD, Brian P. Strollo, MD*, Matthew Bozeman, MD*,
Matthew Benns, MD*, Keith Miller, MD*, Brian G. Harbrecht, MD*
University of Louisville

Presenter: Amirreza Motameni, MD

Objectives: Hemorrhage is the most common cause of death in trauma patients within the first hour of arrival to a trauma center. Delay in Massive Transfusion Protocol (MTP) activation has shown to result in increased mortality. Predicting the need for MT remains a challenge. The Assessment of Blood Consumption (ABC) score has become a widely accepted criteria for MTP activation. The purpose of this study is to compare the use of ABC criteria to clinical judgment in MTP activation.

Methods: Adult trauma patients treated at University of Louisville Trauma Center from January 2016 to December 2016 who either had MTP activation based on clinical judgment or had a Focused Assessment with Sonography for Trauma (FAST) scan performed during the initial trauma resuscitation were included. Activation of ABC score was assessed retrospectively. ABC score was calculated by assigning a value (0 or 1) to each of the following four criteria: penetrating mechanism, free fluid on FAST, arrival blood pressure <90 mm Hg and arrival pulse >120 bpm. A score of 2 or more was used as "positive" to activate MTP.

Results: 1,438 patients were included in this study. After retrospectively applying the ABC criteria, only 40% of the patients who had MTP activation based on the ABC criteria would have used more than 5 units of blood products during their entire hospital stay as compared to 77% of the patients in whom clinical judgment was used to activated MTP. 55% of all MT activations via clinical judgment were activated in the OR and 44% in the ED. 83% of activations that occurred in the OR by clinical judgment could have been activated earlier in the ED using the ABC criteria.

Conclusions: While the ABC criteria overestimates the need for MT, its use does lead to earlier activation of MT. Criteria to trigger MT activation should rely on multiple factors including both clinical acumen and well-studied prediction tools such as the ABC score.

Quick Shots Parallel Session IV

Quick Shot Paper #40
January 11, 2018
4:57pm

THE PRESENCE OF AN APPENDICOLITH ON PREOPERATIVE CT IS ASSOCIATED WITH A SEVERE CLINICAL COURSE AND FAILURE OF NON-OPERATIVE THERAPY IN PATIENTS WITH ACUTE APPENDICITIS

David Wang, BS, Mohamad H. Abouzeid, MD
NYU School of Medicine

Presenter: David Wang, BS

Objectives: As the non-operative therapy of acute appendicitis gains traction in the United States, we sought to examine the subset of patients who were found have an appendicolith on preoperative imaging; specifically, the severity of disease, complications rates, and the rate of failure of non-operative management.

Methods: This is a retrospective review of all adult patients admitted to an academic tertiary care center in 2016 with the primary diagnosis of acute appendicitis. Patient demographics and clinical characteristics including sex, age, perforation rate, sepsis rate, complications, and readmission rates were recorded. Failure of non-operative therapy was also determined in those who did not undergo surgery as first line therapy. Patients with an appendicolith were compared to those without.

Results: A total of 458 cases of acute appendicitis were identified. 239 were female (52.2%) and the mean age was 36.5 years. Appendicoliths were present in 137 (29.9%). The rates of sepsis, perforation, and abscess were significantly higher at 21.2%, 35.8%, and 18.2% respectively in the appendicolith group compared to those without at 8.4% ($P=0.0001$), 21.5% ($P=0.0014$), and 10.9% ($P=0.033$). In the patients who underwent surgery, the complication rate tended to be higher in the appendicolith group at 9.5% vs 5.3%, although it was not statistically significant ($P=0.097$). Non-operative management was attempted in 76 patients, of whom 22 (16.1%) had an appendicolith. Their failure rate was 50% compared to 22.2% for the non-appendicolith group ($P=0.017$).

Conclusions: The presence of an appendicolith in patients with acute appendicitis is a predictor of a more severe disease course and failure on non-operative therapy. We thus recommend strong consideration for early appendectomy in these patients when feasible, rather than non-operative therapy.

Quick Shots Parallel Session IV

Quick Shot Paper #41
January 11, 2018
5:03 pm

TRAUMA SURGEON PERFORMANCE OF APPENDECTOMY IN 5-10 YEAR-OLD CHILDREN IS SAFE AND DECREASES LENGTH OF HOSPITAL STAY

Derek B. Wall, MD*, Carlos Ortega
NorthShore University HealthSystem

Presenter: Derek B. Wall, MD

Objectives: Even in metropolitan areas, on-call pediatric surgeons may not always be immediately available for surgical care of appendicitis, potentially leading to delays in care. Approximately six years ago, the in-house trauma group at a suburban Level 1 trauma center (none with formal pediatric fellowship training) assumed surgical care of 5-10 year-old children with appendicitis within a four hospital system. We propose to compare clinical outcomes before and after this change.

Methods: Retrospective chart review of 5-10 year-olds undergoing emergency appendectomy at a community Level 1 trauma center between January, 2007 and December, 2016 was performed. Patients were classified as having surgery performed by the trauma group or the pediatric surgery group. Patient characteristics, clinical course, and outcomes were compared using the Wilcoxon Rank-Sum Test and Fisher's Exact Test, with $p<0.05$ considered significant.

Results: A total of 220 patients were identified, 138 in the trauma group and 82 in the pediatric surgery group. Patients cared for by the trauma group were more likely to be female (47% vs. 31%; $p=0.03$), were less likely to be diagnosed without imaging (2% vs. 26%; $p<0.0001$), had a shorter time from diagnosis to surgery (214 vs. 318 minutes; $p=0.01$), were more likely to have laparoscopic surgery (70% vs. 55%; $p=0.04$), had a shorter operative time (40 vs. 49 minutes; $p<0.0001$), and had a shorter length of stay (32 vs. 41 hours; $p<0.0001$), despite more of them needing to be transferred from outside hospitals (60% vs. 37%; $p<0.001$). There were no significant differences in patient age, rate of perforated appendicitis, 30 day readmissions, surgical site infections, or unanticipated procedures.

Conclusions: Trauma surgeon performance of emergency appendectomy in 5-10 year-old children decreased length of hospitalization with similar complication rates as compared to pediatric surgeons.

Quick Shots Parallel Session IV

Quick Shot Paper #42
January 11, 2018
5:09 pm

NASOGASTRIC TUBE (NGT) OUTPUT AFTER TWO DAYS PREDICTS THE NEED FOR OPERATION IN SMALL BOWEL OBSTRUCTION (SBO)

D. Dante Yeh, MD*, Mohamed D Ray-Zack, MBBS, Matthew C. Hernandez, MD, Kenji Inaba, MD, Therese M. Duane, MD, FACS*, Salina M. Wydo, MD*, Daniel C. Cullinane, MD*, Andrea Pakula, MD, MPH, FACS*, Asad Choudhry, John Christopher Graybill, Carlos J. Rodriguez, DO, MBA, FACS*, Martin D. Zielinski, MD, FACS*
University of Miami Miller School of Medicine

Presenter: D. Dante Yeh, MD

Objectives: Patients presenting with SBO without signs warranting immediate exploration are often treated with NGT for a trial of non-operative management (non-op). It is difficult to predict patients who will fail non-op. We hypothesized that cumulative NGT output after two days predicts eventual operation.

Methods: A post-hoc analysis of an EAST-sponsored, multi-institutional database collected to study the Gastrografin (GG) challenge in SBO was performed. Only patients with complete data and NGT inserted on the day of admission were included. Exclusions included peritonitis, closed loop obstruction on CT, and operation within 48 h after NGT insertion. The cohort was divided into operative (Op) and non-operative (Non-Op) groups. Descriptive statistics were calculated with comparisons between groups performed using Fisher's exact, t test, and Wilcoxon-rank-sum test as appropriate. Multiple logistic regression analysis controlling for Service of Admission, GG Challenge, and Cumulative NGT output was performed to predict odds of operation.

Results: There were 212 subjects with 50 (24%) ultimately undergoing operation (Table-1). GG challenge was used in significantly more Non-Op patients (68% vs. 42%, p=0.001). Daily and cumulative NGT output by day 2 were significantly greater among Op patients. On regression analysis, odds for eventual operation was significantly greater among patients with surgical service of admission (OR 3.3, 95% CI 1.3-9.6, p=0.029) and cumulative day 2 NGT output >1500mL (OR 3.3, 95% CI 1.6-6.7, p=0.001). GG challenge was predictive of successful non-op (OR 0.3, 95% CI 0.1-0.5, p<0.001).

Conclusions: For patients with SBO treated initially with NGT decompression, cumulative NGT output after two days is predictive of eventual operation. Patients with high NGT output after this time should be strongly considered for exploration.

	All (n=212)	Op (n=50)	Non-Op (n=162)	p
Mean age (SD)	66.6 (15.8)	66.2 (14.3)	66.7 (16.2)	0.8378
Male sex	102 (48%)	23 (46%)	79 (49%)	0.749
Mean weight kg (SD)	79.2 (20.5)	78.5 (22.0)	79.4 (20.1)	0.7967
BMI mean (SD)	27.5 (6.6)	27.5 (1.2)	27.5 (0.5)	0.9830
Hospital LOS median [IQR]	4 [3 – 10]	13 [9 – 20]	3 [2 – 5]	<0.001
Surgical service admission	174 (82%)	45 (90%)	129 (80%)	0.138
History of any cancer	98 (46%)	71 (44%)	27 (54%)	0.256
Prior SBO Admission	99 (47%)	22 (44%)	77 (48%)	0.746
Prior SBO Operative Exploration	57 (27%)	13 (26%)	44 (27%)	1.00
Number of prior abdominal operations	2 [1-4]	2 [1 – 3]	2 [2 -4]	0.06
CT scan	205 (97%)	48 (96%)	157 (97%)	0.669
Transition point identified on CT scan	157 (74%)	37 (74%)	120 (74%)	0.914
Gastrografin challenge performed	131 (62%)	21 (42%)	110 (68%)	0.001
NGT output (mL)				
Day 1	400 [150 – 1000]	600 [270 – 1300]	350 [150 – 920]	0.043
Day 2	615 [250 – 1400]	925 [500 – 1500]	450 [200 – 1250]	<0.001
Cumulative on Day 2	940 [400 – 2100]	1522 [890 – 2950]	800 [350 – 1675]	<0.001
>500 mL	141 (67%)	43 (86%)	98 (60%)	0.001
>1000 mL	99 (47%)	34 (68%)	65 (40%)	0.001
>1500 mL	71 (33%)	25 (50%)	46 (28%)	0.006
Duration from admission to operation: median days [IQR]	4 [2 – 5]	4 [2 – 5]	-	-
Requiring operation	50 (24%)	50	-	-

Demographics, Nasogastric Tube (NGT) output on Day 1 and 2, and operative outcomes.

BMI = body mass index; CT = computed tomography; SBO = small bowel obstruction

Quick Shots Parallel Session IV

Quick Shot Paper #43
January 11, 2018
5:15 pm

NON-TRAUMA SERVICE ADMISSIONS: SHOULD WE CARE?

Brandon Joseph Fumanti, MD*, Lisa Szyzdiak, Michael D. Grossman, MD*
Northwell Health Southside Hospital

Presenter: Brandon Joseph Fumanti, MD

Objectives: ACS-COT requires trauma centers with greater than 10% injured patients admitted to non-trauma services (NTSA) have process to review these for appropriateness of care. We previously described an algorithm to determine the appropriateness of NTSA. Our objective was to determine potential effects of prospective implementation of the algorithm.

Methods: Three-year retrospective analysis of trauma registry in an ACS-COT verified level II trauma center. Patients defined as meeting NTDB submission criteria but **excluding** isolated hip fractures. NTSA appropriate patients by algorithm were included. Differences between patients admitted to a trauma service (TS) and NTSA were compared using χ^2 , Fisher's exact, or Wilcoxon tests with significance at $p=0.05$.

Results: 941 of 2872 (33%) patients met algorithm criteria as appropriate NTSA; 694 (74%) were admitted to TS, 247 (26%) were NTSA. Most common association with admission to TS was trauma consult or activation. Compared to TS patients NTSA patients were older, had similar ISS, and a similar proportion had three or greater pre-existing comorbidities (Table 1). NTSA had similar risk for mortality and complications, but longer length of stay (LOS), and were less likely to have a desirable discharge disposition (Table 2).

Conclusions: Minimally injured elderly patients constitute the majority of NTSA and a large proportion of TS admission. ACS-COT requirement for evaluation of NTSA compared to TS admission allowed determination that care after NTSA was appropriate with respect to mortality and complications. Process of care between TS/NTSA may have accounted for longer LOS and differences in disposition. Prospective application of the algorithm would have resulted in a 36% rate of NTSA, well above the ACS-COT threshold and would not have resulted in improved patient care. Efforts to prospectively identify and manage this population are warranted given changing demographics in many trauma centers.

	Trauma	Non Trauma	p-value
Mean Age (Years)	72.2	77.6	<0.001
Mean ISS	5.9	5.4	0.06
3+ Comorbidities (%)	130 (50.8)	352 (52.6)	0.61

Table 1 - Population baseline characteristics

	Trauma	Non Trauma	p-value
Mean Length of Stay (Days)	4.7	6.1	<0.001
Complication (%)	26(3.8)	13 (5.3)	0.31
Mortality (%)	11 (1.6)	2 (0.8)	0.53
Desirable Discharge (%) [*]	465 (71.2)	105 (43.8)	<0.001

Table 2 - Outcomes.

* Desirable discharge to home or acute rehab setting.

Quick Shots Parallel Session IV

Quick Shot Paper #44
January 11, 2018
5:21 pm

TRENDS IN CIVILIAN PENETRATING BRAIN INJURY; A REVIEW OF 26,871 PATIENTS

David J. Skarupa, MD, FACS*, Muhammad Khan, MD, Dunbar Alcindor, David Ebler, MD*, Albert T Hsu, MD*, Firas G. Madbak, MD, FACS*, Gazanfar Rahmathulla, Brian K. Yorkgitis, DO*, Bellal Joseph, MD*
University of Florida College of Medicine - Jacksonville

Presenter: David J. Skarupa, MD, FACS

Objectives: Penetrating traumatic brain injuries (TBI) are generally associated with higher mortality rates. Principles of management and resuscitation protocols have evolved over the past few years; however, their impact on outcomes remains unclear. The aim of our study is to analyze the 5 years' trends, mortality rate, and factors that influence mortality after civilian penetrating TBI.

Methods: We performed a 5-year (2010-14) analysis of all trauma patients diagnosed with TBI in the Trauma Quality Improvement Program (TQIP). Patients who had penetrating mechanism of injury were included. Our outcome measures were trends of penetrating TBI and mortality rate over the 5-year period. Regression analysis was performed to determine factors associated with mortality. Sub-analysis was performed.

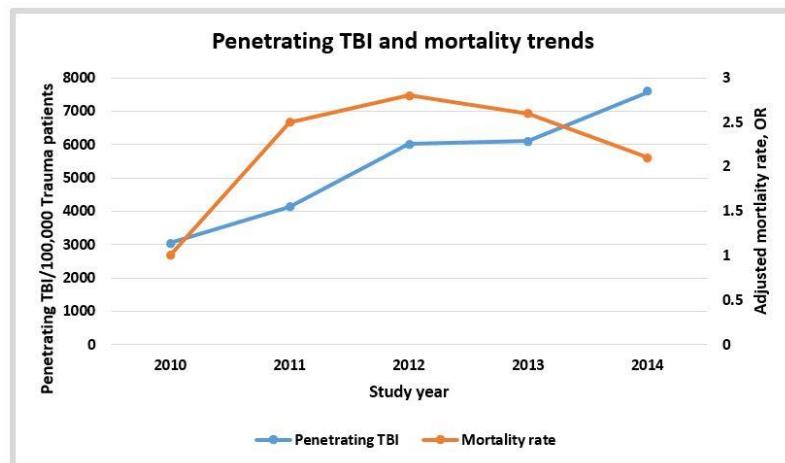
Results: A total of 26,871 had penetrating brain injury over the 5-year period. Mean age was 36 ± 16 years, 86% were males, 53% were white and 32% were African-American. Mechanism of injury was gunshot in 94.6%, of which 44% were self-inflicted. The majority of patients (62%) had severe TBI. Details of operative intervention are summarized in **Table 1**. Overall mortality rate was 34%. The incidence of penetrating TBI increased from 3,042 in 2010 to 7,578 in 2014 per 100,000 trauma patients (**Figure 1**). On regression analysis, independent predictors of mortality were pre-hospital intubation (OR: 1.9 [1.6-2.3]), penetrating injury with sharp object (non-ballistic) (OR: 1.8 [1.6-2.1]), and suicidal intent (OR: 2.1 [1.8-2.5]). Within the first 24 hours of injury, 59% of patients died, and 17% died on the second day after injury. The incidence of self-inflicted penetrating injuries and mortality rate increased with age. On sub-analysis of patients who underwent operative intervention, adjusted mortality rate was highest for patients who had severe TBI (OR: 7.8 [5.6-9.8]) (**Table 1**).

Conclusions: Incidence and mortality after civilian penetrating TBI has gradually increased over the five-year period. Self-inflicted injury and prehospital intubation were the two most significant predictors of mortality. Injury prevention awareness focused on suicide might help reduce such injuries. In addition, more than half of the deaths occurred within the first 24 hours. Early activation of organ donation protocols as well as resources focused on family support and counseling should be considered.

Table 1. Details of Operative Intervention

Intervention	Mild TBI (GCS>12) (n=8748)	Moderate TBI (GCS: 9-12) (n=1446)	Severe TBI (GCS<9) (n=16,677)	p-value
Craniotomy	8.3%	11.8%	6.5%	<0.001
Craniectomy	3.9%	11.1%	4.7%	<0.001
Lobectomy/excision of brain	4.3%	11.1%	5.3%	<0.001
Operative intervention	(n=1285)	(n=415)	(n=2482)	
Post-Op adjusted mortality rate	1(ref)	2.1 [1.7-3.2]	7.8 [5.6-9.8]	<0.001

Details of Operative Intervention



Penetrating TBI and Mortality Trends

Quick Shots Session V

Quick Shot Paper #45
January 12, 2018
9:15 am

EARLY VITAL CAPACITY PREDICTS THE NEED FOR TRACHEOSTOMY IN CERVICAL SPINAL CORD INJURIES

Kaitlin Ritter, MD, John J. Como, MD, MPH*, Michael Kavanagh,
Gregory Nemunaitis, Jeffrey A. Claridge, MD, MS*
MetroHealth Medical Center

Presenter: Kaitlin Ritter, MD

Objectives: The utility of formally using early PFT's to assist in determining the need of tracheostomy in patients with acute cervical spinal cord injuries (AC-SCI) has yet to be evaluated. This study evaluates the predictive nature of early vital capacity (VC) and need for tracheostomy in patients with AC-SCI.

Methods: An analysis of all patients with AC-SCI admitted to a level 1 trauma center during the period April 2013-April 2016 was performed. Need for tracheostomy was the primary outcome evaluated. Information including patient demographics, mechanism of injury, neurologic level of injury (NLOI) and completeness of cord injury, VC, co-existing chest injuries, and other clinical data was obtained via electronic medical records, the trauma registry, and a prospectively maintained rehabilitation database.

Results: A total of 85 patients with AC-SCI had a mean age of 55 years ($SD \pm 17$) and 67 patients were male (80%). Median ISS was 17 (IQ 16-21) and blunt mechanism accounted for 97% of injuries. VC was obtained on average 3.8 days post-injury. Of the 85 total patients, 16 (19%) underwent tracheostomy. Those who underwent tracheostomy were younger, more injured, and demonstrated a significantly lower percent of predicted VC (Table 1). A logistic regression analysis of key variables showed younger age (OR, CI 0.85-0.99, $p = 0.019$), median ISS (OR 1.32, CI 1.08-1.62, $p = 0.007$), and lower percent predicted VC (OR 0.88, CI 0.81-0.97, $p = 0.008$) as significant factors predictive of needing a tracheostomy (C statistic = 0.98).

Conclusions: Decreased percent of predicted VC, measured early in the course of hospitalization, is a strong predictor of need for tracheostomy in individuals who have sustained an AC-SCI. Early assessment of pulmonary function can be utilized to help accurately and expediently identify those in need of tracheostomy within this patient population.

Risk Factors for Tracheostomy, n=85			
	No Tracheostomy (n=69)	Tracheostomy (n=16)	p-value
Mean Age (years)	58.0 ± 14.8	42.6 ± 18.5	0.001
Male	52 (77.6%)	13 (81.3%)	1.00
Blunt Mechanism of Injury	64 (95.5%)	16 (100.0%)	1.00
Median ISS (IQR)	16.0 (16.0-20.3)	25.5 (17.8-33.8)	≤0.001
History and Comorbidities			
Current Smoker	20 (29.0%)	4 (25.0%)	1.00
COPD	3 (4.3%)	1 (6.3%)	0.57
Neurologic Injury			
NLOI (C1-C3)	41 (59.4%)	7 (43.8%)	0.28
ASIA A	9 (13.0%)	10 (62.5%)	≤0.001
Concurrent Chest Injuries			
Rib Fracture	13 (18.8%)	3 (18.8%)	1.00
Hemothorax/Pneumothorax	3 (4.3%)	4 (25.0%)	0.02
Pulmonary Contusion	1 (1.4%)	5 (31.3%)	0.001
Pneumonia (prior to tracheostomy)	1 (1.4%)	5 (31.1%)	0.001
Ventilatory Function Testing			
Mean % Predicted Vital Capacity	47.7 ± 21.5	20.7 ± 11.4	≤0.001

Table 1.

Quick Shots Session V

Quick Shot Paper #46
January 12, 2018
9:21 am

USE OF "SEPSIS ADVISOR TOOL" IMPROVES MORTALITY IN HIGH-ACUITY SEPTIC PATIENTS

Theophilus Pham, MBA, MS2, Yana Puckett, MD, MPH, MS, MBA, Steven Brooks, MD
Texas Tech University Health Sciences Center at Lubbock

Presenter: Theophilus Pham, MBA,MS2

Objectives: Surviving Sepsis Campaign Guidelines was created in an effort to reduce mortality in septic patients worldwide. Texas Tech University Medical Center, a Level 1 Trauma and Regional Burn Center, has implemented a "Sepsis Advisor Tool" (SAT) into our EMR software that allows the physician to place orders quickly based on Surviving Sepsis Campaign Bundle. We hypothesize that SAT use has helped lower the mortality rate in higher-acuity septic patients.

Methods: Electronic medical records were analyzed from January 2016 to March 2017 for cases of sepsis defined by postoperative ICD-10 code A41, J18.9, N39.0 in patients with an age range of 18-89. The cases were divided into two groups: advisor used (SAT) and not used (no SAT). Demographical data as well as data on mortality, LOS, and treatment promptness were compared between the two groups. Independent t-test was used to compare means between continuous variables and Chi-Square test was used to compare categorical variables. Binary logistic regression analysis was used to adjust for severity of illness and outcome of mortality.

Results: A total of 2,461 patients were diagnosed with sepsis between January 2016 and Marc 2017. Of these, sepsis advisor was used on 10.81% (266). Length of stay, age, and BMI comparable between the two groups. Antibiotics were administered within the first 3 hours for 62.78% (167) of SAT patients and 44.46% (976) noSAT patients ($p=0.0001$). After adjusting for age, BMI, admission lactate level, mortality risk, and illness severity, SAT patients were 79% less likely to die if their severity of illness was Grade III or IV OR=0.219; 95% CI (0.164-0.487), ($P=0.005$); and 87.5% less likely to die if their risk of mortality was either Grade III or IV OR= 0.125; 95% CI (0.07-0.222), ($P=0.02$).

Conclusions: The "Sepsis Advisor Tool" was used more frequently in higher-acuity patients, resulting in improved mortality in these patients.

	SAT (n=266)	NoSAT (n=2195)	P-Value
Age	60.89 (17.745)	58.29 (17.68)	0.993
BMI	27.89 (12.97)	27.92 (15.68)	0.656
Payer Status			0.008
Medicare	62.41% (166)	50.30% (1104)	
Medicaid	10.15% (27)	13.17% (289)	
Private Insurance	15.79% (42)	22.19% (487)	
Self-Pay	11.65% (31)	14.35% (315)	
Risk of Mortality Score			0.0001
Grade I	1.13% (2)	1.42% (22)	
Grade II	5.08% (9)	16.89% (262)	
Grade III	18.08% (32)	26.69% (414)	
Grade IV	75.71% (134)	55.00% (853)	
Severity of Illness Grade			0.0001
Grade I	0.0% (0)	1.00% (22)	
Grade II	7.89% (21)	18.27% (401)	
Grade III	42.85% (114)	35.62% (782)	
Grade IV	48.49% (129)	42.73% (938)	

Description of the study population (mean (SD) for continuous variables or n (%) for categorical variables (n=2,461).

	SAT (n=266)	NoSAT (n=2195)	P-Value
Mortality	14.66% (39)	14.67% (322)	0.997
Total Charges (U.S. Dollars)	126,421.25 (202,399.26)	101,658.35 (173,340)	0.002
Total Payments (U.S. Dollars)	19,850.2 (32,389.01)	15,824.44 (29,681.07)	0.016
Total Cost (U.S. Dollars)	30,474.24 (56174.02)	24096.30 (50,534.76)	0.008
LOS (Days)	11.14 (13.05)	9.9 (10.8)	0.025
1st Lactate Level	2.56 (1.8)	2.4 (2.1)	0.8
2nd Lactate Level	1.73 (1.72)	1.36 (2.2)	0.25
Fluid Volume Given	1722.11 (1373.36)	1542.53 (1429.14)	0.922
Fluid Volume Given ml/kg	22.31 (16.43)	19.82 (18.44)	0.362
Fluids Administered Within 1 Hour	69.92% (186)	62.59% (1374)	0.05
Fluids Administered 30 mg/kg	43.23% (115)	31.11% (683)	0.0001
Antibiotics Administered Within 3 Hours of Presentation	62.78% (167)	44.46% (976)	0.0001
Antibiotics Administered Within 1 Hour of Presentation	8.3% (22)	7.6% (167)	0.328
Length of Stay Less than 1 Day	3.4% (9)	1.0% (56)	0.912

Comparison of outcomes between patients that had “Sepsis Advisor Tool” utilized and those that did not (mean (SD) for continuous variables or n (%) for categorical variables (n=2,461).

Quick Shots Session V

Quick Shot Paper #47
January 12, 2018
9:27 am

UNSEEN BURDEN OF INJURY: POST HOSPITALIZATION MORTALITY IN GERIATRIC TRAUMA PATIENTS

Ciara R. Huntington, MD, Ronald F. Sing, DO*, Kevin Kasten, Tanushree Prasad, Amy Lincourt,
Vedra Augenstein, B. Todd Heniford
Carolinas Medical Center

Presenter: Ciara R. Huntington, MD

Objectives: This study utilizes Level I Trauma Center data and the US Social Security Death Database (SSDD) to capture long term, out-of-hospital mortality in geriatric trauma patients.

Methods: Blunt trauma patients age =65 were identified from 2009-2015 in an ACS-verified Level 1 Trauma Center registry database. With IRB approval, dates of death were queried from the SSDD using social security number and unique patient identifiers. Patients without identifiers were excluded. Demographics, injury, diagnoses, treatment, and outcomes were collected and compared with descriptive and univariate analysis; p<0.05 was significant.

Results: 6289 geriatric trauma patients were identified, age 65-105 years. Data included: average age 78.5 ± 8.4 years, 3625 (57.0%) female, 3217 (51.8%) transferred from another medical center, and median length of stay 4 days, mean 5.8 ± 11.0 . Median time to death was 225 days, mean 483 ± 575 days. 2632 patients (41.9%) died within 8 years of injury; 505 (8.0%) died as an inpatient. Overall 24.1% of patients died within 1 year after injury: 757 (12.0%) died <1 month, 488 (7.8%) between 1-6 months, and 274 (4.4%) between 6-12 months. Of those who died, 80.8% were outpatient. Of 488 patients who died within 1-6 months of trauma, only 8 were inpatient at time of death. Patients who died at 1 month after trauma had significant differences compared to survivors: older age ($p < 0.001$) lower mean Glasgow coma scale at presentation (10.8 ± 5.0 vs 14.5 ± 1.8 , $p < 0.001$), and higher Injury Severity Score (18.1 ± 11.5 vs 9.7 ± 7.0 , $p < 0.001$). Fall was the most common mechanism of injury (76%, n=4757), and only 53.5% of patients were alive at long term follow-up. Motor vehicle crash accounted for 19% of geriatric traumas, with 72.4% (n=1212) alive at long term follow-up.

Conclusions: Short term mortality rates fail to fully capture the burden of trauma on the elderly. Though 92% of geriatric trauma patients survive to discharge, almost one-quarter were dead at one year following their injury.

Quick Shots Session V

Quick Shot Paper #48
January 12, 2018
9:33 am

A SELECTIVE PLACEMENT STRATEGY FOR SURGICAL FEEDING TUBES BENEFITS TRAUMA PATIENTS

Joseph H. Marcotte, MD, Joshua P. Hazelton, DO, FACS*, Michael K. Dalton, MPH, Amber Batool, DO*, John Gaughan, Linh Nguyen, John Porter, MD*, Nicole Fox, MD, MPH, FACS*
Cooper University Hospital

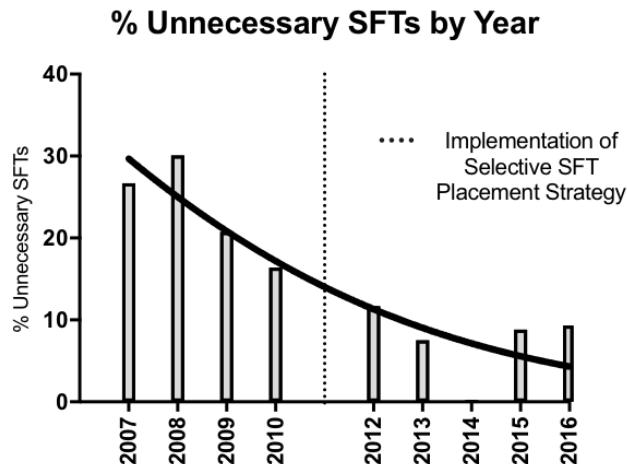
Presenter: Joseph H. Marcotte, MD

Objectives: The indications for surgical feeding tube (SFT) placement in trauma patients are poorly defined. Patient selection is critical as complications from SFTs have been reported in up to 20% of patients. A previous analysis by our group determined that nearly 25% of the SFTs we placed were unnecessary and that older patients, patients with head and spinal cord injuries, and patients who needed a tracheostomy were more likely to require long term SFTs. Following this study, we modified our institutional guidelines for SFT placement. We hypothesized that a more selective placement strategy would result in fewer unnecessary SFTs.

Methods: A retrospective review of all adult patients from 2012-2016 with an ICU LOS ≥ 4 days and a SFT placed during admission was conducted. This group was compared to our data collected prior to our change in practice (2007-2010). Data from 2011 was excluded as a washout period. “Necessary” SFT was defined per established guidelines as either daily use of the SFT through discharge or for ≥ 28 days and “unnecessary” SFT as all others. A p<0.05 was considered significant.

Results: 257 SFTs were placed from 2007-2010 and 244 from 2012-2016. Following implementation of our selective SFT placement strategy, unnecessary SFT placement decreased from 25% in 2007-2010 to 8% in 2012-2016 (p<0.0001) (Fig.1) Significant predictors of necessary SFT placement by univariate regression were: increasing age (OR 1.03/yr CI 1.01-1.04), head injury (OR 2.80 CI 1.71-4.60), cervical spinal cord injury (OR 4.42 CI 1.34-14.50), and need for tracheostomy (OR 1.41 CI 2.21-7.67). The rate of complications related to SFT placement after implementation of a selective strategy was 9%, and was highest following open jejunostomy placement (43%)

Conclusions: A selective placement strategy for surgical feeding tubes in our trauma population resulted in fewer unnecessary SFTs and a complication rate lower than most reported series.



Percentage of unnecessary SFTs by year, with Gaussian line of best fit.

Quick Shots Session V

Quick Shot Paper #49
January 12, 2018
9:39 am

PROGNOSIS OF DIFFUSE AXONAL INJURY (DAI) WITH TRAUMATIC BRAIN INJURY (TBI)

Stephen Humble, BS, MD(c), Laura Wilson, Li Wang, Drew Long, Miya Smith, Jonathan Siktberg,
Aashim Bhatia, Sumit Pruthi, Matthew Day, Mina F. Mirhoseini, MD,
Susanne Muehlschlegel, Mayur B. Patel, MD, MPH, FACS*
Vanderbilt University Medical Center

Presenter: Stephen Humble, BS, MD(c)

Objectives: To determine the prognostic impact of MRI-defined DAI after TBI on functional outcomes, quality of life, and 3-year mortality.

Methods: This retrospective single center cohort included adult trauma patients (age>17y) admitted from 2006-2012 with TBI. Inclusion criteria were positive head CT with brain MRI within 2 weeks of admission. Exclusion criteria included penetrating TBI or prior neurologic condition.

Separate ordinal logistic models assessed DAI's prognostic value for following scores: 1)hospital-discharge Functional Independence Measure (FIM); 2)long-term Glasgow Outcome Scale-Extended (GOSE); and 3)long-term Quality of Life after Brain Injury-Overall Scale (QOLIBRI-OS). Cox proportional hazards modeling assessed DAI's prognostic value for 3-year survival. Covariates included age, sex, race, insurance status, Injury Severity Score (ISS), admission Glasgow Coma Scale Score, Marshall Head CT Class, clinical DAI on MRI (Y/N), research-level anatomic DAI Grades I-III (I:cortical, II:corpus callosum, III:brainstem), ventilator days, time to follow commands, and time to long-term follow up (for logistic models).

Results: Eligibility criteria was met by 311 patients, who had a median age=40y (IQR:23-57), ISS=29 (IQR:22-38), ICU stay=6d (IQR:2-11), and follow-up=5y (IQR:3-6y). MRIs had DAI 47% clinically. Among 300 readable MRIs, 56% of MRIs had anatomic DAI (25% Grade I, 18% Grade II, 13% Grade III). On regression, only clinical (not anatomic) DAI was predictive of a lower FIM score (OR=2.7 [95% CI:1.39-5.26], P=0.003). Neither clinical nor anatomic DAI were related to survival, GOSE, or QOLIBRI scores.

Conclusions: In this longitudinal cohort, clinical evidence of DAI on MRI may only be useful for predicting short-term in-hospital functional outcome. Given no association of DAI and long-term TBI outcomes, providers should be cautious in attributing DAI to future neurologic function, quality of life, and/or survival.

Quick Shots Session V

Quick Shot Paper #50
January 12, 2018
9:45 am

EMERGENT TRANSFUSION IN LEVEL 1 TRAUMA PATIENTS: ARE WE PULLING THE TRIGGER TOO SOON?

Adrian A. Coleoglou Centeno, MD, Kelly Bochicchio, Qiao Zhang, ROHIT K Rasane, MBBS, MS,
Jarot Guerra, MD, Marlon Torres, Chris Horn,
Douglas J.E. Schuerer, MD, FACS*, Grant V. Bochicchio, MD, MPH*
Washington University in St. Louis

Presenter: Adrian A. Coleoglou Centeno, MD

Objectives: Recent studies suggest that early transfusion (TX) of packed red blood cells (PRBCs) saves lives and improves outcome in severely injured trauma patients. However, as with any strategy that aims to improve outcome, there may be a tendency to "pull the trigger" too soon. Our objective was to determine the incidence of unnecessary TXs of PRBCs in high risk trauma patients.

Methods: We prospectively enrolled all Level 1 trauma patients admitted over 1 year who received at least 1 unit of PRBCs and/or were taken emergently to the OR for bleeding control within 2 hours of injury. Patients were stratified into 3 TX categories: 1) Clinically necessary 2) Unnecessary 3) No TX. Unnecessary TX was defined on a case by case basis which included whether there was truly a clinical need for blood TX based on injury and pre/post TX hemoglobin. Outcomes evaluated included infection, hospital, ICU and ventilator days and mortality.

Results: 140 patients were enrolled. 97 (69%) patients received a clinically necessary TX compared to 25 patients (18%) who received no TX. The remaining 18 patients (13%) were evaluated and considered to have been unnecessarily transfused and received a mean number of 2.9 Units of PRBCs. We compared outcome in patients in the unnecessary TX group to the no TX group. There was no significant difference in age (mean = 28.5 years), gender (91% male), mechanism (penetrating = 95%) or ISS (mean = 18) between the 2 groups. Unnecessarily TX patients were more likely to be admitted to the ICU [72% vs. 40% ($p < 0.03$)] and had more ICU days [2.7 days vs. 0.88 ($p < 0.03$)]. There was no significant difference in hospital days, infection rate and sepsis.

Conclusions: 13% of high risk level 1 trauma patients received an immediate unnecessary blood TX which has a potential to have a significant impact on outcome and resource utilization. Further research is needed to determine more appropriate TX triggers.

Quick Shots Session V

Quick Shot Paper #51
January 12, 2018
9:51 am

IMPROVED SEPSIS OUTCOMES IN ELDERLY FEMALES

Julie A. Stortz, MD, Hiroyuki Horiguchi, Steven Raymond, Ricardo Ungaro, Marvin Dirain, Dina Nacionales, Gabriela Ghita, Zhongkai Wang, Tezcan Ozrazgat-Baslanti, PhD, Babette Brumback, Scott C Brakenridge, MD, MSCS, FACS*, Alicia M. Mohr, MD*, Frederick Moore, MD*, Lyle L. Moldawer, PhD, Philip Efron, MD*
University of Florida

Presenter: Julie A. Stortz, MD

Objectives: Whether female gender and estrogen status confer protection against sepsis-related mortality is a topic of considerable debate. We sought to determine the influence of sex and age-related differences on clinical outcomes as well as the genomic and inflammatory responses after surgical sepsis.

Methods: This prospective observational cohort study followed 173 patients with severe sepsis or septic shock (CMS definition) to assess for gender-related differences in sepsis outcomes, serum cytokines, plasma proteins, and total blood leukocyte transcriptomic response. Serial blood samples were collected at intervals between 0.5 and 28 days after sepsis protocol onset.

Results: Seventy-two patients (42%) were female. Although there were no significant differences in age, race, BMI, comorbidities, or APACHE II scores between genders, males were more likely to present in septic shock (54% vs 36%, p=0.03). Males also exhibited higher rates of post-sepsis organ failure (64% vs 49%, p=0.04), chronic critical illness (ICU LOS>14 days plus ongoing organ dysfunction)(57% vs 36%, p=0.02) and post-discharge mortality at 1 year (33% vs 18%, p=0.04). Subanalysis of age within the two gender populations revealed that improved survival in women was limited to elderly females (≥ 55 yrs) and could not be explained by alterations in serum cytokines or biomarkers (IL-6, IL-8, IL-10, and sPD-L1). There was no mortality difference between young (<55 years) males and females. Transcriptomic analysis within the aged populations at 0.5 and 1 days revealed 50 genes that were differentially expressed between septic males and females, 19 of which were sex-linked (p<0.001).

Conclusions: The protective effect of female gender in sepsis is limited to post-menopausal elderly women, thus may be independent of sex hormone status. In the advent of precision medicine, post-sepsis immunomodulation will require a better understanding of the mechanisms underlying these sex-related differences.

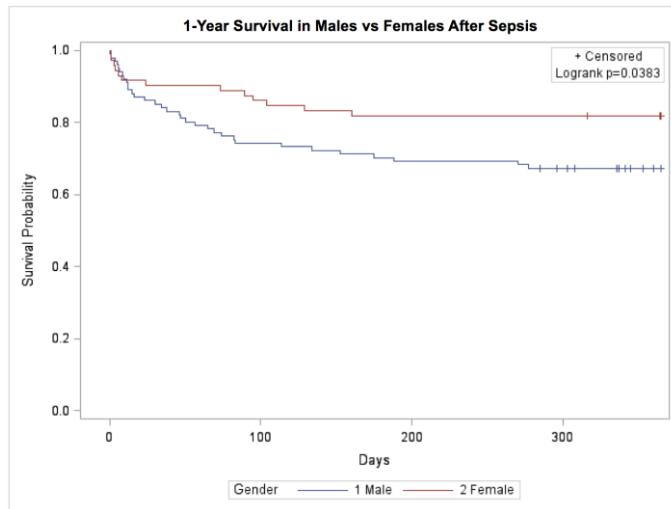


Figure 1. One-year mortality in male vs female patients of all ages with severe sepsis or septic shock. This Kaplan-Meier survival curve shows that male sepsis patients have a higher 1-year mortality. Conversely, females experience improved survival ($p=0.0383$), with the greatest differences between genders in the aged (male and female patients ≥ 55 yrs, data not shown).

Quick Shots Session V

Quick Shot Paper #52
January 12, 2018
9:57 am

BLUNT CEREBRAL VASCULAR INJURY IN ELDER FALL PATIENTS: ARE WE SCREENING ENOUGH AND IS IT WORTH THE RISK

Vince Anto, BS, Andrew B. Peitzman, MD*, Brian Zuckerbraun, Matthew Neal, Gregory A Watson, MD*, Timothy Billiar, MD, Jason L. Sperry, MD, MPH*
University of Pittsburgh Medical Center

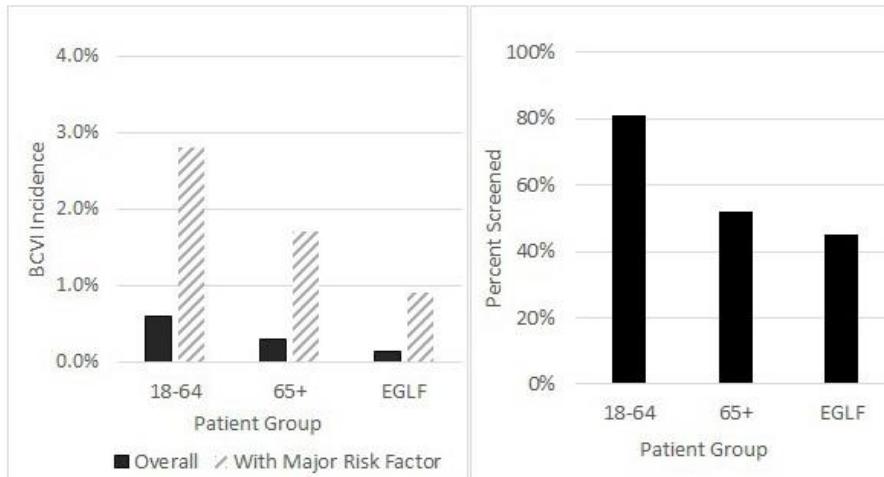
Presenter: Vince Anto, BS

Objectives: Blunt cerebrovascular injuries (BCVI) are generally associated with high-energy injuries. Less is known regarding lower-energy injuries and the risks attributable to screening with intravenous contrast in the elderly. We sought to characterize current BCVI screening practices and associated complications in elderly ground level fall patients (EGLF, =65 years). We hypothesized that BCVI in EGLF patients would be frequent and screened less commonly due to anticipated risks.

Methods: A retrospective study was performed utilizing the National Trauma Data Bank (NTDB, 2007-2014) and single institution data. BCVI risk factors and diagnosis were determined by ICD9 codes and chart review. Presenting creatinine and eGFR, incidence of kidney injury (AKI), and clinical course were obtained by chart review. The NTDB dataset was used to determine the incidence of BCVI and outcomes in the EGLF cohort, local chart review focused on screening complications.

Results: The incidence of BCVI in EGLF patients was 0.14% overall and 0.9% in those with at least one BCVI risk factor. These rates were comparable to those =65 years and age 18-64 years (figure). In EGLF patients, the diagnosis of BCVI was an independent risk factor for mortality (OR-2.1, 95% C.I. 1.6-2.6). Over the same period the institutional data had a BCVI incidence of 0.3% (n=4,603) and 2.7% in those with at least one risk factor (n=451). EGLF patients had a significantly lower rate of BCVI screening (45%, figure). Only 8% of EGLF patient not screened had documented contraindications. The incidence of AKI was 9% irrespective of BCVI screening.

Conclusions: The incidence of BCVI is common in EGLF patients and an independent predictor of mortality. Screening is less common in EGLF patients despite few contraindications. This data suggests that using age and injury mechanism to omit BCVI screening in EGLF patients may exclude an at-risk population.



Incidence of BCVI in NTDB dataset and screening rates from local institution data

Quick Shots Session V

Quick Shot Paper #53
January 12, 2018
10:03 am

LIMITED PRE-HOSPITAL CRYSTALLOID ADMINISTRATION IS ASSOCIATED WITH A DECREASED INCIDENCE OF ARDS: A SECONDARY ANALYSIS OF THE PROPPR TRIAL

Aravind K. Bommiasamy, MD, Elizabeth Dewey, Todd Graham, James Murphy, John B. Holcomb, MD*,
Eileen M. Bulger, MD, Charles E. Wade, PhD, Kenji Inaba, MD, Martin A. Schreiber, MD, FACS*
Oregon Health and Science University

Presenter: Aravind K. Bommiasamy, MD

Objectives: Crystalloid administration is relied heavily upon to treat hemorrhagic shock in the pre-hospital setting. Current evidence suggests that aggressive fluid administration is detrimental and leads to worse outcomes. We hypothesize that patients who receive limited fluid resuscitation in the pre-hospital setting would have improved outcomes.

Methods: Trauma patients admitted to 12 Level I North American trauma centers were studied. Patients were divided into 3 groups, no pre-hospital crystalloid fluid, low pre-hospital fluid (1-250mL), and high pre-hospital fluid (>250mL). Propensity scores were created and added to subsequent analysis to balance for potentially confounding variables between patients in different fluid groups. Cox proportional hazards clustering on site compared 30-day survival between groups. Logistic regression evaluated 3, 6 and 24 hour mortality and complications.

Results: 392 (58%) patients met inclusion criteria for analysis. Patients who received high amounts of fluid (n=231) had longer transport times, lower Glasgow Coma Scale, and higher incidence of traumatic brain injury (Table 1). Patients who received low fluids (n=65) were less likely to develop Acute Respiratory Distress Syndrome (ARDS) compared to patients who received no fluids (n=96) or high fluids (Table 2). This did not translate to improved mortality when comparing low fluid administration to no fluid or high fluid administration. There were no differences in rates of acute kidney injury, multiple organ failure or sepsis between the 3 groups.

Conclusions: Crystalloid resuscitation has been shown to lead to worse outcomes in trauma patients. Low fluid administration was found to be associated with decreased risk of developing ARDS when compared to no fluid and high fluid. However, in patients predicted to receive a massive transfusion, fluid administration did not impact mortality.

	High Fluid (>250mL) (n=231)	Low Fluid (1-250mL) (n=65)	No Fluid (0 mL) (n=96)	p*
Table 1				
Age, Mean(Standard Deviation)	39.37(18.14)	37.32(16.66)	38.93(16.43)	0.71
Transport Time, Mean(Standard Deviation)	39.06(22.87)	24.77(12.23)	26.04(13.65)	<0.01
Injury Severity Score, Mean(Standard Deviation)	33.23(12.51)	34.45(12.27)	32.7(12.05)	0.67
Glasgow Coma Scale ,Mean(Standard Deviation)	8.95(5.61)	10.57(5.24)	10.57(5.00)	0.01
TBI (%)	54.55	38.46	43.75	0.03
1:1:1 Treatment Group	46.32	50.77	56.25	0.25
Geriatric Patient (%)	8.66	7.69	9.38	0.93
Blunt Injury (%)	58.44	52.31	56.25	0.31
Hypotension on Admission (%)	48.48	43.08	46.88	0.74
Tachycardia on Admission (%)	73.59	69.23	68.75	0.60
ARDS (%)	22.08	9.23	15.63	0.03
Ground Transport (%)	69.26	86.15	84.38	<0.01
Total Fluids (L),median (IQR)	0.00(0.00)	0.20(0.10)	1.00(1.00)	<0.01

*p value calculated using F-test, Kruskal-Wallis H test, or χ^2

Table 1. Baseline characteristics. Hypotension was defined as a SBP < 100. Tachycardia was defined as a Pulse > 100. TBI was based on AIS head ≥ 3 or GCS ≤ 8 .

Table 2	OR(95%CI)	p*
3-hour mortality (high vs none)	0.68(0.20,2.26)	0.51
3-hour mortality (low vs none)	1.33(0.49,3.64)	0.56
3-hour mortality (high vs low)	0.51(0.19,1.39)	0.18
6-hour mortality (high vs none)	0.68(0.40,1.17)	0.16
6-hour mortality (low vs none)	0.76(0.36,1.57)	0.44
6-hour mortality (high vs low)	0.91(0.52,1.59)	0.72
24-hour mortality (high vs none)	0.87(0.44,1.69)	0.66
24-hour mortality (low vs none)	1.53(0.83,2.81)	0.16
24-hour mortality (high vs low)	0.57(0.31,1.03)	0.06
ARDS (high vs none)	0.95(0.54,1.69)	0.85
ARDS (low vs none)	0.45(0.20,0.99)	<0.05
ARDS (high vs low)	2.13(1.11,4.09)	0.02
AKI (high vs none)	1.31(0.66,2.60)	0.42
AKI (low vs none)	1.07(0.34,3.34)	0.91
AKI (high vs low)	1.23(0.58,2.61)	0.57
MOF (high vs none)	1.14(0.33,3.96)	0.83
MOF (low vs none)	0.77(0.18,3.24)	0.71
MOF (high vs low)	1.49(0.43,5.14)	0.51
Sepsis (high vs none)	1.13(0.64,2.01)	0.65
Sepsis (low vs none)	0.74(0.41,1.35)	0.31
Sepsis (high vs low)	1.53(0.86,2.72)	0.14

*p calculated using multivariate logistic regression or Cox proportional hazard model

Table 2. Multivariate logistic regression model for complications.

Quick Shots Session V

Quick Shot Paper #54
January 12, 2018
10:09 am

MULTICENTER STUDY OF CRYSTALLOID BOLUSES AND TRANSFUSION IN PEDIATRIC TRAUMA - WHEN TO GO TO BLOOD?

Stephanie F. Polites, MD, Rachel M. Nygaard, PhD, Martin D. Zielinski, MD, FACS*, Chad J. Richardson, Donald Dean Potter, MD*, Denise B. Klinkner, Christopher Moir, MD*
Mayo Clinic

Presenter: Stephanie F. Polites, MD

Objectives: The 9th edition of ATLS recommends up to three crystalloid boluses in pediatric trauma patients with consideration of transfusion after the second bolus however this approach is debated. We aimed to determine if nonresponse to incremental crystalloid boluses is associated with transfusion in injured children.

Methods: 2010-2016 highest tier activation patients <15 years of age from two ACS Level I pediatric trauma centers were identified from prospectively maintained trauma databases. Those with a shock index (heart rate/systolic blood pressure) >0.9 were included. Crystalloid boluses (20 ± 10 cc/kg) and transfusions administered prehospital and within 12 hours of hospital arrival were determined. Univariate and multivariable analyses were conducted to determine association between crystalloid volume and transfusion.

Results: Among 208 patients, the mean age was 5 ± 4 years (60% male), 91% sustained blunt injuries, and median (IQR) ISS was 11 (6,25). 29% received one bolus, 17% received two, and 10% received at least three. Transfusion of any blood product occurred in 69 (18%) patients; mean (range) RBC was 23 (0-89) cc/kg, plasma 8 (0-69), and platelets 1 (0,18). The likelihood of transfusion increased logarithmically from 11% to 43% for those requiring ≥ 2 boluses (Figure 1). This relationship persisted on multivariable analysis that adjusted for institution, age, and shock index with good discrimination (AUROC 0.84). Shock index was also strongly associated with transfusion (Table 1).

Conclusions: Almost half of pediatric trauma patients with elevated shock index require transfusion following two crystalloid boluses and the odds of requiring a transfusion plateau at this point in resuscitation. This supports consideration of blood after the second bolus in conjunction with shock index though prospective studies are needed to confirm this and evaluate the impact on outcomes.

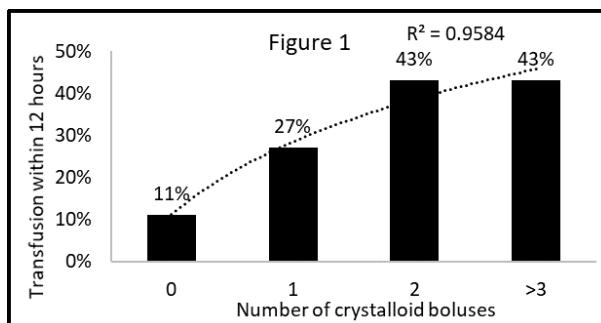


Table 1: Multivariable analysis of characteristics associated with transfusion

Patient Factor	Odds Ratio	Confidence Interval	p value
Number of crystalloid boluses (vs <1)	1	2.28	0.91-5.86
	2	6.07	2.31-16.68
	3	4.28	1.30-14.08
Shock Index Quartile (vs 0.9-1.0)	>1.0-1.2	8.43	2.04-34.85
	>1.2-1.5	25.00	7.10-87.91
	>1.5	18.15	4.92-67.02

*Also adjusted for institution and age