

Quick Shots

Quick Shots Session I - Clinical Trauma

Quick Shot #1
January 11, 2017
4:30 pm

TRANSFUSION OF CRYOPRESERVED RED BLOOD CELLS IMPROVES TISSUE OXYGENATION IN OBESE TRAUMA PATIENTS

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Nicole T. Gordon, David T. Martin, Elizabeth A. Rick, Rondi Dean, BS, CVT,
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Presenter: Belinda H. McCully, PhD

Discussant: Amy Makley, MD, University of Cincinnati

Objectives: Poor tissue oxygenation (StO₂) is associated with morbidity and mortality in obese trauma patients. A novel treatment could be the transfusion of cryopreserved red blood cells (CRBCs), which biochemically favors RBC function. We hypothesized that CRBC transfusion improves StO₂ in obese trauma patients.

Methods: 213 stable trauma patients at five Level 1 trauma centers who required RBC transfusion were randomized to receive 1-2 units of liquid RBCs (LRBCs) or CRBCs. Demographics, injury severity, StO₂, outcomes, and biomarkers of RBC function were statistically compared in non-obese (BMI<30) and obese (BMI≥30) patients. A subanalysis compared moderately obese (BMI 30-34.9) to severely-obese (BMI≥35) patients. StO₂ was normalized and expressed as % change following RBC transfusion. p<0.05 indicated significance.

Results: Non-obese (BMI<30, n=127) and obese (BMI≥30, n=86) patients had similar ISS, GCS, and baseline StO₂. Following LRBC or CRBC transfusion, StO₂ was similar in non-obese patients. StO₂ improved in obese patients who received CRBCs versus LRBCs, with the greatest difference occurring 8hrs following transfusion (CRBC: 104±1% vs LRBC: 99±1%, p<0.05). Free hemoglobin (a biomarker of hemolysis) was lower in obese patients following CRBC (125 (72-259) µg/ml) versus LRBC transfusion (230 (178-388) µg/ml; p<0.05). Improved StO₂ following CRBC transfusion was prevalent in the severely obese patients (BMI≥35) starting at 5hrs following transfusion (Figure 1, p<0.05). Pulmonary embolism was higher in severely obese patients versus non-obese who received CRBCs (19% vs 0%, p=0.008), but similar to severely-obese patients who received LRBCs (19% vs 8%; p=0.207). All other adverse outcomes were similar between groups.

Conclusions: CRBC transfusion improves StO₂ in obese trauma patients. Future studies are needed to determine if CRBC transfusion in obese patients attenuates hemolysis to improve StO₂, and improves clinical outcomes following larger volume transfusions.

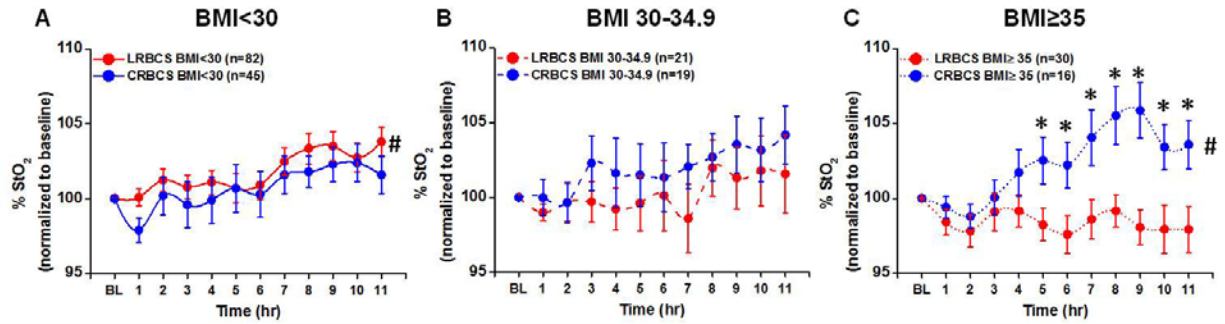


Figure 1. StO₂ (% change from baseline) following transfusion of LRBCs (red) or CRBCs (blue) in non-obese (BMI < 30), obese (BMI 30-34.9) and severely-obese (BMI ≥ 35) trauma patients.
#p < 0.05 over time, *p < 0.05 vs LRBC at each time point.

Quick Shots Session I - Clinical Trauma

Quick Shot #2
January 11, 2017
4:36 pm

SURGICAL RESIDENTS' INTERPRETATION OF DIAGNOSTIC RADIOLOGIC IMAGING IN THE TRAUMATICALLY INJURED PATIENT

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Presenter: Elias Fakhoury, DO

Discussant: Michael J. Anstadt, MD, Loyola University Medical Center

Objectives: Senior surgical residents are of paramount importance in directing further therapeutic modalities based on their interpretation of critical diagnostic imaging. We propose that senior surgical residents are proficiently able to interpret all diagnostic radiologic imaging studies in the traumatically injured patient.

Methods: A prospective cohort study was performed comparing surgery resident interpretations of computerized tomography (CT) scans of the head, maxillofacial bones, spine (cervical, thoracic, lumbar), chest, abdomen, pelvis, and chest X-rays versus final radiologists' reports of trauma patients at a level II trauma center from September 2014 to May 2015. Statistical analysis was performed on data collected and analysis of variance (ANOVA) testing was used to make multiple comparisons of the data.

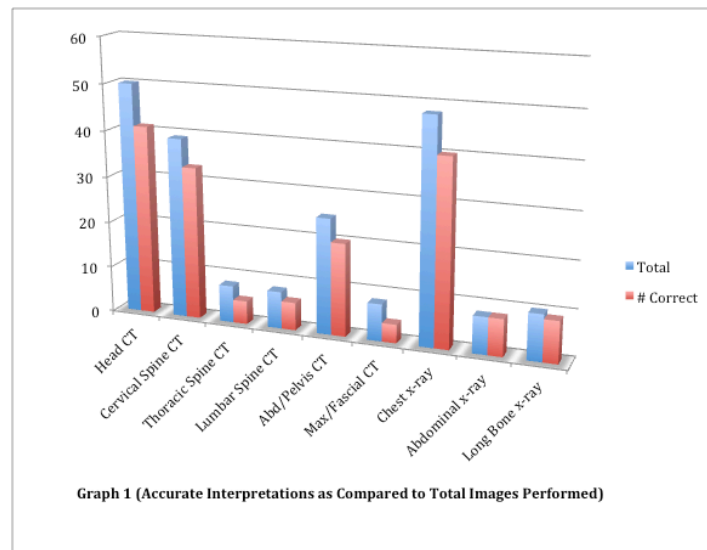
Results: There was a combined 951 trauma alerts activated in the time period stated above. Of these 951 activations, 860 met our specified age inclusion criteria (age>18). There were a total of 204 images included with an overall accuracy of 81.3%. Senior surgical residents were more than 70% successful interpreting 7 out of 9 categories of imaging. Senior surgical residents achieved an accuracy of 84.6%, 62.5% and 75% in the cervical, thoracic and lumbar spine categories, respectively. Residents interpreted 41 of 50 CT scans of the head correctly. Maxillofacial CT scans proved to be the weakest category for the senior surgical residents, with only 50% being read accurately. In regard to CT scans of the abdomen and pelvis, senior surgical residents were 80% proficient. Abdominal x-rays were read correctly in all instances and chest x-rays 83.3%.

Conclusions: Senior surgical residents are capable of interpreting all critical images obtained in the trauma setting. When discordance existed with attending radiologists' interpretation, it did not change the clinical outcome of trauma patients.

	Total Images	Concordant	Discordant	Overall Correct (%)
Cervical Spine CT	39	33	6	84.60%
Thoracic Spine CT	8	5	3	62.50%
Lumbar Spine CT	8	6	2	75%
Head CT	50	41	9	82%
Abdomen/Pelvis CT	25	20	5	80%
Max/Facial CT	8	4	4	50%
Chest x-ray (CXR)	48	40	8	83.30%
Abdominal x-ray (AXR)	8	8	0	100%
Long Bone x-ray	10	9	1	90%

Table 1 (Percentage of Resident Reads in Concordance with Radiologists by Type of Image)

Percentage of Resident Reads in Concordance with Radiologists by type of image.



Accurate Interpretations as Compared to Total Images Performed.

Quick Shots Session I - Clinical Trauma

Quick Shot #3
January 11, 2017
4:42 pm

MILD TBI IS NOT 'MILD'... SURVIVORS TELL THEIR COMPLICATED STORIES

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Samuel M Galvagno, DO, PhD*, Jennifer Kidd, Gordon Smith
R Adams Cowley Shock Trauma Center, University of Maryland School of Medicine

Presenter: Maureen McCunn, MD, MIPP, FCCM

Discussant: Oliver L. Gunter, Jr., MD, Vanderbilt University

Objectives: Patients with isolated mild traumatic brain injury (TBI) are not routinely followed after initial treatment but may have symptoms of post-concussive syndrome. Mild *complicated* TBI (mcTBI) [GCS 13-14, + head CT findings, AIS > 2, and persistence of symptoms] is poorly studied. The objective of this pilot study is to collect preliminary data on patients' symptoms following discharge for isolated mcTBI.

Methods: A prospective, cross-sectional, longitudinal survey identified 142 mcTBI patients meeting study criteria from Sep-Dec 2014. Screening was conducted via medical charts, public records, and an obituary search. Subjects were called 3-6 months after injury and administered the Health Utilities Index, EuroQual 5D, SF-12 and a pain score. A 1-year follow-up interview was conducted for patients who indicated they were experiencing symptoms during the initial interview.

Results: Of eligible patients, 25 were excluded for dementia, mental disease, homelessness, or non-English speaking; 28 were excluded for receiving surgery and 2 were deceased. "Opt-out" letters were sent to 87 patients: 5 letters were returned to sender and 8 patients declined. Patients were contacted up to 3 times; 25 initial and 10 follow-up interviews were completed. Over 60% (n=16) of patients in the initial cohort reported symptoms up to 6 months following injury (Table 1). Of these patients, 80% (n=8) had continued symptoms at 1-year follow-up (Table 2). Some required changes to daily living, including utilization of a cane or cessation of driving and employment. Symptomatic patients were referred to neurosurgery clinic for further follow-up.

Conclusions: These pilot data suggest that for many patients with mcTBI, symptoms persist for at least a year. Depression and/or anxiety are common, but physical disability is also reported. Although a small sample size, our data have led us to design programs for long-term care to address our patients' unmet needs.

Table 1. Symptoms described by patients 6 months or more following mcTBI (Total cohort = 25)

Any symptom	64% (n=16)
Health worse than before injury	44%
Depression and/or anxiety	36%
Dizziness, nausea, head or neck pain	32%
Increase in disability following injury	20%
Memory loss	12%

Table 2. Symptoms described by patients at 1-year follow-up (Sub-cohort = 10)

Any symptom	80% (n=8)
Health worse than before injury	10%
Health worse than 6 months after injury	40%
Depression and/or anxiety	70%
Dizziness, nausea, head or neck pain	40%
Increase in disability following injury	10%
Increase in disability from 6 months after injury	10%
Memory loss	20%

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Quick Shot #4
January 11, 2017
4:48 pm

A PROSPECTIVE STUDY OF 7-YEAR EXPERIENCE OF USING PERCUTANEOUS 14-FRENCH PIGTAIL CATHETER FOR TRAUMATIC HEMOTHORAX AT A LEVEL 1 TRAUMA- SIZE STILL DOES NOT MATTER

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The University of Arizona

Presenter: Zachary M. Bauman, DO, MHA

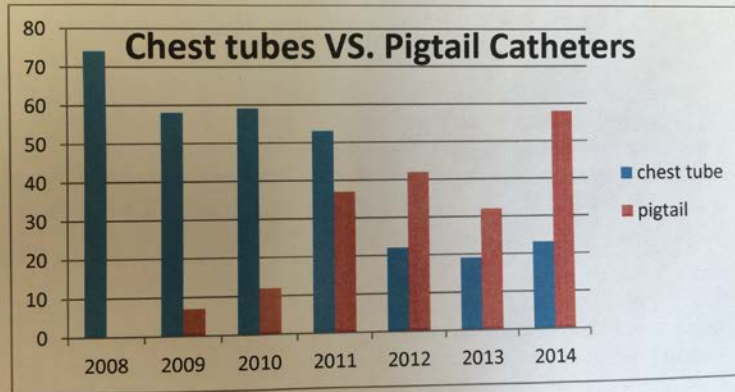
Discussant: Travis M. Polk, MD, Naval Medical Center Portsmouth

Objectives: We have previously shown that 14-French (F) pigtail catheters (PCs) work equally as well as the standard 32-40F chest tubes (CTs) for managing patients with traumatic hemothorax (HTX) and/or hemo-pneumothorax (HPTX) but with less insertion pain. We now reported our increased experience and the outcomes in using PCs.

Methods: We analyzed our ongoing PC database for all trauma patients who required chest drainage from 2008 to 2014. We included only trauma patients who required chest drainage for HTX or HPTX. Outcomes of interest, comparing PCs to CTs, were initial drainage output, tube days, failure rate defined as another procedure intervention, and tube insertion-related complications. We also studied the trend in our PC usage.

Results: During the 7-year period, 496 trauma patients required chest drainage for HTX/HPTX; 308 by CTs and 188 by PCs. PC patients were older (52 ± 21 vs. 42 ± 19 , $P < .001$) and suffered more blunt trauma (86% vs. 56%, $P = < .001$). PCs had higher initial drainage output (430 cc vs. 300 cc, $P < .001$) and shorter tube days (4 days vs. 5 days, $P < .001$). Failure rate (21% PCs vs. 24% CTs, $P = 0.42$) and insertion-related complications (7% PCs vs. 5% CTs, $P = 0.23$) were similar. The graph demonstrates our increased PC usage ($P < .001$) over the years.

Conclusions: PCs had similar outcomes to CTs in terms of failure rate and tube insertion-related complications. A future multi-center study is needed.



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Quick Shot #5
January 11, 2017
4:54 pm

VTE PROPHYLAXIS WITH LOW MOLECULAR WEIGHT HEPARIN IS PROTECTIVE FOR MORTALITY IN TRAUMA PATIENTS

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University of Michigan

Presenter: Benjamin N. Jacobs, MD

Discussant: Steven Allen, MD, Penn State University

Objectives: Venous thromboembolism (VTE) is a common complication in trauma patients. Pharmacologic prophylaxis is used in trauma patients to reduce risk of a VTE event. American College of Chest Physicians and Eastern Association for the Surgery of Trauma both recommend use of Low Molecular Weight Heparin (LMWH) as the preferred agent in these patients. There is literature suggesting that Unfractionated Heparin (UFH) is an acceptable, and less costly, alternative VTE prophylaxis agent with equivalent efficacy.

Methods: We conducted an analysis of Michigan Trauma Quality Improvement Program (MTQIP) data from January, 2012 to December, 2014. The data set contains information on date, time, and type of first dose of VTE prophylaxis. 37,868 patients from 23 hospitals were present in the data set with an ISS ≥ 5 and hospitalization >24 hrs. Patients were excluded if they died within 24 hrs, received agents other than UFH or LMWH or no pharmacologic VTE prophylaxis while admitted. The analysis cohort consisted of 18,010 patients. We compared patients receiving LMWH to UFH. Outcomes were VTE, Pulmonary Embolism (PE), Deep Vein Thrombosis (DVT), and in-hospital mortality. We used a generalized estimating equations approach to fit population-averaged logistic regression models with type of first dose of VTE prophylaxis as the independent variable. UFH was used as the reference value. Timing of first dose of VTE prophylaxis was entered into the model in addition to standard covariates.

Results: Patients administered LMWH had a decreased risk of mortality, VTE, PE and DVT when compared to UFH following risk-adjustment. Odds ratios are presented in Table 1.

Conclusions: In our examination of VTE prophylaxis drug effectiveness, we found LMWH to be superior to UFH in reducing incidence of mortality and VTE among trauma patients. Therefore LMWH should be the preferred prophylaxis agent for use in hospitalized trauma patients.

Table 1: Adjusted Odds Ratios for Primary Outcomes				
Outcome	N	OR	95% CI	p-value
Venous Thromboembolic Event	18,010	0.67	0.53 - 0.84	0.001
Pulmonary Embolism	18,010	0.52	0.35 - 0.78	0.001
Deep Venous Thrombosis	18,010	0.73	0.57 - 0.95	0.02
Mortality	18,010	0.63	0.49 - 0.81	<0.001

Table 1: Adjusted Odds Ratios for Primary Outcomes

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Quick Shot #6
January 11, 2017
5:00 pm

A METRIC OF OUR OWN: FAILURE TO RESCUE IN TRAUMA

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Hospital of the University of Pennsylvania

Presenter: Daniel N. Holena, MD, MSCE

Discussant: Andrew B. Peitzman, MD, University of Pittsburgh Medical Center

Objectives: Failure to rescue (FTR) is defined as death after a complication. Derived in elective surgical populations, the original metric includes all deaths, assuming that even those without recorded complications resulted from unrecorded complications. This approach lacks validity in trauma because patients may die as a direct result of injury. Another common approach simply excludes deaths without recorded complications, but this approach reduces the reliability of the metric. We hypothesized that a hybrid metric excluding expected deaths but including unexpected deaths without recorded complications in FTR analysis would improve reliability relative to simple exclusion of these cases.

Methods: Using 3 years of single-state adult trauma registry data from 30 trauma centers, we constructed 2 FTR metrics: 1.) FTR Excluding all deaths not preceded by complications analysis (FTR-E), and 2.) FTR Trauma (FTR-T), including deaths not preceded by complications in FTR analysis except those with predicted mortality >50%, maximum abbreviated injury score of 6, or <24hrs after admission. Mortality, complication, and FTR rates were calculated for each measure and reliability was tested using Spearman's correlation for split-sample center rankings.

Results: A total of 89,780 patients were included (median age 49(IQR 26-73), 82% Caucasian, 60% male, 87% blunt, median ISS 9 (IQR4-13)). FTR rates varied by metric (FTR-E: 11.21%; FTR-T 15.36%), as did the proportion of deaths preceded by complications (FTR-E 28%; FTR-T: 100%; table 1). Split-sample reliability was higher FTR-T ($\rho=0.48$, $p=0.012$) than FTR-E ($\rho=0.27$, $p=0.17$); figure.

Conclusions: A trauma-specific metric increases reliability relative to simply excluding deaths without recorded complications but avoids unfairly penalizing centers caring for patients expected to die. Measurement of FTR rates in trauma should use a metric designed for this cohort.

FAILURE TO RESCUE METRIC	Alive	Dead (%)	Total	Precedence rate
FTR-E				0.28
Excluding deaths not preceded by complications (n=2890)				
No Recorded Complications	77,337	2,809 (3.50%)	80,146	
Complications	8,554	1,080 (11.21%)	9,634	
Total	85,891	3,889 (4.33%)	89,780	
FTR-T				
1.) Excluding expected deaths				
Predicted probability of mortality $\geq 50\%$ (n=1,748)				
AIS=6 (n=4)				
Died in <24 hours (n=589)				
No Recorded Complications	77,337	740 (0.95%)	78,077	0.52
Complications	8,554	812 (8.67%)	9,366	
Total	85,891	1,552 (1.77%)	87,443	
2.) Reclassifying deaths without recorded complications as FTR events				1.00
No Recorded Complications	77,337	0 (0.0%)	77,337	
Complications	8,554	1,552 (15.36%)	10,106	
Total	85,891	1552 (1.77%)	87,443	

Table: Composition, classification, and precedence (proportion of deaths preceded by complication) rates of candidate FTR metrics in a statewide trauma cohort.

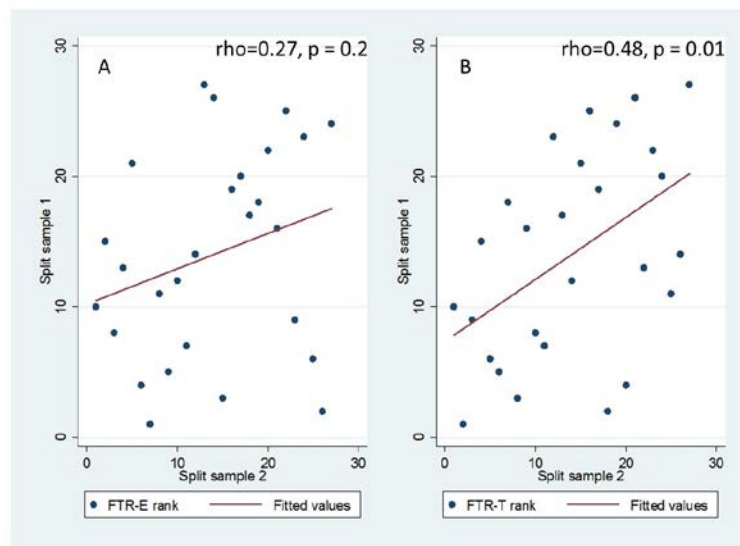


Figure: Split-sample reliability rankings of 30 level I and level II trauma centers for (A) FTR-E (excluding all deaths without recorded complications from FTR analysis) and (B) FTR-T (excluding expected deaths but otherwise including deaths without complications in FTR analysis).

Quick Shots Session I - Clinical Trauma

Quick Shot #7
January 11, 2017
5:06 pm

CAN WE BE FASTER? FAST EXAMINATION AFTER ROLLING TO THE RIGHT DRAMATICALLY INCREASES SENSITIVITY

Danielle A. Pigneri, MD, Paul Granet, MD*
Guthrie Clinic/Robert Packer Hospital

Presenter: Danielle A. Pigneri, MD

Discussant: Ashley Menne, MD, R Adams Cowley Shock Trauma Center

Objectives: Our objective is to determine if gravity can be used to improve the sensitivity of the FAST examination. We hypothesize that rolling patients onto their right will encourage accumulation of small volumes of fluid into the deepest area of the abdomen, leading to increased sensitivity.

Methods: We designed a small pilot study to test our hypothesis. After gaining IRB approval, peritoneal dialysis (PD) patients at our community hospital were recruited for voluntary participation. After obtaining informed consent, they were drained of residual dialysate. Each participant underwent a FAST exam. He was rolled onto his right side for 30 seconds. He was then rolled supine and a new FAST exam (FASTeR, FAST exam after Right roll) performed. 50cc of dialysate was placed into the abdomen via the PD catheter. FAST and FASTeR were then repeated. 50cc aliquots of dialysate were added to the abdomen followed by repeat FAST/FASTeR exams until a positive exam occurred. A single conversion to positive FASTeR study after negative FAST would be considered a significant finding worth investigating with further research. All FAST and FASTeR exams were performed in 2015 by the same sonographer to eliminate variation in skill level.

Results: Seven total participants were recruited. One participant was found to have an equivocal examination secondary to body habitus and polycystic kidneys. Of the remaining six participants, none converted to a positive FAST examination following addition of fluid. Rather, all six participants converted to a positive FASTeR examination at the same volume of intra-abdominal fluid at which they had a negative standard FAST exam (see Table 1).

Conclusions: Rolling participants to the right side makes it possible to detect a given volume of intra-abdominal fluid which was missed via standard FAST exam. By converting false negative exams to true positive exams, the sensitivity of the test is improved via right-sided roll. Further research remains to be done utilizing this technique in the Trauma Bay in a prospective fashion.

	1	2	3	4	5	6	7
0cc FAST	Negative	Negative	Negative	Negative	Negative	Negative	Negative
0cc FASTeR	Negative	Equivocal	Negative	Negative	Negative	Positive	Positive
50cc FAST	Negative		Negative	Negative	Negative		
50cc FASTeR	Positive		Negative	Negative	Positive		
100cc FAST			Negative	Negative			
100cc FASTeR			Positive	Negative			
150cc FAST				Negative			
150cc FASTeR				Positive			

Table 1. Results of FAST and FASTeR examinations by participants (columns) and intra-abdominal volumes (rows).

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Quick Shot #8
January 11, 2017
5:12 pm

EVALUATING COMMUNICATION IN A LEVEL 1 TRAUMA CENTER: THE VALIDATION OF A TRAUMA TEAM COMMUNICATION ASSESSMENT (TTCA-24)

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John Myers, MD, Jessica A. Raley, PhD, MA, BA
University of Texas Health Science Center San Antonio

Presenter: Stephanie DeMoor

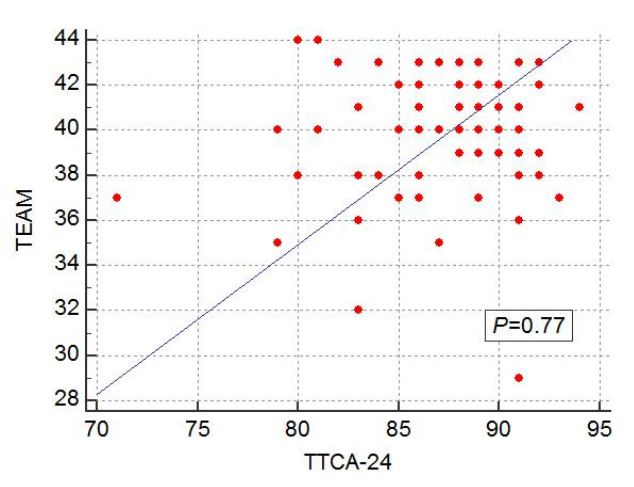
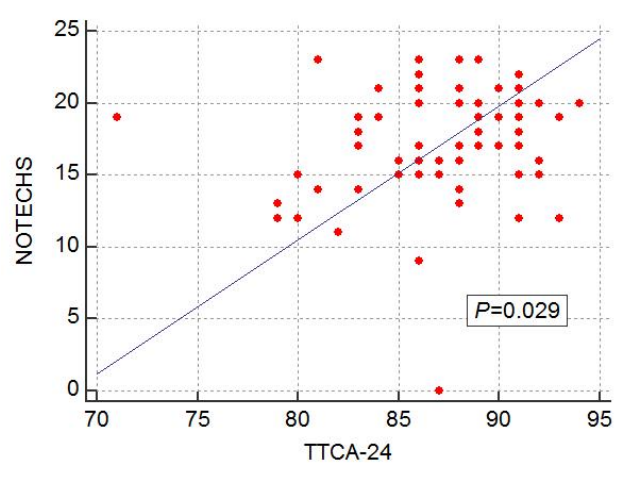
Discussant: Matthew J. Eckert, MD, Madigan Army Medical Center

Objectives: Non-technical skills (NTS) such as team communication are well recognized determinants of trauma team performance and good patient care. Measuring these competencies during trauma resuscitations is essential, yet few valid and reliable tools are available. We aimed to demonstrate that the TTCA-24 is a valid and reliable instrument that measures communication effectiveness during activations.

Methods: Two tools with adequate psychometric strength (T-NOTCHES, TEAM) were identified during a systematic review of medical literature and compared with TTCA-24. Three coders used each tool to evaluate 35 stable and 35 unstable patient activations (defined according to ATLS criteria). Inter-rater reliability was calculated between coders using the Intraclass correlation coefficient (ICC). Spearman rank correlation coefficient was used to establish concurrent validity between TTCA-24 and the other two validated tools.

Results: Coders achieved an ICC of .87 for stable patient activations and .78 for unstable activations scoring excellent on the inter-rater agreement guidelines. The median score for each assessment showed good team communication for all 70 videos (TEAM = 39.8 out of 54, T-NOTECHS = 17.4 out of 25, and TTCA-24 = 87.4 out of 96). A significant correlation between TTCA-24 and T-NOTECHS was revealed ($P=0.029$), but no significant correlation between TTCA-24 and TEAM ($P=0.77$). Team communication was rated slightly better across all assessments for stable versus unstable patient activations, but not statistically significant.

Conclusions: TTCA-24 correlated with T-NOTECHS an instrument measuring NTS for trauma teams, but not TEAM a tool that assess communication in generic emergency settings. TTCA-24 is a reliable and valid assessment that can be a useful adjunct when evaluating interpersonal and team communication during trauma activations.



Quick Shots Session I - Clinical Trauma

Quick Shot #9
January 11, 2017
5:18 pm

BIG FOR SMALL: VALIDATING BRAIN INJURY GUIDELINES IN PEDIATRIC TRAUMATIC BRAIN INJURY

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Narong Kulvatunyou, MD*, Gary A. Vercruysse, MD*, Bellal Joseph, MD*
The University of Arizona

Presenter: Asad Azim, MD

Discussant: Brett W. Engbrecht, MD, MPH, Penn State Hershey Children's Hospital

Objectives: Brain Injury Guidelines (BIG) were developed to reduce over utilization of Neurosurgical Consultation (NC) as well as CT imaging. Currently the BIG have been successfully applied to adult population but implementation of these guidelines among pediatric patients remains unknown. The aim of our study was to evaluate the established BIG (BIG-1 category) for managing pediatric traumatic brain injury (TBI) patients with intracranial hemorrhage (ICH) without neurosurgical consultation.

Methods: We prospectively implemented BIG-1 category (Normal neurological exam, ICH $\leq$ 4mm limited to 1 location, no skull fracture) to identify pediatric TBI patients (age $\leq$ 21 years) that were to be managed without neurosurgical consultation (No-NC). Propensity score matching was performed to match these patients with No-NC to a similar cohort of patients managed with NC before the implementation of BIG in a 1:1 ratio for demographics, severity of injury, and type and size of ICH. Primary outcome measure was need for neurosurgical intervention

Results: A total of 355 pediatric TBI patients were enrolled of which 136 (68: NC and 68: No-NC) were propensity score matched. The mean age was 9.03 ± 7.47 years, 62.1% (n=85) were male, median Glasgow Coma Scale (GCS) was 15 [13-15], and median head-abbreviated injury scale (AIS) was 2 [2-3]. On sub-analysis by stratifying patient based on age groups there was decrease use of RHCT (p=0.02) in No-NC group with no difference in progression (p=0.34) and need for neurosurgical intervention (p=0.9) compared to NC group.

Conclusions: The Brain Injury Guidelines level 1 criteria can be safely and effectively implemented in pediatric TBI patients. Adhering to the BIG-1 guidelines helps in reducing radiation exposure across all age groups as well as better utilization of neurosurgical resources.

Outcomes			
Characteristics	No-NC (n=68)	NC (n=68)	<i>P</i>
RHCT, % (n)	8.82% (6)	60.29% (41)	0.001
Progression on RHCT, % (n)	1.4% (1)	7.3% (5)	0.1
Neurosurgical intervention, % (n)	0%	0%	0.9
Hospital admission, % (n)	80.89% (55)	88.2% (60)	0.20
ICU admission, % (n)	14.7% (10)	23.5% (16)	0.19
RHCT – Repeat Head Computed Tomography Scan, NC – Neurosurgical consultation			

Outcomes

Sub-analysis based on Age groups		
	RHCT	
	NC	No-NC
Age 0-5yrs	71.40%	6.25%*
Age 6-10yrs	68.42%	9.50%*
Age 11-15yrs	54.16%	9.10%*
Age >16yrs	45.45%	11.10%
*p<0.05, RHCT – Repeat Head Computed Tomography Scan,		

Sub-analysis based on age groups

Quick Shots Session I - Clinical Trauma

Quick Shot #10
January 11, 2017
5:24 pm

OUTCOMES AFTER THE IMPLEMENTATION OF GERIATRIC TRAUMA SERVICE IN PATIENTS WITH ISOLATED HIP FRACTURES

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Grant V. Bochicchio, MD, MPH*, Douglas J.E. Schuerer, MD, FACS*
Washington University in St. Louis

Presenter: Pamela M. Choi, MD

Discussant: Sasha D. Adams, MD, University of Texas Houston

Objectives: Hip fractures are one of the most common injuries in the elderly population and have been associated with significant morbidity and mortality. The purpose of this study was to compare outcomes in geriatric trauma patients with isolated hip fractures before and after the initiation of a Geriatric Trauma Service (GTS).

Methods: The trauma registry was queried for all patients over 55 years of age admitted with an isolated hip fracture between 1/1/2008 and 12/31/2015. Patients with isolated hip fracture prior to 1/1/2013 were admitted to various services (PRE). We excluded patients who were admitted between 1/1/2013 and 9/30/2013 as GTS was being gradually implemented during this time. The formal start date of GTS was 10/1/2013. Continuous variables were compared using t-test while categorical variables were compared using chi-square and Cochran-Armitage trend tests. Linear regression was used to determine independent risk factors associated with longer times to OR and length of stay.

Results: A total of 771 patients were included in this study. There were 500 patients in the PRE group while there were 271 GTS patients (Table 1). There were no differences in age, gender, ISS, percentage of patients who went to the OR, ASA, ICU requirements or ICU LOS, or mortality. However, GTS patients did have decreased time to OR (GTS: 1.30.9 days vs PRE: 1.71.4 days, $p=0.0006$) as well as decreased overall LOS (GTS: 5.02.1 days vs PRE: 6.49.0 days, $p=0.01$). Both higher ASA and the PRE group were both independently associated with longer time to surgery as well as increased LOS (Table 2). The day of admission was not associated with a delayed time to surgery or increased LOS.

Conclusions: Although the patient populations are comparable in terms of age, ISS, and ASA, the institution of GTS has resulted in improved outcomes as well as cost-saving from faster time to OR and decreased length of hospitalizations.

	PRE	GTS	p-value
N	500	271	
Age	77.9 ± 11.4	79.4 ± 10.3	0.06
Sex	318 (63.6%)	178 (65.7%)	0.6
ISS	9.1 ± 0.4	9.2 ± 0.5	0.06
Admitted to Floor	475 (95%)	252 (93.0%)	0.07
ICU requirement	58 (11.6%)	39 (14.4%)	0.3
Required operative management	466 (93.2%)	249 (91.9%)	0.5
Time to OR, <i>days</i>	1.7 ± 1.4	1.3 ± 0.9	0.0006
ASA	2.9 ± 0.6	3.0 ± 0.5	0.1
Mortality	11 (2.2%)	2 (0.7%)	0.1
LOS	6.4 ± 9.0	5.0 ± 2.1	0.01
ICU LOS	4.1 ± 4.0	3.1 ± 1.5	0.2

Table 1: Demographics and Outcomes of PRE and GTS Patients

Variable	Time to OR		Length of Stay	
	Coefficient	p-value	Coefficient	p-value
Intercept	1.2		-2.6	
Age	0.0008	0.9	-0.02	0.4
Sex				
Male	Reference		Reference	
Female	-0.08	0.4	-0.3	0.7
ISS	-0.10	0.2	0.5	0.4
Day of Week				
Monday	Reference		Reference	
Tuesday	-0.3	0.1	-1.9	0.07
Wednesday	-0.2	0.2	-1.9	0.1
Thursday	-0.08	0.6	-1.2	0.3
Friday	-0.1	0.5	-1.0	0.3
Saturday	0.1	0.5	-1.8	0.09
Sunday	-0.1	0.4	-1.5	0.2
ASA	0.5	<.0001	2.1	<.0001
Admitting Service				
GTS	Reference		Reference	
PRE	0.4	0.0002	1.7	0.004

Table 2: Linear Regression Results for Time to OR and Length of Stay

Quick Shots Session II - Trauma Systems

Quick Shot #11
January 11, 2017
4:30 pm

THE ROLE OF EXTRAMEDULLARY HEMATOPOIESIS FOLLOWING SEVERE TRAUMA AND CHRONIC STRESS

Ines Alamo, MD, MPH, Ines Alamo, MD, MPH, Kolenkode Kannan, Tyler Loftus, MD,
Harry Ramos, Philip Efron, MD*, Alicia M. Mohr, MD*
University of Florida

Presenter: Ines Alamo, MD, MPH

Discussant: Yanjie Qi, MD, University of Rochester Medical Center

Objectives: Severe traumatic injury is associated with bone marrow dysfunction that manifests as impaired erythropoiesis and loss of hematopoietic progenitor cells from the bone marrow. Extramedullary hematopoiesis (EMH), the development of blood cells outside the bone marrow, can occur in response to anemia, injury, and infection but has not been studied following severe injury and critical illness. In a clinically relevant rodent model of lung contusion (LC) and hemorrhagic shock (HS), we hypothesize that the addition of chronic stress (CS) increases EMH in the spleen.

Methods: Male Sprague-Dawley rats (n=4-7/group) were subjected to LCHS and LCHS/CS. On day 7 spleen weight, growth of spleen erythroid progenitors including CFU-GEMM, BFU-E, and CFU-E colonies, and spleen erythropoietin (EPO) and erythropoietic receptor (EPOr) expression were all assessed. Data was presented as mean $\pm$ SD; *p<0.05 vs. naïve and **p<0.05 vs. LCHS by t-test.

Results: Seven days after LCHS, there was no significant difference in spleen size as compared to naïve. After the addition of CS to LCHS, spleen weight significantly increased by 22% (Figure 1). Spleen CFU-GEMM, BFU-E, and CFU-E growth following LCHS were comparable to that of naïve rodents (Table 1). However, LCHS/CS increased growth of spleen colonies by 28-39% (Table 1). Similarly, spleen EPO and EPOr expression following LCHS was comparable to naïve. LCHS/CS significantly increased splenic EPO expression by 23% but splenic EPOr expression decreased by 43% and LCHS/CS rodents had persistent anemia (Table 1).

Conclusions: Following LCHS, chronic stress triggers splenic EMH that manifests as increased spleen weight, increased splenic erythroid colony growth, and increased splenic EPO expression. However, spleen EPOr expression is suppressed and despite EMH there is a persistent anemia. Further investigation of role of the EPO receptor in persistent anemia following severe trauma is warranted.

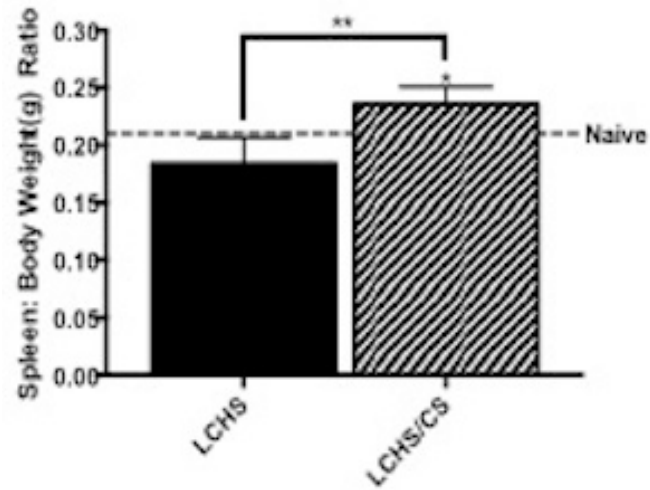


Figure 1: Spleen weight.

	Naive	Seven Days Following LCHS/CS	
		LCHS	LCHS/CS
CFU-GEMM (colonies/plate)	11±2	9±3	14±3**
BFU-E (colonies/plate)	12±3	15±1	24±4**
CFU-E (colonies/plate)	14±1	16±2	22±4**
Spleen EPO (cDNA/B-actin)	29±3	30±4	39±6
Spleen EPOr (cDNA/B-actin)	47±16	42±6	27±5**
Hemoglobin (g/dL)	14.3±0.3	12.3±0.7*	10.8±0.9**

Table 1: Spleen erythroid colony growth, EPO and EPOr expression.

Quick Shots Session II - Trauma Systems

Quick Shot #12
January 11, 2017
4:36 pm

PERCUTANEOUS DEPLOYMENT OF SELF-EXPANDING RESQFOAM FOR CONTROL OF TORSO EXSANGUINATION IN WEIGHTLESSNESS: SURGICAL SIMULATION DURING PARABOLIC FLIGHT

David King, MD*, Homer Tien, MD*, Jessica McKee, Anthony LaPorta, Susan Brien,
Timothy Leslie, Paul McBeth, Andrew Kirkpatrick
Massachusetts General Hospital

Presenter: David King, MD

Discussant: Stephanie Savage, MD, MS, Indiana University School of Medicine

Objectives: Traumatic injuries resulting in non-compressible abdominal hemorrhage may require treatment by civilians, military, and astronauts alike during dynamic flight. Flight worthiness of foam therapy has never been investigated. We hypothesized that self-expanding ResQFoam (Arsenal Medical, Inc, Watertown, MA) could be successfully delivered during flight in a zero-gravity environment.

Methods: The inanimate, anatomically-correct, visceral compartment of a partial task surgical simulator (Cut-suit, Strategic Operations, San Diego, CA) was augmented with a pressurized liver injury and secured on-board a Falcon 20 research aircraft capable of generating weightlessness (0g) repeatedly during parabolic flight. Abdominal access, trocar placement, foam preparation/mixing, delivery system assembly, and injection were performed in 0g. Time for completion of all tasks and blood loss were recorded. Foam was sampled for chemical characterization.

Results: All foam delivery steps were successfully performed in weightlessness (n=3 foam deployments) in 3.4 $\pm$ 0.2 minutes. Additional terrestrial foam deployments (n=3, 1g) were accomplished in similar times (p>0.05). Compared to rate of blood loss without intervention, blood loss was reduced 3-fold (p<0.01) after foam delivery. Foam samples were recovered and found to have identical physical characteristics to foam samples from terrestrial 1g foam deployments (compression force deflection modulus, density, pore size, expansion ratio).

Conclusions: ResQFoam can be successfully delivered during dynamic flight in a 0g environment. Foam deployment time and final foam characteristics are no different in 0g than 1g, demonstrating the airworthiness of the intervention. Foam therapy may be considered for non-compressible intracavitary hemorrhage during dynamic flight when surgical intervention is not immediately available.

Notes

Quick Shots Session II - Trauma Systems

Quick Shot #13
January 11, 2017
4:42 pm

PERIOPERATIVE USE OF NONSTEROIDAL ANTI-INFLAMMATORY DRUGS AND THE RISK FOR ANASTOMOTIC FAILURE IN EMERGENCY GENERAL SURGERY

Nadeem N. Haddad, MD, Brandon Bruns, MD, FACS*, Margaret H Lauerma, MD*,
David Turay, MD*, Joseph V. Sakran, MD, MPH, MPA, FACS*, Alisan Fathalizadeh,
Kristen Arnold, Jason S. Murry, MD, Matthew M. Carrick, MD*,
David S. Morris, MD*, Martin D. Zielinski, MD, FACS*
Mayo Clinic

Presenter: Nadeem N. Haddad, MD

Discussant: Katie M. Love, MD, Virginia Tech Carilion School of Medicine

Objectives: Nonsteroidal anti-inflammatory drugs (NSAIDs) are some of the most commonly used pain medications in adults. Recent studies suggested that NSAIDs use could potentially increase risk of anastomotic failure in the gastrointestinal tract. We aim to study the effects of perioperative NSAIDs on anastomotic failure in emergency general surgery.

Methods: Post hoc analysis of a multi-institutional prospectively collected database was done, involving patients undergoing urgent/emergent bowel resection. Patient demographics and relevant clinical data were collected. Dehiscence/leak, fistula and abscess compromise anastomotic failure. The group with perioperative NSAIDS use was compared to the one without .Data is presented as percentages, mean and standard deviation.

Results: Overall, 438 patients were included in the study, mean Age 59.7 ± 17.7 years, 52% males. 45% (n=200) had perioperative NSAID usage. The rate of anastomotic failure was 15% in the NSAID group vs 10.5%, $p=0.15$. No difference between the NSAID group and other group in perioperative steroid use (19% vs 15%, $p=0.23$), anastomosis operating time (186 vs 178 ± 92 minutes, $p=0.24$), or Mortality (8.5 vs 7.6%, $p=0.72$). Multivariable analysis revealed that perioperative NSAIDs use, intraoperative hypothermia, and contamination (local and diffuse purulent, feculent and succus) were independently associated with anastomotic failure (Table1).

Conclusions: Perioperative use of NSAIDS seems to have an influence on anastomotic failure in emergency general surgery. Future randomized trials should validate the effects of perioperative NSAIDs use on anastomotic failure.

Variable	OR	95% CI
Perioperative NSAIDS	2.07	1.03-4.23
Contamination	2.74	1.25-6.03
Intra-operative hypothermia	2.35	1.15-4.86
Open abdomen	2.10	0.86-5.08
Use of vasopressors	0.88	0.43-1.77
Perioperative corticosteroids	2.31	0.99-5.21
Male gender	1.24	0.62-2.53
Damage control	0.52	0.09-2.32
Age (per year)	1.01	0.99-1.04

Table (1)

Quick Shots Session II - Trauma Systems

Quick Shot #14
January 11, 2017
4:48 pm

EARLY ENTERAL NUTRITION IS ASSOCIATED WITH REDUCED MORBIDITY IN CRITICALLY-ILL SOFT TISSUE PATIENTS

Bryce E. Haac, MD, Sharon M. Henry, MD*, Jose J. Diaz, MD*,
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: Bryce E. Haac, MD

Discussant: Jennifer L. Hartwell, MD, Indiana University School of Medicine

Objectives: Critically-ill patients with soft tissue diseases including necrotizing infections have high mortality and morbidity with hospital-acquired infection rates up to 76%. Given these patients are known to have high metabolic requirements, we sought to determine the relationship between early enteral nutrition and rate of nosocomial infection.

Methods: We conducted a retrospective review of soft tissue patients requiring ICU admission for >72 hours who presented from January 2013 through December 2014 to a high volume dedicated soft tissue service. Variables were compared using chi-squared, t-test, and linear and binary logistic regression analysis with $p < 0.05$ considered significant.

Results: 85 patients were included. 80% were started on early enteral nutrition within 48 hours of admission. 26% were diagnosed with a hospital-acquired infection post-admission. Patients who were started on early nutrition had fewer ventilator days (mean 5 vs. 12, $p < 0.001$), shorter ICU (mean 11 vs. 18 days, $p = 0.004$) and hospital (mean 18 vs. 40 days, $p = 0.003$) length of stay (LOS), and fewer operative debridements (mean 3.5 vs. 5.8, $p = 0.015$) with smaller maximum wound size (mean 625cm^2 vs. 1302cm^2 , $p = 0.045$) compared to those fed later. When adjusted for age, sex and confounding variables present on admission, the association between early nutrition with shorter LOS and fewer ventilator days remained. The early enteral nutrition group also had fewer hospital-acquired infections (18% vs. 59%, $p = 0.001$) when adjusted for confounding factors (aOR 0.15, $p = 0.045$). There was no significant difference in mortality ($p = 0.04$) or for these same outcomes when evaluating percentage of goal calories or protein received or time to goal feeds.

Conclusions: Early enteral feeding is associated with reduced in-hospital morbidity in critically-ill soft tissue patients including fewer nosocomial infections and ventilator days, and shorter LOS.

	Early enteral nutrition	Late enteral nutrition	p-value
Male	62%	53%	0.507
Mean age in years	60.1	58.2	0.578
*Necrotizing infection	69%	94%	0.035
*Disseminated infection	19%	53%	0.006
Transfer	93%	100%	0.249
*Debrided prior to transfer	38%	7%	0.027
*Diabetes	63%	35%	0.037
*Liver failure	5%	19%	0.050
Immunosuppressed	11%	0%	0.173
Respiratory disease	24%	13%	0.309
CHF	17%	6%	0.290
ESRD	9%	6%	0.671
Alcohol abuse	14%	19%	0.604
Septic	70%	82%	0.298
**Mean LRINEC score	7.5	7.2	0.746

Table 1. Patient admission characteristics by timing of enteral nutrition initiation.

*Confounding factors that were controlled for in the final logistic and linear regression models in addition to age and sex. **LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score is used to distinguish necrotizing fasciitis from other soft tissue infections early in the disease course.

Dependent Outcome Variable	All Patients		Surviving Patients Only	
	Coef	p-value	Coef	p-value
Total LOS (length of stay)	-25.813	0.017	-23.94	0.042
ICU LOS	-7.115	0.043	-7.06	0.058
Ventilator days	-6.428	0.014	-7.37	0.004
Wound size	-375.994	0.363	-370.33	0.393
Number of operative debridements	-1.433	0.299	-1.11	0.458

Table 2. Linear regressions of effect of early compared to late enteral nutrition on continuous outcome variables adjusted for age, sex and other potentially confounding variables.

Quick Shots Session II - Trauma Systems

Quick Shot #15
January 11, 2017
4:54 pm

INCREASED ANATOMIC SEVERITY IN APPENDICITIS IS ASSOCIATED WITH OUTCOMES IN A SOUTH AFRICAN POPULATION

Matthew C. Hernandez, MD, Victor Kong, Johnathon Aho, John Bruce, Stephanie F Polites,
Martin D. Zielinski, MD, FACS*, Damian Clarke
Mayo Clinic

Presenter: Matthew C. Hernandez, MD

Discussant: Andrew N. Beckett, MD, Canadian Army/McGill University

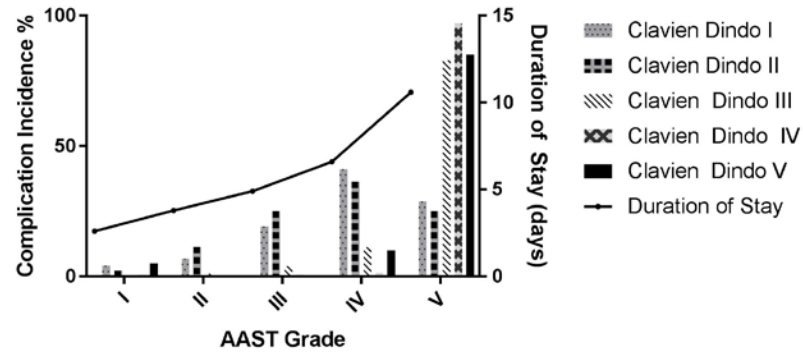
Objectives: Previous work has demonstrated validity of the AAST EGS grading system for appendicitis in the United States. In order to demonstrate generalizability, we aim to externally validate this grading system in South African patients with appendicitis.

Methods: Patients with acute appendicitis between 2010-2016 were identified at multi institutional sites within South Africa. Baseline demographics and procedure types were recorded and AAST grades were assigned based on intraoperative findings. Outcomes included duration of stay, mortality, and Clavien-Dindo complications. Summary statistical univariate and nominal logistic regression analyses were performed to compare AAST grade and outcomes.

Results: 1415 patients with a median [IQR] age of 19 years [14-28] were included (55% male). 100% underwent appendectomy: 64% completed via midline laparotomy, 36% via limited incision (31.4% via McBurney incision and 4.6% via laparoscopy). Overall 30-day mortality rate was 1.2% and complication rate of 44%. Most common complications were: surgical site infection with sepsis (66%), pneumonia (20%), and acute kidney injury (6.8%). Distribution of AAST grade is as follows: Grade 0 (10, 0.7%), Grade I (247, 17.4%), Grade II (280, 19.8%), Grade III (158, 11.3%), Grade IV (179, 12.6%), and Grade V (541, 38.2%). Increased median [IQR] AAST grades were recorded in patients with complications, 5 [3-5], compared to those without, 2 [1-3], $p=.001$. Duration of stay was increased for patients with higher AAST grades: IV and V (10.6 ± 5.9 days) versus I and II (3.6 ± 4.3 days), $p=.001$. AUROC analysis to predict presence of any complication based on AAST grade was 0.90.

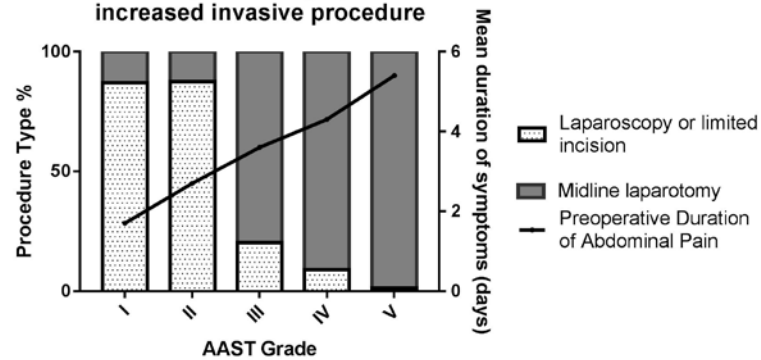
Conclusions: The AAST EGS grading system is associated with important clinical outcomes in a South African population. These results support generalizability of the AAST EGS grading system for appendicitis in a developing nation.

Increasing AAST, Clavien Dindo Grades and Mean Duration of Stay in Appendicitis



Increased AAST EGS grade is associated with increased complications and duration of stay in appendicitis

Increased AAST Grade and Preoperative Symptoms Duration Associated with increased invasive procedure



Patients with increasing AAST grade in appendicitis have increased preoperative symptoms and more invasive procedures

Quick Shots Session II - Trauma Systems

Quick Shot #16
January 11, 2017
5:00 pm

FIREARM INJURIES INCREASE AFTER CIVIL UNREST

Pamela M. Choi, MD, Wen-Hui Tan, William Kollmar, Ellen Wangler, Maureen Schmid,
Steven Woods, RN, BSN, MBA*, Grant V. Bochicchio, MD, MPH*,
Martin Keller, MD*, Douglas J.E. Schuerer, MD, FACS*
Washington University in St Louis

Presenter: Pamela M. Choi, MD

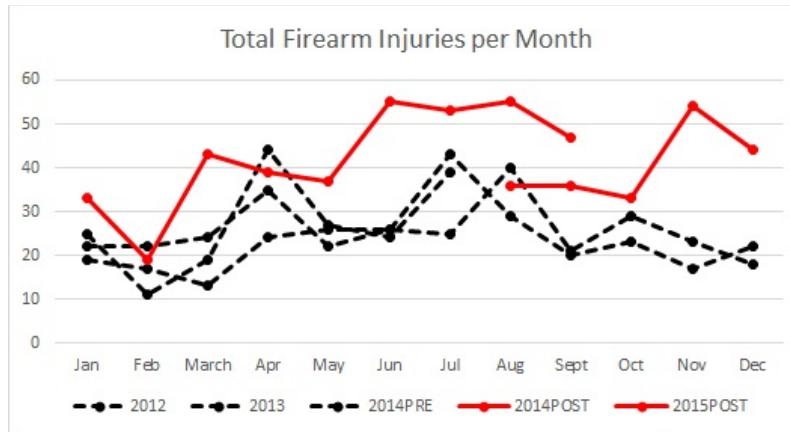
Discussant: Marie L. Crandall, MD, MPH, University of Florida Jacksonville

Objectives: After a police involved shooting, there was civil unrest in our area. Since the event occurred, there has been a perceived rise in firearm (GSW) injuries. We sought to determine if the civil unrest did coincide with an increase in firearm related injuries and resource utilization in our metropolitan area.

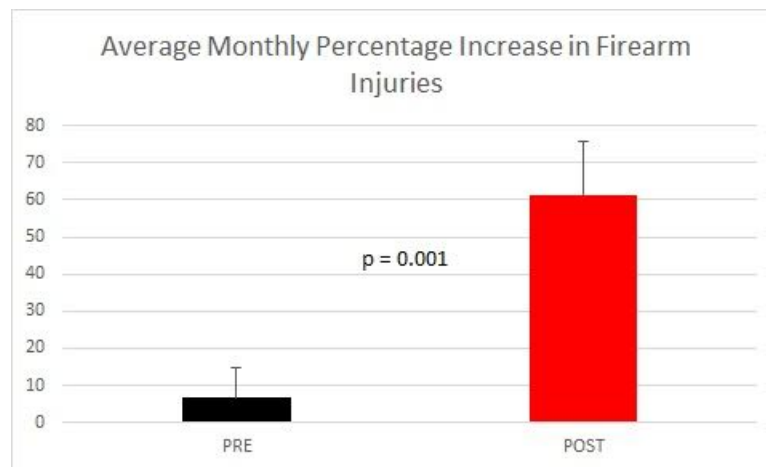
Methods: After receiving IRB approval, the Trauma Registry was queried for all patients injured by a firearm between 1/1/2012 and 9/30/2015 at our pediatric and adult trauma centers. We assessed time before (PRE) and after (POST) the August 2014 shooting. Standard demographic data was collected. Both trauma centers, located closest to the area of unrest, are ACS Level-1 verified within a single university system.

Results: Both adult and pediatric trauma centers experienced a significant increase in the number of GSW injuries after July 2014 (Figure 1). The average number of GSW injuries seen per month at our adult trauma center increased significantly from 21.3 (PRE) to 35.6 (POST) ($p < 0.0005$), and at our pediatric trauma center, from 3.7 to 6.3 ($p = 0.001$). In order to account for seasonal variations, we also calculated a monthly percentage change from year to year for all patients. In the PRE era, a 6.7% year to year monthly increase was appreciated; this increased to 61.4% POST (Figure 2, $p = 0.001$). In both adult and pediatric patient populations, there were no differences in age, injury severity score, hospital length of stay, and mortality PRE vs POST.

Conclusions: Firearm injuries significantly increased after civil unrest in our metropolitan area. As a result, a multi-institutional collaboration has been initiated among our city's major adult and pediatric trauma centers. The data from this study will be used to identify patient risk factors with the goal of creating a region-wide violence intervention program. Firearm injuries have become a common problem, and physicians must take an active part in the solution.



Total Firearm Injuries per Month



Average Monthly Percentage Increase in Firearm Injuries

Quick Shots Session II - Trauma Systems

Quick Shot #17
January 11, 2017
5:06 pm

STOP THE BLEED: TOURNIQUET APPLICATION SKILL RETENTION IN THREE DISTINCT POPULATIONS AFTER ONE YEAR

David King, MD*, George Velmahos, MD, PhD, MEd, Daniel Dante Yeh, MD*, Peter Fagenholz,
Kathryn Butler, MD*, Haytham Kaafarani, MD, MPH*, Marc A. deMoya, MD*,
Elie Ramly, MD, Jarone Lee, MD, MPH*
Massachusetts General Hospital

Presenter: David King, MD

Discussant: Alexander Eastman, MD, MPH, UT Southwestern/Parkland Memorial Hospital

Objectives: We have previously demonstrated that proper tourniquet application can be successfully taught to medical providers and lay-persons alike. This hemorrhage control posture may prevent unnecessary deaths from limb exsanguination. We hypothesized that, after one year of knowledge decay, most trainees could still correctly apply a tourniquet.

Methods: Following institutional review board approval, three distinct groups were educated on the proper technique for tourniquet application: physicians, nurses/paramedics, and teachers at a pre-kindergarten through 8th grade elementary school. All underwent short, intensive psychomotor instruction and were evaluated on proper tourniquet application technique on a simulated limb to assess competence. Three serially, untutored, observed correct applications were required for competence. No re-education was provided before 1-year skill testing, and no proctoring was provided during the retesting. If the application was incorrect, this was recorded as skill non-retention and the subject was re-educated. No subject observed the retesting of another.

Results: Physicians (n=30), nurses and paramedics (n=31) and elementary school teachers (n=36) underwent training and one-year skill retesting. Of all the subjects, only three physicians reported applying a tourniquet in real world patient care in the previous year. All subjects, except one teacher, correctly applied the tourniquet. Physicians performed the skill fastest (mean 22±3 seconds), followed by nurses and teachers (mean 54±11 and 107±15 seconds, respectively, p<0.05 between groups).

Conclusions: Tourniquet application skill retention at one year is robust following a short, intensive, psychomotor training program. This demonstrates that an aggressive hemorrhage control posture, such as that advocated by the Hartford Consensus, is possible to maintain for at least one year after training. Further work is required to determine the absolute knowledge decay for this skill-set.

Notes

Quick Shots Session II - Trauma Systems

Quick Shot #18
January 11, 2017
5:12 pm

DELIRIUM IN THE ICU, WHAT ABOUT THE WARD?

Anthony Cahill, MD, Manuel Lorenzo, MD*, Phillip Sladek, MD*, Michael Truitt, MD
Methodist Dallas Medical Center

Presenter: Anthony Cahill, MD

Discussant: Uzer Khan, MD, MBBS, West Virginia University

Objectives: Delirium is a condition associated with cognitive dysfunction and inattention. Given its multifactorial etiology and variable presentation, it is often underdiagnosed resulting in a mortality of ~10%. Past literature indicates 15% of all adult Intensive Care Unit (ICU) patients will develop delirium. No study to date has evaluated the incidence and associated risk factors among patients admitted to the Acute Care Surgeon (ACS) in Non-Critical Care Areas (NCCA). Here we present the outcomes of the first prospective study evaluating the above.

Methods: After IRB approval, all patients admitted to ACS in NCCA (ward) over the study period were prospectively administered the Confusion Assessment Method (CAM) every 12hrs. Patient demographics and in-hospital medications were captured. Variations between patients who screened positive for delirium (D+) vs. those who screened negative (D-) were evaluated by chi-square test.

Results: Overall, 145 patients were evaluated (632 CAM surveys) with 8% screening positive for delirium (D+). In the cohort of patients > 65 y/o, 21% of ACS on the ward screened positive (D+). No significant variations in patient sex, ethnicity, PCP or insurance status were noted. D+ were found to be significantly older (70 ± 5 D+ vs. 51 ± 2 D-) and to have a Foley catheter (43% D+ vs. 6% D-; $p < 0.0$). Also, a significantly higher number of D+ were on anticoagulants (100% D+ vs. 62% D-; $p: 0.008$), statins (42% D+ vs. 12% D-; $p < 0.000$), non-narcotic pain meds (67% D+ vs. 37% D-; $p: 0.044$) and narcotic pain meds (67% D+ vs. 37% D-; $p: 0.043$).

Conclusions: This is the first study to delineate an overall 8% incidence of delirium in ACS patients on the ward and 21% in the cohort > 65 y/o. Age, presence of a foley catheter, anticoagulants, statins, non-narcotic and narcotic pain medications were independent risk factors. Given the high incidence of delirium, incorporation of screening in the clinical management of the ACS NCCA patients should be considered.

Notes

Quick Shots Session II - Trauma Systems

Quick Shot #19
January 11, 2017
5:18 pm

A NOVEL APPROACH TO OPTIMAL PLACEMENT OF NEW TRAUMA CENTERS WITHIN AN EXISTING TRAUMA SYSTEM USING GEOSPATIAL MAPPING

Michael Horst, PhD, Frederick Rogers, MD, MS, FACS*, Brian Gross, Turner Osler, MD, MSc, FACS,
Alan D. Cook, MD*, Eric H. Bradburn, DO, MS, FACS*
Penn Medicine Lancaster General Health

Presenter: Michael Horst, PhD

Discussant: Peter E. Fischer, MD, MS, University of Tennessee Health Science Center

Objectives: While much research has been done to optimize the care of trauma patients, few analyses have been conducted to assess where trauma centers (TC) should be placed to provide optimal access to care. We sought to determine optimal resource placement based upon a number of key factors. We hypothesized that within a mature trauma system, geospatial mapping could inform health policy at a statewide level.

Methods: We used Pennsylvania Trauma Systems Foundation (PTSF) registry data of adult (age ≥ 15) trauma for calendar years 2003-2015 (n=408,432), hospital demographics, road networks, and US Census data files. We included TCs and zip codes outside of PA to account for edge effects with trauma cases aggregated to the zip code centroid of residence. Our model assumptions included existing PTSF level 1 and 2 TCs, a maximum travel time of 60 minutes to the TC, capacity based on mean statewide ratios of trauma cases per hospital bed size, ISS, candidate hospitals ≥ 200 licensed beds and ≥ 30 or ≥ 15 minutes from an existing TC in non-urban/urban areas respectively. We used the Network Analyst Location-Allocation function in ArcGIS Desktop to generate spatial models.

Results: Of the 132 candidate sites, only 16 met the bed size and travel time criteria from an existing TC. Approximately 70% of zip codes and 91% of cases were within 60 minutes of an existing TC. Adding 1 to 6 new optimally paced TCs increased to a maximum of 82% of zip codes and 96% of cases within 60 minutes of an existing TC. Changes to model assumptions had an impact on which candidate sites were selected.

Conclusions: Intelligent trauma system design should include an objective process like geospatial mapping rather than the current system which is driven by competitive models of financial and healthcare system imperatives.

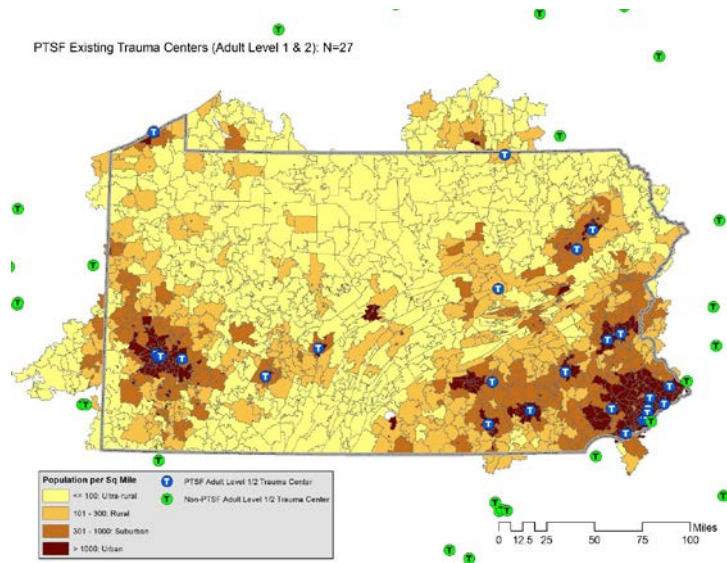


Figure 1: Existing level 1 and 2 trauma centers in the Commonwealth of Pennsylvania.

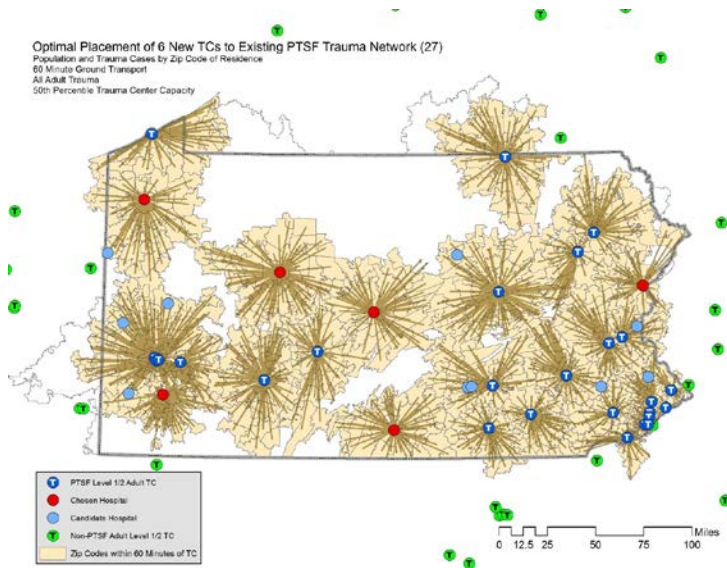


Figure 2: Geospatial representation of optimal placement of 6 additional trauma centers in the Commonwealth of Pennsylvania.

Quick Shots Session II - Trauma Systems

Quick Shot #20
January 11, 2017
5:24 pm

MODULATION OF THE CHOLINERGIC ANTI INFLAMMATORY PATHWAY FOLLOWING SHOCK CONDITIONS: A POTENTIAL ADJUNCT IN THE OBESE TRAUMA PATIENT

Mark E. Diebel, MD, David Liberati, MS, Lawrence N. Diebel, MD*
Wayne State University

Presenter: Mark E. Diebel, MD

Discussant: Omar K. Danner, MD, Morehouse School of Medicine

Objectives: Obesity has been associated with worse outcomes in trauma, especially following severe injury. It is well known that obesity is characterized by autonomic dysfunction (i.e. sympathovagal imbalance) and increased production of proinflammatory cytokines and adipokines principally by adipose tissue. Vagal nerve stimulation has a protective effect following hemorrhagic shock (HS), burns and sepsis. Moreover, activation of the cholinergic anti inflammatory pathway decreases obesity-induced inflammation and insulin resistance in murine studies. We therefore studied the anti inflammatory effects of nicotine and the specific $\alpha 7$ nicotinic acetylcholine receptor on proinflammatory cytokine and adipokine production in a *in vitro* model of simulated HS.

Methods: Established adipocyte-macrophage (ADSC/Raw 264.7) co cultures were exposed to hypoxia-reoxygenation (H/R) +/- epinephrine (epi, 10-3 μ M) to simulate *in vivo* hemorrhagic shock conditions. Nicotine or AR-R17779, a specific $\alpha 7$ nicotinic acetylcholine agonist was added following H/R, +/- epi and cytokines/adipokines measured by ELISA at 60 or 120 minutes.

Results: See table.

H/R + epi had a synergistic effect on TNF α , IL-6 and leptin production from adipose cultures in our *in vitro* model. Both the non-specific agonist nicotine and the specific $\alpha 7$ agonist, AR-R17779, ameliorate the proinflammatory response to H/R +/- epi challenge in our model. These agonists also abrogated the decrease in the "anti-inflammatory" adipokine, adiponectin following exposure of "adipose" tissue to H/R +/- epi.

Conclusions: Vagal nerve stimulation or pharmacologic modulation via the $\alpha 7$ nicotinic acetylcholine receptor may decrease inflammation following shock and severe injury in the obese patient and may thus have a protective role in this patient population.

Results: mean $\pm$ SD; N = 5 for each group

	TNF (pg/ml)	IL-6 (pg/ml)	Leptin (ng/ml)	Adiponectin (ng/ml)
ADSC/Raw control	79.8 $\pm$ 3.5	38.4 $\pm$ 2.5	3.6 $\pm$ 0.3	41.2 $\pm$ 1.1
ADSC/Raw + Epi (10^{-3} μ M)	169.2 $\pm$ 8.9*	81.9 $\pm$ 3.7*	5.1 $\pm$ 0.2*	30.5 $\pm$ 0.8*
ADSC/Raw + HR	158.6 $\pm$ 7.5*	84.1 $\pm$ 2.3*	5.6 $\pm$ 0.2*	31.4 $\pm$ 1.0*
ADSC/Raw + epi(10^{-3} μ M) + HR	248.8 $\pm$ 9.3*	181.4 $\pm$ 4.9*	8.3 $\pm$ 0.4*	26.9 $\pm$ 0.4*
ADSC/Raw + epi(10^{-3} μ M) + HR + nicotine	141.6 $\pm$ 8.8*#	131.4 $\pm$ 5.2*#	6.2 $\pm$ 0.5*	35.2 $\pm$ 0.9*#
ADSC/Raw + epi(10^{-3} μ M) + HR + AR-R17779	129.6 $\pm$ 5.5*#	116.7 $\pm$ 4.1*#	5.8 $\pm$ 0.4*	38.7 $\pm$ 0.4*#

*p<0.001 vs. ADSC/Raw control, #p<0.001 vs. same group no nicotine or AR-R1779