Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #1
January 13, 2016
8:00 am

IN BLEEDING PATIENTS UNDERGOING DAMAGE CONTROL LAPAROTOMY, HYPERTONIC SALINE IMPROVES PRIMARY FASCIAL CLOSURE AT THE FIRST TAKE BACK

Lindley E Folkerson, MD, Ryan A. Lawless, MD*, Joseph D Love, DO, FACS*,
Michelle McNutt, MD*, Laura J. Moore, MD*, Bryan A. Cotton, MD, MPH*,
Charles E. Wade, PhD, John A. Harvin, MD*
Center for Translational Injury Research, Department of Surgery, University of Texas-Houston

Presenter: Lindley E. Folkerson, MD

Discussant: Margaret Lauerman, MD, University of Maryland

Objectives: Following damage control laparotomy (DCL) for trauma, primary fascial closure (PFC) at the first take back is associated with reduced complications. The use of hypertonic saline (HTS) after DCL has been shown to improve PFC rates. A limitation of prior studies was the inclusion of moderately injured patients likely to achieve PFC regardless of fluid choice. The purpose of the current study was to evaluate the impact of post-operative HTS on PFC rates among bleeding trauma patients undergoing DCL.

Methods: DCL patients who met Critical Administration Threshold (CAT) blood transfusion criteria (≥3 units RBCs/hour) were analyzed. Patients were dichotomized into those who received standard maintenance fluids, STD (admitted 01/2010-06/2011) and those who received HTS (07/2013-12/2014). Primary outcome was PFC at the first take back. Continuous variables expressed as medians with inter-quartile range.

Results: 95 patients met inclusion (54 STD, 41 HTS). There were no differences in demographics or injury severity score, however, patients in the HTS group were more hypotensive (88 mmHg, 79 and 100 vs 91 mmHg, 77 and 118; p=0.02), had a greater base deficit (10 mmol/L, 6 and 13 vs 7 mmol/L, 3 and 9, p=0.01) on arrival, and received more OR RBCs (9 U, 6 and 15 vs 7 U, 4 and 10; p=0.07). They also had a significantly lower fluid balance in the first 24 hours (2.5 L, 0.6 and 7.0 vs 6.1 L, 3.7 and 10.5; p<0.001) and 48 hours (3.8 L, 1.3 and 6.7 vs. 9.0 L, 5.3 and 12.0; p<0.001). After adjusting for injury severity and resuscitation volumes, the use of HTS was found to be an independent predictor of PFC at the first take back (OR 3.82, 95% CI 1.02-14.31, p=0.047).

Conclusions: In a group of seriously injured, bleeding trauma patients undergoing DCL, the use of HTS was associated with a lower fluid balance and higher rate of PFC at the first take back.

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #2
January 13, 2016
8:20 am

BRAIN HYPOXIA IS EXACERBATED IN HYPOBARIA DURING AEROMEDICAL EVACUATION IN SWINE WITH TBI

Steve Chun, MD, Ashraful Haque, Brittany Hazzard, Saha Biswajit, Martin Harssema, Charles Auker, Debra L. Malone, MD*, Richard McCarron, Anke H Scultetus, MD
Naval Medical Research Center

Presenter: Steve Chun, MD

Discussant: Joel Elterman, MD, CSTARS Cincinnati, University of Cincinnati Medical Center

Objectives: The rapid evacuation of combat casualties to definitive care is current standard practice. On occasion, civilian aero-medical transfers happen as well. Not much is known about the effects of long range aero-medical evacuation in hypobaric environments on patients. Casualties are "stabilized along the continuum of care," rather than "stable" prior to evacuation thus being more vulnerable than healthy passengers to the physiological challenges of altitude. This study investigated the effects of hypobaria during aero-medical evacuation on systemic and neurophysiology in a swine model of TBI.

Methods: Anesthetized swine had fluid percussion TBI and injury-specific care over 2 hours, followed by a 4 hour aeromedical evacuation simulated in a hypobaric chamber with atmospheric pressure equivalent to an altitude of 8000 ft. (HYPO, n=6).Control animals were kept at normobaria (NORMO, n=6).At 6 hours, animals were euthanized. Systemic and neurophysiology [brain tissue oxygenation ($p_{br}O_2$)] data were collected. Blood was analyzed for arterial gases and electrolytes. Repeated-measures ANOVA with $P<0.05$ was considered significant.

Results: Baseline parameters were similar in both groups. During flight, mean arterial pressure (MAP) in HYPO animals decreased ($p<0.104$) while intracranial pressure (ICP) increased ($p< 0.008$) compared to NORMO. This resulted in significantly lower cerebral perfusion pressure (CPP) in HYPO animals ($p< 0.0001$). $p_{br}O_2$ was also reduced in HYPO animals.

Conclusions: In this swine model of TBI prolonged hypobaria resulted in a significant elevation of ICP and reduction in CPP, and in reduced brain tissue oxygenation compared to normobaric conditions. These findings may suggest that hypobaric conditions exacerbate hypoxia in swine already under neurophysiological compromise due to TBI. Further studies are indicated to simulate other en route care scenarios and possibly re-evaluate casualty evacuation guidelines.

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #3
January 13, 2016
8:40 am

PERCUTANEOUSLY DRAINED INTRA-ABDOMINAL INFECTIONS DO NOT REQUIRE LONGER DURATION OF ANTIMICROBIAL THERAPY

Rishi Rattan, MD*, Casey J Allen, Robert Sawyer, MD*, Nicholas Namias, MD*
University of Miami Miller School of Medicine

Presenter: Rishi Rattan, MD

Discussant: Jennifer Knight, MD, West Virginia University

Objectives: The length of antimicrobial therapy in complicated intra-abdominal infections (CIAI) is controversial. A recent prospective, multicenter, randomized controlled trial found that 4 days of antimicrobial therapy after source control of CIAI resulted in similar outcomes when compared to longer duration. We sought to examine whether outcomes remain similar in the subgroup of patients who received percutaneous drainage for source control of CIAI.

Methods: Using the STOP-IT database, patients age >16 years with a CIAI and either temperature >38º C, white blood cell count >11,000 cells/mm³, or peritonitis-induced gastrointestinal dysfunction who received percutaneous drainage were analyzed. Patients were randomized to receive antibiotics until 2 days after the resolution of fever, leukocytosis, and ileus, with a maximum of 10 days of therapy or receive a fixed course of antibiotics for 4±1 calendar days. Outcomes included recurrent intra-abdominal infection, time to recurrent infection, Clostridium difficile infection, hospital days, and mortality.

Results: Of 129 patients identified, 72 received a 4-day course of antibiotics and 57 patients received a longer course. Baseline characteristics, including demographics, comorbidities, and severity of illness were similar. When comparing outcomes of the 4-day group to the longer group, rates of recurrent intra-abdominal infection (9.7 vs 10.5%, p=1.00), Clostridium difficile infection (0 vs 1.8%, p=0.442), and hospital days (4.0 [2.0-7.5] vs 4.0 [3.0-8.0], p=0.91) were similar. Time to recurrent infection was shorter in the 4-day group (12.7±6.2 vs 21.3±4.2 days, p=0.015). There was no mortality.

Conclusions: In this analysis of a prospective, multicenter, randomized trial, there was no difference in outcome between a shorter and longer duration of antimicrobial therapy in those with percutaneously drained source control of a CIAI.

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #4
January 13, 2016
9:00 am

N-ACETYL CYSTEINE RENDERS AIRWAY BARRIER AT RISK FOR BACTERIAL PASSAGE AND SUBSEQUENT INFECTION.

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

Presenter: Jonathan Friedman, MD

Discussant: Stephen Fann, MD, Medical University of South Carolina

Objectives: The use of inhaled aerosols in mechanically ventilated patients is common practice in the ICU. However, a recent trial using a combination of nebulized heparin, albuterol, and the mucolytic/antioxidant N-acetylcysteine (NAC) demonstrated an increased incidence of pneumonia. Recent work has demonstrated the importance of the physiologic mucus barrier in the respiratory airway. We hypothesize that NAC will alter mucus properties, cytokine response to bacteria, and bacterial transcytosis in vitro.

Methods: Calu-3, a human bronchial epithelial cell monolayer, was grown in a 2-chamber cell culture system. Epithelial mucin and free O-linked oligosaccharide (OSC) content of Calu-3 cultures pretreated with NAC (0.3μg/mL for 15 mins), albuterol (10^{-6} M for 24 hrs), or control were quantified using ELISA. In a separate experiment, *Klebsiella pneumonia* (10^5 CFU/mL) was added to the apical chamber of Calu-3 monolayers pretreated with NAC, albuterol, or control. Basal cytokine response and bacterial transcytosis (at 60, 120, 240 mins) were measured.

Results: Epithelial mucin content and free OSC content of Calu-3 cultures were decreased with 15 minutes of NAC administration. In response to innoculation with K. pneumonia, Calu-3 cultures had an attenuated basal IL-6 and TNF response when pretreated with NAC. Bacterial translocation of K. pneumonia was increased in NAC pretreated cultures at 60, 120, and 240 minutes.

Conclusions: NAC adversely affected respiratory mucus chemical properties and epithelial barrier integrity. Short-term administration of NAC attenuated apical mucin content, free OSC, cytokine response to bacterial presence, and increased the translocation of bacteria across the epithelial surface. Our data supports that “routine” use of NAC in mechanically ventilated patients, including those with smoke inhalation injury should be avoided.

	Mucin content (µg)	OSC (ng/ml)
Calu-3 control	4.2 ± 0.4	3.2 ± 0.6
Calu-3 + Albuterol (24hrs.) 10^{-6}M	4.8 ± 0.6	3.8 ± 0.5
Calu-3 + NAC (0.3µg/ml)	1.6 ± 0.2*	1.2 ± 0.4*

*P<0.001 vs. all other groups.

	Basal cytokine (pg/ml)		Bacterial translocation (log_{10}CFU/ml *Kleb. pneumo.*)		
	TNF	IL-6	60 min.	120 min.	240 min.
Calu-3 control	15.2 ± 1.2	9.2 ± 0.8	-	-	-
Calu-3 + *K. pneumo.*	27.3 ± 0.9*	15.7 ± 0.5*	1.6 ± 0.10	1.9 ± 0.10	2.3 ± 0.20
Calu-3 + Albuterol 10^{-6}M+ *K. pneumo.*	25.9 ± 1.5*	14.4 ± 1.1*	1.7 ± 0.06	2.0 ± 0.10	2.6 ± 0.20
Calu-3 + NAC (0.3µg/ml) + *K. pneumo.*	19.1 ± 2.2	11.9 ± 1.4	2.5 ± 0.08*	2.9 ± 0.10*	3.7 ± 0.3*

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #5
January 13, 2016
9:20 am

BLOOD TRANSFUSION: IN THE AIR TONIGHT?

Benjamin T. Miller, MD, Liping Du, Michael Krzyzaniak, MD*,
Oliver L. Gunter, Jr., MD, FACS*, Timothy C. Nunez, MD, FACS*
Vanderbilt University Medical Center

Presenter: Benjamin T. Miller, MD

Discussant: Brian Kim, MD, Mayo Clinic

Objectives: The use of prehospital blood transfusion (PBT) in air medical transport has become widespread. However, the effect of PBT remains unknown. The aim of this study was to examine the impact of PBT on 24-hour and overall in-hospital mortality.

Methods: This is a retrospective cohort study of all trauma patients carried by air medical transport from the scene to a Level One Trauma Center from 2007 to 2013. We excluded patients who died on the helipad or in the emergency department. Primary outcomes measured were 24-hour and overall in-hospital mortality. Multivariable logistic regressions using all available patient data or the propensity score (for receiving PBT) matched patient data were performed to study the effect of PBT on these outcomes.

Results: Of the 5581 patients included in the study, 231 (4%) received PBT. Multivariable regression analyses did not show evidence of PBT effect on 24-hour mortality (odds ratio [OR] 1.22; 95% confidence interval [CI] 0.61-2.44), nor on overall mortality (OR 1.20; 95% CI 0.55-1.79). Additionally, using 1:1 propensity score matched data, the analysis did not show evidence of PBT effect on 24-hour mortality (OR 1.04; 95% CI 0.54-1.98), nor on overall mortality (OR 1.05; 95% CI 0.56-1.96). Factors associated with increased 24-hour mortality were advanced age, penetrating injury, increased blood transfusion requirement in the first 24 hours, and decreased Glasgow Coma Scale score ($p < 0.05$). These factors were also associated with overall mortality, in addition to increased Injury Severity Score ($p < 0.05$).

Conclusions: This is the largest study to date of trauma patients who received PBT and were transported from the scene by air medical transport. Our results show no effect of PBT on 24-hour and overall in-hospital mortality. Previous studies also suggest no benefit of PBT, which is counterintuitive to damage control resuscitation. Prospective data on PBT is needed to assess risk, cost, and benefit.

Table 1: The effects of the studied covariates on 24-hour in-hospital mortality that are estimated from the multivariable logistic regression using the propensity score matched data and considering the match.

	Comparing groups	Effect Odds Ratio	Lower 95% CI	Upper 95% CI	P value
Age	60 years vs. 40 years	2.22	1.48	3.36	<0.001
ISS	high-low=21	1.38	0.89	2.14	0.14
HCT	high-low=9	1.06	0.68	1.66	0.79
ED pulse	140 vs. 100	1.44	0.59	3.51	0.58
ED SBP	150 vs. 100	0.99	0.44	2.26	0.98
24-hour blood	high-low=4	1.32	1.17	1.49	<0.001
Travel duration	high-low=21minutes	0.78	0.50	1.21	0.27
Sex	Female vs. Male	1.33	0.62	2.84	0.46
Race	Others vs. white	0.48	0.07	3.31	0.58
	Black vs. white	0.58	0.15	2.27	
Penetrating	Yes vs. no	3.25	1.50	7.03	0.003
PBT	Yes vs. no	1.04	0.54	1.98	0.91
ED GCS	ED GCS 3 vs. 14-15	5.30	1.98	14.16	0.004
	ED GCS 4-13 vs. 14-15	2.51	0.41	15.23	

ISS: Injury Severity Score, HCT: hematocrit, ED: emergency department, PBT: pre-hospital blood transfusion, GCS: Glasgow Coma Scale. Note: One hundred and ninety-five patients who had no PBT were matched with 195 patients who received PBT using the nearest neighbor matching method and propensity score obtained from a logistic regression model on PBT use.

Table 2: The effects of the studied covariates on overall in-hospital mortality that are estimated from the multivariable logistic regression using the propensity score matched data and considering the match.

	Comparing groups	Effect Odds Ratio	Lower 95% CI	Upper 95% CI	P value
Age	60 years vs. 40 years	2.69	1.78	4.07	<0.001
ISS	high-low=21	2.27	1.46	3.53	<0.001
HCT	high-low=9	1.06	0.73	1.56	0.75
ED pulse	140 vs. 100	1.43	0.66	3.10	0.41
ED SBP	150 vs. 100	1.40	0.73	2.71	0.24
24-hour blood	high-low=4	1.22	1.08	1.37	<0.001
Travel duration	high-low=21minutes	1.03	0.77	1.38	0.83
Sex	Female vs. Male	1.22	0.63	2.35	0.56
Race	Others vs. white	0.25	0.03	1.79	0.22
	Black vs. white	0.47	0.13	1.62	
Penetrating	Yes vs. no	2.93	1.44	5.95	0.003
PBT	Yes vs. no	1.05	0.56	1.96	0.88
ED GCS	ED GCS 3 vs. 14-15	4.49	2.00	10.08	0.001
	ED GCS 4-13 vs. 14-15	2.03	0.37	11.05	

ISS: Injury Severity Score, HCT: hematocrit, ED: emergency department, PBT: pre-hospital blood transfusion, GCS: Glasgow Coma Scale. Note: One hundred and ninety-five patients who had no PBT were matched with 195 patients who received PBT using the nearest neighbor matching method and propensity score obtained from a logistic regression model on PBT use.

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #6
January 13, 2016
10:00 am

THERE'S AN APP FOR THAT: A HANDHELD SMARTPHONE-BASED INFRARED IMAGING DEVICE TO ASSESS ADEQUACY AND LEVEL OF AORTIC OCCLUSION

Kyle K. Sokol, MD, George Black, Matthew Eckert, Matthew J. Martin, MD*
Madigan Army Medical Center

Presenter: Kyle K. Sokol, MD

Discussant: Khanjan Nagarsheth, MD, Rutgers University-Robert Wood Johnson Medical School

Objectives: Technological advances have made thermal imaging an appealing non-invasive point-of-care imaging adjunct in the trauma setting. We sought to assess whether a smartphone-based infrared imaging device (SBIR) could determine presence and level of aortic occlusion in a swine model. We hypothesized that various levels of aortic occlusion would transmit significantly different heat signatures at various anatomical points.

Methods: This study was performed using a FLIR One (Wilsonville, OR) mobile phone infrared imaging device. Six swine underwent sequential zone 1 (Z1) aortic cross clamping as well as zone 3 (Z3) aortic balloon occlusion (REBOA). SBIR readings were taken at 5 anatomic points (axilla [A], subcostal [S], umbilical [U], inguinal [I], medial malleolar [M]) and used to determine significant ($p \leq 0.05$) thermal trends 5-10 min after Z1 and Z3 occlusion. SBIR images were then reviewed for obvious qualitative differences during various levels of occlusion.

Results: Temperatures were similar among A,S,U,I,M points prior to and after aortic occlusions. Among the anatomical 2-point ratios evaluated, A/M and S/M ratios were the best predictors of aortic occlusion, whether at Z1 (8.2°F, $p<0.01$; 10.9°F, $p<0.01$) or at Z3 (7.3°F, $p<0.01$; 8.4ºF, $p<0.01$). The best predictor of Z1 vs Z3 occlusion was the S/I ratio (5.2°F, $p<0.05$ vs 3.4ºF, $p=0.27$)(Fig. 1). SBIR generated qualitatively different thermal images among occlusion groups (Fig. 2).

Conclusions: SBIR detected significant thermal trends during Z1 and Z3 occlusion by using an anatomical two point thermal ratio and easily recognized qualitative differences between control and occlusion images that would allow immediate determination of adequate balloon occlusion of the aorta. Portable SBIR represents an inexpensive and accurate tool for assessing perfusion, adequate REBOA placement, and even the aortic level of occlusion.

Occlusion	RATIO	Temp Diff (μ_Z-μ_{CON})	% Temp Change (μ_{Zx}/μ_{Zy}x100)	P-value
Zone 1	A/M	8.16°F	11.9%	0.002
Zone 1	S/I	5.23°F	4.4%	0.043
Zone 1	S/M	10.92°F	10.8%	0.001
Zone 1	U/M	11.26°F	10.8%	0.003
Zone 1	I/M	5.58°F	6.8%	0.002
Zone 3	A/M	7.33°F	11.1%	0.004
Zone 3	S/M	8.37°F	8.3%	0.006
Zone 3	I/M	4.76°F	5.9%	0.006

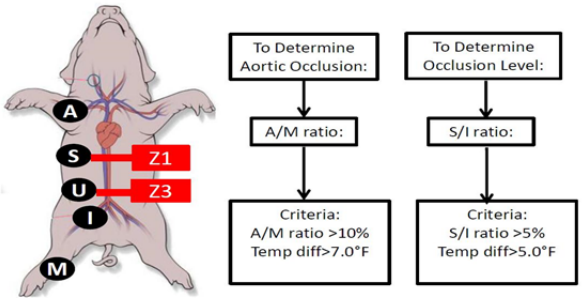
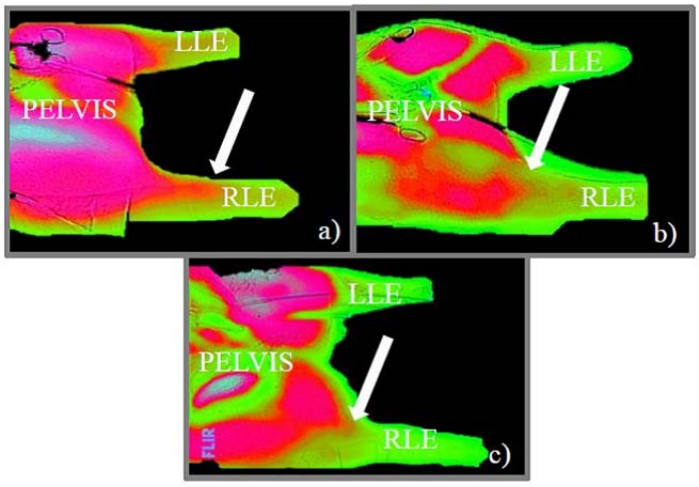


Figure 1. Anatomical location and significant five point thermal ratio patterns during zone I vs zone III occlusion (A=axillary, S=subcostal, U=umbilical, I=inguinal, M=medial malleolar, Z1=zone 1 aortic occlusion, Z3=zone 3 aortic occlusion, μ_z=mean temperature at specified zone of occlusion, μ_{CON}=temperature change prior to specified aortic occlusion)



Smartphone-based infrared (SBIR) imaging of the lower torso and extremities without aortic occlusion (a), after zone 1 occlusion (b), and after zone 3 occlusion (c). Red/blue color indicates hotter and green color indicates cooler heat signatures. White arrows indicate substantial qualitative changes in thermal signature (LLE=left lower extremity, RLE=right lower extremity).

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #7
January 13, 2016
10:20 am

PUSH OVER PULL: MANAGING THE SURGE IN DEMAND FOR BLOOD FOLLOWING MASS CASUALTY EVENTS

Simon M. Glasgow, MBBS, BSc, DMCC, MRCEM, MRCS, Christos Vasilakis, Zane Perkins, Susan I. Brundage, MD, MPH, FACS*, Nigel Tai, Karim Brohi
Queen Mary University of London

Presenter: Simon M. Glasgow, MBBS, BSc, DMCC, MRCEM, MRCS

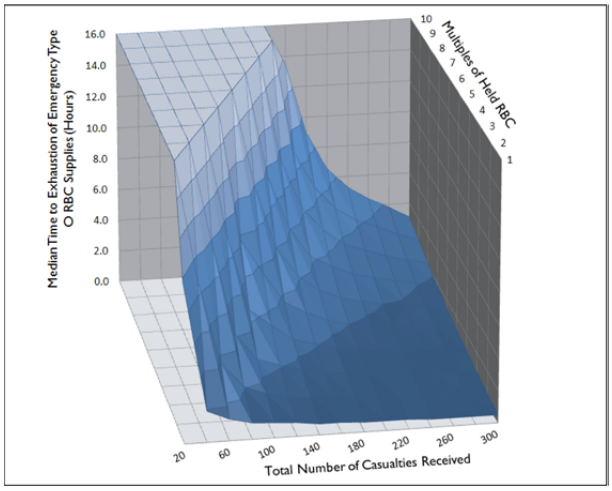
Discussant: Eric Campion, MD, University of Colorado/Denver Health Medical Center

Objectives: Traumatic hemorrhage is a leading preventable cause of mortality following mass casualty events (MCEs). Improving outcomes requires adequate in-hospital provision of high volume red blood cell (RBC) transfusions. This study investigated strategies for optimizing RBC provision to casualties in MCEs using simulation modeling.

Methods: A computerized simulation model of a UK major trauma centre (MTC) transfusion system was developed. The model used input data from past MCEs, civilian and military trauma registries. We simulated the effect of varying on-shelf RBC stock hold and the timing of externally restocking RBC supplies on MTC treatment capacity across increasing loads of priority one (P1) and two (P2) casualties from an MCE.

Results: 35,000 simulations were performed. A casualty load of 20 P1&2s under standard MTC RBC stock conditions left 35% (95% CI 32-38) of P1s and 7% (4-10) of P2s inadequately treated for hemorrhage. Additionally, exhaustion of type O emergency RBC stocks (a surrogate for reaching surge capacity) occurred in a median of 10hrs (IQR 5->12). Doubling the casualty load increased this to 60% (57-63) & 30% (26-34) respectively with capacity reached in 2hrs (1-3). The model identified a minimum requirement of 12U of on-shelf RBCs per P1/2 casualty received to maintain optimum care and avoid surge capacity being reached (Figure 1). Restocking supplies in an MCE versus greater permanent on-shelf RBC stock holds was considered at increasing hourly intervals. T-test analysis showed no difference between stock hold versus supply restocking in terms of overall outcomes for MCEs up to 80 P1&2s in size ($p<0.05$), provided the restock occurred within 6hrs.

Conclusions: Even limited sized MCEs threaten to overwhelm MTC transfusion systems. An early automated push approach to restocking RBCs initiated by regional suppliers can produce equivocal outcomes compared with holding excess stock permanently at MTCs.



Time to exhaustion of emergency type O red blood cell stock (a surrogate for reaching surge capacity) in relation to increasingly larger mass casualty events and with further multiples of the standard on-shelf red blood cell stock available at a UK major trauma centre prior to a mass casualty event.

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #8
January 13, 2016
10:40 am

UTILITY OF CPR IN HEMORRHAGIC SHOCK, A DOG MODEL

David R. Jeffcoach, MD, Juan Gallegos, Sophy Jesty, Patricia Coan, Jason Chen, Robert Heidel, Brian J. Daley, MD, MBA*
University of Tennessee Medical Center-Knoxville

Presenter: David R. Jeffcoach, MD

Discussant: Jacob Glaser, MD, NAMRU San Antonio

Objectives: Cardiopulmonary resuscitation was designed for sudden cardiac events usually triggered by thrombotic phenomena. Despite this, it is routinely employed in trauma resuscitations as per the American Heart guidelines. There is no data as to the utility of chest compressions in hemorrhagic shock. An evidence based CPR protocol has now been developed for dogs. We sought to determine the effects and outcomes of chest compressions in hemorrhagic shock in a canine model.

Methods: Eighteen dogs were randomized to three treatment groups - Chest compressions only after hemorrhagic shock (CPR), chest compressions with fluid resuscitation after hemorrhagic shock (CPR+FLU) and fluid resuscitation alone after hemorrhagic shock (FLU). Under anesthesia dogs were hemorrhaged until pulse was lost; they were maintained in a pulseless state for 30 minutes and then resuscitated over 20 minutes. Vital signs and laboratory values were recorded at determined intervals. Echocardiography was performed throughout the study. Upon termination of the study kidney, liver, heart and brain tissue histology was evaluated for evidence of end organ damage. Statistical significance was $p<0.05$ with a Bonferroni correction for multiple comparisons.

Results: Bloodloss and mean time to loss of pulse was similar between groups. Dogs in the CPR group had significantly lower MAP and higher pulse at all points compared to CPR+FLU and FLU ($p<0.05$). Ejection fraction was lower in the CPR group at 5 and 10 minutes compared to the other groups ($p<0.05$). Vital signs and labs between CPR+FLU and FLU were equivalent. Two of six dogs in the CPR group died while no dogs died in CPR+FLU or FLU groups. Dogs in the CPR group were found to have more episodes of end organ damage.

Conclusions: There was no benefit to chest compressions in the hypovolemic animals. Chest compressions in addition to fluid did not reverse signs of shock better than fluids alone. CPR in hypovolemic shock should be abandoned.

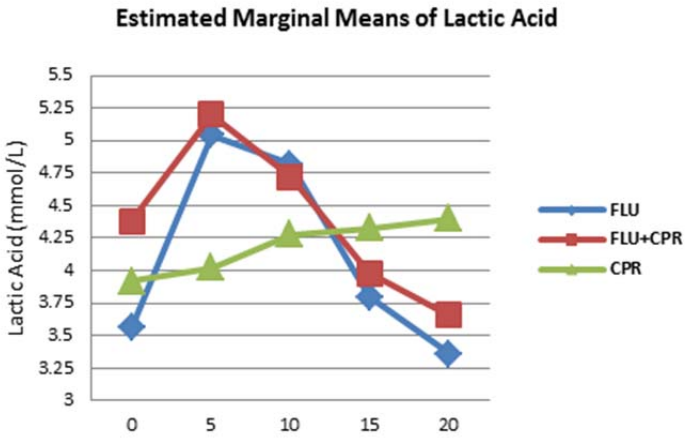


Figure 1: Change in lactic acid over time during the 20 minute resuscitation phase following hemorrhagic shock. FLU = Fluid Only (Crystaloid and Blood). FLU+CPR = Fluid and Cardiopulmonary Resuscitation. CPR = Cardiopulmonary Resuscitation Only

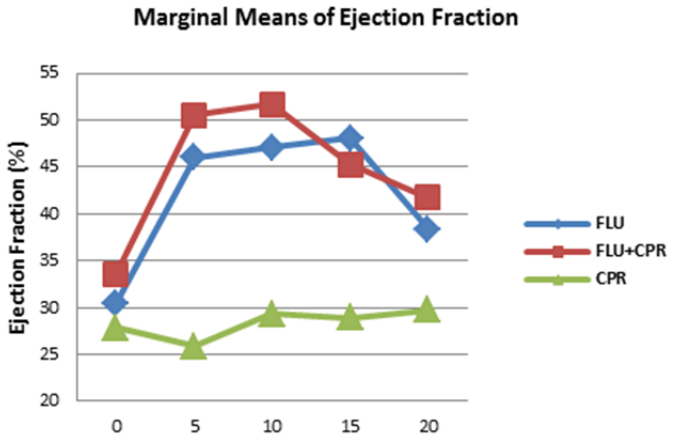


Figure 2: Change in calculated ejection fraction over time during the 20 minute resuscitation phase following hemorrhagic shock. FLU = Fluid Only (Crystaloid and Blood). FLU+CPR = Fluid and Cardiopulmonary Resuscitation. CPR = Cardiopulmonary Resuscitation Only

Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #9
January 13, 2016
11:00 am

NOT ALL PREHOSPITAL TIME IS EQUAL: INFLUENCE OF SCENE TIME ON MORTALITY

Joshua B. Brown, MD, MSc*, Matthew R. Rosengart, MD, MPH, FACS*,
Raquel M. Forsythe, MD*, Benjamin R. Reynolds, MPAS, PA-C *, Andrew B. Peitzman, MD*,
Timothy Billiar, MD, Jason L. Sperry, MD, MPH*
University of Pittsburgh Medical Center

Presenter: Joshua B. Brown, MD, MSc - @joshua_b_brown

Discussant: Lance Stuke, MD, Louisiana State University

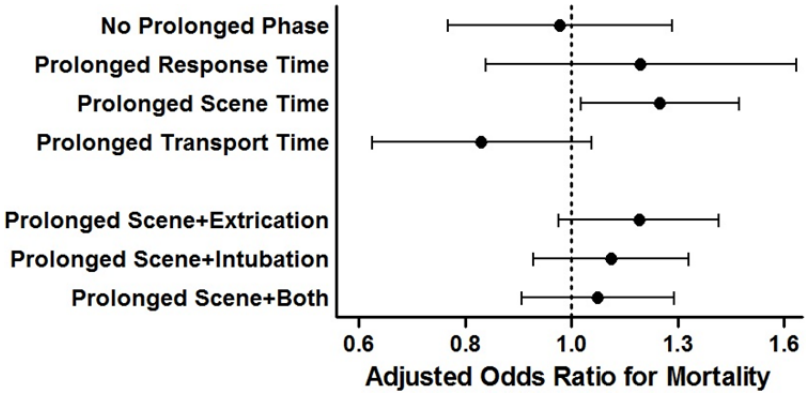
Objectives: Trauma is time-sensitive and minimizing prehospital (PH) time is conceptually appealing. However, many studies have failed to link increasing PH time with worse outcomes, as raw PH times are highly variable. It is unclear whether a specific pattern of PH time based on PH phase (response/scene/transport) affects outcome. Our objective was to evaluate the influence of PH time pattern on mortality.

Methods: Patients transported by EMS in the Pennsylvania trauma registry 2000-13 with total prehospital time (TPT) ≥20min were included. The relative proportion of TPT was calculated for each PH time phase. A prolonged phase was defined as a PH phase contributing ≥50% of TPT. PH time pattern was grouped by presence of a prolonged PH phase or no prolonged PH phase (all PH phases <50% of TPT). Patients were matched for TPT and conditional logistic regression determined the association of mortality with PH time pattern, controlling for confounders.

Results: 164,471 patients were included. Table 1 shows group characteristics. Patients with prolonged scene time had increased odds of mortality (OR 1.21; 95%CI 1.02-1.44, p=0.02). Prolonged response time, transport time, and no prolonged PH phase were not associated with mortality (Fig). Requiring extrication and PH intubation were potential mediators, associated with both prolonged scene time (p<0.01) and mortality (p<0.01). Adjusting for these factors, prolonged scene time was no longer associated with increased mortality (OR 1.06; 0.90-1.25, p=0.50), while extrication (OR 1.46; 1.23-1.72, p<0.01) and PH intubation (OR 4.53; 3.52-5.82, p<0.01) were.

Conclusions: Prolonged scene time is associated with increased mortality in trauma patients. PH factors that prolong scene time may mediate this association. Further study should evaluate whether these factors drive increased mortality because they prolong scene time or by another mechanism, as reducing scene time may be a target for intervention.

TABLE 1	No prolonged prehospital time N=78,782 (48%)	Prolonged response time N=2,386 (2%)	Prolonged scene time N=32,026 (19%)	Prolonged transport time N=51,277 (31%)
Response time [min, med (IQR)]	11 (7, 15)	24 (20, 28)	4 (4, 9)	7 (4, 11)
Scene time [min, med (IQR)]	15 (11, 20)	9 (4, 11)	22 (17, 28)	11 (9, 15)
Transport time [min, med (IQR)]	15 (13, 22)	11 (7, 15)	11 (7, 15)	26 (22, 35)
Total prehospital time [min, med (IQR)]	42 (33, 54)	43 (33, 50)	39 (30, 50)	48 (37, 59)
Response time [med % of total time (IQR)]	25.9 (19.6, 33.3)	52.9 (50.0, 57.1)	13.6 (8.3, 19.0)	15.3 (9.5, 21.2)
Scene time [med % of total time (IQR)]	36.6 (29.7, 42.9)	19.6 (13.7, 25.4)	56.4 (52.4, 62.0)	25.9 (19.0, 32.3)
Transport time [med % of total time (IQR)]	39.2 (33.3, 44.1)	27.0 (19.4, 32.3)	28.3 (21.2, 34.6)	56.9 (52.6, 62.9)
Age [yrs, med (IQR)]	47 (29, 69)	40 (25, 57)	48 (30, 70)	53 (34, 75)
Mechanism (% blunt)	92.9	90.7	92.3	94.5
ISS [med (IQR)]	10 (5, 19)	13 (8, 21)	10 (5, 19)	9 (5, 16)
Head AIS≥3 (%)	24.5	24.7	24.9	20.1
Transport mode (%)				
Ground	64.4	40.5	84.5	90.6
Helicopter	35.6	59.5	15.5	9.4
Extrication required (%)	16.5	19.9	21.5	8.9
Prehospital level of care (%)				
BLS	7.6	6.1	5.8	13.8
ALS	92.4	93.9	94.2	86.2
Prehospital intubation (%)	6.9	6.0	8.1	1.1
Mortality (%)	7.3	8.0	9.4	4.5



Notes

Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #10
January 13, 2016
11:20 am

CREATION OF A DECISION AID FOR GOAL-SETTING AFTER GERIATRIC BURNS

Erica I. Hodgman, MD, Bellal Joseph, MD, Jane Mohler, Steven E. Wolf, MD*, Elizabeth Paulk, Ramona Rhodes, Paul Nakonezny, Herb A. Phelan III, MD, FACS*
University of Texas Southwestern Medical Center

Presenter: Erica I. Hodgman, MD

Discussant: Jeffrey Carter, MD, Wake Forest School of Medicine

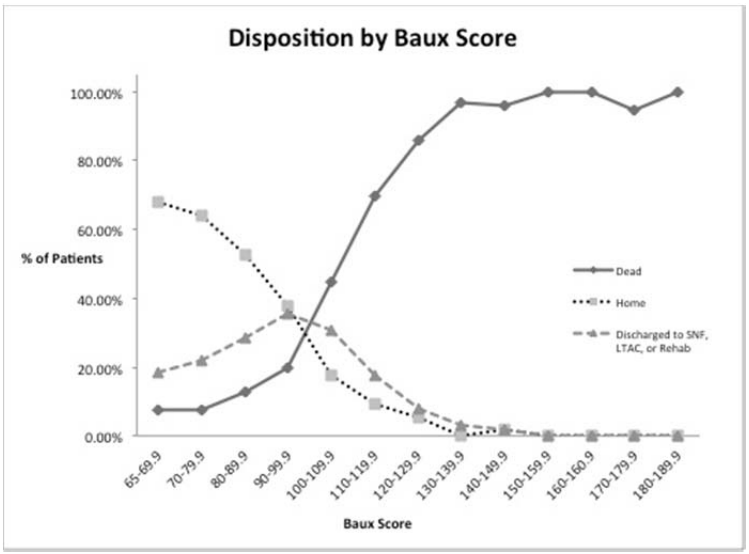
Objectives: It is imperative to delineate goals of care early after geriatric burn admission by reconciling patients' values and preferences with accurate prognostic information. We hypothesized that a decision-support aid to predict index admission mortality and discharge disposition for geriatric burns could be constructed based on the well-accepted Baux score (age + total body surface area burned) utilizing a geriatric cohort from a national burn registry.

Methods: The National Burn Repository version 8.0 (2002-2011) was queried for all patients aged ≥65 yrs. Exclusion criteria were: elective admits; non-burn injuries; unknown inhalation injury status; transfer to another burn center; and/or length of stay ≤1 day. Patients were grouped into Baux score deciles. The incidence of each discharge outcome (death, home, discharge to an alternate setting) was measured per decile. Receiver operating curve analysis was done to determine optimal Baux scorecutpoints based on the Youden Index in discriminating between discharge dispositions.

Results: The sample was 8,001 patients (Table 1). Withdrawal of care was documented in 17.5% of deaths (n=264); median time to withdrawal was 3 days (range 0-231). As Baux score increased, three peaks in disposition were seen (Figure 1). Baux score <86.15 was predictive of discharge home (AUC 0.698, 75.28% sensitivity, 54.64% specificity), a score >77.12 predicted discharge to an alternate setting (AUC 0.539, 74.91% sensitivity, 34.38% specificity), and a score >93.3 was predictive of mortality (AUC 0.779, 57.46% sensitivity, 87.08% specificity).

Conclusions: For geriatric burn patients whose Baux scores exceed 87, return-to-home rates drop drastically; risk of mortality increases dramatically at a score of 93, and mortality is nearly universal at a score of 130 and above. We are piloting a display of the descriptive data as a decision-making aid when setting goals of care with stakeholders after geriatric burns.

Table 1: Selected demographics by Baux Score													
Baux Score decile	65 - 69.9	70 - 79.9	80 - 89.9	90 - 99.9	100 - 109.9	110 - 119.9	120 - 129.9	130 - 139.9	140 - 149.9	150 - 159.9	160 - 169.9	170 - 179.9	180 - 189.9
n	766	2466	2465	1241	498	211	135	64	52	43	35	18	7
Age (median)	66.82	71.37	79.20	83.21	81.00	80.60	80.90	77.00	80.42	79.32	82.70	80.75	89
Sex (%M)	499 (65.1%)	1494 (60.6%)	1345 (54.6%)	672 (54.2%)	282 (56.6%)	129 (61.1%)	79 (58.5%)	41 (64.1%)	30 (57.7%)	20 (46.5%)	19 (54.3%)	10 (55.6%)	5 (71.4%)
% TBSA (median)	0.10	3.0	5.00	11.0	23.00	34.50	43.18	58.0	65.0	74.0	82.5	91.0	97.0
Inhalation injury	97 (12.7%)	331 (13.4%)	329 (13.3%)	1086 (12.5%)	108 (21.7%)	78 (37.0%)	62 (45.9%)	34 (53.1%)	27 (51.9%)	27 (58.1%)	25 (71.4%)	11 (61.1%)	3 (42.9%)



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Scientific Session I - Raymond H. Alexander, MD Resident Paper Competition
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #11
January 13, 2016
11:40 am

PERIOPERATIVE RISK FACTORS IMPACT OUTCOMES AMONG EMERGENCY VERSUS NON-EMERGENCY SURGERY DIFFERENTLY: TIME TO SEPARATE OUR NATIONAL RISK-ADJUSTMENT MODELS?

Jordan D. Bohnen, MD, MBA, Elie Ramly, Naveen F Sangji, Marc A. deMoya, MD*, Daniel Dante Yeh, MD*, Jarone Lee, MD, MPH*, George Velmahos, MD, PhD, MSEd, David C. Chang, Haytham Kaafarani, MD, MPH*
Massachusetts General Hospital

Presenter: Jordan D. Bohnen, MD, MBA

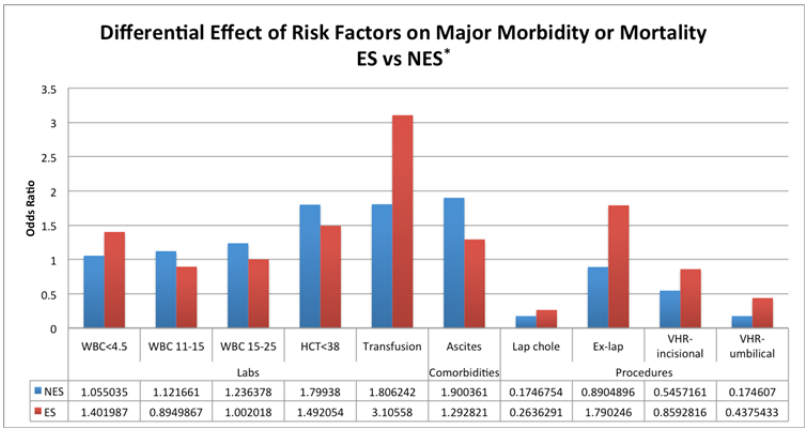
Discussant: David S. Morris, Mayo Clinic

Objectives: Emergency surgery (ES) carries a different risk profile than non-emergency surgery (NES). Yet, little is known about how perioperative risk factors affect 30-day outcomes in ES vs NES.

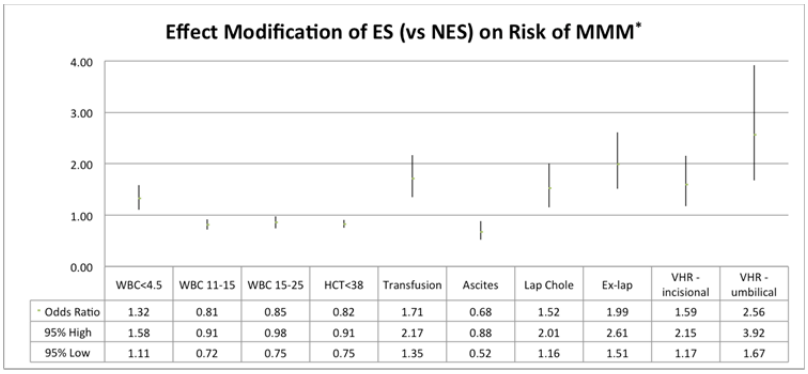
Methods: Using the 2011-2012 ACS-NSQIP database, the 20 most common ES procedures were identified by CPT code. CPT codes with <300 observations in either ES or NES were excluded. ES cases were defined as "Emergent" & "non-elective" per ACS-NSQIP criteria. Multivariable regression models were constructed to identify predictors of 30-day major morbidity or mortality (MMM)) in each group, controlling for demographics, ASA, comorbidities, preop labs, and procedure type. Odds Ratios of independent predictors of MMM in ES and NES were derived then compared between groups; "effect modification" of procedure status (ES vs NES) on each risk factor was subsequently calculated. Statistical significance was set at $p<0.05$.

Results: Of 986,034 patients, 170,131 met inclusion criteria (59,949 ES, 110,182 NES). Overall risk of MMM was significantly higher in ES vs NES (16.75% vs. 9.73%, $p<0.001$). Out of 40 ES and 38 NES-identified independent risk factors, preop transfusion and WBC≤4.5 carried significantly higher risk of MMM in ES vs NES (Figure 1). Conversely, ascites, preop anemia, and leukocytosis (WBC 11-25) carried greater risk for MMM in NES. Four procedures (laparoscopic cholecystectomy, laparotomy, umbilical and incisional herniorrhaphies) were riskier in ES vs NES. The effect modification of ES (vs NES) on the risk of MMM for each of these variables is shown in Figure 2.

Conclusions: Perioperative risk factors impact postoperative morbidity and mortality differently in ES vs NES. Instead of using the same risk-adjustment model for both ES and NES, as currently practiced, our findings strongly suggest the need to benchmark emergent and elective surgeries separately.



* ES and NES regressions used the same demographic, comorbidity, laboratory, CPT code, and other variables (eg. ASA, Sepsis, transfer, functional dependence). Each variable was captured in at least 50% of cases. Final ES regression contained 46,310 observations (AUROC 0.9078). Final GS regression contained 84,150 observations (AUROC 0.8768).



* Odds ratios for effect modification calculated from multivariate regression with the same set of variables used to generate Figure 1. This regression for effect modification contained 130,460 observations (AUROC = 0.8918).

Notes

Scientific Session III-A - Trauma
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #12
January 14, 2016
8:00 am

SUCTION EVACUATION OF HEMOTHORAX: A PROSPECTIVE STUDY

Stephanie Savage, MD, MS, George A Cibulas, II, PharmD, MD, Tyler A Ward,
Ben L. Zarzaur, MD, MPH*, Corinne A. Davis
University of Tennessee Health Science Center - Memphis

Presenter: Stephanie Savage, MD, MS

Discussant: Ali Salim, MD, Brigham & Women's Hospital

Objectives: While tube thoracostomy is common following thoracic trauma, incomplete evacuation of fluid places the patient at risk for retained fluid. As little as 300-500cc may require a second thoracostomy tube or, in more severe cases, lung entrapment and empyema. We hypothesized that suction evacuation of the thoracic cavity prior to tube placement would decrease incidence of retained hemothorax and late complications.

Methods: Patients requiring tube thoracostomy within 4 days of admit were prospectively identified and had suction evacuation of the thoracic cavity (YATS) prior to chest tube placement. Study patients were compared to historical controls (CON), who had standard tube thoracostomy placement. Data on demographics, admission vital signs and laboratory values and outcomes were collected on all patients. Multivariate logistic regression was used to compare outcomes between groups.

Results: 205 patients were identified. 9 were excluded leaving 94 CON patients and 102 YATS patients. There were no differences in basic demographics, injury severity, admission labs or vital signs or hospital length of stay. Mean hemothorax volume in YATS patients was 218cc (min 0cc, max 1500cc), with only 42% have a volume greater than 100cc evacuated at tube placement. 3 patients developed empyema and 19 demonstrated retained fluid; there was no difference between YATS and CON patients (Table). YATS was significantly protective against recurrent pneumothorax following chest tube removal (OR 0.332; 95% CI 0.148, 0.745).

Conclusions: Preemptive suction evacuation of the thoracic cavity is well-tolerated and simple. It neither protected against, or contributed to, late empyema or retained hemothorax. Suction evacuation did significantly decrease recurrent pneumothorax. Though the mechanism is unclear, such a benefit may make this simple procedure worthwhile. A larger sample size is required for validation and to determine if preemptive thoracic evacuation has a clinical benefit.

Variable	N	Odds Ratio (95% CI)	p-value
Empyema/Retained Hemothorax	3/19	1.576 (0.574, 4.330)	0.3778
Residual Pneumothorax	24	0.332 (0.148, 0.745)	0.0076

Notes

Scientific Session III-A - Trauma
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #13
January 14, 2016
8:20 am

AGE IS JUST A NUMBER: OSTEOPENIA AND SARCOPENIA ARE BETTER PREDICTORS OF INJURY SEVERITY THAN CHRONOLOGIC AGE

Morgan Oskutis, Margaret H. Lauerman, MD*, Joseph A Kufera, MA,
Cynthia Burch, MPH, Shiu Ho, Thomas M. Scalea, MD, FACS, FCCM*,
Deborah M. Stein, MD, MPH, FACS, FCCM*
University of Maryland School of Medicine

Presenter: Morgan Oskutis

Discussant: Bellal Joseph, MD, The University of Arizona

Objectives: In the modern era, chronologic age often does not reflect health. Many older patients are physically active and vibrant, while many younger patients are less functional and phenotypically older than their age. While chronologic age has been associated with morbidity and mortality after motor vehicle crashes, markers targeted towards patient strength and durability are likely better contemporary predictors of injury development and severity.

Methods: The Crash Injury Research and Engineering Network (CIREN) database, which collects crash and patient information, provides a unique opportunity to control for crash characteristics and severity. Computed Tomography (CT) images of patients 40 years of age and above were analyzed for radiographic markers of osteopenia and sarcopenia, and compared with presence of injury and injury severity. Injuries likely susceptible to fragility were chosen.

Results: 202 patients from the CIREN database were included. In univariate analysis, patients with sarcopenia were associated with severe thoracic injury ($p= 0.03$), but neither sarcopenia nor osteopenia was associated with severe spine, upper extremity, or lower extremity injury. However, when a multivariable analysis was created controlling for age and crash variables, osteopenia was the only factor significantly associated with a severe spine injury ($p=0.02$), with osteopenic patients sustaining a severe spine injury at a rate of 4 times the non-osteopenic patients. Sarcopenia, was also associated with development of a severe thoracic injury ($p=0.007$). Chronologic age was not significantly associated with developing either severe spine injury or severe thoracic injury when controlling for crash variables.

Conclusions: Osteopenia and sarcopenia are associated with severity of injury. Radiographic markers provide a better assessment of patient susceptibility to injury than chronologic age.

Notes

Scientific Session III-A - Trauma
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #14
January 14, 2016
8:40 am

IMPROVING OUTCOMES OF INJURED GERIATRIC PATIENTS: SMALL STEPS, BIGGER PROBLEM.

Peter M. Hammer, MD*, Annika Storey, Demetria Bayt, Teresa Bell,
Ben L. Zarzaur, MD, MPH*, David V. Feliciano, MD, FACS*,
Grace S. Rozycki, MD, MBA, FACS*
Indiana University

Presenter: Peter M. Hammer, MD

Discussant: Kevin Pei, MD, Yale School of Medicine

Objectives: Due to the unique physiology and co-morbidities of injured geriatric patients, specific interventions are needed to improve outcomes. The purpose of this study was to assess the effect of a change in triage criteria for injured geriatric patients evaluated at an ACS Level I trauma center.

Methods: As of October 1, 2013, all injured patients >70 years of age were mandated to have Level I (highest) trauma activations upon arrival in the emergency department regardless of physiology or mechanism of injury. Patients admitted prior to that date were designated PRE, while those admitted after that date were designated POST, and the study period was from January 1, 2012, through April 30, 2015. Data collected included demographics, Injury Severity Score (ISS), comorbidities, emergency department length of stay (ED LOS) and overall length of stay, complications and mortality. PRE vs. POST ED LOS and overall length of stay were compared using Wilcoxon Rank Sum Test and multinomial regression, while PRE vs. POST mortality was compared using multivariable logistic regression, with $p<0.05$ = significant.

Results: 2,494 patients (mean age = 80.63 years; mean ISS = 12.2; PRE 1,397/POST 1,097) were included in the study. On multivariable analysis, increasing age, higher ISS, and renal comorbidity were all associated with higher mortality. POST patients were more likely to have an ED LOS <2 hours (OR 1.47, 95% CI 1.011-2.137) after controlling for age, ISS, and comorbidities. Also, POST mortality was significantly decreased (OR 0.634, 95% CI 0.45-0.823).

Conclusions: Based on age alone, the focused intervention of a higher level of trauma activation decreased ED LOS and mortality in injured geriatric patients.

Notes

Scientific Session III-A - Trauma
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #15
January 14, 2016
9:00 am

THE PROFILE OF WOUNDING IN CIVILIAN ACTIVE SHOOTER FATALITIES

E. Reed Smith, MD, Geoff Shapiro, Babak Sarani, MD, FACS, FCCM*
George Washington University

Presenter: E. Reed Smith, MD - @CommitteeTECC

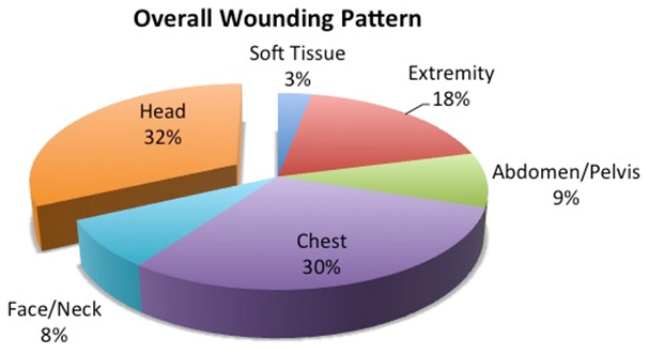
Discussant: Matthew Martin, MD, Madigan Army Medical Center

Objectives: Since the 2012 mass shooting in Newtown, CT, there has been focus on improving survival in active shooter events with emphasis on tourniquets/external hemorrhage control. This guidance is based on combat wounding patterns where 9% of deaths are due to extremity hemorrhage. We hypothesize that wounding in active shooter events differs from combat and thus may require different therapeutic emphasis. As such, we seek to define the fatal wounding pattern in civilian active shooter events.

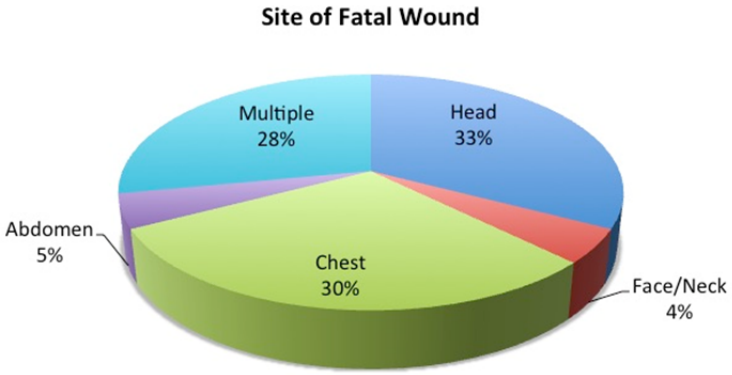
Methods: Autopsy reports from randomly selected active shooter events with 5 or more fatalities from 1983-2012 were requested through the Freedom of Information Act. If precluded by state law, a de-identified summary of all wounds and causes of death was requested. We reviewed the reports to determine the anatomic region for every wound, site of fatal injury, and whether the wounds were potentially survivable assuming pre-hospital care within 15 minutes and definitive care within 60 minutes of injury.

Results: We received reports from 8 events including 107 victims with 231 wounds. The head was both the most commonly injured region (33%) and the most common fatal injury (tables 1 and 2). 28% of victims had fatal injuries to multiple anatomic regions. Although 22% of wounds were to the extremities, none of the autopsies showed extremity hemorrhage to be the cause of death. 6 victims had isolated wounds to the torso that were considered survivable.

Conclusions: The wounding pattern in civilian active shooter fatalities differs from that in combat. Fatal injury was from non-survivable brain or torso injury in all cases. Although tourniquets and external hemorrhage control techniques hold value, their role in active shooter events may be over-emphasized as a means to decrease fatality. Instead, rapid access to the wounded, initiation of damage control resuscitation, and rapid extrication to definitive care may offer a more effective means to minimize mortality.



Overall Wounding Pattern in Fatalities



Site of Fatal Wound

Notes

Scientific Session III-A - Trauma
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #16
January 14, 2016
9:20 am

OUTCOMES OF LOWER EXTREMITY VASCULAR REPAIRS EXTENDING BELOW THE KNEE: A MULTICENTER RETROSPECTIVE REVIEW

Gerald Richard Fortuna, Jr., MD*, Joseph J. DuBose, MD*, Mina Boutrous, Ranan Mendelsberg, Kenji Inaba, MD, Ansab Haider, Bellal Joseph, MD, David J. Skarupa, MD, Matthew Selleck, Jan-Holly Nicolas, Xian Luo-Owen, Chad Ball, Ali Azizzadeh, Kristofer Charlton-Ouw
University of Texas Health Science Center at Houston

Presenter: Gerald Richard Fortuna, Jr., MD

Discussant: Scott Brakenridge, MD, University of Florida

Objectives: To determine the outcomes of vascular injury interventions extending below the knee.

Methods: Vascular injury repairs extending below the knee from Jan 2008 – Dec 2014 were collected from 6 ACS Level I trauma centers. Demographics, management and outcomes were collected and analyzed.

Results: 194 vascular injuries were identified; Mean age 33.7, 88.1% male, 71.1% blunt injury. Admission SBP was < 90 mm Hg in 10.8%; pre-hospital tourniquets utilized in 5.6%. Median MESS Score was 6.0 [IQR 6]. Imaging used included CTA (58.2%) and angiography (7.2%); 66 (34.0%) proceeding directly to OR based upon exam. Vascular interventions were conducted primarily by vascular (66.0%) and trauma (25.3%) surgeons at a median time from injury of 8 hours (IQR 7). Initial interventions included graft interposition (57.7%) with saphenous vein (111) or synthetic graft (1), primary repair (14.9%), endovascular stent-graft (1.5%) and patch angioplasty (2.1%). Fasciotomy was done at initial operation in 41.8%, and for delayed compartment syndrome in 2.1%. Vascular re-intervention was required in 20 patients (6.7%) for bleeding (7) or thrombosis (13). There was no difference between specialties with regards to re-intervention need. There was a trend towards higher re-intervention rates for thrombosis among interposition grafts with distal anastomotic sites at the below-knee popliteal compared to those extending to the tibioperoneal trunk or distal trifurcation vessels (4/60, 6.7% vs. 6/49, 12.2%; *p = 0.34*). Post-intervention amputation rates were significantly higher among interposition grafts extending distal to the popliteal (4/60, 6.7% vs. 15/49, 30.6%; p = 0.006).

Conclusions: The management of vascular injuries extending below the knee remains a complex issue of extremity trauma care. The need for delayed amputation is significantly more common when revascularization below the distal popliteal artery is required.

Notes

Scientific Session III-A - Trauma
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #17
January 14, 2016
9:40 am

MILITARY INJURY SEVERITY SCORE: A BETTER PREDICTOR OF COMBAT-RELATED MORTALITY THAN INJURY SEVERITY SCORE

Kirby R. Gross, MD*, Jean Orman, ScD, Zsolt T. Stockinger, MD, FACS*,
Mary Ann Spott, MPA, MSIS, MBA, Susan West, Michael Galarneau,
Edward Mazuchowski, Tuan Le, MD, DrPH
US Army Institute of Surgical Research

Presenter: Kirby R. Gross, MD

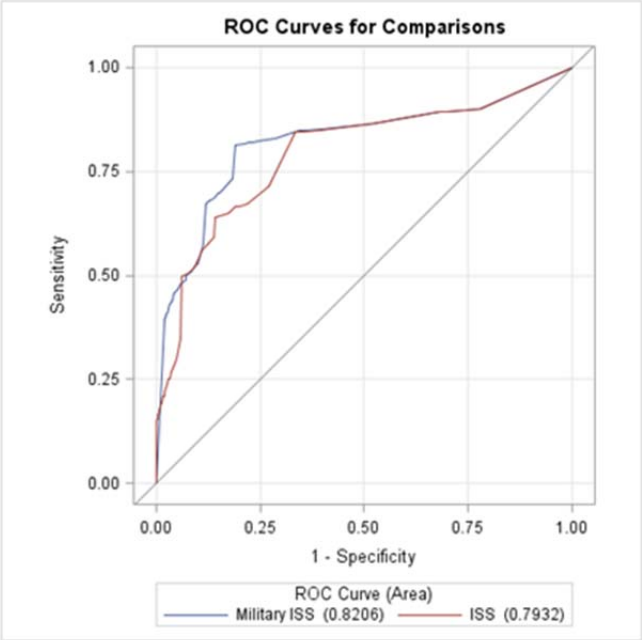
Discussant: Travis Polk, MD, Naval Medical Center Portsmouth

Objectives: We compared military Injury Severity Score (mISS) & Injury Severity Score (ISS) as predictors of combat-related mortality.

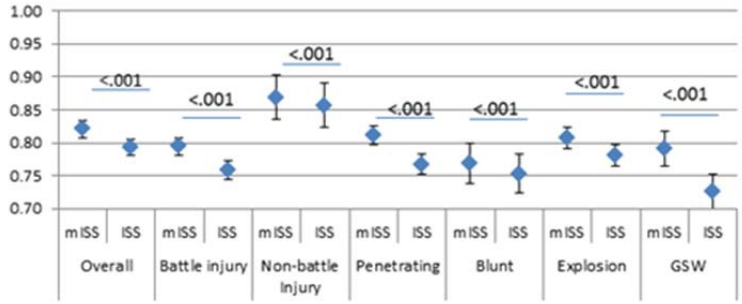
Methods: DoD Trauma Registry data for patients wounded in Iraq & Afghanistan in 1/2003-12/2014 were analyzed. ISS is the sum of the squares of the 3 most worst AIS scores from 6 body regions; mISS is a variant of ISS but uses AIS 2005-Military score developed by a panel of military trauma surgeons. Mortality was the primary outcome.Area under the ROC curve (AUC) was used to discriminate between mISS & ISS. Sensitivity & specificity were compared. Logistic regression was used to calculate the likelihood of mortality by levels of mISS & ISS overall & by battle (BI) vs. non-battle (NBI), type & mechanism of injury. Mann-Whitney or t-test & chi-square test were used. P <0.05 is significant.

Results: A total of 30,364 patients were analyzed. Median [IQR] age was 24 [21-29]. BI was 65.3%. Penetrating (39.5%) & blunt (54.2%), types & explosion (51%) & gunshot (15%) mechanisms predominated. The total mortality rate was 6.0%.Median mISS & ISS were 5.0 [2.0-13.0] & 5.0 [2.0-10.0] overall, 5 [2-10] & 5 [2-10] in survivors, 30 [16-75] & 24 [9-23] in non-survivors, respectively. mISS & ISS scores were discordant in 5,352 patients (17.6%), accounting for 56.2% of deaths. For cases with discordant severity scores, the median difference between mISS & ISS was 9 [7-16]; range 1-59. mISS & ISS shared 78% variability (R^2=0.78). AUC was higher in mISS than ISS overall (0.82 vs 0.79), for BI (0.79 vs 0.76), NBI (0.87 vs 0.86), penetrating (0.81 vs 0.77), blunt (0.77 vs 0.75), explosion (0.81 vs 0.78), & gunshot wound (0.79 vs 0.73), all P-values < 0.001. Higher mISS & ISS were associated with an increased risk of mortality; mISS had higher sensitivity than ISS (81.2 vs 63.9) but slightly lower specificity (80.2 vs 85.7).

Conclusions: mISS is a better predictor of combat-related mortality than ISS.



Comparison of the ROC curves between military Injury Severity Score (mISS) and Injury Severity Score (ISS) for predicting combat-related mortality



Comparison of AUC between military Injury Severity Score (mISS) and Injury Severity Score (ISS) for predicting combat-related mortality overall, injury classification (battle- vs Non-battle injury), injury type (penetrating vs blunt), and injury mechanism (explosion vs gunshot wound)

Notes

Scientific Session III-B - Cox-Templeton Injury Prevention Competition
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #18
January 14, 2016
8:00 am

TRAUMA IS AN INDEPENDENT FACTOR FOR BRIEF INTERVENTION SUCCESS.

Peter Ehrlich, MD, MSc, H BSc*, Jessica Roche, Rebecca Cunningham, MD, Stephen Chermack, PhD, Brenda Booth, PhD, Frederic C Blow, PhD, Kris Barry
University of Michigan

Presenter: Peter Ehrlich, MD, MSc, H BSc

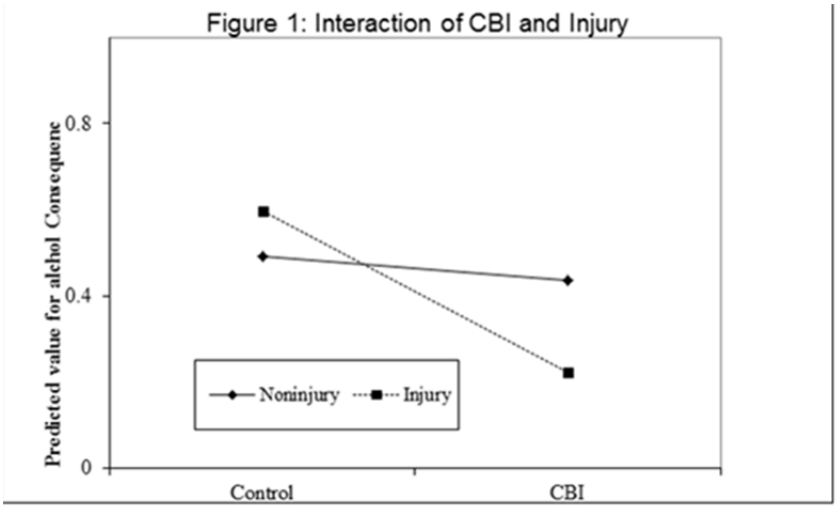
Discussant: Tiffany Overton, MA, MPH, JPS Health Network

Objectives: Few studies have examined whether presenting for injury affects the efficacy of a brief interventions' (BI) as compared to those presenting for other reasons. We recently completed a Randomized Control Trial (RCT) comparing the efficacy of BI delivered by computer or a therapist to a control group among underage risky drinkers at an Emergency Department. The RCT showed that compared to the control, the therapist BI and computer BI significantly reduced alcohol consumption and alcohol-related consequences at 3 and 12 months. Our hypothesis is that injury is an moderator of intervention response.

Methods: Patients (ages 14-20) screening positive for risky drinking (AUDIT-C score) completed a baseline assessment and were randomized to: a computer-delivered BI (n=277), a therapist-delivered BI (n=278), or a control (n=281). Regression models examined effects of the BI and interaction effects of those presenting to the ED with injury at baseline

Results: Among 4389 patients screened, 24.0% (n=1054) reported risky drinking and 836 (79.3% participation) were enrolled in the RCT (mean age = 18.6, 51.6% male, 79.4% Caucasian) of which 303 (36.2%) had a primary complaint of injury. At baseline, injured patients were more likely to be male ($p < 0.001$), have higher alcohol consumption ($p < 0.01$), but were less likely to misuse prescription drugs ($p = 0.02$). There were no differences in race, illicit drug use or frequency of alcohol consequences at presentation. Regression models demonstrated that at the 3(and 12) month follow-up the computer BI was more effective at reducing alcohol consequences among those presenting with injury. There was no difference in the efficacy of the computer BI based on injury presentation on alcohol consumption. In contrast, ED presentation did not affect the efficacy of the therapist BI on alcohol consumption or consequences.

Conclusions: Injury is an independent factor of BI success.



Interaction of Injury and Brief Intervention

Notes

Scientific Session III-B - Cox-Templeton Injury Prevention Competition
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #19
January 14, 2016
8:20 am

HOME SAFE HOME: EVALUATION OF A CHILDHOOD HOME SAFETY PROGRAM

Tanya Charyk Stewart, B.Sc, M.Sc, Jane Harrington, Jason Gilliland, Michael Miller, Tania Haidar, Brandon Batey, kelly vogt, Neil G. Parry, MD*, Douglas D. Fraser, Neil Merritt
London Health Sciences Centre

Presenter: Tanya Charyk Stewart, B.Sc, M.Sc

Discussant: Brian Brewer, MD, Indianapolis University

Objectives: The Home Safety Program (HSP) provides safety devices, education, a safety video and home safety checklist to all first-time families for the reduction of childhood home injuries. The objective of this study was to evaluate the HSP for the prevention of home injuries in children up to 5 years of age.

Methods: A program evaluation was performed with participant follow up survey, along with an interrupted time-series analysis of ED visits for home injuries 5 years pre-implementation and 2 years post (2007-15). Spatial analysis of ED visits was undertaken to assess differences in home injury rates by dissemination areas controlling for social determinants (i.e., income, education, lone-parent status).

Results: A total of 3458 first-time families were given a HSP kit (74% compliance rate). Of these, 12% (n=407) of parents responded to our questionnaire with 93% reporting the program to be useful (median 6, IQR=2 on a 7-point Likert scale) and 78% learning new strategies for preventing home injuries. The most useful products were electric outlet covers, bath thermometers and cabinet locks. The home safety check list was used by 88% of respondents to identify hazards in their home, with 95% taking action to minimize the risk. Qualitative comments included *"The information built confidence for first-time parents. I felt much safer bringing my son home because of it."* The time-series demonstrated no significant difference in ED visits for home injuries in 0-5-year-olds post implementation. Spatial analysis revealed injury clusters.

Conclusions: Removing hazards, supervision and installing safety devices are key facilitators in the reduction of home injuries. First-time parents found our HSP useful to identify hazards, learn new strategies, build confidence and provide safety products. More time is required to definitively assess the HSP effect on home injury incidence. The spatial analysis can be used to target the HSP to families at highest risk.

Notes

Scientific Session III-B - Cox-Templeton Injury Prevention Competition
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #20
January 14, 2016
8:40 am

CREATION OF THE FIRST HARTFORD CONSENSUS COMPLIANT SCHOOL IN THE UNITED STATES

Elie Ramly, Jordan D. Bohnen, MD, MBA, Peter Fagenholz, Marc A. deMoya, MD*,
George Velmahos, MD, PhD, MSEd, Daniel Dante Yeh, MD*,
Haytham Kaafarani, MD, MPH*, Kathryn Butler, MD*
Massachusetts General Hospital

Presenter: Jordan D. Bohnen, MD, MBA

Discussant: Michael F. Rotondo, MD, University of Rochester School of Medicine

Objectives: The Hartford Consensus established a framework for minimizing deaths due to mass shootings, specifically eliminating preventable deaths due to limb exsanguination. Two major principles defined within this framework are 1) redefining the first responder role and 2) the ubiquitous availability of tourniquets and proper training in application. We hypothesized that this hemorrhage control posture could be fully translated to an elementary school.

Methods: Following institutional review board approval, all teachers at a pre-kindergarten through 8th grade elementary school underwent short, intensive instruction on their role as a first responder, as well as indications and proper technique of tourniquet application for limb exsanguination. All teachers self-reported their confidence in tourniquet application indications and technique before and after instruction and results compared by paired t-test. Following instruction, teachers were evaluated on proper tourniquet application technique on a simulated limb to assess competence.

Results: 22 elementary school teachers and 2 administrative staff underwent training. All reported low confidence in tourniquet application technique and indications before training. Following training, all teachers reported improved, high confidence ($p<0.0001$). Testing demonstrated 100% compliance with correct tourniquet application technique. Following training, each classroom was equipped with a purpose-made commercial tourniquet, and a dedicated hemorrhage control bag was placed in the school's central administrative office.

Conclusions: All teachers were successfully trained in correct tourniquet application technique and verified by testing. Tourniquets were prepositioned throughout the school. This is the first elementary school to adopt a hemorrhage control posture to eliminate preventable deaths from limb exsanguination advocated by the Hartford Consensus.

Notes

Scientific Session III-B - Cox-Templeton Injury Prevention Competition
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #21
January 14, 2016
9:00 am

EVERY 15 MINUTES: A HIGH SCHOOL INTERVENTION TO REDUCE ALCOHOL RELATED COLLISIONS

Paul J. Chestovich, MD*, David Velez, Douglas R. Fraser, MD*, Deborah A. Kuhls, MD*,
Nichole Ingalls, MD, MPH*, Nadia Fulkerson,
Kelly Raybuck, Phillip Lynn, John J. Fildes, MD*
University of Nevada School of Medicine

Presenter: Paul J. Chestovich, MD

Discussant: Daryhl Johnson, MD, University of North Carolina at Chapel Hill

Objectives: Over 10,000 people are killed annually in the US in alcohol related crashes. Teen drivers are 3 times more likely to be in a fatal crash, 20% of which are alcohol related. *Every 15 Minutes* (E15M) is a 2-day high school program to reduce impaired driving. Our objective is to measure the impact of E15M on high school students.

Methods: Day 1 of E15M consists of a simulated crash, EMS rescue of the student victims, transport to trauma center and attempted resuscitation. Deceased students are taken to the morgue, parents notified, and the drunk driver is arrested, jailed, and sentenced to prison in court. Day 2 involves a school assembly with letters read by the deceased and impact speakers including trauma surgeons and actual DUI victims. Student surveys were conducted before and after the event. Participants were asked to rank the likelihood of engaging in activities using a 5-point Likert scales, with 1=”Much Less Likely” 3=”No Change” and 5=”Much More Likely.” Post-survey Likert averages were compared between groups defined by pre-survey behaviors using Wilcoxon Rank-Sum Test with $p<0.05$ significant.

Results: 63 students completed both pre and post surveys. Results are summarized in the Table below. After E15M, participants were highly unlikely to drive under the influence or ride with an impaired driver, but highly likely to stop a friend from driving impaired. No difference was seen between students with and without an active license. Students reporting alcohol use and drinking enough to get drunk showed greater likelihood to drive under the influence or ride with impaired driver, while these groups showed no difference at stopping a friend from driving impaired.

Conclusions: The E15M program is successful at changing the attitudes of high school students about the risks of driving and alcohol use. It is effective in all students, but appears to have the greatest impact on students not already using alcohol.

Post-Survey Likelihood (1=unlikely 5=likely)	Pre-Survey Behaviors									
	All Participants N=63	Active License		p	Drink Alcohol		p	Drink to get "drunk"		p
		Yes	No		Yes	No		Yes	No	
		50	13		27	36		14	49	
Drive under influence	1.08	1.10	1.00	0.369	1.19	1.00	0.042	1.36	1.00	0.001
Ride w/ impaired driver	1.05	1.06	1.00	0.467	1.11	1.00	0.010	1.21	1.00	0.008
Stop friend driving impaired	4.90	4.87	5.00	0.476	4.92	4.88	0.867	4.86	4.91	0.384

Summary of post-survey responses with 5=much more likely 4=more likely 3=no change 2=less likely and 1=much less likely. Comparisons are made between groups identified on the pre-survey.

Notes

Scientific Session III-B - Cox-Templeton Injury Prevention Competition
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #22
January 14, 2016
9:20 am

INJURY PREVENTION PROGRAMS AGAINST DISTRACTED DRIVING AMONG STUDENTS

Bellal Joseph, MD, Ansab A Haider, MD, Tahereh Orouji, Narong Kulvatunyou, MD*, Terence O'Keeffe, MD, MSPH*, Lynn Gries, Donald Green, MD, Gary A. Vercruysse, MD*, Rifat Latifi, MD*, Peter Rhee, MD, MPH*
The University of Arizona

Presenter: Bellal Joseph, MD

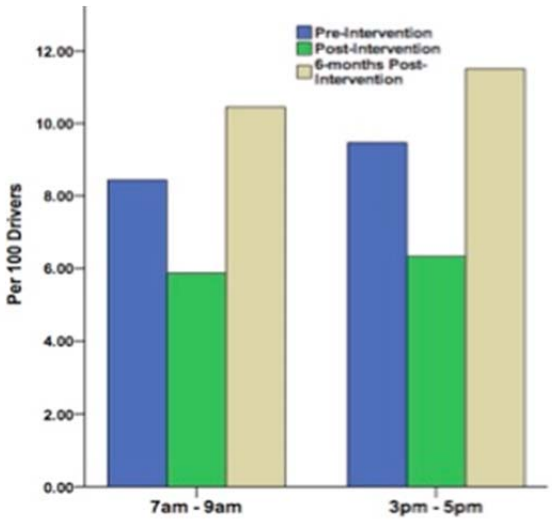
Discussant: Lisa Allee Barmark, MSW, LICSW, Boston Medical Center

Objectives: The aim of this study was to identify the incidence of distracted driving (DD) among students and to create awareness against DD. We hypothesized that DD is prevalent among students.

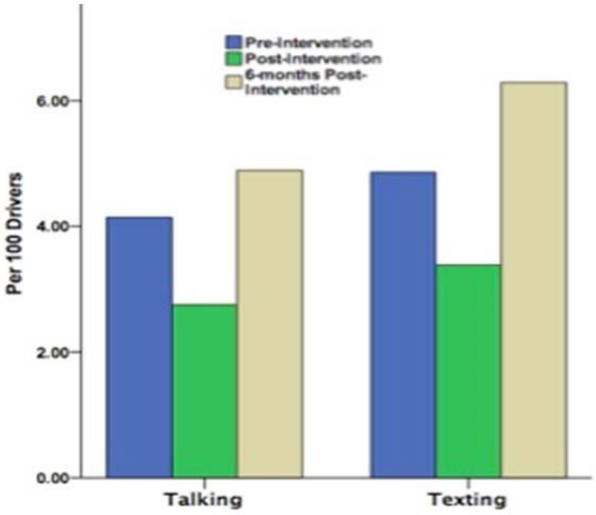
Methods: We performed a 4 phase prospective interventional study of university students at our campus. Phase one: 1 week pre-intervention observation, phase two: 1 week intervention, phase three: 1 week post-intervention observation, and phase 4: 1 week 6 month post-intervention observation. Intervention comprised of informative emails, pamphlets and banners in student union. Outcome measure was incidence of DD pre, post, and 6 months post intervention.

Results: A total of 47,764 observations (Pre: 14,844, Post: 17,939, 6-months Post: 14,981) were performed. The baseline incident of DD among students was 9.0 ± 1.2 per 100 drivers (Texting: 4.8 ± 1.7 per 100 drivers, Talking: 4.1 ± 1.1 per 100 drivers). There was a significant reduction in overall DD after intervention (9.0 ± 1.2 vs. 6.1 ± 1.7, $p<0.001$) however the incidence of DD returned to baseline at 6-month post-intervention and trended towards increase (9.0 ± 1.2 vs. 11.1 ± 8.4, $p=0.34$). There was a significant reduction in DD in each time interval of observation between the pre and post intervention **(Figure 1).** On sub-analysis, there was a significant decrease in talking (p=0.001) and texting (p=0.01) while driving post-intervention as compared to that of pre-intervention. **(Figure 2)**

Conclusions: There was 32% reduction in the incidence of distracted driving post-intervention however a single episode of intervention did not have a sustainable preventive effect on the DD and the incident increased and exceeded the baseline at 6-month follow up. Implementation of an effective injury prevention campaign with repeated boosters may reduce the incidence of distracted driving among the students.



Incidence of Distracted Driving



Notes

Scientific Session III-B - Cox-Templeton Injury Prevention Competition
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #23
January 14, 2016
9:40 am

A TARGETED HIGH SCHOOL SEAT BELT AWARENESS PROGRAM INCREASES SEAT BELT USAGE FOR ADOLESCENT DRIVERS

A. Britton Christmas, MD, FACS*, Peter E. Fischer, MD, MS*, Bradley Thomas, Ronald F. Sing, DO*, Janice Williams
Carolinas Medical Center

Presenter: A. Britton Christmas, MD, FACS

Discussant: Shannon M. Foster, MD, Reading Health System/University of Pennsylvania

Objectives: Seat belt (SB) use has been associated with decreased morbidity and mortality following motor vehicle crashes and is mandatory for drivers and front seat passengers in 34 states. At our trauma center, we discovered that 34% of adolescent MVC victims were unbelted which significantly differed from our observed 90% SB usage rate in the community. We undertook this study to assess a targeted SB intervention program at local high schools.

Methods: High schools were demographically matched and placed into either a control (CON) group or an intervention group (INT). Each school in the INT group received a standardized seatbelt awareness intervention program and chose additional intervention methods ranging from newsletter and social media to more personal interventions. During the 2013-2014 school year, SB usage was documented at school exits by two trained observers according to the North Carolina SB assessment form during pre-intervention (PRE) and post-intervention (POST) phases.

Results: Four CON schools were compared to 6 INT schools during the study period. Overall (68.3% vs. 70.2%), driver (78.5% vs. 78.8%), and passenger (57.3% vs. 60.8%) SB usage was similar between both CON and INT groups during PRE. Comparing PRE to POST, driver SB usage increased in INT (78.8% vs. 83%) but remained unchanged in the CON group (78.5% vs. 77.5%). No impact was observed on the SB usage of passengers. (Tables 1 & 2)

Conclusions: At our trauma center, we observed lower SB usage among adolescents compared to the observed community rate. Our SB intervention program targeting local high schools successfully increased driver SB usage at all INT schools compared to CON. No effect was observed on passenger SB use.

Table 1. Intervention (INT) Schools PRE vs. POST

	PRE			POST		
School	Driver SB	Passenger SB	Overall SB	Driver SB	Passenger SB	Overall SB
A	89%	64%	77%	93%	62%	78%
B	64%	25%	45%	70%	24%	47%
C	78%	71%	78%	85%	73%	79%
D	84%	71%	78%	88%	73%	81%
E	70%	62%	66%	74%	61%	68%
F	88%	72%	80%	89%	71%	80%
All INT	79%	61%	71%	83%	61%	72%

Table 2. Control (CON) Schools PRE vs. Post

	PRE			POST		
School	Driver SB	Passenger SB	Overall SB	Driver SB	Passenger SB	Overall SB
G	61%	42%	51%	64%	35%	50%
H	81%	58%	70%	74%	57%	66%
I	80%	61%	71%	79%	61%	70%
J	92%	69%	81%	93%	68%	81%
All CON	79%	57%	68%	78%	55%	66%

Notes

Scientific Session IV-A – Coagulation
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #24
January 15, 2016
8:00 am

TRAUMA PATIENTS ON NEW ORAL ANTICOAGULATION AGENTS HAVE LOWER MORTALITY THAN THOSE ON WARFARIN

Adrian A. Maung, MD*, Bishwajit Bhattacharya, MD*, Kevin M. Schuster, MD, MPH*,
Kimberly A. Davis, MD, MBA, FACS, FCCM*
Yale School of Medicine

Presenter: Adrian A. Maung, MD

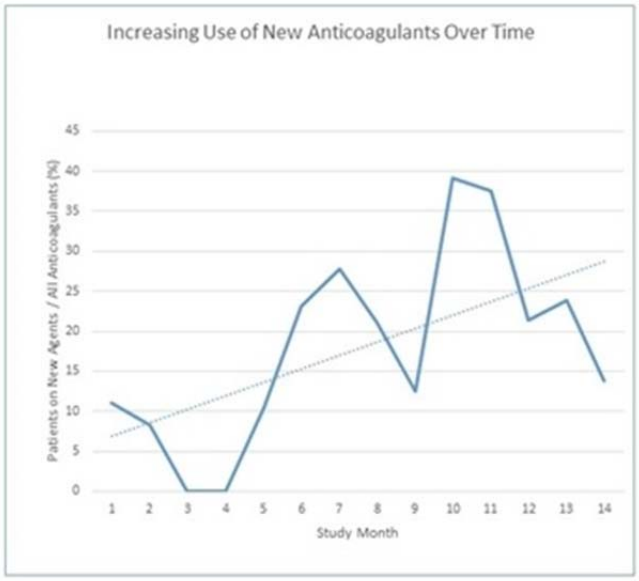
Discussant: Uzer Khan, MD, MBBS, West Virginia University

Objectives: Although anticoagulation with warfarin has been associated with increased risk of adverse outcomes after trauma, the effects of the new oral agents (NOA) such as dabigatran, apixaban, rivaroxaban are not yet well characterized.

Methods: A retrospective review of a Level 1 trauma center database identified all patients age ≥ 50 admitted after trauma during a 14 month period starting Sept 2013. Demographics, including pre-admission anticoagulation agents, injuries, hospital course and outcomes were abstracted from the EMR.

Results: Over the 14 month period, 1994 patients were admitted; 48 (2.4%) were anticoagulated with NOA and 227 (11.4%) with warfarin with a trend toward increasing utilization of the new agents compared to warfarin over that time period (Figure 1). Although comparable in age, gender, ISS and mechanism of injury (Table 1), patients anticoagulated with warfarin had a higher mortality (12.8%) compared to the NOA (6.25%) or the non-anticoagulated control group (6.05%). ($p < 0.001$) Patients on warfarin or NOA required admission to ICU or SDU more frequently than control patients. (43.6% and 50% vs. 36.2% respectively, $p=0.018$). There were no significant differences in RBC transfusions among the three groups but the warfarin group more often received prothrombin complex concentrate (13.2% vs. 8.3% and 0.1% respectively, $p < 0.001$) and FFP (26.0% vs. 4.2% and 1.9%, $p < 0.001$) The incidence of traumatic brain injury (TBI) was similar among the three groups. However, although it did not reach statistical significance, mortality in the TBI subset was highest in the warfarin group (23.6%) vs. the NOA group (10%) or the control group (13.1%) ($p=0.1$).

Conclusions: Although the experience with the new oral anticoagulation agents is still limited, patients on these agents appear to have lower mortality after traumatic injury than patients on warfarin.



	Warfarin (n = 227)	New Anticoagulants (n = 48)	Not Anticoagulated (n = 1719)	P
Age (years)	80.7 ± 9.7	79.1 ± 10.6	73.1 ± 13.9	0.001
Male Gender (%)	52.4	39.5	46.4	0.135
ISS	9.40 ± 6.69	10.54 ± 10.99	8.89 ± 6.71	0.116
TBI (%)	24.2	20.8	19.1	0.191
Length of Stay (days)	6.48 ± 6.91	7.46 ± 11.25	5.50 ± 7.69	0.05
Death (%)	12.8	6.3	6.1	0.001
ICU/SDU (%)	43.6	50.0	36.2	0.018
Surgery (%)	34.4	27.1	37.2	0.272
PRBC Transfusion (%)	18.9	16.7	15.7	0.471
# PRBC (Units)	2.79 ± 2.71	2.25 ± 1.67	2.70 ± 2.76	0.881
FFP Transfusion (%)	26.0	4.2	1.9	0.001
PCC (%)	13.2	8.3	0.1	0.001
Respiratory Failure (%)	11.9	18.8	9.7	0.077

Notes

Scientific Session IV-A – Coagulation
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #25
January 15, 2016
8:20 am

INFLUENCES OF LIMITED RESUSCITATION WITH PLASMA OR PLASMA PROTEIN SOLUTIONS ON HEMOSTASIS AND SURVIVAL OF RABBITS WITH NON-COMPRESSIBLE HEMORRHAGE

Bijan S. Kheirabadi, PhD
US Army Institute of Surgical Research

Presenter: Bijan S. Kheirabadi, PhD

Discussant: Michael Cripps, MD, UT Southwestern/Parkland

Objectives: Prehospital resuscitation of combat casualties with a small volume of plasma or Hextend is military standard of care. We compared outcomes of this standard resuscitation using fresh plasma vs purified plasma protein or crystalloid in an uncontrolled hemorrhage model.

Methods: Anesthetized spontaneously breathing rabbits (3.3±0.1 kg) were instrumented and subjected to a splenic uncontrolled hemorrhage. Shocked rabbits (MAP<40 mmHg) were resuscitated at 15 min with Plasma-Lyte (PAL; 30 ml/kg), PAL+ fibrinogen (PAL+F; 30ml+100mg/kg), fresh rabbit plasma (PL; 15ml/kg), or 25% albumin (AL; 5 ml/kg); all given in two bolus IV injections (20 min apart) to achieve a MAP of 65 mmHg, n=8-9/gp. Animals were monitored 2 hrs or until death and blood loss measured (Table). Blood samples were analyzed for ABG, CBC, protein and coag tests. Data were analyzed statistically and expressed as mean ± SEM.

Results: There were no differences among gps in baseline measures, nor in initial blood loss (11.7±0.3 ml/kg) at 15 min. Twenty min after 2nd bolus fluid resuscitation when blood was sampled (Table), MAP was higher with AL than with crystalloids (PAL or PAL+F), but shock indices were not different. No differences were found in hemostatic effects of PL vs. AL. Fibrinogen addition to PAL increased clot strength but reduced clotting rate. AL resulted in the numerically lowest blood loss and highest survival outcomes (P<.05). Blood values and final outcomes are shown in Table.

Conclusions: Fibrinogen addition to a compatible crystalloid (given at 100 mg/kg dose) did not improve the outcomes in this model. Small volume resuscitation with 25% albumin solution increased hemodynamics and produced best survival outcomes at 1/3 volume of plasma. These outcomes are consistent with our previous finding using 5% albumin solution at a volume equal to plasma. The benefit of using plasma for resuscitation may be mostly due to its albumin component rather than its clotting proteins.

group (gp)	MAP mmHg	Base def (mM)	Lactate (mM)	Total protein g/dl	Albumin g/dL	Fibrinog mg/dL	TEG R-time (min)	TEG α angle	TEG MA (mm)	Blood Loss ml/kg	Survival rate	Survival time min
PAL	27±4	5.7±1.3	7.8±1.2	3.1±0.1	1.0±0.1	182±15	7.1±0.1	69±1	66±2	12.2±2.2	4/9	95±9
PAL+F	31±6	5.3±1.4	8.4±1.5	3.3±0.1	1.0±0.1	467±20*	8.9±0.6	60±2*	77±1*	13.4±2.5	3/8	94±10
PL	38±4	2.4±1.7	7.6±1.0	4.1±0.2*	1.3±0.1*	222±14	8.0±0.9	68±2	70±1	13.9±2.8	6/8	112±5
AL	51±6*	3.3±1.0	6.4±0.8	5.6±0.1*	4.1±0.1*	136±7	6.0±0.4*	67±1	62±1	10.9±1.8	8/8*	120±0*

(*P<.05 vs. crystalloids (PAL or PAL+F), +P<.05 *vs* all groups, °P<.05 *vs* PAL+F)

Table 1.Blood pressure (MAP), blood sample analysis and final outcomes of rabbits with uncontrolled hemorrhage after receiving limited fluid resuscitation

Notes

Scientific Session IV-A – Coagulation
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #26
January 15, 2016
8:40 am

SUBCUTANEOUS ADIPOSE TISSUE DRIVES POST INJURY HYPERCOAGULABILITY

Robert D. Winfield, MD*, Vincent Mellnick, MD, Isaiah Turnbull, Constatine Raptis, MD, Kelly Bochicchio, Philip C. Spinella, MD, FCCM*, Grant V. Bochicchio, MD, MPH*
Washington University School of Medicine

Presenter: Robert D. Winfield, MD - @rwinfield11

Discussant: Rachael Callcut, MD, MSPH, University of California-San Francisco

Objectives: Obesity is associated with a hypercoagulable state at baseline and following injury. Location of adipose deposition may influence the type of thrombotic event, with visceral adipose tissue (VAT) associated with arterial, and subcutaneous adipose (SAT) predisposing to venous, thrombosis. We sought to determine whether adipose tissue amount and location correlated with measures of coagulation.

Methods: All adult Level I Trauma Activations at our institution between January and August 2013 who underwent admission abdominal CT scan and had admission ROTEM measurements were included. Patients were excluded for history of anticoagulant use and known coagulopathy/hypercoagulable state. Admission CT was used to obtain cross-sectional VAT and SAT areas at the umbilicus utilizing a novel software system; VAT and SAT measurements were associated with markers of coagulation utilizing Spearman's correlation and multiple linear regression with significance set at $p<0.05$.

Results: 138 patients met inclusion and exclusion criteria. 71% of patients sustained blunt injury, 83% were male, median age was 34 years, 24% were obese or morbidly obese, and median ISS was 14. 12% of patients had acute DVT or PE during hospitalization. SAT correlated negatively with PT, INR, and positively with platelet count (PLT); VAT correlated only with PLT. VAT and SAT correlated negatively with clot formation time (CFT) and positively with TEM fibrinogen (TF), alpha angle (AA), and maximum clot firmness; stronger correlations and greater significance were seen between SAT and these measures. Multiple linear regression confirmed significant relationships between SAT and TF, AA, and CFT; VAT only showed a significant relationship with PLT (Table 1).

Conclusions: Increased adipose tissue correlates with relative hypercoagulability following trauma. SAT shows a stronger relationship with functional measures of coagulation, suggesting that SAT may be associated with hemorrhage resistance and hypercoagulability after injury.

Table 1. Linear Regression Relationship between Adipose Tissue and Measures of Coagulation

	Subcutaneous Adipose Tissue		Visceral Adipose Tissue	
	Odds Ratio	p-value	Odds Ratio	p-value
Prothrombin Time	0 (-0.004, 0.003)	0.957	-0.007 (-0.015, 0.003)	0.097
INR	0 (0, 0)	0.903	-0.001 (-0.001, 0)	0.081
Platelet Count	0.079 (-0.008, 0.165)	0.075	0.223 (0.022, 0.425)*	0.030
TEM Fibrinogen	0.018 (0.010,0.026)*	<0.001	-0.007 (-0.025,0.011)	0.459
Clot formation Time	-0.067 (-0.131, -0.004)*	0.039	-0.024 (-0.174, 0.126)	0.750
Alpha-angle	0.010 (0, 0.019)*	0.045	0.009 (-0.012, 0.031)	0.394
Maximum Clot Firmness	0.009 (-0.002, 0.020)	0.122	0.019 (-0.007, 0.046)	0.151

Data are presented as OR (95% CI), * indicates p-value <0.05

Notes

Scientific Session IV-A – Coagulation
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #27
January 15, 2016
9:00 am

TRAUMA-INDUCED COAGULOPATHY IN A CRITICALLY INJURED PEDIATRIC POPULATION - DEFINITION, CONTRIBUTING FACTORS, AND IMPACT ON OUTCOMES

Christine M. Leeper, MD, Matthew Kutcher, MD, Isam Nasr, Christine J. McKenna, MSN*, Jason L. Sperry, MD, MPH*, Barbara A. Gaines, MD*
University of Pittsburgh Medical Center

Presenter: Christine M. Leeper, MD

Discussant: Robert Letton, Jr., MD, The Children's Hospital at OU Medical Center

Objectives: Trauma-induced coagulopathy is a well-described entity in adults. Children also develop coagulopathy after serious injury, however literature in pediatric patients is lacking. We seek to characterize the definition, contributors and impact of trauma-induced coagulopathy in a pediatric population.

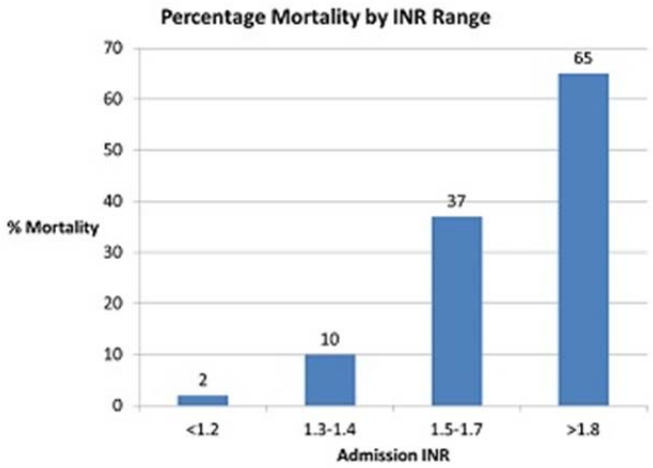
Methods: We retrospectively reviewed trauma ICU admissions age 0-17 in a level 1 pediatric trauma center from 2005-2014. Variables of interest included demographics, labs, vital signs, injury severity and mechanism, transfusion requirement and mortality. We performed univariate analysis with Student t-test, Wilcoxon rank-sum, Fisher exact and logistic regression modeling using BIC-based forward selection criteria. $p<0.05$ was significant.

Results: 776 patients met criteria - 29.2% (n=227) had admission INR ≥1.3, and 13.3% (n=103) had admission INR ≥1.5. Mortality rate was 11.1% (n=86) and increased proportionately with INR (Figure 1). The incidence of mortality was clinically meaningful in coagulopathic patients using a cutoff of INR ≥1.3. Coagulopathy was the strongest independent predictor of mortality with odds ratio 3.77 ($p<0.001$, ROC=0.9)(Figure 2). As expected, coagulopathic patients more likely required transfusion within 6 hours (60.8% vs. 7.5%) with OR=10.95 even when adjusting for ISS, acidosis and hypotension ($p<0.001$). Predictors of coagulopathy after controlling for hypotension, hypothermia and acidosis were GCS<8, penetrating mechanism and ISS.

Conclusions: Coagulopathy, defined as INR ≥1.3, is common in severely injured pediatric patients and is the strongest independent predictor of mortality. GCS<8, injury severity and penetrating mechanism are associated with admission coagulopathy. Additional research is needed to clarify the precise nature of this coagulation dysregulation, as well as the impact of early identification and intervention for coagulopathy.

Predictors of Mortality				
	INR ≥ 1.3		INR ≥ 1.5	
	Odds Ratio (95% Confidence Interval)	P value	Odds Ratio (95% Confidence Interval)	P value
Coagulopathy	3.77 (1.95 – 7.32)	*P<0.001	4.78 (2.47 – 9.26)	*P<0.001
Hypotension	3.45 (1.33 – 9.02)	*P=0.011	3.54 (1.33 – 9.40)	*P=0.011
Hypothermia	3.73 (1.96 – 7.07)	*P<0.001	3.70 (1.93 – 7.11)	*P<0.001
Acidosis	2.38 (1.29 - 4.39)	*P=0.005	2.15 (1.14 – 4.03)	*P=0.017
Injury Severity Score	1.06 (1.03 - 1.08)	*P<0.001	1.06 (1.03 - 1.09)	*P<0.001
Traumatic Brain Injury	3.34 (1.45 – 7.66)	*P<0.001	3.70 (1.57 – 8.69)	*P=0.003

Independent Predictors of Mortality in Critically-Injured Pediatric ICU Trauma Admissions - Logistic Regression Model



Percent Mortality by Admission INR Ranges

Notes

Scientific Session IV-A – Coagulation
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #28
January 15, 2016
9:20 am

HOW LONG SHOULD WE FEAR? LONG-TERM RISK OF VENOUS THROMBOEMBOLISM IN PATIENTS WITH TRAUMATIC BRAIN INJURY

Olubode A. Olufajo, MD, MPH, Brian Yorkgitis, PA-C, DO, David Metcalfe, LLB MBChB, Arturo J. Rios Diaz, MD, Adil H. Haider, MD, MPH*, Joaquim M. Havens, MD*, Zara Cooper, MD, MSc*, Edward Kelly, MD*, Jonathan D. Gates, MD, MBA*, Ali Salim, MD*
Brigham and Women's Hospital

Presenter: Olubode A. Olufajo, MD, MPH

Discussant: Sherry Sixta, MD, Christiana Care Health System

Objectives: To determine how long the risk of Venous Thromboembolism (VTE) persists in patients that have traumatic brain injury (TBI) and to identify associated factors.

Methods: Patients 18 years and older with ICD 9-CM diagnoses of isolated TBI (Head Abbreviated Injury Scale (AIS) ≥3 and AIS <3 for all other body regions) were identified in the California State Inpatient Database (2007-2010). Patient and admission (injury severity score, length of stay, complication rate, discharge disposition) characteristics were assessed. Hospital factors (teaching status, trauma center verification, bed size) were extracted from the American Hospital Association database. Patients that developed VTE during the index admission and after discharge were determined. Multivariate logistic regression models were used to assess the associated risk factors for VTE post-discharge.

Results: There were 50,132 patients with isolated TBI identified. The incidence of VTE was 1.26% during the index admission and the cumulative incidence of VTE involving hospitalization within 1 year of injury was 2.76%. The Table and Figure show the cumulative incidence of VTE over time for each AIS category. The major risk factors for VTE 1 year after discharge (not including the index admission) were age >64 years vs. 18 – 44 years [Adjusted Odds Ratio: 2.97 (95% Confidence Interval: 2.00 – 4.42)], discharge to a skilled nursing facility vs. home [2.77 (1.95 – 3.93)], hospital length of stay > 7 days vs. ≤ 3 days [2.00 (1.55 – 2.59)], and Charlson score ≥ 2 [1.29 (1.08 – 1.55)].

Conclusions: The risk of VTE persists long after discharge in a significant proportion of patients with TBI. Demographic and admission characteristics of patients play significant roles in the risk of VTE after discharge. These results highlight the need for sustained surveillance and preventive measures among TBI patients at increased risk for long-term VTE.

Time Period	Cumulative incidence of VTE, %			
	Overall population	Head AIS 3 (N= 24,595)	Head AIS 4 (N = 24,511)	Head AIS 5 (N = 1,026)
During index admission	1.26	1.17	1.34	1.30
30 days after injury	1.82	1.60	2.07	1.30
60 days after injury	2.14	1.81	2.51	1.65
90 days after injury	2.25	1.88	2.66	1.65
180 days after injury	2.47	2.01	2.98	1.65
360 days after injury	2.76	2.23	3.10	1.75
	In-hospital Mortality			
1 year mortality	12.15	8.62	12.89	76.48

AIS – Abbreviated Injury Scale

Table: Cumulative Incidence of Venous Thromboembolism in Traumatic Brain Injury Patients

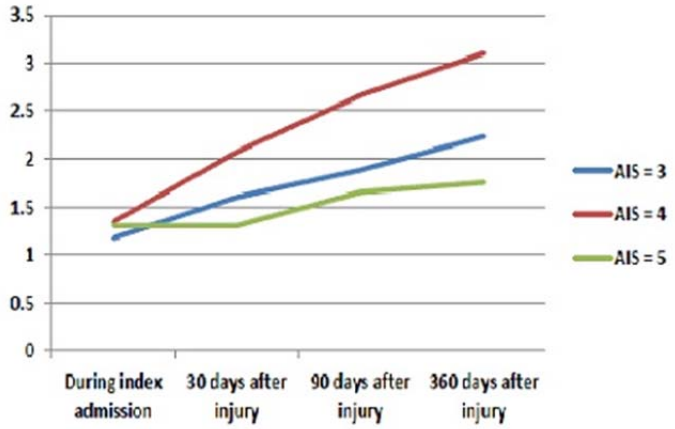


Figure: Graph showing risk of Venous Thromboembolism during One Year after Injury

Notes

Scientific Session IV-A – Coagulation
Location: Cibolo Canyon Ballroom 1-6, Level 2

Paper #29
January 15, 2016
9:40 am

UNIVERSAL WHOLE BLOOD FOR TRAUMATIC HEMORRHAGIC SHOCK: A PILOT STUDY TO DETERMINE SAFETY

Alan Murdock, MD, Louis H. Alarcon, MD*,
Jason L. Sperry, MD, MPH*, Darrell Triulzi, Mark Yazer
University of Pittsburgh Medical Center

Presenter: Alan Murdock, MD

Discussant: Kyle Remick, MD, US Army Medical Research & Materiel Command,
Ft. Detrick/Uniformed Services of the Health Sciences

Objectives: Whole blood (WB) has been extensively transfused by the military. WB can be either type-specific or "universal" low titer type O (UWB). UWB provides a simplified package for trauma resuscitation. We aimed to show that there was no significant increased risk of adverse events following UWB administration.

Methods: UWB was collected from O+ male donors using Terumo Imuflex system with platelet sparing leukocyte reducing filter. UWB with titers of anti-A and B < 1:100 was stored in the ED at 4^{o} C for up to 10 days. Up to 2 UWBs were transfused to male trauma patients with hypotension and suspected hemorrhage. UWB was followed with 1:1:1 component therapy as clinically indicated. UWB group was compared to cohort group (Component) who did not receive UWB in the 6 months prior to "change of practice" approach.

Results: Thus far 31 male trauma patients have received 51 UWBs. Table 1 compares HR, BP, ISS, and mortality for both groups. There were 10/24 non-group O UWB recipients who received ABO mismatched PLTs capable of causing hemolysis; the mean number of mismatched PLTs was 9.5±6.9 per patient; the mean total number of mismatched products (PLT+WB) was 11.3±6.8 per patient. Mean haptogloblin for UWB recipients was 13±7 mg/dl, which was consistent with reported literature for trauma patients who received type-specific PRBCs. No transfusion reactions were reported following UWB. Mean age of UWB was 7.9±2.8 days. Mean 24 hr blood products per patient: UWB 1.7±0.6 units; PRBC 9.7±12.5 units; plasma 10.8±15.9 units; platelets 5.9±9.5 units; cryoprecipitate 5.0±9.9 units.

Conclusions: Although the initial safety determination study is still in progress there does not appear to be a significantly increased risk of adverse events from transfusing up to 2 UWBs per trauma patient. Once we have completed the initial pilot, we will increase the number of UWB units transfused to assess morbidity and mortality in patients treated with WB compared to standard component therapy.

	UWB N=31	Component N=69
Initial BP	97 ± 34	104 ± 47
Initial HR	108 ± 40	95 ± 38
ISS	20 ± 12	19 ± 15
Mortality	29%	28%

Table 1. Comparison of UWB group and Component group.

Notes

Scientific Session IV-B – Emergency General Surgery
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #30
January 15, 2016
8:00 am

SURGICAL RESCUE: THE NEXT PILLAR OF ACUTE CARE SURGERY

Matthew E. Kutcher, MD, Samuel Zolin, Marcus Hoffman, Anisleidy Fombona, Tianhua Zhou, Robert Becher, Raquel M. Forsythe, MD*, Timothy Billiar, MD, Jason L. Sperry, MD, MPH*, Andrew B. Peitzman, MD*
University of Pittsburgh Medical Center

Presenter: Matthew E. Kutcher, MD

Discussant: Joshua Hazelton, DO, Cooper University Hospital

Objectives: The field of acute care surgery (ACS) traditionally includes trauma, emergency general surgery, and critical care. We here sought to describe the additional vital role of 'surgical rescue' to the practice of ACS.

Methods: A prospective ACS database at an urban academic medical center was screened for procedural complications by ICD-9 code and chart review. Complications were coded as 'internal' (related to a procedure performed by ACS), 'institutional' (related to a procedure performed by another service), or 'regional' (related to a procedure performed at another institution).

Results: Of 2,301 ACS patients screened from 1/2013 to 5/2014, 489 (19.9%) had procedural complications. Surgical rescue patients were older, more obese, and had more comorbidities than other ACS patients (all $p<0.05$). Hemoglobin and albumin were lower, while peak creatinine and lactate were higher (all $p<0.04$). 88% of complications were secondary to an operation, and 12% to an interventional or endoscopic procedure. Interventions for rescue included critical care (53%), mechanical ventilation (39%), interventional or endoscopic procedures (68%), and operation (83%). Exploring complication origin, 26% were internal, 49% institutional, and 25% regional. Institutional rescue patients had the highest peak creatinine and lactate, required more critical care and mechanical ventilation, had longer hospital and ICU stay, and higher 90-day and 1-year mortality (all $p<0.03$). Internal rescue patients required more interventional procedures ($p<0.01$), while regional patients required more operative intervention ($p=0.01$).

Conclusions: In addition to the provision of trauma, emergency surgical, and critical care, the acute care surgeon has a crucial role in the management of surgical complications. Surgical rescue is of vital importance to other surgical services as well as to regional hospital systems, constituting a key pillar of Acute Care Surgery.

	Yes (n=426)	No (n=1,872)	P-value
Hospital length of stay	11 (5-22)	5 (2-13)	<0.01
ICU length of stay	1 (0-5)	0	<0.01
Mechanical ventilation	38%	2%	<0.01
Tracheostomy	12%	1%	<0.02
Discharge to home	54%	63%	<0.02
In-hospital mortality	9%	7%	0.06
30-day mortality	13%	10%	0.05
90-day mortality	17%	13%	0.04
1-year mortality	24%	18%	0.01

Table 1. Outcomes of acute care surgery patients with procedural complications.

	Internal (n=110)	Institutional (n=210)	Regional (n=110)	P-value
Hospital length of stay	6 (3-16)	15 (6-29)	9 (5-17)	<0.01
ICU length of stay	0 (0-2)	2 (0-8)	0 (0-4)	<0.01
Mechanical ventilation	22%	50%	34%	<0.01
Tracheostomy	5%	18%	7%	<0.01
Discharge to home	63%	46%	62%	<0.01
In-hospital mortality	7%	12%	7%	0.33
30-day mortality	10%	16%	10%	0.18
90-day mortality	12%	22%	13%	0.03
1-year mortality	17%	29%	21%	0.04

Table 2. Outcomes of surgical rescue by complication type.

Notes

Scientific Session IV-B – Emergency General Surgery
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #31
January 15, 2016
8:20 am

EMERGENCY GENERAL SURGERY SPECIFIC FRAILTY INDEX: A VALIDATION STUDY

Tahereh Orouji Jokar, Kareem Ibraheem, Peter Rhee, MD, MPH*,
Narong Kulvatunyou, MD*, Andrew L. Tang, MD*, Rifat Latifi, MD*,
Randall S. Friese, MD*, Mindy Fain, MD, Jane Mohler, Bellal Joseph, MD
The University of Arizona

Presenter: Tahereh Orouji Jokar

Discussant: Eric Bradburn, DO, MS, VTC-Carilion Clinic

Objectives: Assessment of operative risk in geriatric patients undergoing emergency general surgery (EGS) is challenging. Frailty is an established measure for risk assessment in surgical cases. The aim of our study was to validate a modified 15 variable emergency general surgery specific frailty index (EGSFI).

Methods: We prospectively collected geriatric (age > 65) emergency general surgery patients for 1-year. Post-operative complications were collected. Frailty Index was calculated for 200 patients based on their pre-admission condition using 50-variable modified Rockwood Frailty Index (FI). EGSFI was developed based on the regression model for complications and the most significant factors in FI. We validated our results using 60 patients. ROC curve analysis was performed. Patients with EGSFI > 0.325 were defined as Frail.

Results: A total of 260 patients (200 developing, 60 Validation) were enrolled in this study. Mean age was 73 Â± 11, and 30% developed complications. Mean EGSFI was 0.22 Â± 0.16. Most common complications were wound infection (14%), sepsis (7%), and pneumonia (6%).

In validation cohort, Frail patients were more likely to have post-operative complications (61.5% vs. 38%; p=0.012) compared to non-frail patients. Frail status based on EGSFI was a significant predictor of post-operative complications (OR=7.3, 95%CI = 1.7 – 19.8; p=0.006). Age was not a predictor for post-operative complications (OR=0.96, 95%CI = 0.91 – 1.02; p=0.20).
On ROC curve analysis EGSFI was a reliable predictor for post-operative complications (AUC=0.725; p=0.008).

Conclusions: The 15 variable EGSFI is an independent predictor of post-operative complications in geriatric emergency general surgery patients. EGSFI is an effective tool that can aid clinicians in post-operative management of geriatric emergency general surgery patients.

Notes

Scientific Session IV-B – Emergency General Surgery
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #32
January 15, 2016
8:40 am

GO FOR THE JUGULAR: ASSESSING VOLUME RESPONSIVENESS IN CRITICALLY ILL SURGICAL PATIENTS

Sarah B. Murthi, MD, Daniel Haase, Jacob Glaser, MD*, Hegang Chen, PhD,
Raymond Fang, MD, FACS*, Stephen Biederman, Cassandra Cardarelli,
Matthew Vasquez, Thomas M. Scalea, MD, FACS, FCCM*
University of Maryland

Presenter: Sarah B. Murthi, MD

Discussant: Brian Williams, MD, UT Southwestern Medical Center

Objectives: Ultrasonographic (US) measures of volume responsiveness (VR) could be affected by surgery, trauma, or mode of ventilation. The objective of this study is to compare the accuracy of four US measures in prediction of VR in critically ill surgical patients.

Methods: This is a prospective observational study in critically ill patients receiving fluid for clinical indications. A focused rapid echocardiogram (FREE) was performed before and after the bolus and the percent increase in stroke volume (SV) measured. The Inferior Vena Cava respiratory variation (Î”r IVC), stroke volume respiratory variation (Î”r SVV), stroke volume passive leg raise variation (Î”plr SVV), and a new measure, positional IJ change (Î” p IJ) were assessed prior to the bolus. The Î” p IJ assesses change in the diameter of the IJ between 0 and 90Âº (flat and head-up). The area of the receiver operating curve was used to determine threshold values for each measure in prediction of > 10% in SV (+VR).

Results: From 11/15/13 through 06/30/15, 159 patients completed the study. The majority were intubated 90%, 67% were trauma and 28% other surgical patents. Analysis of the first 50 patients demonstrated that Î” plr SVV could not be reliably assessed with echo and the measure was abandoned. The remaining measurements were associated with +VR. The ROC was best for Î” p IJ (0.93), followed by Î”r SVV (0.75) and Î”r IVC (0.67), with sensitivities and specificities of 93 and 89%, 81 and 64%, 69 and 66% respectively. When Î” p IJ and Î”r SVV were combined the ROC increased to (0.95). Analysis of the remaining patients is ongoing.

Conclusions: Ultrasound predicts VR. Positional IJ change is easy to perform, and is the most accurate measure. Ultrasound should be considered an essential part of volume assessment in critically ill patients. Studies on the impact of ultrasound-directed management on outcome are warranted.

Notes

Scientific Session IV-B – Emergency General Surgery
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #33
January 15, 2016
9:00 am

ACUTE CARE SURGERY AND EMERGENCY GENERAL SURGERY: ADDITION BY SUBTRACTION

Brandon Bruns, MD, FACS*, Ronald B. Tesoriero, MD*,
Mayur Narayan, MD, MPH, MBA, FACS, FICS*,
Lindsay O'Meara, Margaret H Lauerman, MD*, Barbara Eaton,
Thomas M. Scalea, MD, FACS, FCCM*, Jose J. Diaz, MD*
R Adams Cowley Shock Trauma Center, University of Maryland School of Medicine

Presenter: Brandon Bruns, MD, FACS

Discussant: Stephen Barnes, MD, University of Missouri Department of Surgery

Objectives: The formation of Acute Care Surgery (ACS) leads to decreased time to treatment and improved outcomes for emergency general surgery (EGS) patients. However, minimal work has focused on the ideal care delivery system and team structure. We hypothesize that the implementation of a dedicated Emergency General Surgery (EGS) team (separate from trauma and surgical critical care), with EGS-specific protocols and dedicated (operating room) OR time, will increase productivity and improve mortality.

Methods: This is a retrospective review of financial and EGS registry data from fiscal year (FY) 12 to FY15. Data are from an academic, university-based EGS team composed of 2 ACS attendings, nurse practitioners (NPs), residents, and a fellow. In FY12, processes were implemented to standardize: paging of consults, patient signout with attending participation, clinical/billing protocols, OR availability, and quality improvement. Outcomes included RVUs, surgical case volume, charges/payments, and number of patient encounters. The secondary outcome was mortality. Chi-square test was used to compare mortality and $p<0.05$ was considered significant.

Results: Total patient encounters increased from 6,723 in FY12 to 8,193 in FY15 (+22%). RVUs increased from 18,422 in FY12 to 23,198 in FY15 (+26%). Charges increased 61% and payments increased 36% from FY12 to FY15 **(TABLE)**. Charges per encounter increased from $461 in FY12 to $602 in FY15 (+130%). Additionally, both inpatient and outpatient surgical case loads increased **(TABLE)**. Mortality remained stable throughout the study period (FYs 12-4.5%, 13-5.2%, 14-5.3%, 15-3.2%, $p=0.183$).

Conclusions: Implementation of dedicated OR time, defined EGS team structure, practice protocols, and active attending/NP participation, has led to increased case volume, patients seen, and revenue, while mortality remained unchanged. Further study is necessary to establish the translatability of this data to other systems.

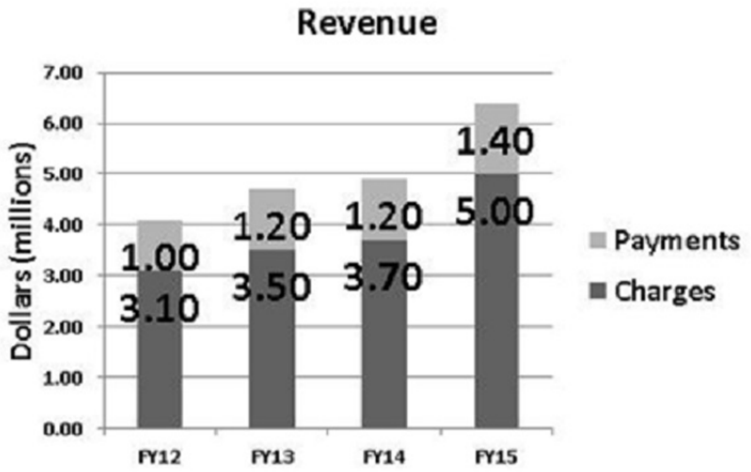


Table 1. Fiscal year (FY)12 - FY15 charges and payments collected.

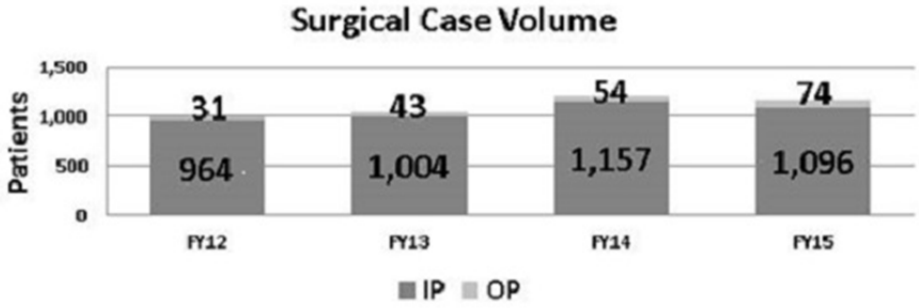


Table 2. Fiscal year (FY)12 - FY15 inpatient and outpatient surgical case volume.

Notes

Scientific Session IV-B – Emergency General Surgery
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #34
January 15, 2016
9:20 am

THE TRANSFORMING POWER OF EARLY CAREER ACUTE CARE SURGERY RESEARCH SCHOLARSHIPS ON ACADEMIC PRODUCTIVITY

Ben L. Zarzaur, MD, MPH*, Nakul Valsangkar, MD, Paul Martin,
David V. Feliciano, MD, FACS*, Grace S. Rozycki, MD, MBA, FACS*, Leonidas Koniaris
Indiana University

Presenter: Ben L. Zarzaur, MD, MPH

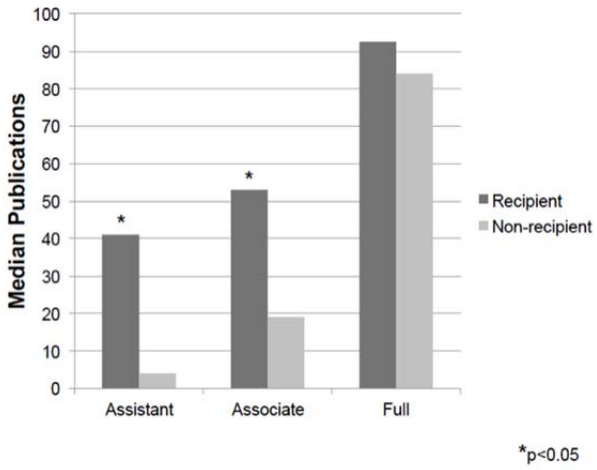
Discussant: Martin Zielinski, MD, Mayo Clinic

Objectives: Over 75% of respondents to an Eastern Association for the Surgery of Trauma (EAST) survey felt that barriers to research had increased and that acute care surgeon (ACS) academic productivity had decreased. Recent data confirm this impression and show lower academic productivity of junior ACS faculty compared to peers in other general surgical fields. The purpose of this study was to determine if early career ACS research scholarships are associated with improved ACS academic productivity.

Methods: Faculty data at the top 55 National Institutes of Health (NIH) funded departments of surgery (TOP55) was obtained using SCOPUS, NIH, department and professional society databases. Academic productivity was measured using total publications (PUBS), citations and the h-index. Scholarship recipients from the American Association for the Surgery of Trauma (AAST) and EAST were identified (RECIPIENTS).

Results: 4,101 surgical faculty (8.3% ACS) in TOP55 and 85 RECIPIENTS were identified. After merging, 34 RECIPIENTS (40%) were current faculty at a TOP 55 and 24 of those (71%) were ACS faculty. RECIPIENTS had higher median PUBS compared to NON-RECIPIENTS at assistant and associate ranks, but not at full professor rank (Figure 1). For all ranks, RECIPIENTS were more likely to have NIH funding compared to NON-RECIPIENTS (33% vs 11% $p<0.05$). On multivariable analysis, only NIH funding was associated with increased PUBS with an average of 89 more publications over a career ($p<0.05$). Citation and h-index findings were similar.

Conclusions: Research scholarships granted by ACS professional organizations remain largely among ACS faculty in TOP 55. Among junior ACS faculty, RECIPIENTS are associated with increased academic productivity and NIH funding. To fill the academic productivity gap among junior ACS, professional organizations should consider increasing research funding scholarships for promising investigators



Median Publications for Acute Care Surgeon Scholarship Recipients and Non-Recipients by Academic Rank

Notes

Scientific Session IV-B – Emergency General Surgery
Location: Nelson Wolff Exhibit Hall A, Level 1

Paper #35
January 15, 2016
9:40 am

STRESS AMONG SURGICAL ATTENDINGS AND TRAINEES: A QUANTITATIVE ASSESSMENT DURING TRAUMA ACTIVATION AND EMERGENCY SURGERIES

Bellal Joseph, MD, Tianyi Swartz, Peter Rhee, MD, MPH*, Saman Parvaneh, Bardiya Zangbar, MD, Narong Kulvatunyou, MD*, Andrew L. Tang, MD*, Gary A. Vercruysse, MD*, Jane Mohler, Bijan Najafi
The University of Arizona

Presenter: Bellal Joseph, MD

Discussant: Natasha Keric, MD, Banner University Medical Center Phoenix

Objectives: The aim of our study was to assess the level of stress using subjective data and objective heart rate variability (HRV) among attending surgeons (AS),junior (JR) (PGY2/PGY3), and senior (SR) (PGY5/PGY6) residents during trauma activation and emergency surgery.

Methods: We performed a prospective study enrolling participants over eight 24-hour calls in our Level-1 trauma center. Stress was assessed based on decrease in heart rate variability (HRV), which was recorded using body worn sensors continuously. Stress was defined as HRV below 85% of baseline HRV. We collected subjective data using the State-Trait Anxiety Inventory (STAI) and NASA Task Load Index (NTLI) for each participant during calls. Three groups (AS,JR,SR) were compared for duration of different stress levels through trauma activation and emergency surgery.

Results: A total of 22 participants (AS: 8, JR: 7, SR:7) were evaluated over 192 hours, which included 33 trauma activations and 50 emergency surgeries. Stress level increased during trauma activations and operations regardless of level of training. AS were stressed on average 13% of the time in trauma activations. Residents' stress-levels were both higher and lasted longer for both trauma activations (69% vs. 27%; p=0.001) and surgeries (81% vs. 47%; p=0.001) compared to AS. When comparing SR to JR, there was no difference in overall stress during trauma activations (71% vs. 68%; p=0.8) or emergency surgeries (p=0.4). There was no correlation between objectively measured stress level and subjectively measured stress using STAI(R^2=0.166; p=0.01) and NTLI(R^2=0.127; p=0.02) among surgeons or residents.

Conclusions: Surgeon wellness is a significant concern and this study provides empirical evidence that trauma and acute care surgeons encounter stress and fail to recognize it. Increasing surgeons' awareness to stress may be an important element of training and practice.

Notes