

ADRENOMEDULLIN LEVELS CORRELATE WITH RATES OF SEPSIS, MULTI-ORGAN SYSTEM FAILURE AND MORTALITY, INDEPENDENTLY OF PERCENT TOTAL BODY SURFACE AREA BURNED IN BURN PATIENTS

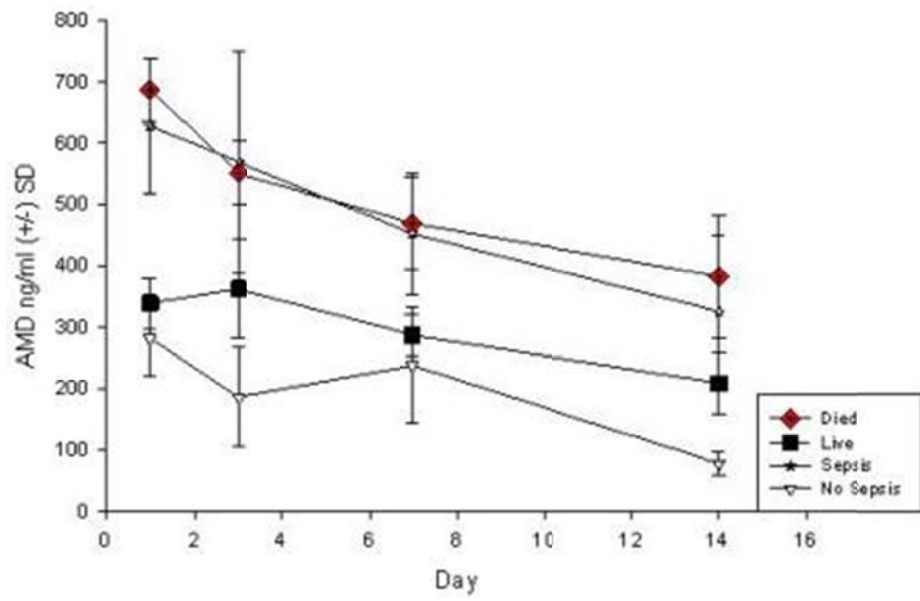
Rafael F. Diaz-Flores, MD, MPH, Fernando A Rivera-Chavez, MD, Francis R. Ali-Osman, MD, Joseph P. Minei*, MD, FACS, Steven E. Wolf*, MD, Ming-Mei Liu, MS, Christian T. Minshall*, MD, PhD,
University of Texas Southwestern Medical Center

Objectives: Adrenomedullin (ADM) is an endothelial-derived protein that modulates cardiac contractility in response to injury and shock states. Burn patients have a physiologic response that is dependent on the degree of injury and are high risk for multi-organ failure (MOF), sepsis and death. Our objective is to characterize the ADM response in burn patients and its association with these outcomes.

Methods: An enzyme linked immunoabsorbent assay (ELISA) was used to measure serum ADM (ng/ml) in samples drawn from 24 burn patients stratified by percentage of total body surface area (TBSA, group A: <15, group B: 16-30, group C: > 60) on post-injury days 1,3,7 and 14. Data were analyzed using Mann-Whitney test; statistical differences were defined as $p < 0.05$.

Results: ADM levels were significantly higher on days 1 and 3 in groups B and C as compared to group A. There were no differences between groups on days 7 or 14. Patients with sepsis, MOF or that died had significantly higher levels at all times independent of %TBSA burned (see graph, MOF not shown).

Conclusion: ADM levels correlate with high degree of injury in burn patients. These levels remain elevated in patients with sepsis, MOF and mortality independent of %TBSA burned. Further studies are needed to better understand the role of ADM in response to injury, as well as the potential for its therapeutic use in resuscitation.



Notes

PENETRATING VIOLENCE: A CALL FOR PREVENTION

Joan M. Pirrung*, RN, MSN, ACNS-BS,
Pamela Woods*, RN, ACNS-BC, CEN, Michael Kalina*, DO,
Kathleen Boyer, BSN, RN, CCRN, Mark D. Cipolle*, MD, PhD,
Christiana Care Health System-Christiana Hospital

Objectives: Violence is a major public health issue in the US and an alarmingly new concern in a suburban trauma center. In 2009, the city's violent crime rate average was higher than the national average and has one of the highest crime rates per capita nationally. Over a 10 year period, the trauma center's registry catalogued an increase in gun shootings by 62%. Therefore, injury prevention efforts are focused in high-risk violent crime areas. The initial effort was to create a short film depicting real life situations known to glorify gang membership along with medical and legal consequences related to gun violence.

Methods: In partnership with the US Attorney 's Office, a local film production company, city officials and trauma center clinicians, a short film was written and produced. The film is part of a violence prevention program presented in the following format: 1) view the short film, 2) lecture by a US Attorney representative on the legal consequences of violent activities and 3) lecture by a trauma clinician on physical injuries and emotional harm associated with gun violence.

Results: Since the premier of the violence prevention program in October of 2011, 56 programs have been conducted reaching 2000 at-risk youths, young adults and parents. Eight hundred and forty eight post-program surveys were distributed with 603 (71.1%) returned. Of those who returned the survey: 1) 97.8% responded that the film and presentation provided information influencing positive choices to avoid gun and gang violence, 2) 95.2% felt that they increased their knowledge regarding negative consequences associated with gang membership, and 3) 91.9% responded that they would recommend the film and presentation.

Conclusion: There has been overwhelmingly positive feedback on the content of the short film and associated presentations. Future plans are to develop a documentary including live footage in the trauma bay with interviews from medical experts and gang members on the impact of violence in the communities.

Notes

**MORTALITY INCREASES WITH REPEATED EPISODES OF
NON-ACCIDENTAL TRAUMA IN CHILDREN**

Katherine Deans, MD, MHSc, Johanna R Askegard-Giesmann, MD, Jonathan I. Groner*, MD, Jonathan Thackeray, MD, Peter C Minneci, MD, MHSc,
Nationwide Children's Hospital

Objectives: Non-accidental trauma (NAT) is a leading cause of childhood traumatic injury. The objective of this study was to assess the mortality risk in children who are victims of repeated episodes of NAT.

Methods: Using the Ohio State Trauma Registry, we identified the records of all patients <16 years of age hospitalized between 2000-2010 with an ICD-9 code for NAT. Potential victims of repeated episodes of NAT were identified by using data matches between records within the registry for all of the following elements: date of birth, race, and gender. We subsequently applied temporal sequencing to eliminate records where death occurred prior to the second record. Statistical comparisons were made using Fisher's exact and Wilcoxon rank sum tests.

Results: 1,572 victims of NAT were identified with 53 patients meeting criteria for repeated episodes of NAT. Compared to patients with a single episode of NAT, patients with repeated episodes of NAT were more likely to be male (66% vs. 52%, $p=0.05$), white (83% vs. 65%, $p=0.03$), evaluated at a pediatric trauma center (87% vs. 70%, $p=0.008$), and were more likely to die (24.5% vs. 9.9%, $p=0.002$). Within the group of children who suffered repeated NAT, black patients were more likely to die (57% vs. 20%, $p=0.05$). Patients who died with repeated episodes of NAT had a longer interval from initial episode to second episode (median (IQR): 527 days (83-1099) vs. 166 days (52-502), $p=0.07$) and were older during their second episode of NAT (1 year (0-3) vs. 0 years (0-1), $p=0.05$). At initial presentation, lower extremity fractures ($p=0.09$) and liver injuries ($p=0.06$) were reported more commonly in non-survivors of repeated episodes of NAT.

Conclusion: Mortality is significantly higher in children who suffer repeated episodes of NAT. Therefore, it is critically important to accurately identify a child's initial episode of NAT. Subsequently, appropriate resources and follow-up should be provided to these children to prevent future catastrophic episodes of NAT.

Notes

ENDOTRACHEAL TUBE REPOSITIONING: HOW ACCURATE?

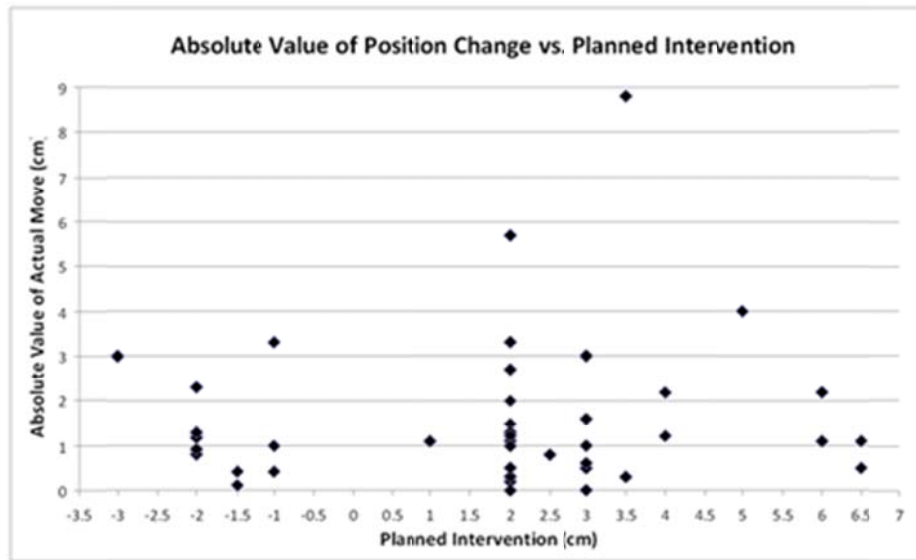
Ming-Li Wang, MD, Kevin M. Schuster*, MD,
Bishwajit Bhattacharya*, MD, Adrian A Maung*, MD,
Lewis J. Kaplan*, MD, FACS, FCCM, FCCP, Kimberly A. Davis*, MD,
Yale University School of Medicine

Objectives: Sub-optimal positioning of endotracheal tubes (ETs) is often identified on routine chest radiographs prompting adjustment. The accuracy of ET adjustments based on tube measurement markings at the incisors has not been reported.

Methods: We performed a one-year prospective observational study of all surgical ICU patients requiring repositioning of their ET based on chest x-ray (CXR). The ET was repositioned by a respiratory therapist using tube markings at the incisors and follow up CXRs were obtained within 2 hours. CXR tube locations were compared to the planned intervention. Mean, median, interquartile range (IQR) and chi-square results are reported.

Results: Fifty five patients met inclusion criteria and had a complete set of data (80% male). The most common sub-optimal positioning was an ET requiring advancement (80%). Patients requiring ET withdrawal were more likely female (8/11, $p < 0.001$). The mean difference between the planned and actual intervention was 1.55cm (95% CI 1.16cm – 1.95cm) achieving a mean of 40% of the planned intervention (95% CI 29.0% - 51.0%). For advancement the median starting position was 7.10cm (IQR 2.20cm) from the carina with a median planned advancement of 2.00cm. The actual advancement was a median of 1.15cm, achieving 57.5% of the goal. For the withdrawal group the median starting position was 0.70cm (IQR 1.05cm) from the carina with a planned median withdrawal of 2.00cm (IQR 0.75cm). The actual withdrawal was a median of 1.00cm, achieving 50.0% of the goal. There was no correlation between the original location or the planned intervention and the accuracy of the intervention (figure). In three cases the ET moved opposite of the planned intervention.

Conclusion: ET re-positioning based on measurement at the incisors is inaccurate. Magnitude of the intervention did not correlate with the degree of inaccuracy. Blind repositioning of ETs should be abandoned or follow up CXRs obtained.



Notes

Poster 05

THE ECONOMIC IMPACT OF INTENSIVIST FELLOWSHIP TRAINING

Jeffrey Carter, MD, Daryhl L. Johnson, II*, MD, MPH,
Renaë Stafford*, MD, Preston B. Rich*, MD
University of North Carolina

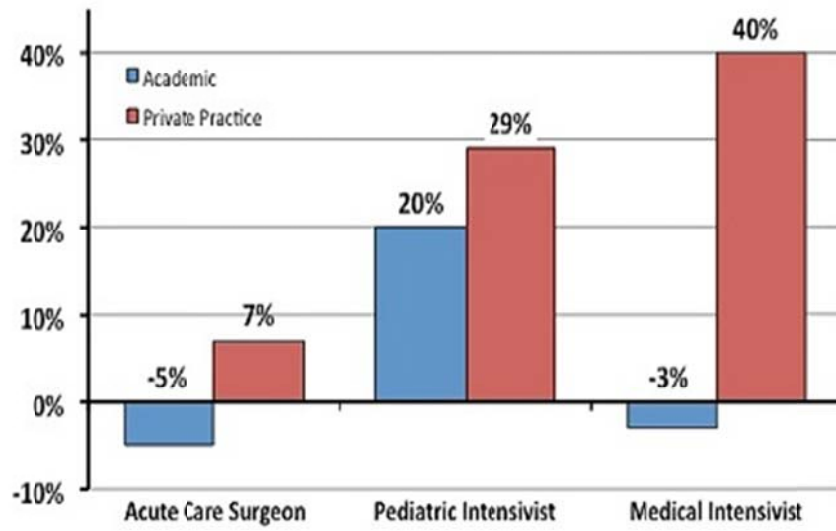
Objectives: Rising medical student debt and changes in physician reimbursement patterns are requiring residents to carefully examine their return on investment (ROI) for fellowship training. At the same time, there is a growing shortage of intensivists, especially surgical intensivists which are evolving into acute care surgeons. Our goal was to analyze the ROI of intensivist fellowship training in private and academic practice.

Methods: Using survey data from the Association of American Medical Colleges and the Medical Group Management Association, we calculated the ROI of acute care surgery, pediatric, and medical intensivists in today's dollars. Our financial analysis incorporated average medical debt, annual income, and federal income tax into a net present value (NPV) calculation at a 5% discount rate with career duration from internship to retirement at age 65. Relative career value was defined as the ratio of intensivist to generalist NPV.

Results: Over 17,000 specialty specific responses were included in the analysis. Private practice physicians had a relative career value (RCV) 15-66% higher than their academic counterparts. Academic acute care surgeons and medical intensivists decreased their RCV by 5% and 3% respectively compared to academic general surgeons and medical internists. Academic pediatric intensivists increased their RCV by 20% compared to academic pediatricians. Private practice acute care surgeons increased their RCV by 7% compared to their private practice general surgeons but remained below average for fellowship-trained surgeons.

Conclusion: Academicians have lower relative career values when compared to private practitioners. Academic acute care surgeons have the lowest relative career value, which calls into question the ROI and future recruitment into the specialty. Resolving the intensivist shortage will require further analysis of the financial implications of critical care training when compared to alternative career paths.

Intensivist Relative Career Value



Notes

DEATH BY NUMBERS: HOW DO TQIP AND UHC COMPARE?

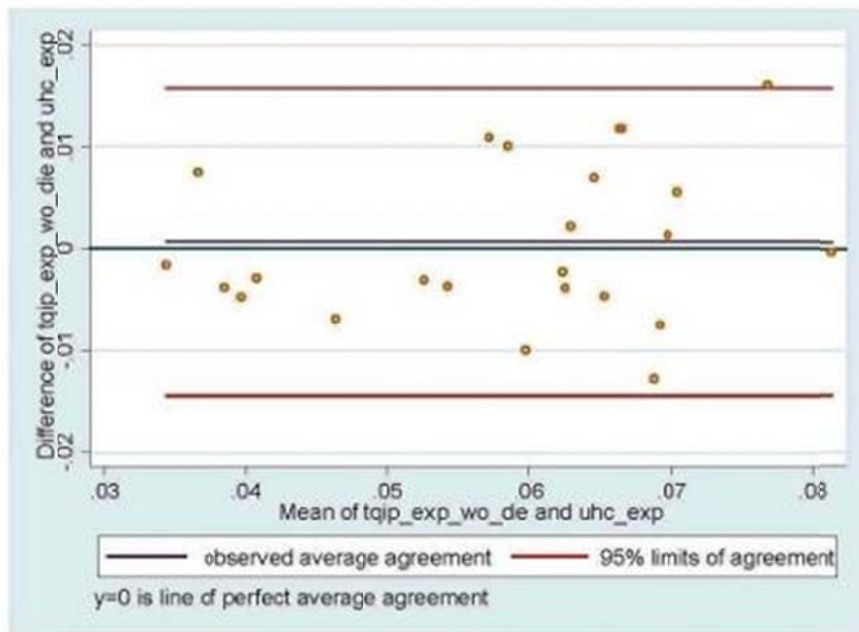
Lillian S Kao, MD, MS, Miriam Morales, MS, Avery B. Nathens*, MD, PhD, MPH,
Edmund P Dipasupil, CSTR, CAISS, Sheila Lopez, RN, BSN, MA, Toni von
Wenckstern, RN, MS, John B. Holcomb*, MD, Rosemary Kozar, MD, PhD,
University of Texas Health Science Center at Houston

Objectives: The Trauma Quality Improvement Program (TQIP) and the University HealthSystem Consortium (UHC) provide risk-adjusted mortality rates to participating hospitals. TQIP includes a more severely ill subset of trauma patients (ISS \geq 9) than UHC and is considered the gold standard for trauma quality improvement and benchmarking. The two programs calculate their mortality models based on different components. We hypothesized that TQIP would more accurately predict mortality.

Methods: Patients who were admitted to a Level I trauma center in 2009 and were in both the TQIP and UHC databases were included. Goodness-of-fit tests ($p < 0.05$ indicates the model does not fit the data) and areas under the receiver operating characteristic (ROC) curves were performed for the two models for mortality. Agreement between expected mortality rates were examined using the Bland-Altman method (Stata SE v12).

Results: Of 2753 TQIP patients, 2490 patients were in the UHC database. The p-values for the goodness-of-fit tests were not significant. There was no difference in the area under the ROC curves for mortality – 94.1% for TQIP and 93.6% for UHC ($p = 0.87$). As assessed using the Bland-Altman method (Figure), agreement was excellent when predicted probability of death was either low ($< 20\%$) or high ($> 70\%$).

Conclusion: Both UHC and TQIP models predicted mortality with similarly high accuracy. However, there are differences in a small proportion of patients whose outcomes might be most amenable to intervention. These differences might be explained by different model characteristics or, alternatively, by unique attributes of specific patient populations. As these differences occur in a population where outcomes might be modifiable, it is critically important to understand the limits of quality improvement programs based on external benchmarking approaches.



Notes

ADHERENCE TO PRBC TRANSFUSION TRIGGER GUIDELINES IS IMPROVED WITH ELECTRONIC CLINICAL DECISION SUPPORT

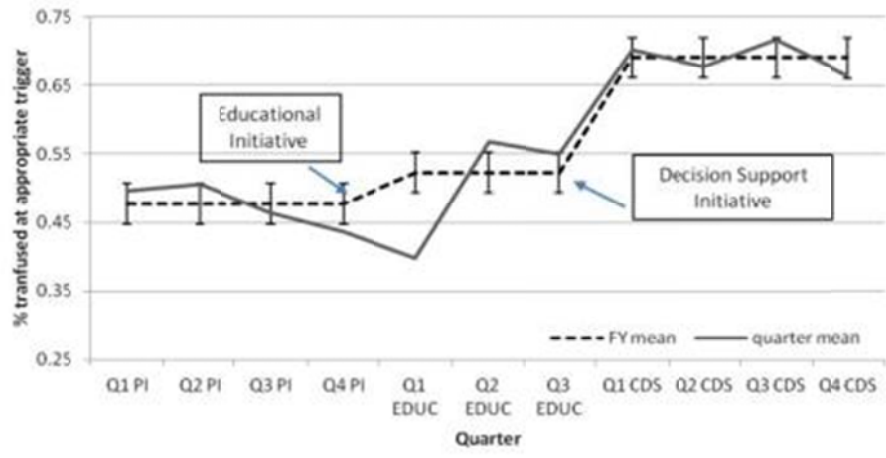
Rachael Callcut*, MD, MSPH, L. Tim Goodnough, MD, Steven Philips, BS, Paul Maggio, MD, MBA, Stanford University

Objectives: Despite evidence based guidelines supporting a restrictive transfusion strategy in hemodynamically stable critically ill patients, physician practice remains variable. Traditionally, educational initiatives have been employed to improve compliance, however, the improvements are modest. In contrast, electronic real-time clinical decision support (CDS) has not been previously studied and may provide additional benefit for reduction of unnecessary packed red blood cell transfusion (PRBC).

Methods: A prospective, cohort of all med-surg ICU patients was followed from September 2008 to August 2011 and in hospital transfusion data was collected. All hemodynamically stable, non-hemorrhaging ICU patients were included in this analysis. An educational initiative was introduced in fiscal year 2010 and a CDS alert in 2011. Physician were notified via the computerized order entry CDS alert if the PRBC transfusion was outside of hospital guidelines. Compliance to trigger guidelines was compared in the pre-intervention (PI) vs. the educational (EDUC) initiative vs. CDS alert year.

Results: Compliance with PRBC trigger guidelines improved with the greatest benefit seen after introduction of the real-time CDS alert (PI 48%, EDUC 52%, CDS 69%, $p < 0.0001$, FIGURE). The mean (+/- SEM) pre-transfusion hemoglobin was unchanged after introduction of the educational initiative (baseline 8.3 +/- 0.1 g/dL vs. 8.2 +/- 0.1, $p = \text{NS}$), however, there was a significant decrease with the CDS alert (mean 7.6 +/- 0.1, $p < 0.0001$). Transfusions per ICU day at risk also markedly decreased with the CDS alert compared with the PI and EDUC years (PI 9.8%, EDUC 8.9%, CDS 5.9%, $p < 0.0001$). There was no change in mortality or case mix index during the study.

Conclusion: Implementation of real-time CDS improves compliance with evidence based transfusion trigger guidelines for critically ill patients.



Notes

**OUTCOMES OF PRE-HOSPITAL VERSUS IN-HOSPITAL
INTUBATION IN TRAUMA PATIENTS - DOES LOCATION
MATTER?**

Christopher Stephens, MD, Jay Menaker*, MD, Jeffrey Glaser, MSII,
Nicholas T Tarmey, FRCA, Daniel Mayer, BS, Mary E Kramer, RN,
Deborah M. Stein*, MD, Thomas M. Scalea*, MD, FACS, FCCM,
University of Maryland School of Medicine - R Adams Cowley
Shock Trauma Center

Objectives: Controversy exists on the association of outcome after injury when comparing in-hospital versus pre-hospital intubation. The purpose of this study was to evaluate outcomes based on location of intubation.

Methods: Over a 9-month period, patients intubated in the field (FI) or within 60 minutes of arrival to the trauma center (TCI) were prospectively enrolled. Patients with cardiac arrest or those transferred were excluded. Demographics, admission physiology, Injury Severity Score (ISS), Glasgow Coma Scale (GCS), hospital length of stay (HLOS), intensive care unit (ICU) LOS, ventilator days, field time when available, and mortality were collected. Multivariate analysis was used to determine the independent effect of location of intubation on in-hospital mortality.

Results: 422 patients were identified. 102(24%) patients were FI and 320(76%) were TCI. In the FI group, 86(84%) had blunt and 12(12%) penetrating injuries. In the TCI group, 248(78%) blunt, 65(20%) penetrating. There was no significant difference in age between the two groups. FI patients had significantly higher ISS (27.8 vs. 20.7, $p<0.0001$) and lower GCS (4.8 vs.10.8, $p<0.0001$). FI patients had significantly longer field time (1.3 vs. 0.8 hours, $p<0.0001$). In unadjusted analysis, FI patients had significantly higher mortality rates (40% vs.15%, $p<0.0001$) and ventilator days (7.2 days vs. 5.5 days, $p=0.004$). ICU and HLOS were not significantly different (6.3 days vs. 4.6 days, $p=0.063$; 8.9 days vs. 7.8 days, $p=0.95$). In adjusted analysis, there was no difference in outcome based on location of intubation with respect to mortality, HLOS, ICU LOS, and ventilator days.

Conclusion: Despite previous reports, in a mature trauma system, field intubations are not independently associated with worse outcomes. Further studies are needed to determine the ideal location of intubation to improve outcome following injury.

Notes

**OUTCOMES FOLLOWING SUPERSELECTIVE
ANGIOEMOBLIZATION FOR GASTROINTESTINAL
HEMORRHAGE**

David King*, MD, Hasan B Alam, MD, Oscar A Birkhan, MD, Catrina M Cropano, BS, Marc A. deMoya*, MD, Ayesha M Imam, MD, Sanjeeva Kalva, MD, Antonios C Sideris, MD, George C Velmahos, MD, T Gregory Walker, MD, Ali Y Mejaddam, M.D., Massachusetts General Hospital

Objectives: Therapeutic angioembolization is a relatively new treatment modality for gastrointestinal hemorrhage (GIH). The purpose of our study is to evaluate the safety and effectiveness of transcatheter superselective angioembolization (SSAE) for the treatment of GIH.

Methods: A retrospective review of consecutive patients who underwent SSAE for GIH between January 2001 and June 2011 was performed. All patients with evidence of active contrast extravasation described on the radiology report were included. Data was collected on demographics, co-morbidities, clinical presentation, and type of intravascular angioembolic agent used. Outcomes included technical success (cessation of extravasation), clinical success (no rebleeding requiring intervention within 30 days), and incidence of ischemic complications.

Results: 98 patients underwent SSAE for GIH during the study period; 47 were excluded due to lack of active contrast extravasation. Of the remaining 51 patients, 22 (43%) presented with a lower GIH and 29 (57%) with upper GIH. The majority were embolized with a permanent agent (71%), while the remaining patients received either a temporary agent (16%) or a combination (14%). The overall technical and clinical success rates were 98% and 71%, respectively. Of the 15 patients with rebleeding, 4 were managed successfully with re-embolization, while 2 underwent endoscopic therapy, and 9 had surgical resections. Only one patient had a major ischemic complication (jejunal infarction) requiring resection.

Conclusion: SSE, with re-embolization if necessary, is an effective treatment modality for active GIH in 80% of patients. Ischemic complications are extremely rare.

Notes

DVT IN TRAUMA PATIENTS: INJURY RELATED, NOT A MEASURE OF QUALITY OF CARE

Meredith S. Tinti*, MD, Adam M. Shiroff*, MD, Marianne Boylston, Non-member, Vicente H. Gracias*, MD, UMDNJ-Robert Wood Johnson U Hospital

Objectives: Due to Pay for Performance and new organizational definitions of quality of care, various conditions are being labeled as non-acceptable complications of health care. Deep venous thrombosis (DVT) is one condition that has been targeted as a measure of quality of care. We hypothesized that DVT is often related to mechanism of injury and not a lack of care provided by a health care institution.

Methods: A retrospective study was performed by querying the Trauma Registry at our Level 1 Trauma Center for all patients that were diagnosed with a DVT or pulmonary embolism (PE) between January 2005 and December 2011. The data was then analyzed with regard to hospital days until diagnosis was made and with regard to mechanism of injury.

Results: 288 patients with a diagnosis of DVT or PE were identified (2.67% of all Trauma patients) during the time period. 7.6% were diagnosed within 24 hours of admission. 11.1% were diagnosed between 24 and 48 hours and 12.2% between 48 and 72 hours. 30.9% of DVT/PE's were diagnosed in less than 72 hours from admission. Additionally, the rate of DVT amongst patients who required extrication from a vehicle at the scene was 5.88%, 2.2 times the rate in our general trauma population.

Conclusion: Although our DVT/PE screening process does not routinely evaluate patients for these conditions until hospital day 3 or 4, nearly one third of our patients with thromboembolic events were diagnosed in less than 72 hours from the time of admission. The fact that the DVT/PE rate is twice as high in patients with a documented extrication time at the scene of the injury, supports the theory that these events are related to mechanism of injury. The early thromboembolic events should be considered to be present on arrival or injury related and should not be used as measures of quality of care. Early screening methods may help elucidate this further.

Notes

INTERMOUNTAIN RISK SCORE IS HIGHLY PREDICTIVE OF MORTALITY IN TRAUMA PATIENTS

Sarah Majercik, MD, MBA, FACS, Benjamin Horne, PhD, MPH, FACC, Stacey Knight, PhD, MStat, Jolene Fox, RN, Mark H. Stevens*, MD, FACS, Intermountain Medical Center

Objectives: The Intermountain Risk Score (IMRS) uses components of the admission complete blood count (CBC) and basic metabolic profile (BMP) to predict mortality. IMRS has been validated in medical and cardiology patients, but has not been evaluated in trauma patients. This study tested whether IMRS is predictive of mortality in a trauma population at a Level One trauma center.

Methods: Admitted trauma patients with CBC and BMP from October, 2005 -December, 2011 were evaluated. Sex-specific 30-day and 1-year IMRS values were calculated using multivariable modeling of components of the CBC, BMP, and patient age. Three risk thresholds were established (high, medium, low). Actual mortality was determined using the medical record and Social Security Administration death data.

Results: 3637 females and 5901 males were evaluated at 30 days and 1 year. IMRS was highly predictive of death at 30 days ($c=0.772$ for females, $c=0.783$ males) and 1 year ($c=0.778$ for females, $c=0.831$ males). Cox regression analysis, adjusted for injury severity score, blunt vs. penetrating, and length of stay, showed increased mortality risks among patients in the moderate and high risk IMRS-defined groups at both 30 days and 1 year, with hazard ratios (table) ranging from 4.96-57.88 (all $p<0.001$).

Conclusion: IMRS strongly predicts mortality in trauma patients at this single Level I trauma center. The ability to quickly and accurately determine a patient's mortality risk at the time of admission makes IMRS a powerful and potentially clinically important tool.

Hazard Ratios between IMRS risk groups				
	30 day death		1 year death	
	Mod vs. low	High vs. low	Mod vs. low	high vs. low
Male	4.96	13.72	12.64	57.88
N	low: 2324, mod: 2235, high: 1342		low: 2350 mod: 2752, high: 620	
Female	6.15	14.95	4.95	19
N	low: 1472, mod: 1360, high: 805		low: 975, mod: 1499, high: 3511	

Notes

**UNCONTROLLED HEMORRHAGIC SHOCK RESULTS IN A
HYPERCOAGUABLE STATE MODULATED BY INITIAL FLUID
RESUSCITATION REGIMENS**

Gordon M Riha, MD, Nicholas R Kunio, MD, Philbert Y Van, MD,
Igor Kremenevskiy, MD, PhD, Ross Anderson, BS, Gregory J Hamilton, BS,
Jerome A Differding, MPH, Martin A. Schreiber*, MD, FACS,
Oregon Health & Science University

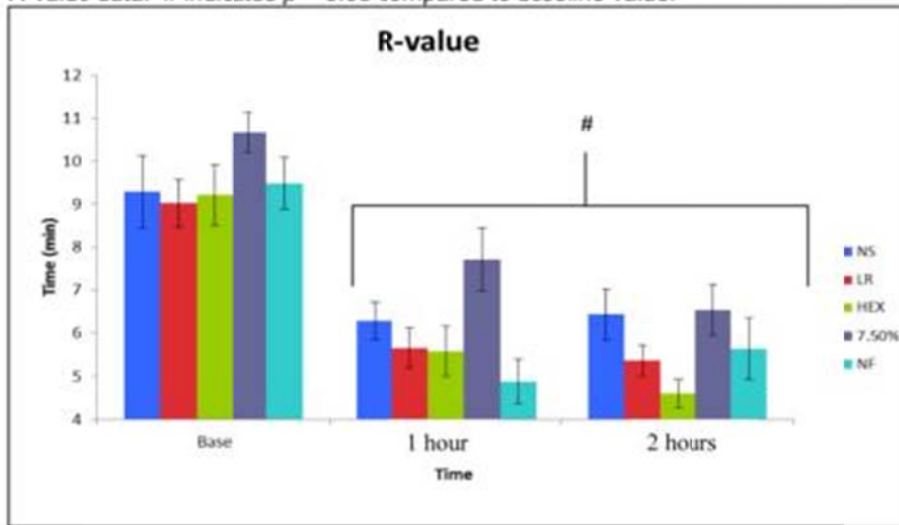
Objectives: Previous studies have shown large volume resuscitation modulates coagulopathy and inflammation. Our objective was to analyze the effects of initial bolus fluids utilized in military and civilian settings on coagulation and inflammation in a prospective, randomized, blinded trial of resuscitation of uncontrolled hemorrhage.

Methods: Fifty swine were anesthetized, intubated, ventilated, and had monitoring lines placed. A grade V liver injury was performed followed by 30 minutes (30') of hemorrhage. After 30', the liver was packed, and randomized fluid resuscitation was initiated over a 12' period with two liters of normal saline (NS), two liters of Lactated Ringer's (LR), 250 ml of 7.5% saline with 3% Dextran (HTS), 500 ml of Hextend, or no fluid (NF). Animals were monitored for 2 hours post-injury. Thrombelastograms (TEGs), prothrombin time (PT), partial thromboplastin time (PTT), fibrinogen, as well as serum IL-6, IL-8, and TNF- α levels were drawn at baseline, 1 and 2 hours.

Results: The NF group had less post-treatment blood loss compared to other groups, $p < 0.01$. Blood loss was similar in the other groups. TEG R-values in each group were decreased at 1 and 2 hours compared to baseline, $p < 0.02$ (Figure 1). NS, HTS, and HEX had lower TEG-MA values compared to NF, $p < 0.02$. All fluids except LR resulted in significant increases in PT and decreases in fibrinogen compared to NF, $p < 0.02$. Fluid resuscitation groups as well as the NF group demonstrated significant increases in inflammatory cytokines from baseline to 1 hour and baseline to 2 hours. There were no significant differences in inflammatory cytokines between groups at 2 hours (Figure 2).

Conclusion: Withholding fluid resulted in the least significant change in PT, fibrinogen, and MA, and the lowest post-treatment blood loss. Resuscitation with different initial fluid resuscitation strategies did not result in increased pro-inflammatory mediators compared to no fluid.

R-value data. # indicates $p < 0.05$ compared to baseline value.



TNF- α data. ^a indicates baseline < 1 hour; ^b indicates baseline < 2 hour; ^c indicates 1 hour < 2 hour; ^d indicates LR < NF and NS; ^e indicates NF > HTS. For significant comparisons, $p < 0.05$.

Fluid	Baseline	1 Hour	2 Hour
NS	62.0 (49.0, 84.9)	70.4 (54.6, 92.5)	108.0 (98.3, 167.7) ^{b,c}
LR	54.7 (39.2, 60.0)	52.5 (40.4, 70.1) ^d	102.5 (68.4, 138.4) ^{b,c}
HEX	47.3 (44.6, 59.8)	69.3 (52.4, 90.0) ^a	93.6 (64.4, 132.3) ^{b,c}
HTS	54.5 (45.9, 74.9)	63.0 (53.1, 79.7) ^a	78.8 (64.1, 111.7) ^{b,c}
NF	57.6 (50.6, 77.7)	84.5 (68.8, 106.6) ^{b,c}	94.6 (74.4, 118.9) ^{b,c}

Notes

EVALUATION OF THE RISK OF NONCONTIGUOUS FRACTURES OF THE SPINE IN BLUNT TRAUMA

Daniel W Nelson, DO, Matthew J. Martin*, MD, Niels Douglas Martin*, MD, Alec Beekley, MD, Madigan Army Medical Center

Objectives: There is significant debate over the risk of additional noncontiguous (NC) fractures among blunt trauma patients with an identified spinal injury, often prompting routine full spine imaging. We sought to determine the incidence of NC spinal fractures and the relationship between injury pattern and mechanism.

Methods: A review of all adult blunt trauma patients from the 2010 National Trauma Databank with a spine fracture. Patient demographics, mechanism of injury and frequencies of all combinations of spinal fractures were analyzed.

Results: Among 654,052 blunt trauma patients, 83,338 (13%) had a diagnosed spine fracture. The mean ISS was 15 + 11. Of these, 7% (5,496) sustained spinal cord injury and 17% (14,413) underwent spinal surgery. The overall incidence of NC fractures was 22% and was associated with severe truncal injuries, primarily involving the chest. The relative incidences of cervical, thoracic and lumbar fractures were 41% (34,480), 37% (30,383), and 43% (35,778) respectively. Rates of NC fractures of the spine included 9% (7,406) cervicothoracic, 4% (3,415) cervicolumbar, and 10% (7,929) thoracolumbar. The slight majority (57%) of patients with spinal fractures sustained high velocity trauma compared to 43% associated with low velocity trauma. However, NC fractures of the spine were strongly associated with high velocity trauma (Figure).

Conclusion: Spine fractures are relatively common with blunt trauma, and approximately 20% will have a NC fracture. NC fractures were associated with other severe injuries and should be mainly suspected and investigated in high velocity mechanisms.

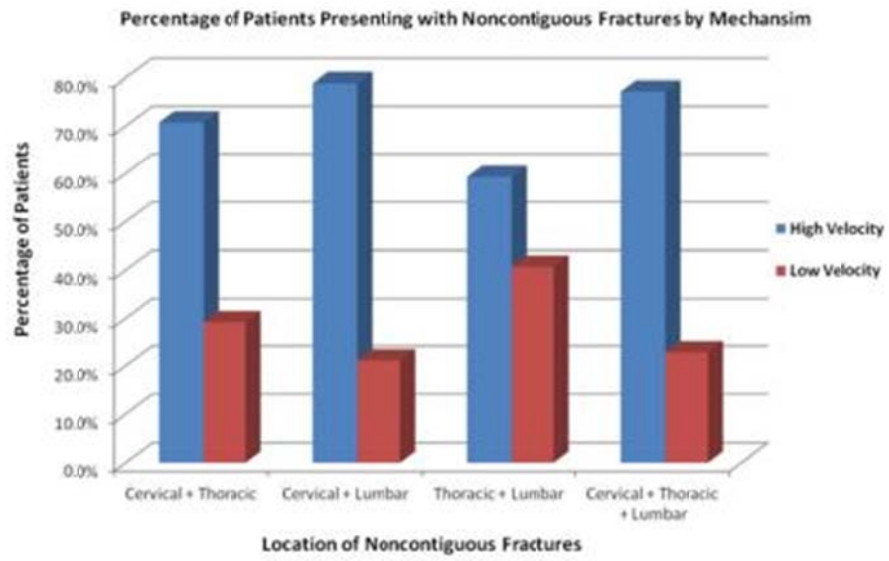


Figure 1. Percentage of patients presenting with noncontiguous fractures of the spine based on mechanism of injury.

Notes

**INCREASED MORBIDITY AND MORTALITY OF TRAUMATIC
BRAIN INJURY IN VICTIMS OF NONACCIDENTAL TRAUMA**

Katherine Deans, MD, MHSc, Peter C Minneci, MD, MHSc,
Wendi Lowell, CAISS, Jonathan I. Groner*, MD,
Nationwide Children's Hospital

Objectives: The purpose of this study was to determine if the morbidity and mortality associated with traumatic brain injury (TBI) is worse in children who are victims of nonaccidental trauma (NAT) compared to TBI from other traumatic mechanisms.

Methods: We identified all pediatric patients admitted with the diagnosis of TBI between 2001-2010 in our institutional trauma registry with an Abbreviated Injury Score (AIS) >1. Patients were divided into groups based on a nonaccidental (NAT) or accidental mechanism of injury. Need for gastrostomy tube insertion was used as a marker of more severe neurologic morbidity in survivors of TBI. Group comparisons were made using Fisher's exact tests.

Results: 2,782 patients with TBI were included. 315 (11.3%) patients had TBI secondary to NAT. Overall mortality and AIS-specific mortality were higher in patients with TBI secondary to NAT (Table). In comparison to patients with TBI secondary to accidental mechanisms, patients with TBI secondary to NAT were younger (mean 1 vs. 8 years), had longer ICU stays (mean 3 vs. 1 days), and required gastrostomy tubes more often (6% vs. 1%, $p<0.0001$). Even amongst the subgroup of patients with severe TBI, (AIS 4 and 5), patients with NAT required gastrostomy tubes more often (5% vs. 2%, $p=0.014$).

Conclusion: Patients with TBI from NAT have increased morbidity and mortality compared to patients with TBI from accidental mechanisms; these differences are present at all levels of severity of injury. Patients with TBI from NAT represent a vulnerable group of pediatric trauma patients that are at increased risk of death and worse outcome and that will require greater short and long term medical resources.

Title: Mortality in patients with traumatic brain injury			
AIS score	Deaths in patients with NAT (%)	Deaths in patients with accidental mechanism (%)	p-value
2	0/43 (0%)	1/831 (0%)	NS
3	5/72 (7%)	3/891 (0%)	<0.0001
4	12/107 (11%)	14/476 (3%)	0.0008
5	33/92 (36%)	61/249 (24%)	0.041
6	1/1 (100%)	18/20 (90%)	NS
Overall	51/315 (16%)	97/2467 (4%)	<0.0001

Notes

**MAINTENANCE OF NORMOTHERMIA IMPROVES FUNCTIONAL
OUTCOME IN SEVERE CLOSED HEAD INJURY PATIENTS**

Kara E Friend, MD, L. D. Britt*, MD, Rebecca C Britt, MD,
Jessica Robin Burgess, MD, Jay N. Collins*, MD,
Timothy J. Novosel*, MD, Leonard J. Weireter Jr. *, MD,
Eastern Virginia Medical School

Objectives: The deregulation of the hypothalamic axis and subsequent hyperthermic response have been shown to be deleterious to full recovery in closed head injuries. Cooling catheters have been suggested to maintain normothermic states.

Methods: All patients age 18-80 diagnosed with severe closed head injury from June 2010 – May 2012 were evaluated. Cooling catheters were placed in the femoral vein within 24 hours of admission. Cooling catheters maintained the patient at 97 degrees Fahrenheit. APACHE II scores were calculated as was GCS score on admission and discharge. Other parameters assessed included mechanism of injury, CT findings, temperatures, mannitol use, hypertonic saline use, outcomes, and disposition.

Results: 51 patients were evaluated, with a total of 17 receiving cooling catheters (CC). The average age for CC patients was 35.9 and 43.7 for controls (p=0.1322). The mean APACHE score for control patients score was 19.68 compared to 22.71 (p=0.1040) for cooling catheter patients. The average change in GCS score from admission to discharge was 3.96, with 2.32 for controls and 7.24 for cooling catheter patients (p=0.0068). 14 patients died, 10 controls (29.4%) and 4 CC patients (23.5%). 12 patients developed hypothermia (temp under 96.3), 2 with CC and 10 controls. The length of stay was longer at 22.6 days for CC patients and 9.76 for controls (p=0.0009). Mannitol use and 3% saline use were equal between the groups (p=0.4304 and p=0.1657). Maximum temperature in CC patients was 101.8 and 101.1 in the control population (p=0.2351). Infectious complications occurred in 9 times in patients (26.5%) and 16 times in the CC patients(94%). Infections complications included blood stream infection, urinary tract infections, pneumonias and no episodes of clostridium difficile. There were no vascular complications from the placement of lines in either group.

Conclusion: Early data from cooling catheter patients suggests an improvement in neurologic outcome but an increased infection rate.

	Cooling Catheter	Control	P value
Change in GCS	7.24	2.32	0.0068
Death	4 (23.5%)	10 (29.4%)	0.6649
Hypothermia	2 (11.8%)	10 (29.4%)	0.1678
Maximum temperature	101.8	101.1	0.2351
Length of stay	22.6 days	9.76 days	0.0009
Mannitol (20%)	340 ml	103 ml	0.1657
Hypertonic saline (3%)	558.8 ml	404.41	0.4304
Tylenol use	12 (70.6%)	5 (14.7%)	0.0001

Notes

IMPACT OF IMPLEMENTATION OF AN ACUTE CARE SURGERY SERVICE ON PERCEPTIONS OF PATIENT CARE AND RESIDENT EDUCATION

Monisha Sudarshan, MD, Liane Feldman, MD, FRCSC, Etienne St. Louis, DEC,
Mostafa Al-Habboubi, MD, Muhamad Elhousseini, MD, Paola Fata, MD,
Dan Leon Deckelbaum, MD, Tarek S. Razek*, MD,
Kosar A. Khwaja*, MD, MBA, MSc, FACS,
McGill University

Objectives: Our objective was to document the impact of implementation of an Acute Care Surgery (ACS) service on perceptions of quality and efficiency of emergency surgical care and education.

Methods: Prior to ACS service implementation at a large teaching hospital, a 34 item web-based survey evaluating perceptions of the quality of emergency surgical care and education was distributed to staff surgeons (SS) and general surgery residents (GSR). One year after ACS, the perceptions of the SS and GSR who had rotated on the service were re-evaluated with the same survey. Responses were graded on a 5 point Likert scale and a 3-point progress scale. Responses on the Likert scale were graded and compared pre and post ACS with Mann Whitney U-tests. $p < 0.05$ was considered significant.

Results: The pre-ACS response rate was 7/9 (78%) for SS and 36/60 (60%) for GSR. The post-ACS response rate was 10/10 (100%) for SS and 11/20 (55%) for GSR. The time to see consults were considered to have decreased by 8/10 (80%) of SS post-ACS. The sign-out system between staff was also considered to have improved by 5/10 (50%) of SS post-ACS. The impact of ACS duties on elective OR, clinics and research did not appear to change post-ACS for SS ($p = \text{NS}$). All SS (10/10) surveyed believed there was more opportunity to assess resident's knowledge, with improvement in their clinical skills post ACS. Patient care was also considered to be more efficient by 9/11 (82%) of GSR with the ACS model, with an improvement in resident sign-over procedures ($p = 0.0018$). Residents also thought they received more teaching around cases by staff when managing ACS patients ($p = 0.0004$). The ACS model was considered to have improved the general surgery training for 8/11 (72%) of residents, with 9/11 (82%) believing that their ability to review patients with staff and leadership skills (8/11 (72%)) had improved.

Conclusion: Surgeons and residents consider the ACS model has a positive impact on timely care, trainee knowledge, management and leadership skills.

**VENA CAVA FILTER (VCF) RETRIEVAL RATES ARE
DEPENDENT UPON PROTOCOL AND PATIENT DISPOSITION**

Paul D. Colavita, MD, A. Britton Christmas*, MD, FACS, John M. Green*, MD,
Peter E. Fischer*, MD, MS, Korsica Lassiter, BS, Ronald F. Sing*, DO,
Carolinas Medical Center

Objectives: VCF are commonly inserted in both critically ill, trauma and non-trauma patients. Recent studies demonstrate that VCF registries improve follow-up and retrieval rates. This study evaluates patient follow-up in the trauma compared to the non-trauma population.

Methods: A prospectively collected registry of VCF insertions and retrievals at a single hospital was reviewed from 2006 to 2010. Patients who died prior to retrieval were excluded. Data collected included: demographics, patient disposition, complications, and compliance (contacted and agreed to retrieval attempt). Nominal variables were evaluated using chi-square analysis.

Results: VCF were placed in 545 patients; 488 were contacted for follow-up (57 deaths). Male/female = 69%/31%, mean age 41.9 years. Trauma patients comprised 82% of the population. Only 37% of patients were compliant; of those, 87% were successfully retrieved. Retrieval was unsuccessful in 10.8% and not attempted in 2.7%. Mean implant time was 149.5 days (range 14-927). Younger patients were more likely to be compliant (compliant vs noncompliant: 38.2 vs 44.1 yrs, $p<0.05$), while patient gender had no effect. Trauma patients were compliant more often than others (40.1% vs 26.7%, $p=0.021$). 34.3% of patients discharged to rehabilitation, skilled nursing, or long-term facilities completed follow-up compared with 48.0% of patients discharged to home ($p=0.008$). After a non-home discharge, trauma patients were more compliant (37.7%) than non-trauma patients (3.4%, $p<0.0001$). Insertion complications were infrequent ($<6\%$) and similar with regard to compliance. Late complications occurred in 19.2% of patients with follow-up.

Conclusion: Disposition plays a key role in follow-up for VCF retrieval. Patients discharged to medical facilities have lower rates of follow-up than those discharged home. Trauma patients are more likely to follow-up after VCF placement, particularly due to a formal registry and contact protocol.

Notes

COMPARISON OF AN UNVENTED (HALO®) WITH A VENTED (BOLIN™) CHEST SEAL FOR TREATMENT OF PNEUMOTHORAX (PTX) AND PREVENTION OF TENSION PTX IN A SWINE MODEL

Bijan S Kheirabadi, PhD, Lorne H Blackbourne*, MD, Victor Covertino, PhD,
Michael Dubick, PhD, Robert Gerhardt, MD, Harold Klemcke, PhD,
Alexandra Koller, BS, Irasema Terrazas, MS,
US Army Institute of Surgical Research

Objectives: Objective: Unvented Halo chest seals (CS) are preferred by medics for treating pneumothorax (PTx) on the battlefield because of their superior adhesiveness. Since no data exist, we compared the efficacy of the Halo CS with a vented CS (Bolin) in a swine PTx model.

Methods: Methods: An open chest wound PTx was created in the left thorax of spontaneously air-breathing anesthetized pigs (n=8). A CS was applied over the injury and tension PTx was induced by incremental air injections (200 ml) into the pleural cavity via a cannula that also was used to measure intrapleural pressure (IP). Both CS were tested on each pig in series with a respiratory recovery between tests following a restored baseline IP. Heart rate, blood pressure (MAP), central venous pressure, pulmonary artery pressure (PAP), venous O₂ saturation (SvO₂), cardiac output (CO), peripheral O₂ saturation (SpO₂), tidal volume (Vt), respiratory rate and IP were recorded throughout. Tension PTx was defined by a mean IP \geq +1mmHg and when any 4 of these 5 changes were present: MAP \downarrow 20%; CO \downarrow 20%; SvO₂ \downarrow 30%; Vt \downarrow 20%; PAP \uparrow 30%; and then confirmed by chest X-ray. PO₂ and PCO₂ were measured in blood at baseline and the end of each CS test.

Results: Results: PTx produced immediate respiratory difficulty and significant \uparrow in IP and PAP (Fig. 1) and \downarrow in Vt, SpO₂ and SvO₂ (Fig. 2) with no change in other parameters. Sealing the wound with either CS returned all parameters to near baseline within 5 min. With the Bolin CS subsequent air injection equal to the total lung capacity (~2050 ml) produced no change in the above parameters. In contrast, Halo use led to deterioration of all parameters, hypoxemia and development of tension PTx in all instances after ~1275 ml air injection.

Conclusion: Conclusion: CS with or without a venting valve provide immediate breathing comfort and improve blood oxygenation of patients with PTx. However, over time in the presence of an airway leak, an unvented CS can lead to tension PTx, hypoxemia, respiratory and cardiac arrest.

Intraleural & Pulmonary Artery Pressure

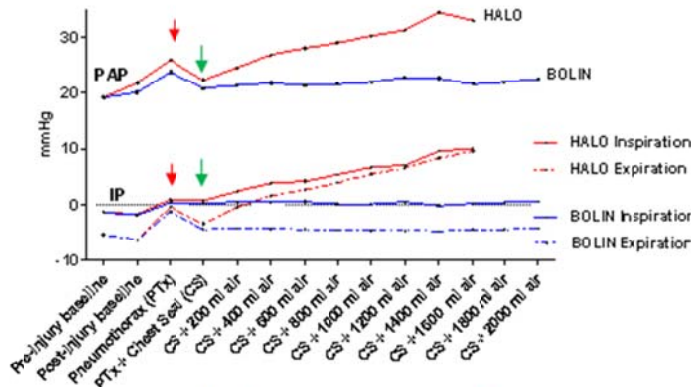


Figure 1. Changes of PAP in response to increasing IP that were measured by Swan-Ganz and intraleural catheters. The pressure changes caused by PTx and by chest seal application are shown by red and green arrows, respectively. Halo experiments were discontinued when tension PTx developed.

Peripheral & Venous O2 Saturation

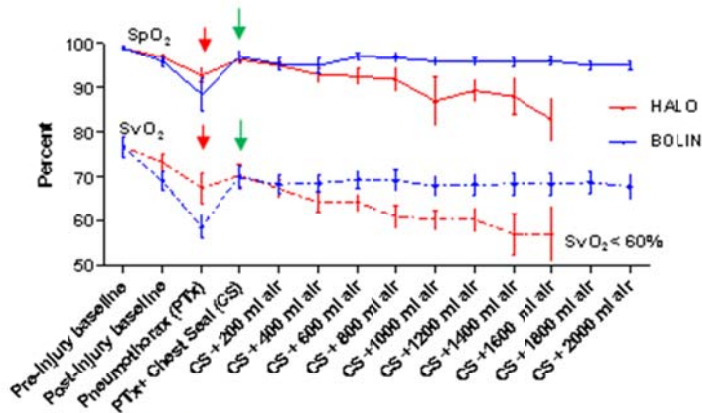


Figure 2. SpO₂ and SvO₂ changes were measured by pulse oximeter and Swan-Ganz catheter. Note the changes after PTx induction (red arrows) and chest seal application (green arrows). Halo experiments were discontinued after 800-1600 ml air injection when tension PTx developed.

Notes

Poster 19

HOW SAFE IS THE BACK SEAT IN TRAFFIC CRASHES? A PROFILE OF SEVERE INJURIES AND OUTCOMES FOR RESTRAINED REAR OCCUPANTS

Tanya Charyk Stewart, MSc, Neil G. Parry*, MD, Kevin McClafferty, BSc,
Jean-Louis Comeau, BEng, Michael Shkrum, MD,
Jason Gilliland, PhD, Douglas D. Fraser, MD, PhD,
London Health Sciences Centre

Objectives: To examine injury profiles, crash characteristics and outcomes of severely injured restrained rear occupants.

Methods: Retrospective cohort of severely injured (ISS>12) patients involved in a traffic MVC as a restrained rear occupant of a passenger vehicle and treated at one of two regional Trauma Centres from 2001-10. Data were described and statistically compared by 4 age groups (child, 0-8 years; adolescent, 9-17 years; adult, 18-54 years; senior, 55+ years). Logistic regression modeling was completed for severe head/neck injury.

Results: A total of 123 severely injured rear occupants were restrained (54%). Seniors had the highest proportion of restraint use (76%) and 18-54 year olds the lowest (42%; $p=0.001$). Children had significantly more severe head/neck injuries than older occupants (85% vs. 25%, 26%, 18% for adolescents, adults and seniors, respectively). Types of head injuries differed with more DAI, skull fractures, SDH, SAH, edema and contusions in children than older age groups ($p<0.05$). More children were seated in the middle rear than older occupants (27% vs. 17%, 5%, 0%, respectively; $p=0.034$). Crash details differed with more adults involved in single vehicle (44% vs. 12% child; 28% adolescent; 24% senior; $p=0.012$), frontal collisions (64% vs. 17% child, 48% adolescent; 43% senior, $p=0.031$). Middle rear seating position (OR=5.19; 95% CI 1.04-25.79), and use of an infant/child/booster seat (OR=19.15; 95% CI 3.71-98.73) significantly increased the odds of sustaining a severe head/neck injury. Side rear seating was not significant. Children had the highest mortality rate (19% vs. 3%, 3%, 14%, respectively, $p=0.042$).

Conclusion: Severe injuries occur to rear occupants, despite restraint use. Injury types and severity varied by age group with children < 9 years of age being at most risk of severe head/neck injury and death. Real-world MVC data may aid in the design and improvement of rear occupant restraint systems for the prevention of injuries.

Notes

**FINANCIAL IMPLICATION OF PROPOSED LEGISLATION ON
HOSPITAL REIMBURSEMENT FOR THE INJURED DRUNK
DRIVER**

Patricia Anne Pentiak, MD, Claire Elise Peeples, MD, Holly A Bair, RN MSN NP,
Felicia Ivascu*, MD, Oakland University Beaumont Health System

Objectives: The state of Michigan is one of 12 states to have no-fault automobile insurance, and is the only state that provides unlimited medical benefits. Due to high costs incurred from this, House Bill No. 5588 was proposed which would remove no-fault benefits if a person is found operating a motor vehicle or motorcycle while intoxicated or impaired at the time of the accident, regardless of responsibility. In this study, we examined the financial implications to hospitals that care for these patients.

Methods: We conducted a retrospective review of our level 1 trauma center's trauma registry from 2008-2010. Admitted injured drivers of motor vehicle crashes (MVC), of legal drinking age (>21 years) were included. Intoxicated drivers were defined as those with a blood alcohol level above the legal limit (0.08g/dL). Hospital admission criteria and all costs pertaining to admission and treatment were obtained.

Results: Of the 541 total drivers admitted after a MVC, 10.9% (59) were found to be legally intoxicated. Hospital financial data was available for 52 intoxicated and 482 sober patients. The total charges for all legally intoxicated drivers were \$5.2 million which accounts for 12% of all charges for drivers. This leads to a contribution to the margin of \$2.4 million with 74% of this paid by auto insurance.

Conclusion: Due to the large cost and thus revenue created by treating these patients passage of Bill 5588 would significantly impact hospitals treating intoxicated drivers. There would be a 12% reduction in net revenue generated from the care of injured drivers. This will lead to a large financial burden for hospitals that treat intoxicated drivers requiring them to either absorb this cost or pass it on to Medicaid.

Notes

**A NOVEL FLUOROSCOPY-FREE, RESUSCITATIVE
ENDOVASCULAR BALLOON OCCLUSION SYSTEM OF THE
AORTA IN A PORCINE MODEL OF SHOCK**

Robert Houston, IV, MD, Daniel J Scott, MD, Jeremy Cannon*, MD, SM,
Jonathan L Eliason, MD, Jonathan Morrison, MRCS, Todd E Rasmussen, MD,
James Dean Ross, Ph.D., Jerry Spencer, RVT, Carole Villamaria, MD,
US Army Institute of Surgical Research

Objectives: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is an alternative to aortic clamping in hemorrhagic shock. However, existing technology requires large-sheath arterial access and fluoroscopy for positioning. The objective of this study is to demonstrate the feasibility of a fluoroscopy-free REBOA system compared to current technology.

Methods: Swine (70-90 kg) underwent controlled bleeding to class IV shock and underwent either 60 mins of REBOA using a commercially available balloon (CB, n=8) or a new prototype balloon (PB; n=8) designed as a consolidated wire and balloon system. Devices were introduced from the femoral artery and positioned and inflated in the thoracic aorta without fluoroscopy. Resuscitation for 6 hrs included blood, fluid and vasopressors and was followed by 48 hrs of survival and necropsy. Endpoints were survival, accuracy of position, mean arterial pressure (MAP), brain oxygen tension (PBrO₂), lactate and necropsy results.

Results: Post-hemorrhage, the MAP (mmHg) and PBrO₂ (mmHg) was similar in the CB and PB groups (MAP: 35±8 vs 34±5; p=0.895 and PBrO₂: 13±15 vs 44±83; p=0.204). Accurate positioning occurred in 88% of the PB group. Following REBOA, MAP and PBrO₂ increased comparably in the CB and PB groups (MAP: 81±20 vs 89±16; p=0.211 and PBrO₂: 26±24 vs 53±78; p=0.284 respectively). Lactate peaked in both CB and PB groups (10.8±1.4 vs. 13.2±2.1; p=0.012) 45 minutes post balloon deflation but returned to baseline by 24 hours. Mortality was similar between the CB and PB groups (1 (12%) vs 2 (25%); p=0.500) as was the rate of necrosis seen in cerebral (1 (12%) vs 0 (0%); p=1.000) and spinal tissue (3 (37.5%) vs 3 (37.5%); p=1.000). There was no evidence of injury to the aortic wall.

Conclusion: This study reports the feasibility of a novel fluoroscopy-free REBOA system in a porcine model of shock. Despite the physiologic insult, 60 mins of REBOA is tolerated and recoverable. Additional study is necessary to refine the methodology of this resuscitative adjunct.

Notes

RESUSCITATIVE THORACOTOMIES IN U.S. COMBAT CASUALTIES: A TEN-YEAR REVIEW OF OPERATION ENDURING FREEDOM AND OPERATION IRAQI FREEDOM

Kevin B Waldrep, MD, Lorne H Blackbourne*, MD, Jeremy Cannon*, MD, SM,
Kevin Chung, MD, Stephen Cohn*, MD, Timothy Wallum, MS,
San Antonio Military Medical Center

Objectives: Historically, the use and indications for resuscitative thoracotomy (RT) in civilian trauma patients has been debated due to low rates of survival. We sought to review the experience with resuscitative thoracotomies for U.S. combat casualties wounded in OEF/OIF over the last decade of fighting.

Methods: We queried the Joint Trauma Theater Registry for U.S. soldiers who received a thoracotomy the day of injury in OIF/OEF from January 2003 to May 2011. Coalition forces and civilian casualties were excluded from this study. A chart review was performed to ensure that only patients receiving a resuscitative thoracotomy were included. Of the 242 soldiers identified from the database, 148 soldiers met the inclusion criteria.

Results: Incidence of RT in U.S. combat casualties was 0.6% (148/23,797 patients). Injuries resulting from explosives were the most common mechanism of injury (60.1%) vs. GSW (33.1%) vs. blunt trauma (6.7%). Overall survival was 14.8% with no significant difference in survivability for patients sustaining injuries from explosions (17.8%) vs. GSW's (10.2%) vs. blunt trauma (8.3%). There was no difference of ISS for survivors (31.7) compared to non-survivors (27.7). The ratio of FFP to pRBCs was higher for survivors than non-survivors (1:1.11 vs. 1:1.81 p<0.01 by chi-square analysis)

Conclusion: Our study population has a rate of survival after resuscitative thoracotomy similar to previous reports from either military conflicts or the civilian setting. This procedure is useful in the military setting and will produce a significant percent of neurologic survivors.

Notes

**THE INCIDENCE AND IMPACT OF PRESCRIPTION CONTROLLED
SUBSTANCE USE AMONG INJURED PATIENTS AT A LEVEL ONE
TRAUMA CENTER**

Matthew Bozeman, MD, Kimberly Broughton-Miller, ARNP,
Michelle Frisbie, ARNP, Karina Pentecost, ARNP, Jodi Wojcik, ARNP,
Robert Cannon, MD, Jason Smith*, MD, Brian G. Harbrecht*, MD,
Glen A. Franklin*, MD, Matthew Benns*, MD,
University of Louisville

Objectives: There has been increasing attention focused on the epidemic of prescription drug use in the United States, but little is known about its effects in trauma. The purpose of this study was to define the incidence of prescription controlled substance use among trauma patients and determine its effects on outcome.

Methods: A retrospective review of all injured patients admitted to a level 1 trauma center from January 1, 2011 to December 31, 2011 was performed. Patients who died within 24 hours of admission or whose outpatient medications were unknown were excluded. Data review included home benzodiazepine or narcotic use, gender, age, mechanism of injury, injury severity scores (ISS), intensive care unit (ICU) and overall length of stay, and overall cost. SAS version 9.3 was used for analysis and $p \leq .05$ was considered statistically significant.

Results: 2983 patients were admitted during the study time period and 1797 met inclusion criteria. Overall incidence of prescription controlled substance use was 19.7%. Patients using benzodiazepines and/or narcotics were more likely to be women (27.3% vs 16.2%, $p < .001$), older (48.2 years vs 43.7 years, $p < .001$), had a longer mean ICU length of stay (3.6 vs 2.6 days, $p = .042$), and a longer mean hospital length of stay (8.0 vs 6.6, $p = .021$). ISS and mechanism of injury were not different between groups. Overall cost was greater in drug users (151,651 dollars vs 92,665, $p = .173$), but did not reach significance due to wide variability in charges.

Conclusion: One-fifth of injured patients at our trauma center report the use of prescription controlled substances on admission. Users of these medications are more likely to be women and of older average age. Hospital and ICU length of stays were longer for controlled substance users with no difference in ISS between groups. Outpatient use and abuse of these medications can increase the overall healthcare burden given the large number of patients admitted nationwide following trauma.

Notes

**EARLY TRAUMATIC BRAIN INJURY SCREENING IN 6,594
INPATIENT COMBAT CASUALTIES**

David Zonies*, MD, Kathleen D. Martin*, RN, MSN,
John Jones, BA, Jean Orman, ScD, MPH,
Landstuhl Regional Medical Center

Objectives: Traumatic brain injury (TBI) has been coined the "signature wound" during current U.S. combat operations. All patients injured in Iraq or Afghanistan who transit through Landstuhl Regional Medical Center (LRMC) undergo an initial TBI screen regardless of anatomic injury. The incidence and factors associated with positive screening for concussion (physical event + alteration of consciousness (AOC)) and TBI diagnoses were examined.

Methods: A retrospective review of consecutively admitted patients to LRMC who underwent a TBI screen from 5/06-7/11 was performed. Baseline characteristics, self-reported symptoms, and TBI diagnoses were analyzed.

Results: Among 43,852 patients screened during the 5-year period, 6,594 were admitted. Predominantly male (97.1%), the mean age was 26.7 ± 7.4 yrs. The average GCS and ISS was 13.9 ± 2.8 and 10.1 ± 8.6 , respectively. Positively screened patients averaged 1.8 deployments, 61.9 experienced one or more blasts, 16% experienced one or more vehicular crashes, with 18.0% reporting a prior head injury. Of the 2,806 (42.6%) who screened positive for possible concussion, 2,393 (85.3%) were diagnosed with a concussion/TBI during their inpatient stay; the remaining 412 (14.7%) were identified by screening only. A total of 1,953 (69.6%) of those who screened positive reported 1 or more concussion/TBI-related symptoms at the time of screening, while 532 (27.2 %) reported 5 or more.

Conclusion: Early screening based on self-report identified a large number of patients admitted directly from the combat zone with possible deployment-related concussion and TBI symptoms. Such screening provides valuable information to guide decisions about early management and return to duty.

Notes

**DOES CARING FOR TRAUMA PATIENTS LEAD TO
PSYCHOLOGICAL STRESS IN SURGEONS?**

Ann Marie Warren, Ph.D., Shahid Shafi*, MD, MPH, Monica Bennett, Ph.D.,
Michael Foreman, MD, Kenleigh Roden-Foreman, BS, Alan Jones, MD,
Baylor University Medical Center

Objectives: Post Traumatic Stress Disorder (PTSD) has been shown to occur in caregivers of trauma patients, including healthcare providers. Surgeons routinely care for the injured but the impact of this exposure on their psychological health has not been well studied. We hypothesized that caring for trauma patients is associated with symptoms of PTSD among surgeons.

Methods: Surgeons in various specialties (n=133) were surveyed Jan-May 2012 at two regional surgical conferences. Symptoms of PTSD were identified utilizing the Secondary Traumatic Stress Scale (STSS) which uses specific diagnostic criteria to measure the psychological impact of exposure to trauma patients. Resilience, a positive psychological trait that may protect against PTSD, was measured using the Connor Davidson Resilience Scale, and compared to general population norms. The amount of time caring for trauma patients was used as a measure of risk exposure. The relationship between STSS, resilience and exposure to trauma patients was measured with $p < .05$ considered significant.

Results: Mean age of the participants was 48 ± 16.5 years and 83% were males. Twenty eight surgeons (22%) met diagnostic criteria for PTSD. Approximately two thirds of the surgeons (86 of 133, 65%) exhibited at least one symptom of secondary stress. However, the magnitude of exposure to trauma patients was similar between surgeons with and without PTSD ($p = 0.2177$). Surgeons exhibited higher resilience scores than general population (33 ± 4 vs. 32 ± 5 , $p .0012$). Higher resilience scores were associated with lower STSS ($r -0.369$, $p < 0.0001$). Most importantly, surgeons who met criteria for PTSD exhibited significantly lower resilience scores (31 ± 3.4 vs. 34 ± 3.9 , $p < 0.0001$).

Conclusion: Caring for trauma patients is not associated with an increase in symptoms of PTSD among surgeons. However, symptomatic secondary stress is very common and its negative impact on surgeons may be minimized by utilizing techniques that improve resilience.

Notes

NOT ALL MECHANISMS ARE CREATED EQUAL - A SINGLE-CENTER EXPERIENCE WITH THE NATIONAL GUIDELINES FOR FIELD TRIAGE OF INJURED PATIENTS

Lance E Stuke*, MD, MPH, Juan C. Duchesne*, MD, FACS, FCCP, Norman E. McSwain*, MD, FACS, NREMT, Peter Meade*, MD, MPH, Patrick Greiffenstein, MD, Alan B. Marr*, MD, FACS, John P. Hunt III*, MD, MPH, Louisiana State University School of Medicine

Objectives: Trauma systems utilize pre-hospital evaluation of anatomic & physiologic (A&P) criteria and mechanism of injury (MOI) to determine trauma center need (TCN). MOI criteria are established nationally in a collaborative effort between the Centers for Disease Control and Prevention (CDC) and the American College of Surgeons Committee on Trauma (ACS-COT) and have been revised several times, most recently in 2011. Controversy exists as to which MOI criteria truly predict trauma center need. We review our single-center experience with past and present National Trauma Triage Criteria (NTTC) to determine which MOI predict TCN.

Methods: The trauma registry of an urban Level I trauma center was reviewed from 2001-10 for all patients meeting only MOI criteria. Patients meeting any A&P criteria were excluded. TCN was defined as death, ISS>15, emergency department transfusion, ICU admission, need for laparotomy/thoracotomy/vascular surgery within 24 hours of arrival, pelvic fracture, 2 or more proximal long-bone fractures, or neurosurgical intervention during admission. Logistic regression analysis was used to identify which MOI predict trauma center need.

Results: 3,569 patients were transported to our trauma center who met only MOI criteria and had the MOI recorded in the registry. 821 MOI patients (23%) were identified who met our definition of TCN. Significant predictors of TCN included: death in the same passenger compartment, ejection from vehicle, extrication time > 20 minutes, fall > 20 feet, pedestrian thrown/run-over. Criteria not meeting TCN include vehicle intrusion, rollover MVC, speed > 40 mph, auto-pedestrian/auto-bicycle injury > 5mph, and both of the motorcycle crash (MCC) criteria (Table 1).

Conclusion: With the exception of vehicle intrusion and MCC, the new NTTC accurately predicts TCN. Additionally, extrication time > 20 minutes was a positive predictor of TCN in our system. Elimination of the vehicle intrusion and MCC criteria and re-evaluation of extrication time merits further study.

Table 1:

	MOI status	Mechanism	Univariate OR (CI)	Adjusted OR (CI)
MVC	Current	Death in Car	4.02(1.88-8.62)*	3.40(1.54-7.52)*
	Current	Ejection	2.80(1.96-3.99)*	3.17(2.20-4.55)*
	Removed	Extrication>20 min	4.06(2.66-6.22)*	3.98(2.59-6.12)*
	Current	Intrusion > 12 in	1.18(.90-1.56)	
	Removed	Deformity >20 in	.92(.75-1.12)	
	Removed	Rollover	.68(.54-.85)	
	Removed	Speed>40mph	.72(.60-.88)	
MCC	Removed	Motorcycle/separaton	1.18(.91-1.53)	
	Current	Motorcycle>20mph	.90(.665-1.23)	
Fall	Current	Fall > 20 ft	2.74(2.08-3.61)*	2.74(2.08-3.61)*
Pedestrian	Removed	Ped/Bicycle>5 mph	.767(.64-.93)	
	Current	Ped run over/throw	1.39(1.08-1.78)*	1.54(1.19-1.99)*

* = P<0,05

Notes

PARTIAL TRAUMA TEAM ACTIVATIONS: WHAT ARE WE IDENTIFYING?

Nathan T. Mowery*, MD, Michael C. Chang*, MD,
Jason Farrah, MD, Amy Hildreth*, MD,
Wake Forest University Medical School

Objectives: The efficacy of a tiered trauma triage system has been proven but the utility of the individual criteria is not established. Many institutions use criteria designed for field triage based on mechanism for their partial trauma team activation (PTA) criteria with the goal being identification of significantly injured patients ($ISS \geq 16$). The goal of this study was to evaluate which criteria were associated with the need for urgent intervention.

Methods: The criteria used in 6322 PTA in our Level 1 Trauma Center over an 8 year period were evaluated for correlation with emergency surgery (ES, first 2 hours of admission) and mortality. A cohort matched for ISS, age, mechanism and admission blood pressure was created from the non-leveled trauma patients to determine the effect of being a leveled code. Multiple logistic regression analysis with PTA criteria as the predictor variable were performed with ES or death as the outcome.

Results: Amputation, stab to the torso, GSW to the proximal extremity and a neurovascularly compromised extremity were associated with the need for ES. Flail chest and suspected spinal cord injury were associated with an increased mortality. The remaining criteria were protective or had no association with death or ES. Referring hospital intubation, flail chest, and pelvic fractures were the only criteria associated with a median $ISS > 16$. The matched comparison groups showed no difference in time to the OR ($p = 0.4$) and non-leveled patients had significantly lower mortality (2.6% vs. 5.0%, $p = 0.001$).

Conclusion: The majority of PTC have no association with the need for ES or death. They do not identify an ill population based on ISS. Patients who need urgent intervention are identified by the physiologic criteria that most trauma centers use as full trauma team activation criteria. These data suggest a critical evaluation of the necessity and purpose of PTA criteria is warranted.

	Emergent Surgery	Death
Amputation	24.0*	No deaths
Stab to Torso	7.6*	.06*
Neurovascular Compromise Extremity	6.8*	No deaths
GSW to proximal extremity	2.3*	.1*
Motorcycle Collision	.4*	.1*
Auto-pedestrian	.3*	.2*
Fall >15 feet	.3*	.4*
Altered Mental Status	.1*	.5
Multiple long bone fractures	.3	.4
Resolved Hypotension	1.6	1.1
Fatality at scene	.4	1.4
Suspected pelvis Fracture	No OR	3.4
Referring hospital intubation	1.3	.2*
Ejection	.3	.3*
Spinal Cord Injury	.2	3.2*
Flail Chest	1.1	6.1*
Reported values are odds ratio; * is p<.05		

Notes

**TRIAGE CRITERIA BASED ON BLUNT MECHANISM OF INJURY
ARE OF LITTLE UTILITY**

Cameron Best, BS candidate, Kimberly Barre, RN, Kevin M. Schuster*, MD,
Rebecca M. Lofthouse*, BSN, Kimberly A. Davis*, MD, Yale University

Objectives: Over-triage is often cited as necessary to avoid under-triage and delays in trauma team activation. Mechanism of injury criteria have been steadily devalued with revisions of field triage criteria, however their utility after a complete field evaluation and discussion with an in-hospital trauma nurse remains unclear. To minimize over-triage we reviewed an extensive mechanism based two-tiered in-hospital trauma activation protocol designed to minimize under-triage.

Methods: Prospectively, data was collected over a 21 month period (January 2010-September 2011). Activation criteria prompting unnecessary trauma team activation were determined. Demographics, mechanisms of injury and level of trauma activation were collected. Univariate analysis associated individual triage criteria with outcome measures (admission to floor, ICU, or OR, need for blood products within 24 hrs, and death within 24 hrs).

Results: 6093 patients activated the trauma team, with full data sets available for 1886 (31%). Physiologic criteria, including hemodynamic instability and a GCS<9, were found to be highly predictive of all outcome measures, with odds ratios ranging from 6.5-30, depending on measure evaluated. Only a cavitory penetrating mechanism predicted all outcome measures (OR range 3.2-12.6). Falls from heights > 20 feet predicted admission but not severe injury. Physical exam findings of injuries above and below the diaphragm (OR 3.2-3.7) and more than one long bone fracture (OR 4.4-6.3) also predicted outcomes examined.

Conclusion: The use of mechanistic in-hospital criteria to identify significantly injured patients requiring transfusion, operative intervention, admission to a unit other than a floor, or death results in significant over-triage. Only penetrating mechanisms of injury, certain physical exam findings, physiologic criteria and possibly fall from heights much greater than 20ft predict need for aggressive intervention in the early period post injury.

Notes

**EAST SURVEY: DETERMINING PRACTICE PATTERNS OF BLOOD
PRODUCT TRANSFUSION IN PATIENTS WITH LETHAL
BRAIN INJURY**

Stancie Rhodes*, MD, Michael Mazzei, B.A., Meredith S. Tinti*, MD,
Adam M. Shiroff*, MD, Hesham Ahmed*, MD,
Marissa De Freese*, MD, Vicente H. Gracias*, MD,
Robert Wood Johnson Medical School

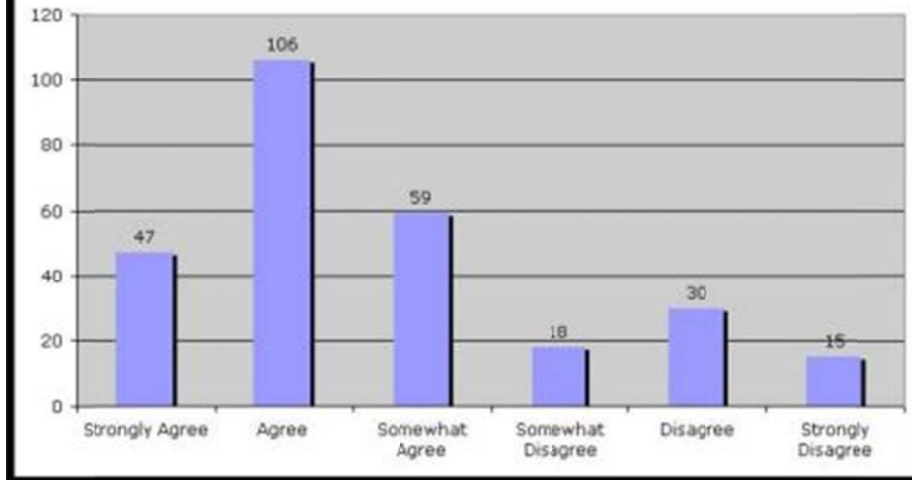
Objectives: In response to the worldwide shortage of transplantable organs, some institutions have initiated Aggressive Donor Management (ADM) protocols designed to manage patients suffering lethal brain injury. These protocols include guidelines for invasive monitoring and correction of metabolic disorders, but no consensus exists regarding the use of blood products. Our objective was to survey current practice patterns among US Trauma Surgeons to further develop these guidelines.

Methods: An anonymous survey was electronically distributed to all Trauma Surgeons in the Eastern Association for the Surgery of Trauma (EAST). The survey sampled participants' transfusion patterns. Questions regarding whether they would transfuse potential donors, and which products they were willing to transfuse and in what ratios were employed. The survey tool was validated using the Content Validity Index prior to its distribution.

Results: A total of 285 EAST members (24.5%) completed the survey. Almost three-quarters (72.5%) of respondents agree with the aggressive management of brain injured patients for the purposes of donation, while less than 10% strongly disagree with it. Of those surveyed, 53.5% currently transfuse these patients, but there was no agreement as to how much blood product to administer. The respondents did not differ significantly; however those practicing in a suburban setting were more likely to agree with transfusion (77%, $p < .04$) than those in rural or urban settings.

Conclusion: The majority of Trauma Surgeons surveyed agree with transfusing blood products in the severely brain injured patient, yet ADMs continue to lack transfusion guidelines. Inclusion may help standardize varying patterns between rural and more urban settings. Further investigation is needed to determine what the transfusion triggers and limits should be to maximize our donor conversion rates.

If a patient with non-survivable brain injury was in hemorrhagic shock, I would consider transfusing blood products in the hope that they could donate organs.



Notes

A NOVEL FREE RADICAL STERILIZATION SYSTEM FOR BURN WOUND DISINFECTION

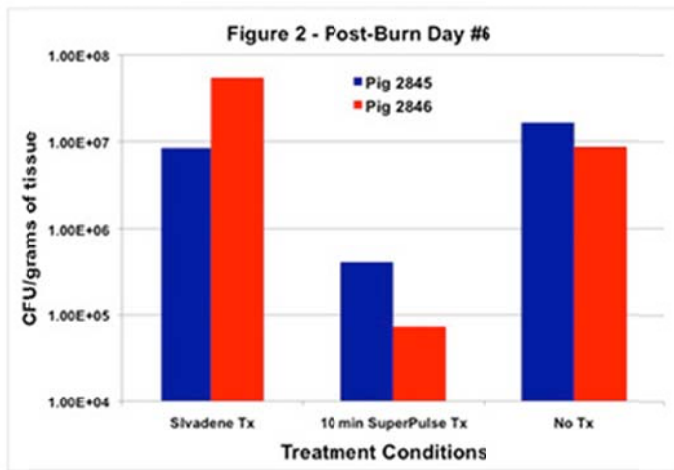
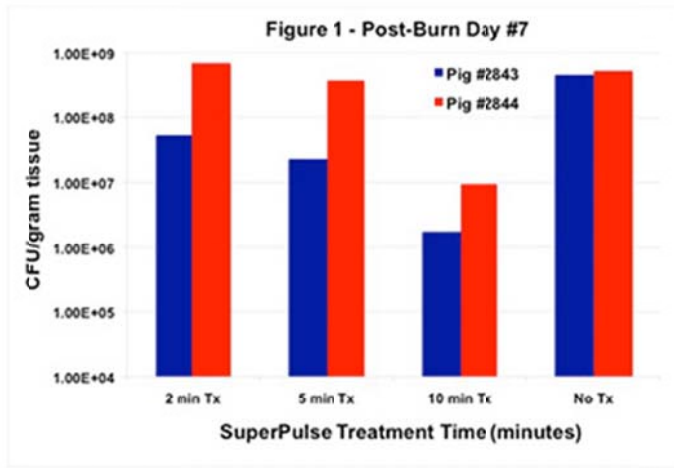
Benjamin David Sadowitz, MD, Czeslaw Golkowski, PhD, Kalenda Kasangana, MD, Mark Golkowski, PhD, Osama Abdel-Razek, MD, David Bruch, MS, Shreyas Roy, MD, CM, Anya Golkowski, Undergraduate, Louis Gatto, PhD, Guirong Wang, PhD, William H. Marx*, DO, FACS, Gary F Nieman, BA, SUNY Upstate Medical University

Objectives: Burn wound infection continues to drive up the 18 billion dollar a year cost of taking care of burn patients in the United States. Our group has developed a novel method of tissue disinfection using non-thermal plasma induced free radicals delivered in an air stream. Our objectives were threefold: (1) to create a porcine model of deep dermal burn wound infection, (2) to determine an optimal treatment time for disinfecting burn wounds with our device, and (3) to compare disinfection of burn wounds between our device and a standard-of-care treatment regimen with Silvadene.

Methods: For all 3 objectives, female Yorkshire pigs (42.8-46 kg, 2 pigs/objective) were sedated and deep dermal partial thickness burn injuries were created using water at 95 °C in a bottle with the bottom replaced with plastic wrap placed in contact with the skin for 20 seconds. Burn wounds were then inoculated with *Staphylococcus aureus* and *Pseudomonas aeruginosa* (5.00E+09 CFU/burn). Histological preparations and quantitative cultures of burn wound biopsies were analyzed for bacterial load and depth of skin invasion.

Results: Objective 1: Tissue analysis on post-burn day 7 demonstrated consistent creation of deep dermal burn wounds heavily colonized with bacteria to the level of the reticular dermis. Objective 2: Tissue analysis on post-burn day 7 showed that daily 10 min treatments with our device displayed a 10-100 fold reduction in bacterial load compared to daily 2 and 5 min treatments (Fig 1). Objective 3: Infected burn wounds were treated daily with either Silvadene or our device for 6 days. Tissue analysis on post-burn day 6 demonstrated between a 10- to 100-fold reduction in bacterial load in those wounds treated with our device compared to Silvadene (Fig 2)

Conclusion: Our novel free radical sterilization system demonstrated a 10-100 fold reduction of bacterial load in infected burn wounds compared to Silvadene. This system has the potential to become a useful adjunct for burn wound treatment in the future.



Notes

**"IT TAKES A VILLAGE" TO RAISE RESEARCH PRODUCTIVITY:
IMPACT OF A NURSE-LEAD TRAUMA INTERDISCIPLINARY
GROUP FOR RESEARCH (TIGR) AT AN URBAN, LEVEL 1
TRAUMA CENTER**

Elizabeth NeSmith*, PhD, MSN, APRN-BC, Regina Simione Medeiros*, DNP,
MHSA, RN, Colville Harvey Ferdinand*, MD, Michael L. Hawkins*, MD,
Steve Holsten*, MD, Keith O'Malley*, MD,
Yanbin Dong, MD/PhD, Haidong Zhu, MD, John Catravas, PhD,
Georgia Health Sciences University

Objectives: Few interdisciplinary research groups include basic scientists, pharmacists, therapists, nutritionists, & lab technicians in addition to RNs and MDs. Increasing interprofessional diversity within scientific teams working to improve trauma care is a goal of national organizations (including EAST and STN) that fund trauma research. Thus, doctorally-prepared nurses founded the Trauma Interdisciplinary Group for Research (TIGR) with a goal to improve research productivity in a Level 1 trauma center in the southeast, and measured the outcomes to quantify TIGR's effectiveness in achieving this goal.

Methods: TIGR was initiated in Fall 2009 and regular meetings were held to discuss projects. Multidisciplinary members were immediately engaged and added to an existing NIH-funded, nurse-led project which aimed to test the hypothesis that accelerated biologic aging from chronic stress increases baseline inflammation and reduces inflammatory response to trauma (projected N=150). Pre- and post- data related to participant screening, recruitment, consent, and data collection were compared.

Results: Screenings for the NIH-funded study increased from N=40 to N=313 in less than 1 year (8-fold increase). Consents increased from N=14 to N=70 (5-fold increase). Lab service fees were reduced from \$300 to \$5/participant (98% cost reduction). Research project submissions increased from N = 0 to N = 6 (600%), including 3 nurse-lead interdisciplinary submissions for federal funding. Dissemination products increased from N = 0 to N = 6 (600%).

Conclusion: Adding professional diversity to our scientific team via TIGR was exponentially successful in improving research productivity and significantly reducing research costs. This success has resulted in many new research products and mentoring activities that the team prior to TIGR had not entertained. The team is now well-positioned to apply for more federally funded projects and more trauma clinicians are considering research careers than before.

Notes

**PROSPECTIVE DETERMINATION OF OPTIMAL ANGIOGRAPHIC
PROTOCOL IN NON OPERATIVE MANAGEMENT OF HIGHER
GRADE BLUNT SPLENIC INJURY**

Jay A. Requarth, MD, Jason Farrah, MD, Cynthia Weber Lauer*, MD,
Wake Forest University School of Medicine

Objectives: Optimal non-operative management (NOM) of blunt splenic injury (BSI) is debated, and the role of splenic artery embolotherapy (SAE) remains unclear. A recent meta-analysis suggested those with grades III-V injuries experienced lower NOM failure rates if SAE was performed. Based on these concepts, we developed a comprehensive protocol of SAE referral in all hemodynamically stable patients with grade III-V BSI, and hypothesized that adherence to this algorithm would lead to lower failure rates of NOM.

Methods: This was a prospective study of all patients admitted to our level I trauma center with BSI over a 5 year period. The treatment protocol included referral of all hemodynamically stable patients with grade III-V injury (and those with parenchymal blush) for SAE, distal embolization in patients with parenchymal vascular injury, measurement of splenic artery stump-aortic pressure gradient and proximal embolization in patients with ≥ 40 mmHg drop in pressure. Success of NOM with this protocol was compared to NOM outcome for standard angiography including: no SAE, distal SAE or proximal and distal SAE based on the discretion of the angiographer.

Results: 89 patients with grades III – V BSI were referred for angiography from 1/1/2007 to 6/22/2012. Patients undergoing NOM per protocol (n=46) had an overall failure rate of 2.2%. Those undergoing angiography but no SAE had a failure rate of 50% (n=10; p=0.00041). Those receiving only distal SAE failed at a rate of 28.6% (n=14;p=0.009) and those undergoing proximal and distal SAE had a failure rate of 4.6% (n=65: p=0.6)

Conclusion: Adherence to an algorithm including proximal and distal SAE in all hemodynamically stable grade III-V injuries significantly decreases NOM failure rates. Addition of measurement of splenic artery stump pressures may further improve failure rates but the role of this specific modality requires further investigation.

Notes

RELIABILITY ADJUSTMENT: A NECESSITY FOR TRAUMA CENTER RANKING AND BENCHMARKING

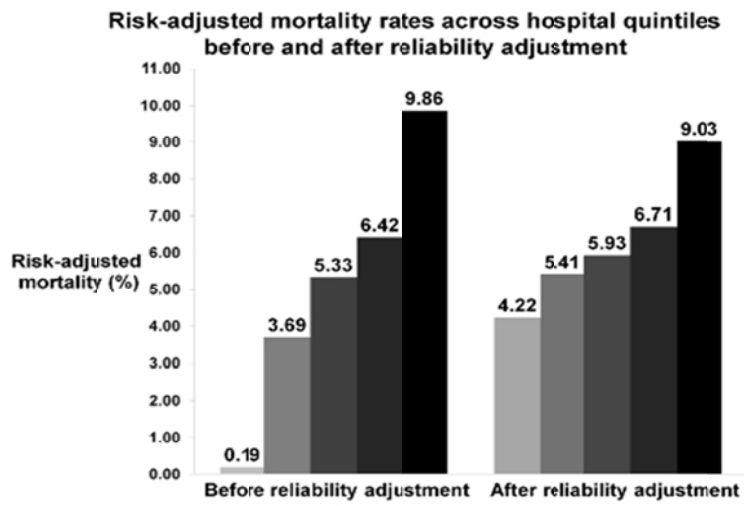
Zain Ghani Hashmi, MBBS, Justin Dimick, M.D., MPH, David T. Efron*, MD, FACS, Elliott R. Haut*, MD, FACS, Eric Schneider, PhD, Nabeel Zafar, MBBS, MPH, Edward E Cornwell*, M.D., FACS, FCCM, Adil H Haider*, MD, MPH, Department of Surgery, Johns Hopkins School of Medicine

Objectives: Currently trauma center quality benchmarking is based on risk adjusted observed:expected (O:E) mortality ratios. However, failure to account for number of patients has been recently shown to produce unreliable mortality estimates, especially for low volume centers. This study explores the effect of reliability adjustment (RA), a statistical technique developed to eliminate bias introduced by low volume, on risk-adjusted trauma center benchmarking.

Methods: Analysis of the NTDB 2010 was performed. Patients ≥ 16 years of age with blunt or penetrating trauma and an Injury Severity Score (ISS) ≥ 9 were included. Using the standard, Trauma Quality Improvement Program (TQIP) methodology, risk-adjusted mortality rates were generated for each center and used to rank them accordingly. Hierarchical logistic regression modeling was then performed to adjust these rates for reliability employing an empiric Bayes approach. The impact of RA was examined by 1) Recalculating inter facility variations in adjusted mortality rates and 2) comparing adjusted hospital mortality quintile rankings before and after RA.

Results: 652 facilities (with 265,278 patients) included. RA significantly reduced the variation in risk-adjusted mortality rates between centers from 52 fold (0.19%-9.86%) to only 2 fold (4.22%-9.03%) after RA. This reduction in variation was most profound for smaller centers. A total of 100 "best" hospitals and 24 "worst" hospitals based on current risk adjustment methods were reclassified after performing RA.

Conclusion: "Reliability adjustment" dramatically reduces variations in risk adjusted mortality arising from statistical noise, especially for lower volume centers. Moreover, the absence of RA had a profound impact on hospital performance assessment, suggesting that nearly one of every five hospitals in NTDB would have been inappropriately placed amongst the very best or very worst quintile of rankings. RA should be considered while benchmarking trauma centers based on mortality.



Change in hospital classification status across quintiles of risk adjusted hospital mortality rankings after reliability adjustment

Quintiles of Risk Adjusted Mortality Rankings	Number of hospitals	Hospital classification after Reliability Adjustment	
		Hospitals correctly classified*	Hospitals potentially misclassified
1 "Best hospitals"	131	31(24%)	100(76%)
2	130	38(29%)	92(71%)
3	131	55(42%)	76(58%)
4	130	100(77%)	30(23%)
5 "Worst hospitals"	130	106(82%)	24(18%)

*Hospitals correctly classified defined as hospitals undergoing no change in their quintile of risk-adjusted mortality ranking before and after reliability adjustment.

Notes

**USING THE CHARLSON COMORBIDITY INDEX TO PREDICT
OUTCOMES IN EMERGENCY GENERAL SURGERY**

Etienne St. Louis, DEC, Monisha Sudarshan, MD, Tarek Razek*, MD, FACS,
Liane Feldman, MD, FRCSC, Kosar A. Khwaja*, MD, MBA, MSc, FACS,
McGill University

Objectives: We evaluated the role of the Charlson Comorbidity Index (CCI), a weighted comorbidity index that reflects cumulative increased likelihood of one-year mortality, in predicting peri-operative outcomes in an emergency general surgery population at a large Canadian teaching hospital.

Methods: A retrospective chart review of emergency general surgery admissions in 2010 was conducted. Patients who had surgery were identified. Mode of surgery and CCI were recorded, as well as measures of outcome, including 30-day mortality, ICU admission, in-hospital complications, length of stay (LOS) and disposition at discharge. Data were analyzed using linear regression and univariate analysis, and considered statistically significant if $p < 0.05$.

Results: Of the 527 admissions to general surgery from the emergency room, 257 patients underwent a surgical intervention. The CCI scores ranged from 0 to 16. We observed a total of 14 deaths (5.4%), 30 ICU Admissions (11.7%) and 45 Non-Home Dispositions (NHD=17.5%). The average LOS was 9.37 days (range: 1-141, median=5), and the average number of complications was 0.44 (range: 0-7, median=0). Odds ratio (OR) of death was highest in the CCI 11-16 group with OR=9.96 [1.86-59.87] ($p < 0.05$). For ICU admissions and NHD, the highest OR was found in the CCI 5-10 group, with OR=5.44 [2.46-12.08] ($p < 0.05$) and OR=3.34 [1.69-6.58] ($p < 0.05$), respectively. The results of univariate analysis are given in detail in the attached table. Using linear regression we determined that every additional point on the CCI score adds 1.43 days to LOS ($p < 0.05$) and 0.12 complications ($p < 0.05$) per admission.

Conclusion: We have shown that the CCI is a valid tool for post-operative outcome prediction in the context of emergency general surgery.

Odds Ratios of Death, ICU Admission and NHD by CCI Category

	<i>CCI</i>	<i>OR</i>	<i>95% CI</i>	<i>p</i>
Death	0-4	0.12	0.04-0.41	0.0006
	5-10	4.78	1.59-14.38	0.0054
	11-16	9.96	1.66-59.87	0.0120
ICU Admission	0-4	0.16	0.07-0.34	0.0001
	5-10	5.44	2.46-12.08	0.0001
	11-16	3.98	0.69-22.74	0.1201
Non-Home Disposition	0-4	0.28	0.14-0.55	0.0002
	5-10	3.34	1.69-6.58	0.0005
	11-16	2.42	0.43-13.63	0.3167

cf. Results

Notes

ACUTE CARE SURGICAL SERVICE: SURGEON AGREEMENT AT THE TIME OF HANDOVER

Richard Hilsden, Brad Moffat, MD,
University of Western Ontario

Objectives: Acute care surgical teams are dedicated teams responsible for emergent surgical patients, which require regular handover between different surgeons. Minimal research has been conducted to determine the rate of clinical agreement during patient handover.

Methods: This prospective cohort study was carried out with our acute care surgical service at a tertiary care teaching hospital. Participating surgeons were given a copy of the handover patient list each morning where, in a concealed manner, they indicated whether they agreed or disagreed with the patient management plan. Aspects of care over which they disagreed were also described. Disagreements were classified as major if they involved a change in diagnosis, time to OR, operative procedure or patient disposition. All others were classified as minor. Rate of disagreement was then calculated.

Results: 6 staff surgeons agreed to participate. The study was conducted from January 2012 to March 2012. A total of 417 unique patients were handed over giving an average of 7.4 patients handed over daily. For the primary outcome, a total of 41 disagreements were recorded for a disagreement rate of 9.8%. 15 of the 41 disagreements were classified as major; for a major disagreement rate of 3.4%. Among the major disagreements 3 involved a delay to the OR, 4 represented a disagreement in diagnosis, 3 represent disagreements over operative decision-making, and 5 represented a disagreement over disposition decisions. Consultant to consultant disagreements were classified as major disagreements 62.5% of the time and consultant to resident disagreements were major 21% of the time (P=0.112). Patients among whom there was clinical disagreement were on average older; 63 YOA vs 57 YOA (P<0.05).

Conclusion: Despite frequent handovers little research has been completed to determine the rate of disagreement over patient management among surgeons. This study demonstrated that the rate of clinical disagreement is low among surgeons participating in acute care surgery.

Notes

ARE WE DELIVERING TWO STANDARDS OF CARE FOR PELVIC TRAUMA? INCREASED TIME TO ANGIOEMBOLIZATION AFTER-HOURS AND ON WEEKENDS IS ASSOCIATED WITH INCREASED MORTALITY

Diane Schwartz*, MD, Michael Medina, MD, Bryan A. Cotton*, MD, Elaheh Rahbar, PhD, Charles Wade, M.D., John B. Holcomb*, MD
University of Texas Health Sciences Center

Objectives: We hypothesized that patients with pelvic fractures and hemorrhage admitted during daytime hours were undergoing angioembolization earlier than those admitted at night and on weekends, thereby establishing two standards of time to hemorrhage control.

Methods: The trauma registry was queried for patients admitted 01/2008-12/2011 with pelvic fractures (AIS \geq 3), hemorrhagic shock, and transfusion of at least one unit of blood. Patients dying <30 minutes were excluded. The control group (DAY) was admitted 0730-1730 Monday-Friday, the study group (after hours, AHR) was admitted 1730-0730 or on weekends. Primary outcome: time from admission to angiography (IR). Secondary outcome: in-hospital mortality.

Results: 191 patients met criteria, 45 DAY and 146 AHR. 103 died <24 hours and without undergoing IR (62% AHR vs. 29% DAY, $p<0.001$). 16 patients (all AHR) died while awaiting IR ($p=0.032$). 88 patients (32 DAY, 56 AHR) formed primary group of interest, those surviving to receive IR. While younger (median 30 years vs. 54, $p=0.007$), AHR patients were more tachycardic (median pulse 119 vs. 90, $p=0.001$) and had more profound shock (median base -10 vs. -6, $p=0.006$) on arrival. Time from CT scan to IR was longer in AHR group (176 min vs. 87, $p=0.011$). While not significant, AHR received more blood products in the first six hours (median 11 units vs. 5, $p=0.203$). Controlling for age, arrival physiology (ED vitals), anatomic severity (ISS) and degree of shock (base deficit), the AHR group had a 94% increased risk of mortality.

Conclusion: AHR patients have a significant increase in time to angiography compared to DAY patients. Moreover AHR patients have an almost 100% increase in mortality. These results are even more dramatic considering the survival bias inherent in the AHR group (almost 10% died awaiting IR). While this is a single center study and retrospective in nature, it suggests that we are currently delivering two standards of care in trauma, depending on day and time of admission.

Notes