VARIATION IN SPLENIC ARTERY EMBOLIZATION AND SPLEEN SALVAGE: A MULTICENTER ANALYSIS

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Presenter: Aman Banerjee, MD

Discussant: Ben L. Zarzaur, MD, MPH University of Tennessee HSC

Objectives: To evaluate if variation in management of blunt splenic injury (BSI) among level 1 trauma centers is associated with different outcomes related to the use of splenic artery embolization (SAE).

Methods: All adult patients admitted for BSI from 2008 to 2010 at 4 level 1 trauma centers were reviewed. Use of SAE was determined and outcomes of spleen salvage and non-operative management (NOM) failure were evaluated. A priori, a 10% SAE rate was used to group centers into high or low use groups.

Results: There were 1275 BSI patients. There were inter-center differences in age, injury severity, and grade of spleen injury (SIS). Mortality was similar by center; however BSI treatment varied significantly by center. Initial SAE was highest at Center A compared to center B, C, and D (14% vs 7%, 1% and 4%,$p<0.01$). Overall SAE use was highest at center A compared to B, C, and D (19%, 11%, 1% and 4%,$p<0.01$). There were significant differences in initial splenectomy rates by center, ranging from 10% to 22% ($p<0.01$), with Center A having the lowest initial splenectomy rate and highest spleen salvage rate (range 73% - 86%,$p<0.05$). Outcomes (Table 1) were evaluated by high vs low SAE use. High SAE use centers had significantly higher spleen salvage rates and fewer NOM failures. Differences in use of SAE and salvage rate were dramatic between high and low use SAE centers for grade 3 and 4 injured spleens. In patients who received initial NOM, multivariate logistic regression analysis showed SAE was an independent predictor of spleen salvage (OR = 5; 95% CI = 1.8 – 13.5,$p<0.01$) as were lower age, lower SIS, and ISS. Patients treated at high SAE use centers were more likely to leave the hospital with their spleen in situ (OR = 3; 95% CI = 1.7 – 6.3,$p<0.01$).

Conclusion: Significant practice variation exists in the use of SAE in treating BSI at level 1 trauma centers. Centers with higher rates of SAE use have higher spleen salvage and less NOM failure. SAE was shown to be an independent predictor of spleen salvage.

Table 1:	High Use Centers (A and B)	Low Use Centers (C and D)
All patients		
N	**612**	**663**
Age (mean)	43	38 **
ISS (mean)	22	30 **
SIS (mean)	2.2	2.3
Admission Splenectomy	15 %	16 %
SAE	14 %	2 % **
Spleen Salvage	82 %	77 % *
Non-Operative Failure	4 %	8 % **
Grade 3 & 4 Spleen Injury		
N	**202**	**216**
Admission Splenectomy	28 %	31 %
SAE	36 %	2 % **
Spleen Salvage Rate	67 %	56 % **
Non-Operative Failure	8 %	20 % **
Non-Operative Patients		
N	**517**	**556**
SAE	17 %	2 % **
Spleen Salvage Rate	97 %	91 % **
Non-Operative Failure	4 %	8 % **

** $p < 0.01$

* $p < 0.05$

Notes

SHOCK INDEX AS A PREDICTOR OF MORTALITY AND RESOURCE UTILIZATION IN PEDIATRIC TRAUMA

Meade Barlow, MD, Lisa Rosen, Sc.M., Steven Stylianos*, MD
Cohen Children's Medical Center

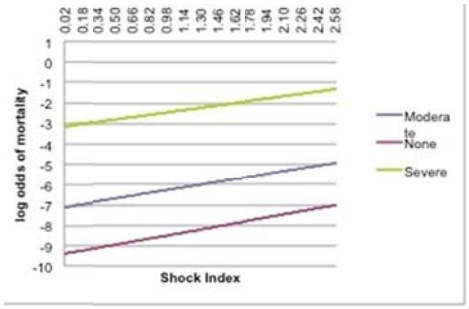
Presenter: Meade Barlow, MD
Discussant: David Gourlay, MD, Children's Hospital of Wisconsin

Objectives: Shock index (SI), calculated by dividing heart rate by systolic blood pressure, has been studied extensively in the setting of adult trauma and has been shown to be predictive of morbidity and mortality. However SI has not been investigated in pediatric trauma. This study examines the association between SI and mortality, the need for transfusion, operative intervention and use of angiography.

Methods: Utilizing the 2009 National Trauma Data Base (NTDB), we reviewed 94,182 cases of pediatric trauma. Survival and rates of transfusion, operative intervention and use of angiography were determined. The two-sample t-test was used to compare the mean SI between groups. Logistic regression was used to model mortality as a function of SI, age, and Glasgow Coma Scale (GCS) on training data. The area under the (AUC) receiver operating characteristic (ROC) curve was used to assess the model's discrimination. A test set was used to validate these models.

Results: SI was significantly higher in patients who died (1.09±0.56 vs. 0.86±0.30, $p<0.001$), required transfusion (1.02±0.44 vs. 0.85±0.29, $p<0.001$) and operative intervention (0.94±0.38 vs. 0.85±0.29, $p<0.001$), but not associated with angiography ($p<0.176$). The model, which included age, SI, GCS, and all two and three-way interactions, was predictive of mortality (AUC: 0.97). This indicates that the effect of SI on mortality risk depends on age and GCS. The misclassification rate was 6.81% in the test set.

Conclusion: Using the NTDB, we demonstrated that an elevated SI is associated with an increased risk of mortality as well as the need for transfusion and operative intervention but not angiography. The SI, in addition to age and GCS, represents a powerful tool allowing physicians to identify patients at risk for severe injury requiring intervention and may allow for early identification of patients requiring a high level of care.



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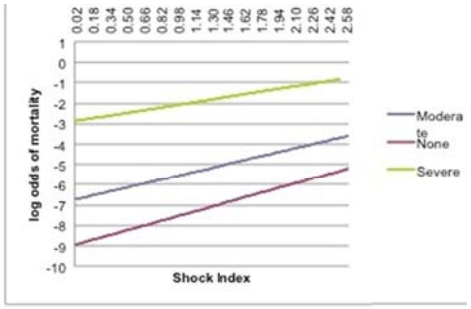

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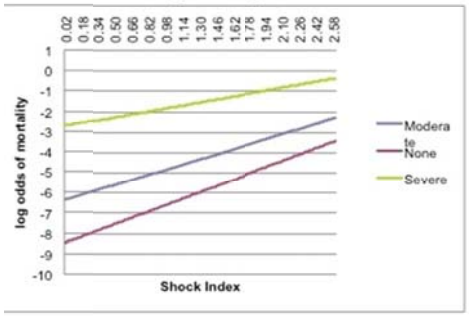

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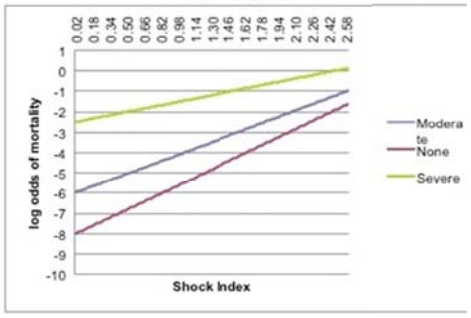
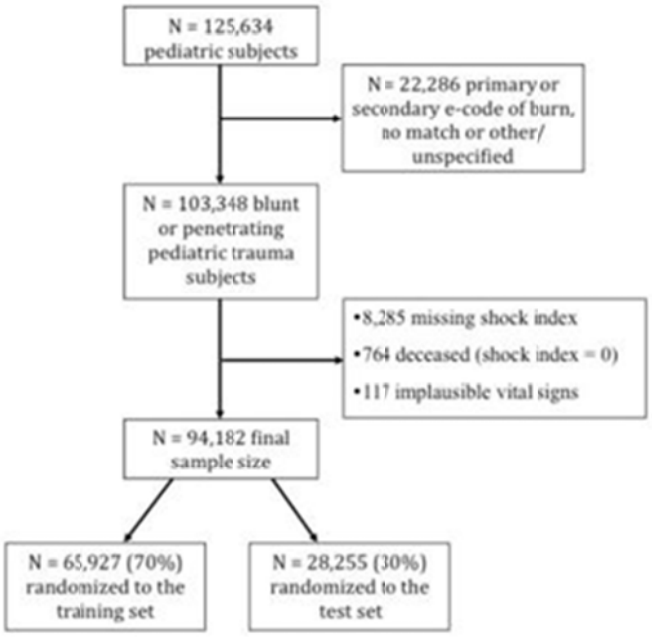


Age 15 years



Notes

AMERICAN COLLEGE OF SURGEONS TRAUMA CENTER VERIFICATION VERSUS STATE DESIGNATION: ARE LEVEL II CENTERS SLIPPING THROUGH THE CRACKS?

Joshua Brown*, MD, Raquel M. Forsythe*, MD, Andrew B. Peitzman*, MD,
Timothy Billiar, MD, Jason L. Sperry*, MD, MPH
University of Pittsburgh Medical Center

Presenter: Joshua Brown, MD
Discussant: Keith Clancy, MD, York Hospital

Objectives: Single center experience has shown that American College of Surgeons (ACS) trauma verification can improve outcomes. The current objective was to compare mortality between ACS verified and State designated centers in a national sample.

Methods: Subjects ≥16yr from ACS verified or State designated level I and II centers were identified in the NTDB 2007-08. A predictive mortality model was constructed using TQIP methodology. Imputation was used for missing data. Probability of mortality in the model determined expected deaths. Observed to expected (O/E) mortality ratios with 90%CI and outliers (90%CI above or below 1.0) were compared across ACS and State level I and II centers. The mortality model was repeated with ACS vs. State included.

Results: There were 900,274 subjects. The model had an AUC of 0.92 to predict death. Level I ACS centers had a lower median O/E ratio than State (0.95 [IQR 0.82-1.05] vs 1.02 [0.87-1.15], $p<0.01$), with no difference in level II centers. Level II State centers had more high O/E outliers (Table). ACS verification was an independent predictor of survival in level II centers (OR 1.26; 95%CI 1.20-1.32, $p<0.01$), but not in level I centers ($p=0.84$).

Conclusion: Level II centers have a disproportionate number of high mortality outliers and ACS verification is a predictor of survival. Level I ACS centers have lower O/E ratios overall but no difference in outliers. ACS verification appears beneficial. This data suggests that level II centers benefit most, and promoting level II ACS verification may be an opportunity for improved outcomes.

	ACS	*State*	*OR (95%CI)*	*p*
Level I	N=122	N=67		
High O/E outlier	15%	24%	-	0.16
Low O/E outlier	28%	16%	-	0.10
Level II	N=124	N=61		
High O/E outlier	4%	13%	0.27 (0.09-0.89)	0.03
Low O/E outlier	23%	21%	-	0.57

Notes

DO ALL BETA BLOCKERS ATTENUATE THE EXCESS HEMATOPOIETIC PROGENITOR CELL MOBILIZATION FROM BONE MARROW FOLLOWING TRAUMA/HEMORRHAGIC SHOCK?

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Presenter: Latha V Pasupuleti, MD

Discussant: Louis Magnotti, MD Univeristy of Tennessee HSC

Objectives: Severe injury results in increased mobilization of hematopoietic progenitor cells (HPC) from the bone marrow (BM) to sites of injury. Norepinephrine induces HPC mobilization and non-selective beta blockade with propranolol has been shown to decrease mobilization. This study investigated selective beta adrenergic receptor blockers (B1B, B2B, B3B) in HPC mobilization following lung contusion (LC) and hemorrhagic shock (HS).

Methods: Male Sprague-Dawley rats were subjected to LC followed by 45 minute of HS. Animals (n=6/group) were then randomized to either receive atenolol (LCHS+B1B), butoxamine (LCHS+B2B), or SR59230A (LCHS+B3B) immediately after resuscitation. BM cellularity, % HPCs in peripheral blood, and plasma G-CSF levels were assessed at 3 hours post LCHS. Plasma from all groups was plated with normal BM to assess its systemic effect on HPC growth. Injured lung tissue was evaluated histologically and a lung injury score calculated. All groups were compared to control animals. *$p < 0.05$ vs. LCHS with ANOVA and Tukey-Kramer.

Results: B2B or B3B following LCHS restored BM cellularity and significantly decreased HPC mobilization (Table). In contrast, B1B had no effect on any parameter examined. Only B3B reduced plasma G-CSF. When evaluating the plasma systemic effects, both B2B and B3B significantly improved BM HPC growth as compared to LCHS alone. The use of B2 and B3 blockade improved lung injury scores 3 hours after LCHS.

Conclusion: B2 and B3, but not B1 adrenergic receptors, are involved in excess HPC mobilization following trauma and HS. Treatment with B3 blockade reduced plasma G-CSF levels compared to B2, suggesting different mechanisms for adrenergic induced G-CSF release. Use of B2 and/or B3, but not B1 blockade, is a potential strategy to reduce BM dysfunction and reduce lung injury following trauma and HS.

Group (n=6/group)	Cellularity ($x10^6$ ml/femur)	HPCs in PB (%)	Plasma G-CSF (pg/ml)	BM HPC Growth (colonies/plate)	Lung Injury Score
Control	221±7	0.4±0.2	5.7±1.5	72.7±1.0	4.3±1.2
LCHS	122±6	7.4±2	311±234	43.8±0.8	7.5±1.3
LCHS + B1B	118±5	12±0.7	250±296	43.4±1.3	7.2±1.6
LCHS + B2B	195±5*	0.6±0.3*	280±242	65.9±2.0*	3.4±1.7*
LCHS + B3B	202±7*	0.2±0.3*	59±4*	66.1±0.7*	5.8±2.3

Notes

IMPROVING OVERTRIAGE OF AEROMEDICAL TRANSPORT: A REGIONAL PROCESS IMPROVEMENT INITIATIVE

Blair A Wormer, MD, Greg Flemming, RRT, A. Britton Christmas*, MD, FACS, Ronald F. Sing*, DO, Michael H. Thomason*, MD, Toan T. Huynh*, MD,
Carolinas Medical Center

Presenter: Blair A Wormer, MD
Discussant: Mark Gestring, MD, University of Rochester

Objectives: Objectives: Aeromedical transport (AMT) is an effective, but costly means of rescuing critically injured patients. Recent studies have shown it improves survival to hospital discharge compared to ground transportation in Level I and II trauma admissions. However, an efficient threshold for this mode of transport remains to be established as universal criteria for AMT triage remains to be determined. Herein, we examined the effect of implementing a Trauma Advisory Committee (TAC) initiative focused on reducing AMT overtriage rates.
Methods: Methods: TAC outreach coordinators (OC) implemented a process improvement (PI) initiative and collected data prospectively from January 2007 to March 2012. Over triage was defined as patients who were airlifted and later discharged from the emergency department. Serving as liaisons to surrounding counties, TAC OC conducted quarterly PI meetings with local EMS agencies. Patients were grouped into those who were airlifted from TAC counties, versus counties outside TAC's jurisdiction (NON). Differences between groups were compared by Mann-Whitney Rank Sum test.
Results: Results: Overall, 3454 patients were airlifted from 19 counties. After implementation, the total AMT and overtriage rates from TAC counties declined compared to NON counties. The reduction in overtriage continued over the study duration.
Conclusion: Conclusions: Implementation of a regional TAC PI initiative focused on overtriage issues led to a more efficient use of aeromedical transport.

	2007		2008		2009		2010		2011		2012 **	
	TAC	NON	TAC	NON	TAC	NON	TAC	NON	TAC	NON	TAC	NON
n	367	385	325	385	301	376	274	389	160	387	31	74
Over triage %	53 14%	62 16%	55 17%	90 23%	33 11% *§	65 17%	49 18%	72 19%	9 6%* §	45 12%	2 6%	7 9%

* $p < 0.05$ vs. NON same year, § $p < 0.01$ vs. previous years. ** 2012 1st Quarter results

Notes

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HYPERCOAGULABILITY AFTER THERMAL INJURY

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University of Miami Miller School of Medicine

Presenter: Robert M. Van Haren, M.D.
Discussant: Sherry Sixta, MD, Cooper University Hospital

Objectives: Virchow's triad describes three factors that contribute to venous thromboembolism (VTE): hypercoagulability, stasis, and endothelial injury. Compared to other surgical patients, burn patients are considered low risk for VTE. We tested the hypothesis that burn patients are not hypercoagulable at admission or during recovery.
Methods: A prospective trial was conducted at an ABA verified Burn Center. Blood was drawn from indwelling catheters upon ICU admission, and weekly for those who remained hospitalized, and analyzed immediately with Thromboelastography (TEG). Routine and special coagulation tests were performed on stored plasma samples. Data are shown as median (IQR).
Results: 19 patients (84% male) were enrolled, age 46 (20) years, TBSA 29 (23)%, 16 suffered thermal burns (4 inhalational injuries) and 3 had electrical burns. 15 patients had repeat samples a week after ICU admission. The repeat TEG was more hypercoaguable: increased angle, maximum amplitude (MA), and clot firmness (G) (all $p<0.05$). D-Dimer, protein C activity (PC ACT), protein S activity (PS ACT), and antithrombin III (AT III) were increased, suggesting a procoagulant state (all $p<0.05$) (Table 1). These changes cannot be attributed to hemoconcentration as fluid balance was more positive and hematocrit was lower on repeat samples (all $p<0.05$). Two patients (11%) developed VTE and their initial clotting time (R), fibrinogen, and partial thromboplastin time (PTT) were decreased (all $p<0.05$) compared to those with no VTE (Table 2). All changes occurred despite pharmacologic thromboprophylaxis.
Conclusion: This is among the first studies to show that burn patients could have a greater susceptibility to VTE than previously recognized. Burn patients are hypercoagulable during recovery based on TEG and laboratory value. Additional monitoring and/or thromboprophylaxis may be indicated.

Table 1. Initial and 1-week repeat samples. ** Denotes p<0.05

	Initial	Repeat 1-Week
TEG Values		
R, min	11.3 (7.1)	8.3 (4.3)
K, min	2.8 (1.5)	2.0 (1.0)
α angle, °	**55.4 (11.3)**	**65.5 (10.3)****
MA, mm	**62.1 (7.0)**	**73.1 (10.0)****
G, d/sc	**8215 (2356)**	**13886 (7232)****
Laboratory Values		
PT	17.9 (2.0)	15.1 (2.5)
INR	1.5 (0.2)	1.2 (0.3)
PTT	35.7 (3.0)	33.3 (8.2)
Fibrinogen	619 (211)	743 (341)
D-Dimer	**3633 (3276)**	**5959 (3700)****
PC ACT	**73 (22)**	**110 (108)****
PS ACT	**69 (13)**	**91 (77)****
AT III	**59 (22)**	**86 (48)****

Table 2. Patients with DVT vs. No DVT. ** Denotes p<0.05

	DVT (n=2)	No DVT (n=17)
Age	47 (11)	46 (19)
TBSA, %	22 (11)	25 (22)
Gender % Male	84%	100%
Thermal burn	100%	82%
Inhalational injury	0%	24%
TEG Values		
R, min	**4.4 (0.2)**	**12.8 (8.0)****
K, min	2.1 (0.7)	2.8 (2.4)
α angle, °	64.1 (7.2)	53.1 (19.2)
MA, mm	57.9 (5.2)	62.1 (6.8)
G, d/sc	8215 (2508)	7055 (1491)
Laboratory Values		
PT	18.9 (3.1)	17.9 (2.3)
INR	1.6 (0.4)	1.5 (0.3)
PTT	**29.2 (0.6)**	**36.8 (8.7)****
Fibrinogen	**198 (83)**	**556 (246)****
D-Dimer	13014 (6986)	5459 (3633)
PC ACT	54 (24)	68 (22)
PS ACT	66 (16)	63 (30)
AT III	51 (16)	52 (37)

Notes

HYPERTONIC RECONSTITUTED LYOPHILIZED PLASMA IS AN EFFECTIVE LOW VOLUME HEMOSTATIC RESUSCITATION FLUID FOR TRAUMA

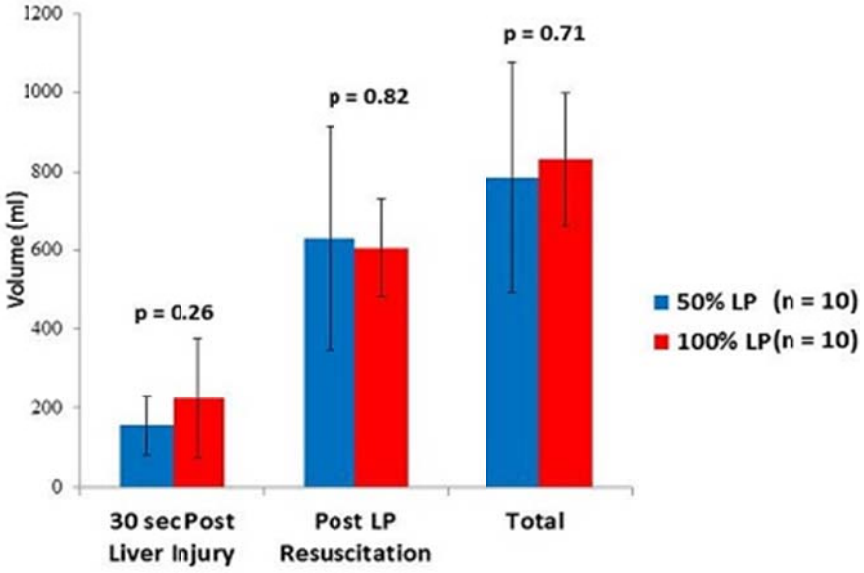
Tim H Lee, MD, Kate Watson, BS, Jerome A Differding, MPH, Loic Fabricant, MD, Jeffrey Barton, MD, Igor Kremenevskiy, MD, PhD, Claire Sands, CVT, Martin A. Schreiber*, MD, FACS, Oregon Health and Science University

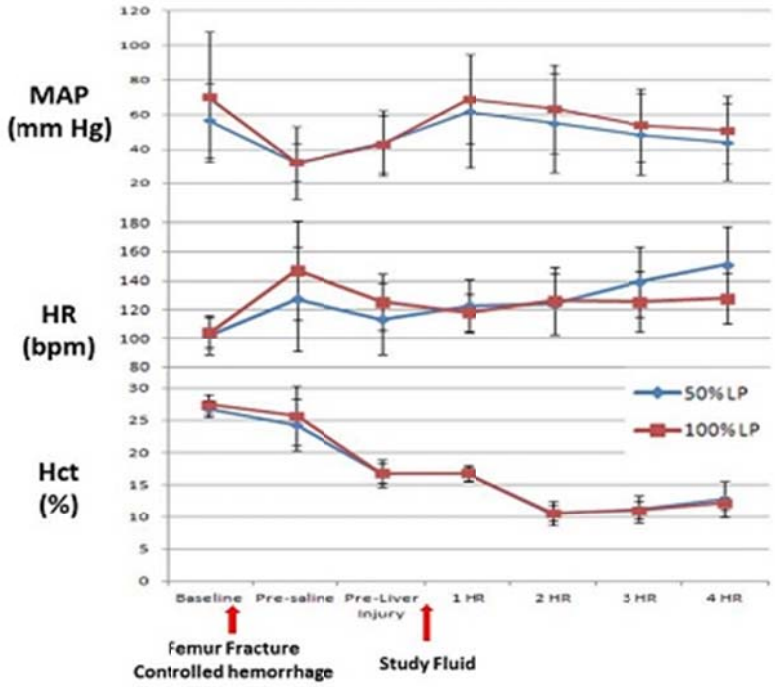
Presenter: Tim H Lee, MD

Discussant: David King, MD, Massachusetts General Hospital

Objectives: We performed this study to optimize reconstituted lyophilized plasma (LP) into a minimal volume fluid that provides effective hemostatic resuscitation for trauma while minimizing logistical limitations.
Methods: We performed a prospective, blinded animal study. Plasma was lyophilized following whole blood collection from anesthetized swine. The minimal volume needed for reconstitution was determined and this solution was evaluated for safe infusion into swine. Reconstituted LP was analyzed for electrolyte content, osmolarity, and coagulation factor activity. Twenty swine were anesthetized and subjected to a validated model of polytrauma and hemorrhagic shock (including a Grade V liver injury), then randomized to resuscitation with LP reconstituted to either 100% of the original plasma volume (100%LP) or the minimal volume LP fluid. Physiologic data were monitored, and blood loss and hematocrit were measured. Coagulation status was evaluated using thrombelastography (TEG).
Results: The minimal volume of reconstituted LP safe for infusion in swine was 50% of the original plasma volume (50%LP). The 50%LP had higher electrolyte concentrations, osmolarity, and increased coagulation factor activity levels by volume compared to 100%LP ($p < 0.05$). Blood loss, hematocrit (Hct), mean arterial pressure (MAP), and heart rate (HR) did not differ between animals receiving 100%LP (n=10) or 50%LP (n=10) at any time point ($p > 0.05$). TEG parameters were not different between groups (R time, K, α – angle, or MA, $p > 0.05$).
Conclusion: Resuscitation with 50%LP fluid was well tolerated and equally effective compared to 100%LP with respect to physiologic and hemostatic properties. The smaller volume of fluid necessary to reconstitute hypertonic LP makes it logistically superior to 100%LP for first responders and may reduce adverse effects of large volume resuscitation.

Blood Loss





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DOES PLASMA TRANSFUSION PORTEND PULMONARY DYSFUNCTION? A TALE OF TWO RATIOS

John P. Sharpe, MD, Jordan A. Weinberg*, MD, Louis J. Magnotti*, MD, Timothy C. Fabian*, MD, Martin A. Croce*, MD, Department of Surgery, University of Tennessee Health Science Center

Presenter: John P. Sharpe, MD

Discussant: Bryce Robinson, MD, University of Cincinnati

Objectives: An unresolved concern regarding resuscitation in the setting of massive hemorrhage is potential lung injury from the transfusion of relatively more plasma-rich components. However, the association between plasma to RBC ratio and subsequent pulmonary dysfunction remains unclear. The purpose of this study was to evaluate the impact of plasma:RBC on P/F ratio in the setting of massive transfusion (MT).

Methods: Over a 5.5 year period, prospective data were collected on trauma patients who underwent MT, defined as ≥10 unit RBC transfusion by completion of hemorrhage control. Deaths within 48h of arrival were excluded. Acute lung injury (ALI) and ARDS were defined as P/F ratio <300 and <200 at 48h respectively. Stepwise multiple regression analysis was performed to determine variables significantly associated with P/F ratio.

Results: 199 patients met inclusion criteria. 159 (80%) developed ALI and 105 (53%) developed ARDS. ALI and ARDS were both associated with subsequent mortality: ARDS (24%) vs. no ARDS (2.5%), $p < 0.05$; ALI (21%) vs. no ALI (2.5%), $p < 0.05$. Paradoxically, patients with P/F ratio ≥300 were found to have received more plasma (5.6 vs. 4.3 units, $p < 0.05$) and higher plasma to RBC ratio (1:2 vs. 1:3, $p < 0.05$) at completion of hemorrhage control. Stepwise multiple regression analysis, however, identified age ($p < 0.001$) and chest AIS ($p = 0.04$), but not plasma:RBC ($p = 0.10$) to be independent determinants of P/F ratio at 48 hours.

Conclusion: In this cohort of MT patients who survived beyond the first 48 hours, pulmonary dysfunction developed in the majority, and was associated with a 10-fold higher risk of subsequent death. However, plasma to RBC ratio achieved during hemorrhage control had neither a positive nor negative impact on subsequent P/F ratio. Liberal transfusion of plasma-rich components in the MT setting may not, in fact, be deleterious to lung function.

Notes

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GUNS AND STATES: PEDIATRIC FIREARM INJURY

Justin Lee, Kevin P Moriarty*, MD, David Tashjian, MD, FACS, FAAP, Lisa A. Patterson*, MD, St. Elizabeth Medical Center, Tufts University School of Medicine

Presenter: Justin Lee

Discussant: John Petty, MD, Wake Forest School of Medicine

Objectives: A recent report indicates that firearm-related injuries are responsible for 30% of pediatric trauma fatality. The literature is however limited in examining pediatric firearm injuries and variations in state gun control laws. Therefore, we sought to examine the association between pediatric firearm injuries and the Stand-Your-Ground (SYG) and Child-Access Protection (CAP) laws.

Methods: All pediatric (age 0-20 years) hospitalizations with firearm injuries were identified from the Kids' Inpatient Database from 2006 and 2009. States were compared for SYG and CAP laws.

Results: A total of 19,233 firearm injury hospitalizations were identified with 64.7% assault, 27.2% accidental, and 3.1% suicide injury. Demographics for assault injury were: mean age of 17.57 years, 88.4% male, 44.4% black, 18.2% Hispanic, 70.5% from metropolitan areas, and 50.1% from the poorest median income neighborhoods. Suicide injury cases were more likely to be white (57.8% vs 16.6%, $P<0.001$) and female (15.1% vs 9.8%, $P<0.001$). States with the SYG law were associated with increased assault injury (OR 1.274, $P<0.001$). There was no statistical association between CAP law and the incidence of accidental injury or suicide. Multivariate logistic regression analysis found other predictive demographic factors for assault firearm injury: black (OR 4.322, $P<0.001$), Hispanic (OR 1.839, $P<0.001$), metropolitan areas (OR 2.038, $P<0.001$), poorest median income neighborhoods (OR 1.598, $P<0.001$), male (OR 36.870, $P<.001$), and age > 16 years (OR 70.273, $P<.001$). Total economic burden was estimated at more than $1 billion dollars with a median length of stay of 3 days, 8.4% discharge to rehab, and 6.2% in-hospital mortality.

Conclusion: A significant increase in assault injuries in states with the SYG law may highlight inadvertent effects of the law. Race, gender, and median income are additional significant factors. Advocacy and focused educational efforts for specific socioeconomic and racial groups can potentially reduce firearm injuries.

Notes

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Paper 10 12:10 PM

THE ACUTE CARE SURGERY MODEL: MANAGING TRAUMATIC BRAIN INJURY WITHOUT AN INPATIENT NEUROSURGICAL CONSULTATION

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Presenter: Hassan Aziz, MD

Discussant: Daniel Yeh, MD, Massachusetts General Hospital

Objectives: Neurosurgical services are a limited resource and effective use of them would improve the health care system. Acute care surgeons (ACS) are accustomed to treating mild traumatic brain injury (TBI) including those with minor radiographic intracranial injuries. We hypothesized that ACS safely manage mild TBI without an inpatient neurosurgical consultation (INC).

Methods: We performed a retrospective analysis of all TBI patients with positive findings on head computed tomography (CT) scan managed without INC over a two year period. Propensity scoring matched INC to No-INC patients on a 1:1 ratio for age, Glasgow Coma Scale (GCS) Score, head Abbreviated Injury Scale (h-AIS) Score, Injury Severity Score (ISS), neurologic exam, skull fracture ,and Intracranial hemorrhage (ICH) was performed.

Results: 180 patients with TBI and positive CT scan findings were included (90: INC and 90: No-INC). 63% were male and mean age was 39±25 years. The median GCS was 15[12-15] and Head AIS 2[1-5]. For both groups, there was no neurosurgical intervention or 30 day re-admission rate. In the No-INC group 8% of the patients had post discharge ED visits compared to 2% of the INC group (p=0.5). All patients with post discharge ED visits in both groups were discharged home from the Emergency Department.

Conclusion: Acute care surgeons can and should manage mild TBI without obtaining an inpatient neurosurgical consultation. Further Guidelines should be established to help identify which patients meet criteria to be safely managed without consultation

Table 1. Findings on Initial Head CT

	No-INC (n= 90)	INC (n= 90)
Skull fracture	36%	40%
ICH	66%	70%
SDH	17%	22%
EDH	0%	2%
SAH	34%	41%
IPH	22%	21%
IVH	3%	1%

CT - Computed Tomography; EDH - Epidural Hematoma;
ICH - Intracranial Hemorrhage; INC - Inpatient Neurosurgical Consultation;
IPH – Intra-parenchymal Hemorrhage; IVH – Intra-ventricular Hemorrhage;
SAH - Subarachnoid Hemorrhage; SDH - Subdural Hematoma

Table 2. Outcomes Comparison

	No-INC (n = 90)	INC (n = 90)	*p*
Hospital admission	87%	90%	0.48
ICU admission	20%	41%	**0.002**
RHCT	20%	72%	**< 0.001**
Post-Discharge head CT	5%	12%	0.18

CT - computed tomography; ICU - intensive care unit;
INC - inpatient neurosurgical consultation; RHCT - repeat head CT
$p = 0.05$ significant

Notes

DILUTING THE BENEFITS OF HEMOSTATIC RESUSCITATION: A MULTI-INSTITUTIONAL ANALYSIS

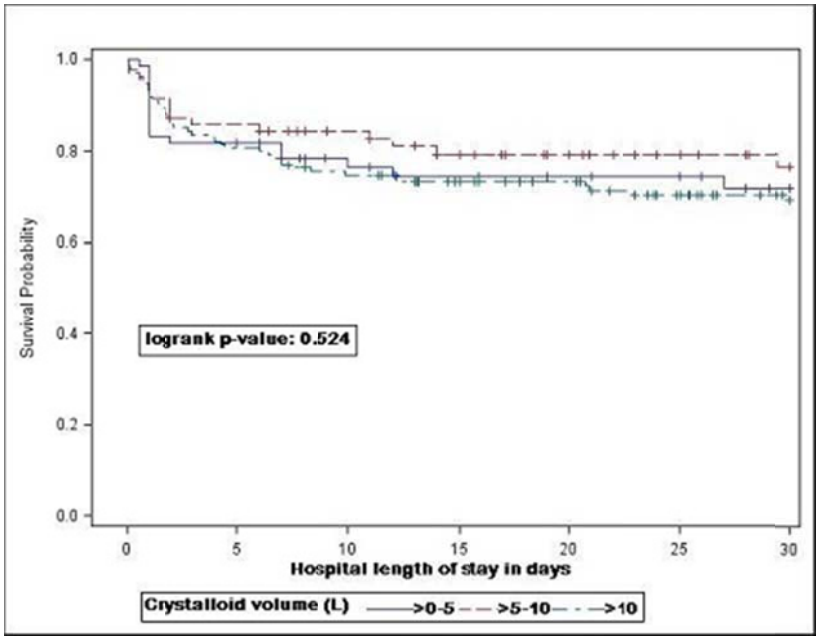
Juan C. Duchesne*, MD, FACS, FCCP, Chrissy Guidry, DO, Jiselle Heaney, M.D., M.P.H., Norman E. McSwain*, MD, FACS, NREMTP, Peter Meade*, MD, MPH, Mitchell Cohen*, M.D., Martin A. Schreiber*, MD, FACS, Kenji Inaba, MD, Dimitra Skiada, M.D., John B. Holcomb*, MD, Charles Wade, M.D., Bryan A. Cotton*, MD, Tulane University School of Medicine

Presenter: Juan C. Duchesne, MD, FACS, FCCP

Discussant: Donald Jenkins, MD, Mayo Clinic

Objectives: Although minimization of crystalloids is widely adopted, its impact on High Ratio Resuscitation (HRR) has not been analyzed. We hypothesize that HRR patients have worse outcomes from crystalloid use.
Methods: 4 year retrospective Multi Institutional Analysis (MIA) of patients with ≥10 units of PRBC/24 hrs. FFP:PRBC groups: High (1-1:2) and Low (<1:2). Crystalloid volume was recorded. Analysis included: KM survival curves and multiple logistic regression for mortality and morbidity prediction.
Results: 5 centers participated with 451 patients. Ratios: High n=365 (80.9%) vs. Low n=86 (19.0%). 24 hour KM survival for the High vs. Low was 85.2% vs. 68.6% (p=0.0004). Volume of crystalloid KM survival curve in High Ratio group was not significant for mortality (FIG.). Morbidity odds ratios (CI 95%) were not significant for High Ratio but were for crystalloids: bacteremia 1.05(1.0-1.1), ARDS 1.13(1.0-1.2), and ARF 1.05(1.0-1.1).

Conclusion: Our results support previous studies with decreased mortality in HRR group. This is the first MIA to demonstrate increased morbidity from crystalloid use in HRR. Within HRR, the ratio was not a predictor of morbidity but crystalloids were. Caution in crystalloid use in HRR is warranted.


1.0
0.8
0.6
0.4
0.2
0.0
Survival Probability
logrank p-value: 0.524
0
5
10
15
20
25
30
Hospital length of stay in days
Crystalloid volume (L) >0-5 >5-10 >10

Notes

Scientific Session III-A – Jan 17, 2013
Paper 12 8:20 AM

A PROSPECTIVE RANDOMIZED STUDY OF 14-FRENCH (14F) PIGTAIL CATHETERS VS. 28F CHEST TUBES IN PATIENTS WITH TRAUMATIC PNEUMOTHORAX: IMPACT ON TUBE-SITE PAIN AND FAILURE RATE

Narong Kulvatunyou*, MD, Lisa Erickson, Randall S. Friese*, MD, Donald Green, Lynn Gries, Bellal Joseph*, MD, Terence S. O'Keeffe*, MB ChB, MSPH, Peter Rhee*, MD, MPH, Andrew L. Tang*, MD, Julie L. Wynne*, MD, MPH,
University of Arizona

Presenter: Narong Kulvatunyou, MD
Discussant: David King, MD, Massachusetts General Hospital

Objectives: Small 14-French (14F) pigtail catheters (PCs) works as well as the traditional large-bore 28-40F chest tubes (CTs), particularly in patients with traumatic pneumothorax (PTX). We hypothesized those PCs, while function equally well, have less tube-site pain than CTs

Methods: We performed a prospective randomized study, comparing 14F PCs and 28F CTs in patients seen at our Level I trauma center with traumatic PTX from July 2010 to February 2012. Excluded were patients who required emergency PC or CT placement; those who refused to consent to participate in the study; and those who were unable to respond to pain assessment. The PCs were placed at bedside by the trauma team using a modified Seldinger technique. The primary outcome measures were tube-site pain, as assessed by a visual analog scale (VAS), and total pain medication use. The secondary outcomes included the failure rate and the insertion-related complications. For our statistical analysis, we used the unpaired Student t-test, the $\chi 2$ (chi-square) test, and the Wilcoxon rank-sum test; we defined significance by a p value < 0.05.

Results: During the study period, 74 patients were eligible to participate; however, after exclusion, 40 patients were enrolled. The baseline characteristics of the PC and CT patients (20 in each group) were similar. Results are summarized in the table.

Conclusion: In patients with traumatic PTX, we found that 14F PCs are safe and functions as well as 28F CTs with significantly less tube-site pain. PCs may have a role for other traumatic indications.

	Pigtail Catheters (n=20)	Chest Tubes (n=20)	*p*
Baseline Chest wall pain, per VAS score			
Day 0, mean ± SD	6.1 ± 2.9	6.0 ± 3.4	0.92
Day 1, mean ± SD	5.4 ± 2.1	5.9 ± 3.3	0.65
Day 2, mean ± SD	4.2 ± 3.2 (n=9)	5.9 ± 3.5 (n=14)	0.27
Tube-site pain, per VAS score			
Day 0, mean ± SD	3.2 ± 2.8	7.7 ± 2.7	**<0.001**
Day 1, mean ± SD	1.9 ± 2.3	6.2 ± 3.3	**<0.001**
Day 2, mean ± SD	2.1 ± 3.2 (n=8)	5.5 ± 3.3 (n=14)	**0.04**
Total pain medication use, (1 urit*), mean ± SD			
Day 1	10.3 ± 11	15.0 ± 15	0.23
Day 2	5.0 ± 10	8.6 ± 9	0.32
Failure rate, %, (n)	5% (1)	10% (2)	0.55
Insertion-related complication rate, %, (n)	10% (2)	10% (2)	1.0
Tube duration in days, median	2 (2, 3)	2 (2, 6)	0.17
Hospital length of stay in days, median	4 (3, 7)	4 (3, 7)	0.86

*1 unit = 1 milligram of morphine or 25 micrograms of fentanyl or 0.1 miligram of Dilaudid per 24 hours
SD = standard deviation; VAS = visual analog scale

Notes

Scientific Session III-A – Jan 17, 2013
Paper 13 8:40 AM

TRANSFUSION OF RED BLOOD CELLS IN PATIENTS WITH A PRE-HOSPITAL GCS ≤ 8 AND NO EVIDENCE OF SHOCK IS ASSOCIATED WITH WORSE OUTCOMES

Joel Elterman*, M.D., Karen Brasel, M.D., Siobhan Brown, PhD, Eileen Bulger*, M.D., Jim Christenson*, M.D., Jeffrey D. Kerby*, MD, PhD, Joseph P. Minei*, MD, FACS, Sandro Rizoli*, MD, PhD, FRCSC, FACS, Martin A. Schreiber*, MD, FACS, Oregon Health & Science University

Presenter: Joel Elterman, MD

Discussant: Mayur Patel, MD, Vanderbilt University Medical Center

Objectives: Red blood cell transfusion practices vary and the optimal hemoglobin for patients with TBI has not been established. We sought to identify the interaction between initial hemoglobin and red cell transfusion on 28-day survival, ARDS free survival, MODs score, and 6-month GOSE in a cohort of patients with a pre-hospital GCS less than or equal to 8 and no evidence of shock.

Methods: A retrospective review of data collected prospectively as part of a randomized, controlled trial involving EMS agencies within the Resuscitation Outcomes Consortium was conducted. In patients with a GCS ≤ 8 without evidence of shock (defined by a SBP <70 or SBP of 70-90 with HR ≥ 108), the association of red cell transfusion with 28-day survival, ARDS free survival, MODs score and 6 month GOSE was modeled using multivariable logistic regression with robust standard errors adjusting for age, sex, ISS, initial GCS, initial SBP, highest field HR, penetrating injury, fluid use, study site and Hgb.

Results: 1158 patients had a mean (m) age of 40, 76% were male and 98% suffered blunt trauma. The initial GCS (m) was 5 and initial SBP (m) was 134. The head AIS (m) was 3.5. Table 1 includes the odds ratio (OR) per unit of blood given in the first 24 hours for 28 day survival, ARDS free survival and 6-month GOSE >4 stratified by initial Hgb level. When the initial Hgb was > 10, each unit of blood transfused increased the MODs score by 0.45 (Co-efficient 95% CI [0.19,0.70] p-value<0.01).

Conclusion: In patients with a suspected TBI and no evidence of shock, transfusion of red blood cells was associated with worse outcomes when the initial hemoglobin was > 10. There was no relationship between blood transfusion and outcomes in the patients with initial hemoglobin ≤ 10.

Initial Hemoglobin g/dL	Range of units transfused	28 Day Survival	ARDS Free Survival	6-month GOSE >4
		OR (95% CI) p-value <0.01	OR (95% CI) p-value <0.01	OR (95% CI) p-value 0.41
<7	0-21	0.95 (0.78, 1.16)	0.98 (0.79, 1.22)	0.88 (0.57, 1.34)
7-10	0-59	0.99 (0.91, 1.09)	1.00 (0.92, 1.09)	0.92 (0.84, 1.02)
>10	0-31	0.83 (0.74, 0.93)	0.82 (0.74, 0.92)	0.82 (0.71,0.94)

Notes

OUTCOMES OF THE MECHANICALLY VENTILATED TRAUMA PATIENT AT THE REGIONAL TRAUMA CENTER

Jerry A Rubano, MD, Jane E. McCormack*, RN, BSN, Michael Paccione*, Marc Shapiro, MD, Stony Brook University Medical Center

Presenter: Jerry A Rubano, MD

Discussant: Nathan Mowery, MD, Wake Forest School of Medicine

Objectives: The correlation between large hospital volumes and improved outcomes in mechanically ventilated patients is well known. This investigation sought to determine the relationship between trauma center volume and outcome after prolonged MV.

Methods: Retrospective analysis of county wide population-based trauma registry. Area reviewed was a suburban county of 1.5 million, served by 11 hospitals (1 Regional Trauma Center [RTC], 4 Area Trauma Centers [ATC] and 6 Non-Trauma Centers [NTC]). Adults (age > 17), with moderate to severe traumatic injury, who were ventilated for > 96 hours were included. The study compared RTC versus the combined group of ATC and NTC. The patient characteristics (age, gender, co-morbidities), injury characteristics (mechanism of injury, GCS, ISS), outcome (mortality, ventilator days, ICU days, hospital days) were compared. Chi-square and Student T-test were performed to predict the outcome between the two groups; a multivariate logistic analysis was performed.

Results: 715 patients met study criteria: 407 at RTC and 308 at other hospitals. RTC patients were younger (48.6 v 54.4., $p < 0.001$) and more severely injured (mean ISS 31.5 v 22.2, $p < 0.001$) than those at other hospitals. There was no significant difference in gender and co-morbidities between the groups. The hospital mortality was significantly lower (17% v 34%) in patients treated in RTC. Shorter hospitals stays and shorter ventilator days were found in RTC group, but no difference in ICU LOS.

Conclusion: Here, the high volume center correlated with the highest level of trauma center designation. Treatment at RTC strongly correlated with improved outcomes in trauma patients requiring prolonged MV. Multivariate logistic analysis demonstrated that treatment at a RTC was associated with improved mortality (OR 0.396, $p<.001$). Pre-existing coagulopathy, increasing age and ISS and decreasing GCS were associated with higher mortality. Transfer of patients requiring prolonged MV to RTC would improve mortality.

Injury Characteristics were as follows:			
	Regional Trauma Center (n=407)	Others (ATC + NTC, n=308)	P-value
Median ED GCS	8.87	9.56	0.041
Median ISS	31.47	22.21	<0.001
Emergent Intubation	285 (70.02%)	210 (71.92%)	0.597
Tracheostomy Required	192 (47.17%)	146 (47.40%)	0.952
Major Operation	185 (45.50%)	135 (43.80%)	0.666
Traumatic Brain Injury	159 (39.07%)	111 (38.01%)	0.408

Outcomes Included the Following			
	Regional Trauma Center (n=407)	Others (ATC + NTC, n=308)	P-value
Mortality (%)	17.00	34.40	<0.001
Mean Ventilator Days	15.14	18.31	0.032
Mean ICU Length of Stay (Days)	22.81	21.10	0.129
Mean Hospital Length of Stay (Days)	38.46	34.58	0.088

Notes

Scientific Session III-A – Jan 17, 2013
Paper 15 9:20 AM

DIRECT PERITONEAL RESUSCITATION MAY ATTENUATE LIVER INJURY AFTER HEMORRHAGIC SHOCK

Jason Smith*, MD, Matthew Benns*, MD, Glen A. Franklin*, MD, Brian G. Harbrecht*, MD, Paul J Matheson, PhD, R Neal Garrison, MD,
University of Louisville

Presenter: Jason Smith, MD

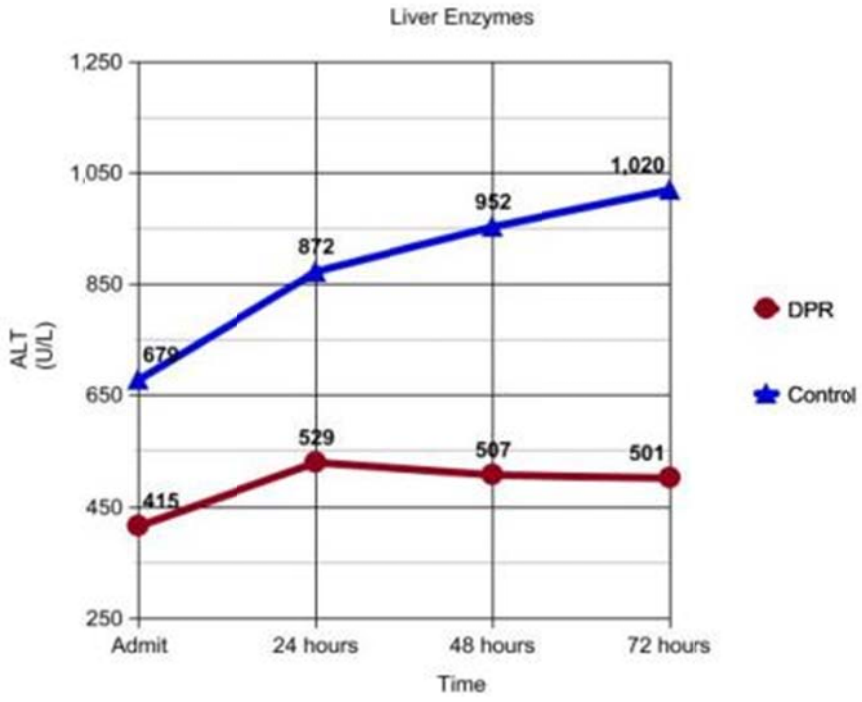
Discussant: Greta Piper, MD, Yale School of Medicine

Objectives: : Hemorrhage due to trauma is a leading cause of death in people under 35 years of age. Despite adequate restoration of central hemodynamics, end organ perfusion often continues to be compromised leading to end organ failure and late death. Direct Peritoneal Resuscitation (DPR) has been shown to improve visceral blood flow. Our objective of this study is to translate these innovative laboratory findings into clinical practice in damage control surgery (DCS) patients.

Methods: Forty-two (42) DCS patients were enrolled over a 4 year (2008-2011) period to undergo DPR in addition to standard resuscitation as part of a prospective case-control study. DPR consisted of peritoneal lavage with 2.5% Deflex solution (a commercially available peritoneal dialysis solution) at a predetermined rate while the abdomen was temporarily closed. Patients were matched against 42 case controls for ISS, type of injury, age, gender and AIS of head and abdominal injury. Univariate and Multivariate analysis was performed.

Results: Patients undergoing DPR had a more rapid normalization of liver enzymes after hemorrhagic shock (Table 1). Also, DPR patients had a lower total transfusion requirement at 48 hours compared to controls. (31 ±14 vs. 39 ±15, p =0.021). Transfusion ratios (RBC:FFP) in the first 24 hours were no different between the two groups (1.76 vs 1.57, p=0.52). DPR patients had a shorter time to abdominal closure (3.6 ±2.1 vs. 5.7 ±3.2, p=0.003) and fewer abdominal complications compared to controls. Mortality between the groups showed a lower overall mortality at 30 days for the DPR group compared to conventional resuscitation (10% vs 14%, p=0.17). Multivariate Analysis showed that DPR was associated with more rapid correction of liver enzymes as well as a more rapid abdominal closure rate.

Conclusion: DPR may attenuate liver injury after hemorrhagic shock. This may lead to less overall transfusion requirements, faster abdominal closure, fewer complications and better outcomes for patients.


Liver Enzymes
1,250
1,050
850
650
450
250
ALT (U/L)
679
872
952
1,020
415
529
507
501
Admit
24 hours
48 hours
72 hours
Time
DPR
Control

Notes

CHOICE OF MOTORCYCLE HELMET MAKES A DIFFERENCE: A PROSPECTIVE OBSERVATIONAL STUDY

Brian L Brewer*, M.D., Alex Diehl, M.D., Laura S Johnson*, MD, Jeffrey P. Salomone*, MD, FACS, NREMT-P, David V. Feliciano*, MD, Kenneth L Wilson, MD, Hany Atallah, M.D., Grace S. Rozycki*, MD, FACS,
Emory University School of Medicine

Presenter: Brian L Brewer, MD

Discussant: Adil Haider, MD, Johns Hopkins University School of Medicine

Objectives: Although many states mandate that motorcyclists wear helmets, the laws do not indicate the type of helmet that should be worn. There are no prospective studies evaluating patterns of injuries as they relate to helmet type. The hypothesis in this study was that full-face helmets reduce injuries associated with motorcycle collisions when compared to other helmet types.
Methods: A prospective observational study was conducted at a Level I Trauma Center to evaluate the efficacy of helmet types relative to craniofacial injuries. Data included patient demographics, full-face helmet type (FFH) versus other helmet (OH) types (half, open face, and modular), injuries, and outcomes. The incidences of facial fractures, skull fractures and traumatic brain injuries (TBI) were compared in victims wearing FFH versus OH during motorcycle crashes.
Results: From 2011-2012, 151 victims of motorcycle crashes (135 males/ 16 female; mean age of 38.4 years, range 19-74) whose helmet types were identified by EMS personnel, emergency medicine physicians, or a trauma team member were entered into the study. The distribution of helmets was 84 FFH and 67 OH (39 half and 28 modular). Facial fractures were present in 7% of the patients wearing FFH (95% CI 0.015, 0.125) versus 27% (95% CI, 0.164, 0.376) of those wearing OH ($p=0.004$). In addition, there were skull fractures in 1% of the patients wearing FFH versus 8% in those wearing OH ($p<0.05$). While there was a trend for victims wearing FFH to have a lower incidence of TBI (13% versus 25% in those wearing OH), this was not statistically significant ($p=0.053$). There were no differences in Injury Severity Score, length of stay, or mortality between the two groups.
Conclusion: Victims of motorcycle crashes who are wearing FFH have a significant reduction in facial and skull fractures when compared to those wearing OH. Further studies will be needed to assess whether FFH will significantly decrease the incidence of TBI.

Notes

FEASIBILITY AND SAFETY OF A NOVEL IN VIVO MODEL TO ASSESS PLAYGROUND FALLS IN CHILDREN

Peter Ehrlich*, MD, MSc, H BSc, Tom Armstrong, PhD, James Ashton-Miller, PhD, Bethany Buschman, Ms, Andrzej Galecki, MD PhD, Sheryl Ulin, PhD, Charles Wolley, MS, Justin Young, PhD, University of Michigan

Presenter: Peter Ehrlich, MD, MSc, H BSc

Discussant: Jason Smith, MD, University of Louisville

Objectives: Falls are the leading cause of nonfatal unintentional injuries among hospitalized children with playground equipment accounting for over 50%. National standards for playground rung and rail design exist but there a lack of in vivo models available to test these standards. We developed a novel in vivo model to test rung and rail design. We report the feasibility and safety of the model.

Methods: A device was built to simulate children hanging onto a playground bar until their hand slips off. This was defined as breakaway strength. The handle unit was mounted on a vertical cable that was mechanically raised and lowered using a linear actuator controlled by the experimenter. The unit was padded The handle unit contained a video camera that recorded the posture of the hand during each trial. Breakaway force and torque were recorded as they held onto the handle by LabView software. In addition standard anthropometrics and grip strength were recorded

Results: Biomedical engineering approved the device. We recruited 397 children ranging in age from 5 – 11 years. 395/397 completed the study, 2 declined due to fear. There were no injuries and no falls. Average time to complete the study was 22 minutes. Ninety-one percent of participants were right-handed, the ethnicity was representative of the local area with 79% were Caucasian and 6% of participants were obese. Mean (± SD) height, weight and body mass index for the 397 participants were 1.28 ± 0.11m, 28.0 ± 8.12kg and 16.31 ± 2.59 kg/m2. Hand size, grip strength and maximum breakaway force, and maximum torque increased with age,. Maximum breakaway strength significantly interacted with handle size ($p<0.001$), age ($p<0.001$), female gender ($p=0.0093$), length ($p=0.019$), breath ($p=0.043$) and grip strength ($p<0.001$).

Conclusion: This model is safe and feasible maybe a viable method to assess rung and rail design for playgrounds

Notes

THE DEVELOPMENT AND 1-YEAR ASSESSMENT OF A NOVEL PROTOCOL FOR REPORTING IMPAIRED DRIVERS FOR POSSIBLE DRIVERS LICENSE REVOCATION

Eric Mahoney*, MD, J. M. Kofi Abbensetts*, MD, Suresh K. Agarwal, Jr.*, MD, LISA ALLEE, MSW, PETER BURKE, MD, Tracey Dechert*, MD, Andrew Glantz*, MD, Katherine Mandell*, MD, MPH, Boston Medical Center

Presenter: Eric Mahoney, MD

Discussant: Alexander Eastman, MD, Univ of Texas Southwestern Med Ctr

Objectives: To our knowledge no Level I trauma center in Massachusetts performs routine reporting of impaired drivers to the Registry of Motor Vehicles (RMV) for evaluation and possible forfeiture of drivers' licenses, often due to concern of violating HIPAA. Therefore, we developed and implemented a novel reporting protocol in collaboration with the RMV after recent state law expanded the ability of health care providers to report impaired drivers.

Methods: The protocol was developed utilizing the impaired driver definition provided by the RMV and the Massachusetts Department of Public health, and included both cognitive and physical derangements caused by medical conditions and substance ingestion. HIPAA compliance was vetted through our institutional legal department and modifications were made accordingly. Drivers admitted to our facility were evaluated for impairment by the Trauma Team, and patient information was then sent via fax to the RMV for evaluation and driver notification.

Results: Sixty-seven patients met criteria and were reported to the RMV over a 1-year period, representing 18% (67/380) of MVC drivers treated at our facility. Impairment was due a medical condition in 21% (14/67), and substance intoxication in 79% (53/67). Medical conditions included syncope, seizure, TIA/CVA, normal pressure hydrocephalus, dizziness and dementia. Substance ingestions included alcohol, cocaine, marijuana, heroin, benzodiazepines, methadone, prescription narcotics and muscle relaxants. This led the RMV to proceed with surrender of license in 13 drivers and request for medical clearance in 54 drivers.

Conclusion: A reporting mechanism of impaired drivers was successfully implemented in our trauma center. With broad adoption by other centers, this may lead to a greater willingness to report impaired drivers. In addition, impaired driving was a frequent factor during MVC, occurring in 18% of drivers.

Notes

Scientific Session III-B – Jan 17, 2013
Paper 19 9:00 AM

PILOT EVALUATION OF THE SHORT TERM EFFECT OF DRIVING SIMULATION ON NOVICE ADOLESCENT DRIVERS

Akpofure Peter Ekeh*, MD, Dustin Bayham, BS, Kyle Herman, MBA, Ronald Markert, PhD, Mary C. McCarthy*, MD, Wright State University

Presenter: Akpofure Peter Ekeh, MD

Discussant: Thomas Hayward, MD, Indiana University

Objectives: Several successful initiatives over the last few decades have led to improvements in driving safety especially among adolescents. In spite of a widespread application in the aviation industry and other fields, computerized simulation has been limitedly utilized as a tool for improving driving safety. We prospectively studied a group of nascent high school drivers, subjected to comprehensive virtual driving simulation modules to identify the subsequent effects on their driving records.

Methods: Forty high school students with driver's licenses that had been issued within 1year were enrolled for participation and prospectively randomized into Simulation and Control groups. The Simulation group underwent 11 modules of training on a Virtual Driving Simulator spanning a total of six hours over five days. Their driving records from the Bureau of Motor Vehicles were compared at 6 month and 1 year periods specifically looking at traffic violation and crashes.

Results: A total of 16 subjects completed the Simulation training and 19 served as controls. Age and gender distribution was similar. Overall mean age was 17.4 yrs. The mean time to the initial offence was similar – Simulation (117 days) vs. Control (105 days) – p= 0.8559. At 180 days, 2/16(12.5%) in the Simulation group had a recorded driving infraction compared with 5/19(26.3%) in the Control group.(p =0.415) At 360 days, 19% of the Simulator group obtained a driving infraction vs 37% of the Control group (p=.2853) No subject in the Simulator group was involved in a car crash compared with 26% in the control group.(p =0.0493)

Conclusion: This pilot evaluation of Driving Simulation demonstrated positive trends in the reduction of traffic violations and offences in novice adolescent drivers. A statistically significant reduction in the number of car crashes in individuals who had undergone Virtual Simulation was observed.

Future studies are warranted to identify the potential utility of this technology in improving driving safety in teens and others.

Notes

Scientific Session III-B – Jan 17, 2013
Paper 20 9:20 AM

ADOLESCENT PERCEPTIONS OF DANGEROUS DRIVING FOLLOWING EXPOSURE TO MOCK CRASHES

Chris McGrath, RN, Chris Schwartz, PhD, Renae Stafford*, MD,
University North Carolina

Presenter: Chris McGrath, RN

Discussant: Melissa Harte, RN, MS, Phoenix Children's Hospital

Objectives: Mock motor vehicle crashes are conducted annually at high schools in the United States. We were unable to identify any scientific literature that addresses their effectiveness to deter dangerous driving decisions. The objective of this study was to determine if mock crashes change teenagers' decision making with respect to dangerous driving over time as measured by the Dula Dangerous Driving Index (DDDI) survey instrument.

Methods: Students from 3 urban and 1 rural high schools in North Carolina were given an anonymous survey that included questions from the DDDI. It was administered 1-2 weeks prior to viewing a mock crash (PRE),immediately following the mock crash event (DAY) and a final time at 180 +/-14 days post event (POST).

Results: 3028 surveys (PRE 1407, DAY 1137, and POST 484) were collected with 2846 complete for data analysis. Not all of the students who completed the first survey were able to attend the mock crash and 1 of the four schools was not able to participate in the 180 day follow-up survey. Students reported texting, using cell phone while driving and driving with 2 or more friends less often immediately after viewing the mock crashes ($p < .01$, $< .01$ and $< .02$, respectively). The mean DDDI (DAY 52.54) was significantly decreased from (PRE 57.04) with $p = 0.029$ but this effect was not sustained at 180 days. Males self identified significantly higher risk behaviors PRE than did females (Mean DDDI 59.16 vs. 54.21) and in 2 of three sub-indices of DDDI. Only the risky driving sub index remained significantly higher for males on DAY. POST data were similar to PRE with males scoring statistically higher than females in the mean DDDI and same 2 of 3 sub-indices.

Conclusion: Mock crashes have an effect on self reported dangerous driving habits immediately after attending the event that is not sustained over time.

Males report more dangerous driving behaviors than females. Further research should include interventions that address this difference and other strategies for sustainability.

Notes

Scientific Session IV-A – Jan 18, 2013
Paper 21 8:00 AM

CHARACTERIZING VASOACTIVE MEDIATOR RELEASE DURING RESUSCITATION OF TRAUMA PATIENTS

Stephen Cohn*, MD, Marc DeRosa, RT, Janet McCarthy, RN, Juquan Song, PhD, Christopher E. White*, MD, FACS, Christopher Louden, MS, Joel Michalek, PhD,
University of Texas Health Sciences Center

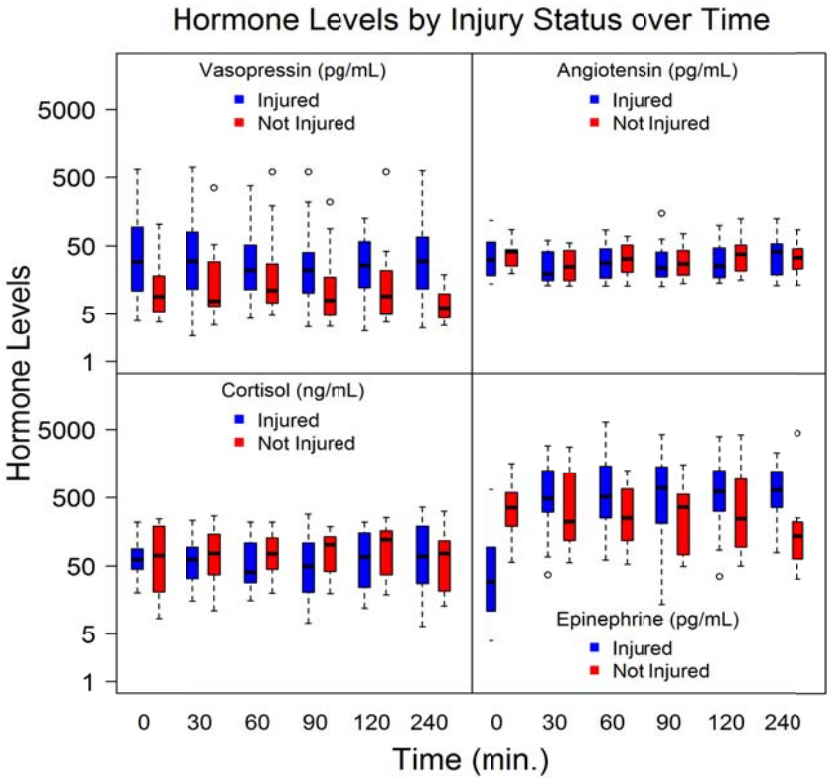
Presenter: Stephen Cohn, MD
Discussant: A. Tyler Putnam, MD, Mountain State Health Alliance

Objectives: Mortality from hemorrhagic shock after arrival to major urban trauma centers has been reported as high as 50%. We sought to perform the first characterization of vasoactive mediators release during resuscitation of hypotensive trauma patients.

Methods: The IRB-approved study was conducted under waiver of consent. Adults with clinical evidence of acute traumatic injury and systolic blood pressure < 90 mmHg within 1 hour of arrival were evaluated at our Level I trauma center. 203 patients were screened with 50 enrolled from February 2010 to February 2011. Demographic information was also collected. Blood samples were obtained at 0, 30, 60, 90, 120 and 240 minutes after arrival and assays were performed for Vasopressin, Angiotensin, Epinephrine, and Cortisol. We assessed the significance of variation in these vasoactive mediators with injury with adjustment for time using repeated measures linear models in log units.

Results: We found that mean vasopressin increased significantly with injury ($p=0.03$), while mean angiotensin ($p=0.60$), cortisol ($p=0.73$), and epinephrine ($p=0.06$) did not. (See Figure).

Conclusion: We believe that this is the first clinical trial to serially evaluate vasoactive mediators following trauma. Vasopressin in particular and epinephrine appear to be the key mediators produced in the human response to severe injury. Deficiency of these two vasoactive substances may contribute to intractable shock states.



Mean vasopressin, angiotensin, cortisol, and epinephrine in log units by injury status (injured=ISS≥15, not injured=ISS <15) and time among 50 civilian casualties.

Notes

PNEUMATOSIS INTESTINALIS PREDICTIVE EVALUATION SCORE (PIPES): A MULTICENTER CENTER EPIDEMIOLOGIC STUDY

Joseph J. DuBose*, MD, Carlos Brown, MD, Michael Esparza, BS, Paula Ferrada*, MD, Kenji Inaba, MD, Steven B. Johnson*, MD, Matthew E. Lissauer*, MD, Xian Luo-Owen, MD, PhD, Adrian A Maung*, MD, Thomas O'Callaghan, MD, Obi Okoye, MD MRCSI, Thomas M. Scalea*, MD, FACS, FCCM, Alison M. Wilson*, MD, University of Maryland / R Adams Cowley Shock Trauma Center

Presenter: Joseph J. DuBose, MD

Discussant: Jill Watras, MD, Henry Ford Health System

Objectives: Pneumatosis intestinalis (PI) is associated with numerous adult conditions, ranging from benign to life-threatening. To date, all series of PI outcomes consist of case reports and small retrospective series.

Methods: We conducted a retrospective multicenter study, involving 8 centers who identified patients with PI from January 2001 to December 2010. Demographics, past medical history, clinical presentation and outcomes were collected. The primary outcome was the presence of pathologic PI defined as confirmed by transmural ischemia at surgery or the withdrawal of clinical care and subsequent mortality. Forward logistic regression was utilized to identify independent predictors for pathologic PI and to develop a regression tree (CART) to generate a clinical prediction rule for pathologic pneumatosis intestinalis.

Results: During the 10-year study period, 500 patients with PI were idenitified. Of this number, 299 (60%) had benign disease and the remaining 201 (40%) had pathologic PI. A wide variety of exam findings, conditions, laboratory values and imaging findings were statistically significant predictors of pathologic PI on univariate comparison, including peritonitis, steroid and antibiotic use, renal failure and hyperlactemia. In the regression model, a lactate ≥ 2.0 was the strongest independent predictor of pathologic PI, with hypotension or vasopressor need, peritonitis, acute renal failure, active mechanical ventilation and absent bowel sounds also demonstrating significance in the model. CART analysis using variables from the regression was used to create a clinical prediction rule. In this tree, the presence of a lactate value ≥ 2.0 and hypotension/vasopressor use had a predictive probability of 93.2%.

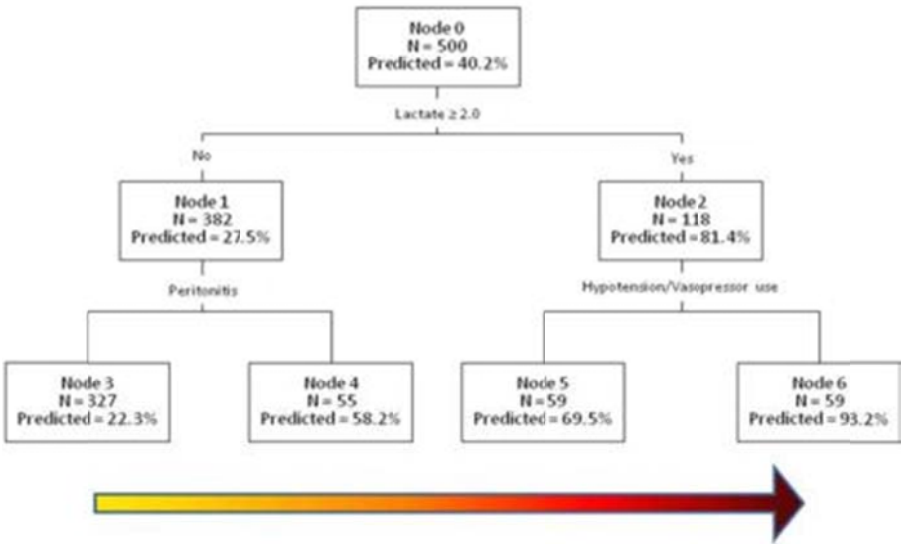
Conclusion: Discerning the clinical significance of PI remains a challenge of modern medical care. We identified the independent predictors of PI in the largest population to date and developed of a basic predictive model for clinical use. Prospective validation is warranted.

Independent predictors of Pathologic Pneumatosis

Variable	Step	OR (95% CI)	p	R
Lactate > 2.0	1	4.3 (2.2, 8.7)	<0.001	0.304
Hypotension or Pressor use	2	5.1 (2.0, 13.0)	0.001	0.097
Peritonitis	3	4.7 (2.2, 10.3)	<0.001	0.053
Acute kidney injury	4	3.4 (1.5, 7.8)	0.004	0.042
Active mechanical ventilation	5	3.3 (1.3, 8.6)	0.013	0.018
Absent bowel sounds	6	2.8 (1.1, 7.1)	0.034	0.015

Other variables in model: Age > 60yrs, Pseudo-obstruction, history of ulcerative colitis, use of corticosteroids, chemotherapeutic agents, lactulose, history of leukemia, chronic renal failure, abdominal distension, abdominal rigidity, diarrhoea, compromised examination, use of antibiotics, current steroid use, active infections, Pneumonia/VAP, blood stream infections, Sepsis, ALI/ARDS, Multi-organ failure, Abnormal WCC, Creatinine >2, Jejunal PI, Ileal PI, Linear PI, Antimesenteric PI, Circumferential PI, Isolated Foci of air, Moderate isolated region of air, Moderate air in multiple segements, Extensive air in diffuse segments, Ascites, and Vascular gas pattern

Figure 1: Tree model for prediction of Pathologic PI generated by Classification and regression tree (CART) analysis



Notes

Scientific Session IV-A – Jan 18, 2013
Paper 23 8:40 AM

MITOCHONDRIAL DAMPS RELEASED BY ABDOMINAL TRAUMA SUPPRESS PULMONARY IMMUNE RESPONSES

Carl J. Hauser*, MD, Cong Zhao, PhD, Alok Gupta*, MD, Stephen R. Odom*, MD, Kiyoshi Itagaki, PhD, Harvard Medical School

Presenter: Carl J. Hauser, MD
Discussant: Jose Pascual Lopez, MD, University of Pennsylvania

Objectives: Historically, fever, pneumonia and sepsis after chest trauma is ascribed to pain, splinting and poor pulmonary toilet. But no evidence supports those assertions and no biologic mechanisms have been advanced to explain these associations. Our studies have shown injured tissues release mitochondrial debris that attracts neutrophils (PMN). Thus we hypothesized mitochondria (MT) released by injured, dying tissue could divert neutrophils from the lung, leaving it susceptible to bacterial invasion.
Methods: Anesthetized rats (6-10/group) underwent chest percussion to induce pulmonary contusion (PC). To model MT release from liver injury, some rats had sonicated MT isolated from rat liver (equivalent to MT from 5% liver necrosis) injected into the peritoneal cavity. At 16h bronchoalveolar and peritoneal lavages were performed. Lavage fluids (BALF, PLF) were assayed for PMN count, albumin, IL-β and CINC.
Results: PC caused a 50-fold increase in BALF neutrophils (Fig 1) and tripled lung albumin leak (Fig 2). Peritoneal MT had no direct effect on lung PMN or leak, but increased peritoneal IL-β and caused marked influx of PMN and albumin into the peritoneum. In rats undergoing PC, additional injection of MT into the peritoneum markedly decreased BALF PMNs ($P<0.001$, Fig 1) and albumin leak ($P<0.002$, Fig 2).
Conclusion: Rather than acting as a 'second hit' to induce PMN-mediated lung injury, MT debris acts as a chemoattractant, diverting PMN away from lung injury to systemic sites of injury. This may diminish acute lung injury but it is expected to make the lung susceptible to infection. This novel paradigm provides a direct mechanistic model of the relationship between systemic blunt tissue injury, pneumonia and sepsis that can now be studied and used to improve care and trauma outcomes.

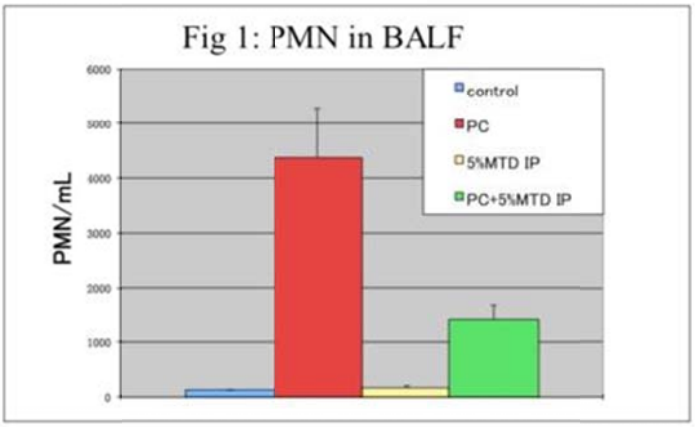


Fig 1: PMN in BALF
PMN/mL
6000
5000
4000
3000
2000
1000
0
control
PC
5%MTD IP
PC+5%MTD IP

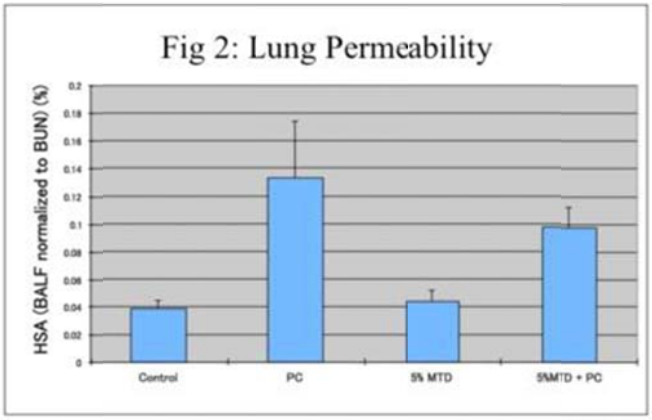


Fig 2: Lung Permeability
HSA (BALF normalized to BUN) (%)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Control
PC
5% MTD
5%MTD + PC

Notes

A PROTOCOL-DRIVEN APPROACH TO SCHEDULING EMERGENT CHOLECYSTECTOMY DECREASES HOSPITAL LOS WHILE MAINTAINING QUALITY

Stancie Rhodes*, MD, Hannah Xu, B.S., Joshua M. Bershad, MD, Vicente H. Gracias*, MD, Robert Wood Johnson Medical School

Presenter: Stancie Rhodes, MD

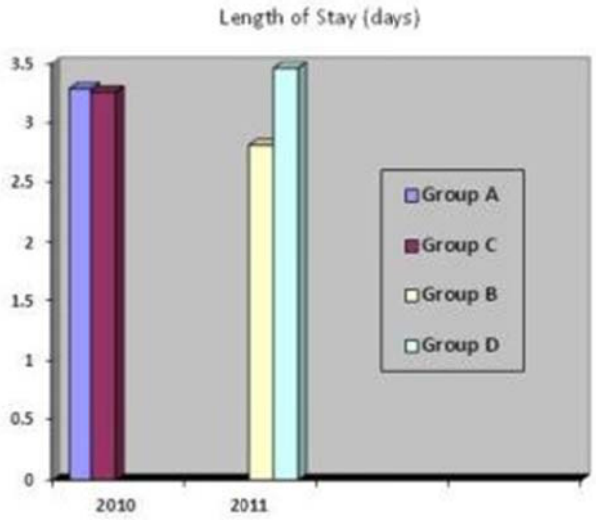
Discussant: John Santaniello, MD, Loyola University Medical Center

Objectives: In April 2011, the Division of Acute Care Surgery began scheduling its cholecystectomies as "Class 3 Emergency" cases, requiring operation within 6 hours. We hypothesize that a protocol-driven approach to classing cholecystectomy as an emergency operation significantly reduces the hospital length of stay (LOS), translating to significant healthcare savings.

Methods: We retrospectively collected data on all patients (DRG 414-419) discharged by the ACS service for 11 months before (Group A) and 11 months following (Group B) implementation of the classing policy. Information regarding group-specific outcomes and expenditures came from the hospital's Crimson Database©. We compared this to data on patients operated on by all members of the Department of Surgery during those time periods (Group C-prior to classing and Group D-after classing).

Results: Cholecystectomy was performed on 183 patients by 7 ACS surgeons over a 22 month period. No significant differences in demographics, severity of illness, or clinical outcomes were found between Groups A – D. The mean length of stay (LOS) for the 106 patients in Group A was similar to that of Group C (3.29 vs 3.26, NS), while LOS for the 77 patients in Group B was significantly less than Group D (2.81 vs 3.46, $p < .05$). This translates to a .6 day decrease in our LOS and a $459/case cost savings. Using the 2010 NJ State Statistics for DRGs 414-419 compiled by the AHRQ, we estimate that this translates to an annual cost savings of $5,315,679 in the state of New Jersey.

Conclusion: A classing policy for rapid operation reduces LOS for emergent cholecystectomy. If a similar classing policy were adopted by New Jersey, the state would save over $5 million per year. This represents a significant reduction in healthcare expenditures while maintaining quality of care.


Length of Stay (days)
3.5
3
2.5
2
1.5
1
0.5
0
2010
2011
Group A
Group C
Group B
Group D

Notes

HOSPITAL BASED TRAUMA QUALITY IMPROVEMENT INITIATIVES: FIRST STEP TOWARDS IMPROVING TRAUMA OUTCOMES IN THE DEVELOPING WORLD

Hasnain Zafar, MBBS, FRCS, Zain Ghani Hashmi, MBBS, Nabeel Zafar, MBBS, MPH, Mehreen Kisat, MBBS, Asad Moosa, MBBS, Farjad Siddiqui, MBBS, Amyn Pardhan, MBBS, Asad Latif, M.D.,MPH, Adil H Haider*, MD, MPH,
Department of Surgery, Aga Khan University Hospital

Presenter: Hasnain Zafar, MBBS, FRCS
Discussant: Mark Seamon, MD, Cooper University Hospital

Objectives: Injuries remain a leading cause of death in the developing world. Whereas new investments are welcome, Quality Improvement (QI) at the currently available trauma care facilities is essential. The objective of this study is to determine the effect, and long term sustainability of trauma QI initiatives on in-hospital mortality and complications at a large tertiary hospital in a developing country.

Methods: In 2002, a specialized trauma team was formed (members trained using ATLS), and a western style trauma program established including a registry and quality assurance program. Patients from 1998 onwards were entered in to this registry, enabling a pre and post implementation study. Adults (≥16 yrs) with blunt or penetrating trauma were analyzed. The main outcomes of interest were 1) in-hospital mortality and 2) occurrence of any complication (see table). Multiple logistic regression was performed to assess the impact of formalized trauma care on outcomes, controlling for covariates reaching significance in the bivariate analyses.

Results: A total of 1,227 patient records were analyzed. Patient demographics and injury characteristics are described in Table 1. Overall in-hospital mortality rate was 6.5% and complication rate was 11.1%. Upon multivariate analysis, patients admitted during the trauma service years were 3 times less likely to die (95% CI= 1.22, 7.69) and 1.1 times (95% CI = 1.04, 1.22) less likely to have a complication than those treated in the pre-trauma service years.

Conclusion: Despite significant delays in hospital transit and lack of pre-hospital trauma care, hospital level implementation of trauma QI program greatly decreases mortality and complication rates in the developing world.

Table 1: Patient demographics and injury characteristics

Variable		n (%)
Year of injury	1998-2001	421 (34.3)
	2002-2010	806 (65.7)
Age	16-25	380 (31.0)
	26-35	370 (30.2)
	36-45	224 (18.3)
	46-55	148 (12.1)
	56-65	59 (4.8)
	66-75	33 (2.7)
	≥76	12 (1.0)
Gender	Male	1,054 (85.9)
	Female	173 (14.1)
Time from injury to Presentation	< 1hour	341 (29.6)
	1-6 hours	567 (49.1)
	6- 24 hours	202 (17.5)
	>24 hours	44 (3.8)
Hypotensive	Yes	70 (5.8)
	No	1,147 (94.3)
GCS	3-8	197 (16)
	9-12	50 (4.1)
	13-15	980 (79.9)
ISS	0-8	449 (37.2)
	9-15	210 (17.4)
	16-24	132 (11.0)
	25-75	415 (34.4)
	Missing	21 (1.7)
Complications	Yes	136 (11.1)
	No	1,091 (88.9)
Mortality	Yes	79 (6.5)
	No	1,138 (93.5)

Table 2: Multivariate analysis; independent factors associated with complications and mortality

Variable		Complications**	Mortality
		OR (95% CI)	OR (95% CI)
Year of injury	1998-2001	1	1
	2002-2010	0.9 (0.82-0.96)*	0.33 (0.13-0.82)*
Age	16-65	1	1
	65 and above	0.8 (0.17-3.62)	8.83 (2.01-38.74)*
Gender	Female	1	1
	Male	1.1 (0.56-2.69)	0.53 (0.20-1.40)
Type of injury	Blunt	1	1
	Penetrating	1.2 (0.56-2.69)	0.76 (0.23-2.51)
Time from injury to presentation	< 1hour	1	1
	1-6 hours	1.7 (0.96-3.08)	0.87 (0.38-2.00)
	6-24hours	2.7 (1.28-4.56)*	1.09 (0.42-2.78)
Intent of injury	Unintentional	1	1
	Intentional	1.4 (0.61-3.04)	1.23 (0.38-4.03)
Hypotensive	No	1	1
	Yes	2.4 (1.20-4.68)*	4.74 (2.03-11.08)*
Glasgow CommaScore (GCS)	3-8	1	1
	9-12	1.6 (0.67-3.67)	0.66 (0.22-1.94)
	13-15	0.2 (0.13-0.44)*	0.26 (0.11-0.63)*
Injury Severity Score (ISS)	0-8	1	1
	9-15	1.5 (0.66-3.38)	2.41 (0.60-9.75)
	16-24	1.9 (0.80-4.36)	4.64 (1.20-17.90)*
	25-75	2.7 (1.37-5.28)*	1.68 (0.50-5.93)
Complications	No	-	1
	Yes	-	8.19 (4.00-16.81)*

*Significant at P<0.05; 1 denotes the reference category
**Complications include: acute renal failure, cardiac arrest, myocardial infarction, coagulopathy, pulmonary embolism, wound infection, urinary tract infection, pneumonia, abdominal abscess, other abscess and sepsis.

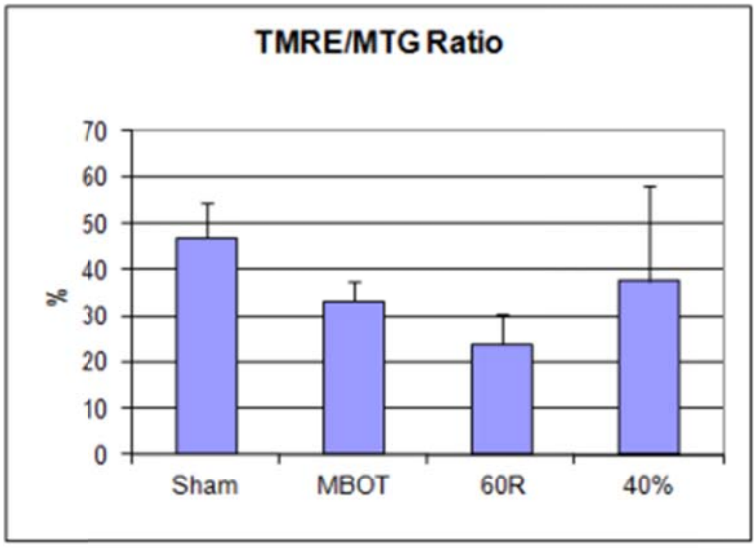
Notes

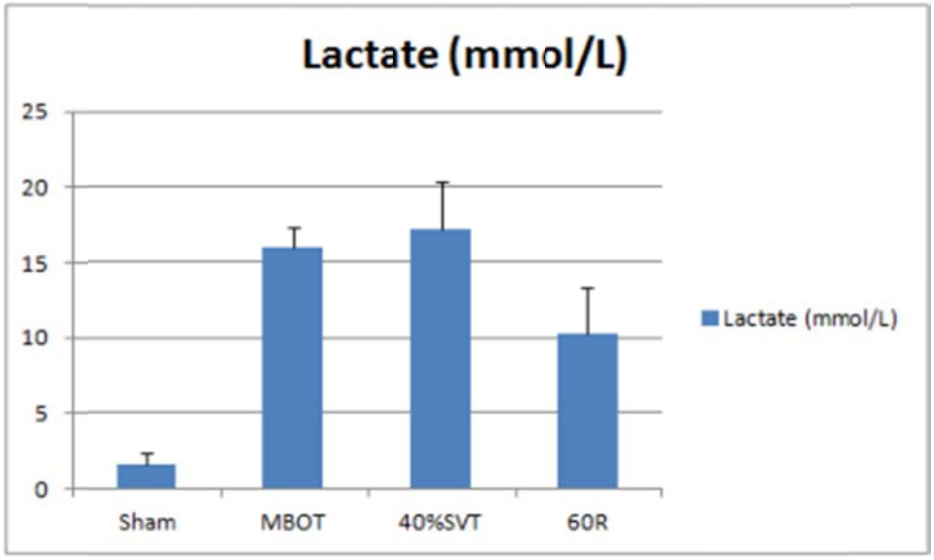
THE MITOCHONDRIAL MEMBRANE POTENTIAL DECREASES IN PERIPHERAL BLOOD MONOUCLEAR CELLS ALONG WITH THE INCREASE IN LACTATE LEVELS IN HYPOVOLEMIC SHOCK IN RATS

José Paul Perales Villarroel, M.D., Evan Werlin, BS Yuxia Guan, B.S.,
Mary Selak, PhD, Lance B. Becker, MD, Carrie A. Sims*, MD, MS,
Hospital of the University of Pennsylvania, Trauma Division

Presenter: José Paul Perales Villarroel, MD
Discussant: Randall Friese, MD, University of Arizona

Objectives: The aim of this study was to investigate the mitochondrial integrity of peripheral blood mononuclear cells (PBMC) and its relationship with serum lactate levels in a hypovolemic shock model in rats.
Methods: In this experimental design, using a experimental hemorrhagic shock model where the subjects were bled to a mean arterial pressure (MAP) of 40 mmHg, 19 Long-Evans rats were distributed in four groups: 1) Sham, 2) maximum bleeding out time (MBOT) that represents physiologic decompensation and loss of vasomotor tone, 3) 40%SVT, where MAP of 40 mmHg was maintained by incrementally infusing 40% of the shed blood volume in Lactated Ringer's (LR) and 4) 60R, where animals were resuscitated with 4 times the total shed volume in LR over 60 minutes (60R) and maintained a blood pressure of 40 mmHg. Blood samples were taken from the femoral artery and PBMC were isolated for flow cytometry (FACS) analysis. Also, lactate levels, oxygen saturation, bicarbonate (HCO3), glucose, blood ureic nitrogen (BUN) and electrolytes were assessed. The mitochondrial content, mitochondrial membrane potential and reactive oxygen species (ROS) were assessed using Mito Tracker green, Tetramethylrhodamine (TMRE) and Mitosox Red , respectively, using FACS.
Results: Data showed a dramatic decrease in the membrane potential in MBOT (p value=0.032) and 60R group (p=0.017) (Figure 1), as well as a markedly increase in lactate levels for the same groups (p=0) (Figure 2). The production of ROS was significantly higher in the MBOT group (p value=0.025).
Conclusion: Decrease in the mitochondrial membrane potential in PBMC might be associated with the gradual increase in lactate levels in hypovolemic shock, in rats. There is an increase in ROS production under the same conditions.


TMRE/MTG Ratio
70
60
50
40
30
20
10
0
%
Sham
MBOT
60R
40%


Lactate (mmol/L)
25
20
15
10
5
0
Sham
MBOT
40%SVT
60R
Lactate (mmol/L)

Notes

Scientific Session IV-B – Jan 18, 2013
Paper 27 8:00 AM

MULTIDISCIPLINARY ACUTE CARE RESEARCH ORGANIZATION (MACRO): IF YOU BUILD IT THEY WILL COME

Barbara Early, BS, David Huang, MD, Clifton Callaway, MD, Mazen Zenati, MD, Derek Angus, MD, Scott Gunn, MD, Donald Yealy, MD, Daniel Unikel, BS, Timothy Billiar, MD, Andrew B. Peitzman*, MD, Jason L. Sperry*, MD, MPH,
University of Pittsburgh

Presenter: Barbara Early, BS

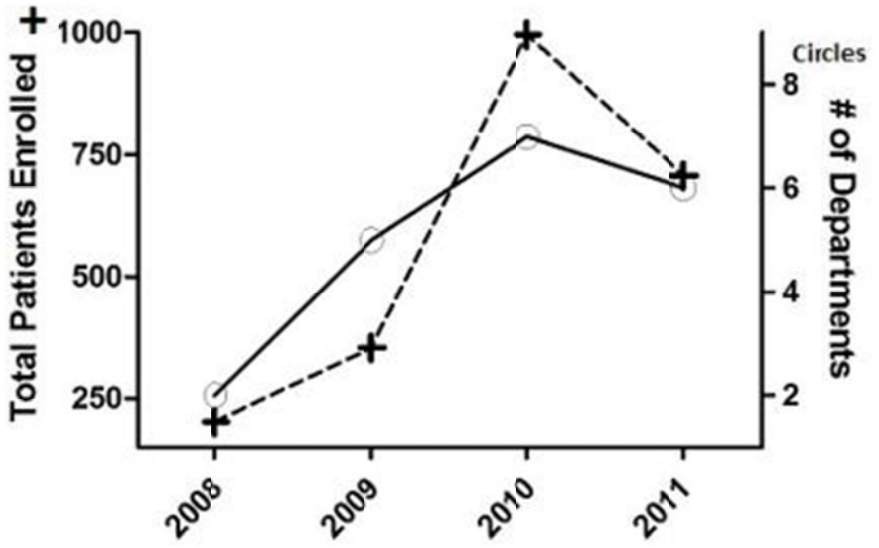
Discussant: Jeffrey Claridge, MD, MetroHealth Medical Center

Objectives: Clinical research will increasingly play a core role in the evolution and growth of acute care surgery (ACS) program development. Effective clinical research infrastructure in the current academic environment remains obscure. We sought to characterize the effects of implementation of a multidisciplinary acute care research organization (MACRO).

Methods: In 2008, to minimize redundancy, cost, and maximize existing resources promoting acute care research, MACRO was created unifying clinical research infrastucture between the Departments of Critical Care Medicine, Emergency Medicine and Surgery. MACRO provides clinical study feasibility evaluation, regulatory submission and compliance, study set-up and execution, data entry, sample processing and storage. Over the time periods 2008-2011 we determined volume of clinical studies, patient enrollment for both observational (OBS) and interventional (INTV) trials, and staff growth since MACROs origination.

Results: From 2008 to 2011, the volume of patients enrolled in clinical studies which MACRO facilitates has significantly increased over 300% (Fig, '+'). The % of INTV/OBS trials has remained stable over the same time period (50-60%). Staff has increased from 6 coordinators to 10 with an additional 15 research associates allowing 24/7 service. With this significant growth, MACRO has become financially self-sufficient and additional outside departments now seek MACROs services. Over 65 principal investigators and co-investigators from 8 different departments currently utilize MACRO services (2012 data).

Conclusion: Appropriate organization of acute care clinical research infrastructure minimizes redundancy and can promote sustainable, efficient growth in the current academic environment. Further studies are required to determine if similar models can be successful at other ACS programs.


Total Patients Enrolled
1000
750
500
250
Circles
8
6
4
2
# of Departments
2008
2009
2010
2011

Notes

Scientific Session IV-B – Jan 18, 2013
Paper 28 8:20 AM

THE IMPACT OF IMPLEMENTING A 24/7 OPEN TRAUMA BED PROTOCOL IN THE SURGICAL INTENSIVE CARE UNIT ON THROUGHPUT AND OUTCOMES

Akash Bhakta*, BS, Matthew Bloom, MD, Heather Warren, MD, Nirvi Shah, BS, Tamara Casas, BS, Tyler Ewing, BS, Marko Bukur, MD, Rex Chung, MD, Eric Ley, MD, Ali Salim*, MD, Daniel Margulies, MD, Darren Malinoski, MD,
Cedars-Sinai Medical Center

Presenter: Akash Bhakta, BS

Discussant: Amy McDonald, MD, MetroHealth Medical Center

Objectives: Increased emergency department (ED) length of stay (LOS) has been associated with increased mortality in trauma patients. In 2010, we implemented a 24/7 open trauma bed protocol in our two surgical intensive care units (SICU) in order to facilitate rapid admission from the ED. This required the maintenance of a daily bump list and timely transferring of patients out of the SICU. We hypothesized that ED LOS and mortality would decrease after implementation.

Methods: The following data from patients admitted directly from ED to the ICU were retrospectively compared before (2009) and after (2011) implementation of a trauma bed protocol at a level-I trauma center: age, gender, GCS, shock on admission (SBP<90 mmHg), mechanism of injury, injury severity scores (ISS and AIS), ED LOS, ICU re-admission rates, and mortality.

Results: 267 of 1611 (17%) patients before and 262 of 1266 (21%, $p<0.01$) patients after the protocol were admitted directly to the ICU, despite similar characteristics. Overall, ED LOS decreased from 4.2 ± 4.0 hrs to 3.1 ± 2.1 hrs ($p=.01$). Mortality was unchanged for all patients (9% vs. 8%, $p=0.56$), but mortality and ED LOS were lower after protocol implementation in patients with an ISS≥25 (30% vs. 13%, $p=0.04$ and 3.1 ± 2.5 vs. 2.2 ± 1.6, $p<0.05$) and in patients with a with a Head AIS≥3 (12% vs. 6%, $p=0.04$ and 4.2 ± 4.9 vs. 3.1 ± 2.0, $p=0.01$). A greater proportion of Head AIS≥3 patients were admitted to a designated surgical ICU after the protocol (88% vs 97%, $p<0.01$). ICU readmission rates were unchanged (0.3% vs. 1.5%, $p=0.2$).

Conclusion: The implementation of a 24/7 open trauma bed protocol in the SICU was associated with a decreased ED LOS in all patients and lower mortality rates in the most severely injured patients. Improved throughput was achieved without an increase in unplanned readmissions to the SICU.

Notes

Scientific Session IV-B – Jan 18, 2013
Paper 29 8:40 AM

A REVISED PRE-HOSPITAL TRAUMA TRIAGE PROTOCOL: SAVING PATIENTS AND RESOURCES

Katherine B Kelly, MD, Aman Banerjee, MD, Michael Nowak, PhD, Patricia A Wilczewski, RN, Deborah Allen, BSN, Jeffrey A. Claridge*, MD, MS,
MetroHealth Medical Center

Presenter: Katherine B Kelly, MD

Discussant: Tanya Zakrison, Miller School of Medicine, Univ of Miami

Objectives: To create a revised pre-hospital trauma triage protocol that could identify a subset of trauma victims that can be safely treated at a local emergency department (ED).

Methods: A revised emergency medical services (EMS) trauma triage protocol checklist was devised which divided patients into Red, Yellow, or Green groups. Red included those most likely to be severely injured while Green had those unlikely to be seriously injured. Changes included decreasing Glasgow Coma Scale score from less than or equal to 13 to <12. The presence of abdominal tenderness, distension, or seat belt sign and speed of a motor vehicle crash were removed. Age requiring a trauma center was increased from 55 to 70. For 3 months in 2011, EMS completed a revised triage checklist for each trauma while continuing to use current triage rules. Revised over and under triage rates were calculated. Green patients requiring ICU or OR admission had their charts reviewed to determine protocol failure or coding error.

Results: There were 614 patients transported by EMS to 3 trauma centers. EMS designated 143(23%) Red, 299 (49%) Yellow, and 172 (28%) Green patients. 510 (83%) of the patients were transported to the Level I center. Level II West received 37 (6%) patients and Level II East received 67 (11%) patients. Of these, 28% of all EMS transports were Green and could be taken to the nearest ED under the revised protocol. There was no mortality in the Green group. There were 7 Green patients who required admission to the ICU or OR. Of these, 2 patients had injuries from falls between 10 and 20 feet. Coding errors were found in 4 of the cases. Correcting for coding errors resulted in an under-triage rate of 1%.

Conclusion: Current trauma triage rules result in inefficient use of trauma center resources by patients with minor injuries. Use of a revised triage protocol could potentially transport patients with minor injuries to a non-trauma hospital ED.

Notes

FACTORS ASSOCIATED WITH HIGHER PATIENT SATISFACTION SCORES FOR PHYSICIAN CARE: WHAT DOES A "SATISFIED" TRAUMA PATIENT LOOK LIKE?

Frederick Rogers*, MD, Jeffrey Anderson, MD, Matthew Edavettal, MD, PhD, Michael Horst, PhD, Turner Osler, MD, Tuc To, BS, Daniel Wu*, DO,
Lancaster General Hospital

Presenter: Frederick Rogers, MD

Discussant: Thomas Esposito, MD, Loyola University Medical Center

Objectives: We hypothesized that specifically lower socioeconomic status and higher injury severity scores (ISS) would lead to lower Press-Ganey (PG) survey scores.

Methods: PG physician satisfaction scores for September 2004 to December 2010 were compared to multiple trauma variables and the association of a mean physician score greater than 75 (surveys are sent out to 100% of discharged inpatients, scores range from 0-100 and based on five specific questions related to the care provided by the surgeon). Those variables which proved significant on univariate analysis were then subjected to multivariate logistic regression analysis. Significance was at $p<0.05$. Variables analyzed included: age, gender, ISS, trauma level, mechanism of injury, length of stay, vent days, trauma surgery, occurrences, pre-existing conditions, Amish, payor status, geographic location, ethnic diversity, and SES.

Results: 1,631 trauma patients (13.4%) returned PG questionnaires out of 12,196 trauma admissions. Patients aged 0-17 and >64 were 1.88 and 2.19 times more likely to give a mean physician score of 75 or higher than the reference. Patients requiring surgery were 1.54 times more likely to give a mean physician score higher than 75 than patients that did not. Patients with a commercial payor status were 1.78 times more likely to give a mean physician score of 75 or higher than the reference payor group.

Conclusion: The profile of a satisfied trauma patient is one that is >64 years old (or < 18 years old), has commercial insurance and requires surgery. ISS and SES were not significantly related to physician satisfaction ratings in trauma patients as hypothesized. Understanding the specific characteristics of PG results for trauma patients will allow surgeons and their hospital partners to develop strategies to improve patients' satisfaction with their trauma surgeon's care.

Logistic Analysis of Significant Factors Associated with PG>75				
	n75 (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Age				
18-29	131 (70.8)	Ref	Ref	-
0-17	**121 (82.9)**	**2.00 (1.17-3.41)**	**1.88 (1.08-3.27)**	**0.026**
30-64	491 (71.9)	1.05 (0.74-1.51)	1.06 (0.73-1.53)	0.769
>64	431 (79.7)	1.62 (1.10-2.36)	**2.19 (1.35-3.56)**	**0.001**
Surgery				
No	916 (74.2)	Ref	Ref	-
Yes	**258 (80.6)**	**1.45 (1.07-1.97)**	**1.54 (1.12-2.11)**	**0.008**
Payor				
Medicaid	48 (64.9)	Ref	Ref	-
Medicare	283 (76.9)	1.80 (1.06-3.08)	1.10 (0.58-2.09)	0.760
Commercial	**396 (77.0)**	**1.82 (1.08-3.06)**	**1.78 (1.05-3.02)**	**0.032**

Notes

DEDICATED SURGICAL CRITICAL CARE SERVICE LINE OFFERS OPPORTUNITY FOR ENHANCED REVENUE AND ADVANCED PRACTITIONER DEVELOPMENT

Brian K. Jefferson, ACNP, Martha Griffo, CPC, John M. Green*, MD, William S. Miles*, MD, Ronald F. Sing*, DO, Michael H. Thomason*, MD, A. Britton Christmas*, MD, FACS, Carolinas Medical Center

Presenter: Brian K. Jefferson, ACNP

Discussant: William Hoff, MD, St. Luke's Hospital

Objectives: While national organizations promote the integration of emergency general surgery for trauma surgeons, the addition of surgical critical care services provides a means to stimulate a challenging practice and to improve procedural productivity for advanced practitioners. We undertook this study to assess the growth of a dedicated surgical critical service line at a Level I trauma center.

Methods: A surgical critical care consult service was established in 2006 staffed by 8 trauma/critical care surgeons (TS) in conjunction with six advanced practitioners (AP). Initially, daily rounds were conducted by a single TS and AP. Prospective data was collected for consults, procedures, daily census, ICU length of stay (LOS), and physician charges from 2008-2011. A single TS and 3 AP's were added during the study period. At present, daily rounds are conducted by a TS in conjunction with 2 AP's.

Results: A dedicated surgical critical care service line yielded 3517 consults (2008–385, 2009–767, 2010–1051, 2011–1314). In addition, 91 organ donors were managed during the course of the study. Average daily census increased from 8.6±1.7 in 2008 to 19.5±2.6 in 2011. Of note, mean ICU LOS decreased from 5.7±1.3 days in 2008 to 4.7±5 days in 2011. From a financial perspective, the development of a dedicated surgical critical care service line generated physician charges of $13,874,149 (2008-$1,785,819, 2009-$2,663,976, 2010-$3,297,330, 2011-$6,127,024). Furthermore, this service line afforded ample procedural opportunities for advanced practitioners and attending physicians. Advanced practitioners assisted with more than 1570 procedures during the 4 year period (460 tracheostomies, 471 bronchoscopies, 393 central lines, 192 PEG placements, and 54 vena cava filter placements).

Conclusion: The creation of a surgical critical care service line provides an invaluable hospital service with the potential to generate substantial revenue while increasing the procedural opportunities for trauma surgical intensivists and AP's.

Notes

BORROWING BEST PRACTICES FROM TRAUMA: AN ACUTE CARE SURGERY REGISTRY AND PI PROGRAM

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Objectives: A dedicated registry and performance improvement (PI) program is integral to trauma care. Hypothesizing that an analogous process may benefit Acute Care Surgery (ACS) patients, we implemented a dedicated ACS registry and PI program.

Methods: This retrospective study evaluated ACS activity at a level I trauma center from 6/11 to 6/12. The ACS registry, designed with a database vendor, captured patient demographics, comorbidities, diagnoses, procedures, user-defined audit filters, and PI occurrences. It was maintained by divisional administrative and PI staff. Trauma registry and PI activity were separate. Impact of ACS involvement on mortality was evaluated by Fisher's exact test; $p<0.05$ was significant. A subset of ACS deaths was subject to focused peer review. PI determinations were compared to University HealthSystem Consortium (UHC) relative expected mortality (REM).

Results: ACS evaluated 1470 patients (48% ED, 40% in-house, 9% transfer, 3% other); 60% had abdominal complaints. Overall mortality was 124/1470 (8.4%). Of 778 (53%) with complete registry data, ACS intervened surgically in 387 (49.7%). Mortality with active ACS involvement was 51/1470 (3.5%) ($p<0.001$). Focused review of 30 deaths identified 112 PI occurrences. Opportunities for improvement were present in 5/30 (16.7%): 2 delays to OR, 2 technical issues, and 1 judgment issue. Of 24/30 deaths with UHC valuation, 20 were "above" or "well above" REM and 4 were "below" REM.

Conclusion: Half of patients evaluated by ACS underwent surgery. Active ACS involvement was associated with improved survival. Internal PI review had high concordance with external risk-adjusted mortality benchmarking. Although potentially resource-intensive, a dedicated registry and PI process may improve outcomes of ACS patients.

Notes