Poster # 1

ASSESSING THE NEEDS OF CONTEMPORARY TRAUMA ADVANCED PRACTITONERS: A SURVEY STUDY

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Objective: Due to multiple changes in the healthcare environment, the use of advanced practitioners (AP) in trauma and critical care has expanded. Appropriate training and ongoing professional development for these providers is essential to optimize clinical outcomes. This study offers a baseline assessment of the academic and professional needs of the contemporary trauma APs in the United States.

Methods: A 14-question electronic survey, using SurveyMonkey™ was distributed to APs at trauma centers identified through the America College of Surgeons website and other on-line resources. Demographic questions included trauma center level, provider type, level of education and professional affiliations. Likert scale questions were incorporated to assess level of mentorship, comfort level with training, and individual perceived needs for academic and professional development.

Results: There were 120 survey respondents: 60 nurse practitioners (NP); 60 physician assistants (PA-C). Sixty-two (62) worked at level I trauma centers (52%) and 95 were hospital-employed (79%). Nearly half (49%) reported working in trauma for = 3 years. One hundred nineteen (99%) acknowledged the importance of trauma-specific education; 98 (82%) were required by their institution to obtain such training. Thirty-six (30%) reported receiving < $1000/year as a CME benefit. Insufficient mentorship, professional and academic development was identified by 24 (20%), 16 (13%) and 30 (25%) of respondents respectively. Opportunities to network with trauma APs outside of their home institution was identified as deficient by 79 (66%).

Conclusion: While APs in trauma recognize the importance of continued trauma-specific education, obtaining education is not universally encouraged by their employers. Financial restrictions may pose an additional impediment to academic development. Therefore, resource-efficient opportunities should be a prime consideration for AP education especially since half of the reported workforce has = 3 years experience. Organizations such as EAST can provide an ideal venue for mentorship, academic development, and networking that is vital to AP professional development and, ultimately, quality patient care.

Poster # 2

HYPOTHERMIA IN MASSIVE TRANSFUSION: ARE WE NOT PAYING ENOUGH ATTENTION TO IT?

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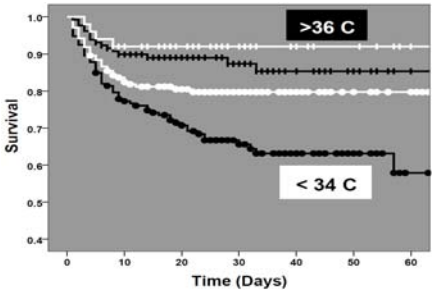
Objective: The development of acidosis, coagulopathy, and hypothermia, 'the lethal triad', has been shown to adversely impact survival following injury. Significant attention has focused on the correction of the early coagulopathy in those requiring massive transfusion (MT). We sought characterize the importance of temperature as a risk factor for poor outcome following massive transfusion. **Methods:** Data were obtained from a multicenter prospective cohort study of blunt injured adults with hemorrhagic shock. MT was defined as =10u PRBC over 24hrs. Lowest 24hr Temperature was categorized into groups (<34.0°C, 34.1-35.0°C, 35.1-36.0°C,>36°C). Kaplan-Meier analysis and multivariate logistic regression were utilized to determine temperature survival differences over time and independent risks of mortality after controlling for all important confounders. **Results:** In the MT cohort (n=604) as temperature decreased, shock parameters, early coagulopathy, injury severity, and blood component transfusion requirements significantly increased. Kaplan-Meier comparison revealed a dose response relationship with a temperature < 34°C resulting in the greatest mortality.(FIG.) Logistic regression analysis revealed that a temperature of < 34°C was associated with a 80% greater independent risk of mortality after controlling for differences in shock, coagulopathy, injury severity and transfusion requirements (OR 1.8, 95%CI 1.1-2.8). When the cohort was stratified into HIGH or LOW plasma to red blood cell transfusion ratio groups (HIGH-FFP:PRBC = 1:2 vs. LOW- FFP:PRBC < 1:2), a temperature < 34°C was associated with an exaggerated 2-fold higher independent mortality risk (OR 2.0, 95%CI 1.1-3.8, p=0.03), only in the LOW FFP:PRBC group. **Conclusions**: A temperature of 34°C appears to define clinically significant hypothermia in MT. The independent risks of mortality were greatest when in those who received a low FFP:PRBC transfusion ratio. These data suggest that prevention of hypothermia may be as important as addressing early coagulopathy. Further research is required to verify if interventional normothermia improves outcome in MT patients.



Poster # 3

THE NATIONAL TRAUMA TRIAGE PROTOCOL: CAN THIS TOOL PREDICT WHICH TRAUMA PATIENTS WILL BENEFIT FROM HELICOPTER TRANSPORT?

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Objectives: Helicopter transport (HT) is an important component of American trauma care, but prospectively identifying patients that would benefit from this resource remains difficult. The National Trauma Triage Protocol (NTTP) was developed to assist scene providers in directing appropriate patients to trauma centers. The objective of this study was to assess the role of the NTTP in selecting patients that would benefit from HT. **Methods:** Subjects transported by HT or ground transport (GT) from the scene of injury in 2007 were identified using the NTDB v8. Criteria from the stepwise NTTP available in the dataset were collected including Physiologic (PHY) data, anatomic (ANA) injuries identified by ICD-9 codes, and age. Subgroups of patients who met specific triage criteria were evaluated using logistic regression to determine if transport modality was an independent predictor of survival after controlling for demographics, injury severity, prehospital time, and presence of other NTTP triage criteria. Standard test characteristics were calculated for each criterion to predict trauma center need (TCN), defined as ISS>15, ICU admission = 24hrs, or urgent surgery. The performance of triage criteria to predict TCN was compared between the groups using independent receiver operating characteristic area under the curve analysis.

	OR survival HT vs. GT group	95% CI	p value	Sensitivity	Specificity
GCS<14	1.19	1.10 – 1.30	<0.01	33%	94%
Abnormal RR	1.17	1.03 – 1.34	0.02	15%	96%
Penetrating injury	1.40	1.13 – 1.74	<0.01	7%	95%
Any PHY + ANA	1.29	1.15 – 1.44	<0.01	13%	99%
Age = 55	1.15	1.03 – 1.30	0.01	19%	84%

Results: There were 258,387 subjects transported by either helicopter (16%) or by ground (84%). HT subjects were more severely injured (ISS 15.9±12 vs. 10.2±10, p<0.01). Logistic regression identified HT as an independent predictor of survival in subjects with a subset of triage criteria (Table). Each criterion above was significantly more predictive of TCN in the HT group than the GT group (p<0.01). **Conclusions:** Patients who meet certain triage criteria in the field appear to have an independent survival benefit if transported to a trauma center by helicopter. Further, these criteria are highly specific and more reliably predict TCN in the HT group. The specific triage criteria listed above should be carefully considered when developing policies for scene helicopter utilization in the trauma setting.

Poster # 4

COMPARED TO CONVENTIONAL VENTILATION, AIRWAY PRESSURE RELEASE VENTILATION INCREASES VENTILATOR DAYS IN TRAUMA PATIENTS

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Objective: Airway Pressure Release Ventilation (APRV) is increasingly used not only as a rescue therapy in patients with acute lung injury and hypoxemia but also as a primary mode of mechanical ventilation. Unlike conventional assist-control volume (ACV) ventilation that utilizes daily spontaneous breathing trials (SBT), APRV weaning consists of gradual decreases in supporting pressure and increases in time at the support pressure. We hypothesized that the APRV weaning process increases total ventilator days compared to SBT-based weaning.

Methods: A retrospective review of a Level I trauma center's ICU and trauma databases identified trauma admissions from 1/1/2007 to 12/31/2010 that required mechanical ventilation > 24 hours and survived. Demographics, injuries, in-hospital complications, ventilation mode(s) and total ventilator days were abstracted.

Results: 362 patients fulfilled the study entry criteria; APRV was utilized in 110 either exclusively (n=20) or in combination with other ventilator modes (n=90). The APRV and non-APRV groups were respectively similar in age (44.9 vs. 43.9 years) and gender (73 vs. 74% male) but differed in injury severity score (ISS) (21.6 vs. 17.7, $p < 0.05$). APRV patients had higher rates of pneumonia (46.4 vs. 23.8%, $p < 0.001$), acute renal failure (35.5 vs. 24.6%, $p < 0.05$), sepsis (12.7 vs. 2.4%, $p < 0.05$) and Abbreviated Injury Scale (AIS) Chest = 3 (58.2 vs. 31.3%, $p < 0.05$). Ventilator days were significantly greater in the APRV group (24.5 vs. 11.7 days, $p < 0.001$). After utilizing univariable analysis to select potential independent variables, multiple regression was performed to adjust for the clinical differences between the two groups and identified APRV as an independent predictor for increased number of ventilator days (B=9, $p < 0.001$) in addition to AIS Abdomen = 3, pneumonia, sepsis and abdominal compartment syndrome.

Conclusion: APRV is frequently utilized in patients who are more severely injured or develop in-hospital complications such as pneumonia. However, after controlling for potential confounding factors in a multiple regression model, the APRV mode itself appears to increase the time patients spend on mechanical ventilation. Further studies will be required to elucidate the exact mechanisms.

Poster # 5

INHALED PROSTACYCLIN IMPROVES OXYGENATION IN SEVERE HYPOXEMIA

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Objective: Inhaled Prostacyclin (Epoprostenol) is a vasodilator; increases pulmonary arterial blood flow and decreases pulmonary pressures; thereby, improving gas exchange and arterial oxygenation. We evaluated the benefits of Inhaled Prostacyclin as a less expensive alternative to Inhaled Nitric Oxide in Ventilated Surgical Intensive Care patients with severe hypoxemia.
Methods: After IRB approval, the records of mechanically ventilated SICU patients who received Inhaled Prostacyclin as therapy for severe hypoxia (PaO2/FiO2 or P/F<100 & Oxygen Saturation 68-98%) in a tertiary care referral center were retrospectively reviewed. Initial P/F ratio and oxygen saturations were compared to values at 12 and 48 hours after administration of Inhaled Prostacyclin. A one-way repeated measures ANOVA compared improvements in oxygenation. Further subgroup analyses evaluated the differences between trauma and non-trauma subgroups; we also, evaluated the time to initiation of Inhaled Prostacyclin (< or > 7 days from time of intubation) subgroups and age subgroups (< or > 60 yr old) using Student's t-Test.
Results: Between 2009-2010, 36 patients (23 trauma and 13 non-trauma) ages 15-80 were treated with Inhaled Prostacyclin. Inhaled Prostacyclin significantly improved both P/F ratio and oxygenation in both trauma and non-trauma subgroups. There was no difference between the two subgroups. Average P/F ratio improved from 66 to 142 after 12 hours of administration of Inhaled Prostacyclin and improved from 142 to 210 after 48 hours of administration of Inhaled Prostacyclin. Patients with severe Hypoxemia requiring increasing ventilator support who received Inhaled Prostacyclin within 7 days of intubation demonstrated a significantly greater improvement in P/F ratio compared to those who received after 7 days from time of intubation with p value of 0.035. Response between age groups did not differ significantly.
Conclusion: Treatment with Inhaled Prostacyclin, a significantly less expensive alternative to Inhaled NO, improved gas exchange in severely hypoxemic surgical patients. Earlier intervention (within 7 days of intubation) is more efficacious at improving oxygenation. Next step is to evaluate and compare the efficacy of Inhaled Prostacyclin to Inhaled NO and their synergism.

Poster # 6

CLINICAL CLEARANCE OF THE CERVICAL SPINE IN PATIENTS WITH DISTRACTING INJURIES: IT IS TIME TO DISPEL THE MYTH

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Objective: The purpose of this study was to prospectively assess the sensitivity and efficacy of clinical examination to screen for cervical spine (c-spine) injury in awake and alert blunt trauma patients with concomitant distracting injuries.

Methods: During the period December 2009 to June 2011, all blunt trauma patients older than 13 years were prospectively evaluated per a standard cervical spine examination protocol by the trauma surgery team at a Level 1 Trauma Center. Awake and alert patients with a Glasgow Coma Score (GCS) $\geq$14 underwent clinical examination of the cervical spine. Clinical examination was performed regardless of distracting injuries. Patients without complaints of pain or tenderness on physical exam had their cervical collar removed, and the c-spine was considered clinically cleared of injury. All awake and alert patients with distracting injuries, including those clinically cleared and those with complaints of c-spine pain or tenderness underwent CT scanning of the entire c-spine. Distracting injuries were defined as closed head injury, extensive facial fractures, > 2 rib fractures, sternum fractures, intra-abdominal organ injury, pelvic fractures and long bone fractures. Patients with minor distracting injuries were not considered to have a distracting injury.

Results: During the study period, 1186 blunt trauma patients had GCS >14, 706 (60%) of which had at least one distracting injury. Two-hundred fifty-eight (37%) of the patients with distracting injuries had a positive c-spine clinical examination, 66 (26%) of which were diagnosed with c-spine injury. Four hundred forty-eight (63%) of the patients with distracting injuries were initially clinically cleared, with one patient (0.2%) diagnosed with a c-spine injury. This yielded an overall sensitivity of 99% (66/67) and negative predictive value greater than 99% (447/448) for cervical spine clinical examination in awake and alert blunt trauma patients with distracting injuries.

Conclusions: In the awake and alert blunt trauma patient with distracting injuries, clinical examination is a sensitive screening method for cervical spine injury. Radiological assessment is unnecessary for safe clearance of the asymptomatic cervical spine in awake and alert blunt trauma patients with distracting injuries. These findings suggest significant potential reduction of both healthcare cost and radiation exposure.

Poster # 7

CAN TRAUMA SURGEONS MANAGE SMALL INTRACRANIAL HEMORRHAGES?

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Objectives: In order to optimize neurosurgical resources, in January 2008, a protocol was instituted allowing trauma surgeons to manage intracranial hemorrhage (ICH) less than or equal to 1 centimeter (≤1 cm). Our objective was to see if trauma surgeons can safely manage small ICH rather than a neurosurgeon.

Methods: We reviewed data collected from our trauma registry for patients who presented between 2006 and 2011. Protocol was instituted as of January 2008 in our Level I Trauma Center allowing trauma surgeons to manage patients with an ICH ≤1 cm and a Glasgow Coma Score greater than 10. Patients with fall as the primary mechanism of injury with a TBI resulting in an ICH ≤1 cm were included. Patients with comorbidities were excluded.

Results: Between 2006 and 2011, 2,109 patients had trauma activations resulting from a fall. Of those patients, 323 presented with a TBI resulting in an ICH =1 cm. One hundred twenty-four patients with TBI were treated prior to initiation of protocol and 199 were treated after protocol. Neurosurgery consults decreased from 93.5% to 83.4% for TBI patients after protocol initiation, $p < 0.01$. No significant differences were observed for age, sex, race, Glasgow Coma Score, or injury severity score. Additionally, there were no differences in outcomes such as length of stay, where patients were discharged to, condition on discharge, or Glasgow Outcome Scores.

Conclusion: This homogenous sample of patients enables us to examine patient outcomes in the absence of comorbidities. We found the number of neurological consultations significantly reduced after protocol implementation. These data suggest patients managed by trauma surgeons did not have outcomes different from those managed by neurosurgeons for ICH ≤1 cm. This study was approved by our hospital's institutional review board.

Poster # 8

AORTIC INJURIES IN NEWER VEHICLES

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Objective: Aortic injuries (AI) are highly lethal and significantly contribute to vehicular crash mortality. It remains unknown whether safety improvements implemented in newer vehicles have resulted in a decreased risk of aortic injuries. The objective of this study is to determine whether newer vehicles are linked to a lower risk of AI. **Methods:** The occurrence of AI was studied in relation to vehicle model year (MY) among front seat vehicular occupants, age $\geq$ 16 entered in the National Automotive Sampling System Crashworthiness Data System (NASS-CDS) between 2000 and 2008. NASS-CDS is a probability sample of all police reported crashes in the US containing detailed data on thousands of minor, serious, and fatal crashes. After weighting NASS-CDS is representative of all crashes in the USA. AI association with other occupant, vehicular and crash characteristics was explored. MY was categorized as <1994, 1994-1997, 1998-2004, or 2005-2008 reflecting the introduction of newer occupant protection technology. Logistic regression was used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) for the association between AI and MY independent of age, gender, direction of impact, delta V, rollover, vehicle type, restraint use, vehicle mismatch, etc. **Results:** AI occurred in 25,404 (0.08%) of the 32,174,651 (weighted) cases, and contributed to 12% of all deaths. AIs were positively associated with age>60, near side impact, high ?V, rollover, ejection and vehicle mismatch, and negatively associated with seatbelt use. The univariate analysis revealed no association between MY and AI. After adjustment for confounders, however, MY 98-04 and MY 05-08 showed increased odds of AI [OR 1.19 (1.02-1.40) and 1.62 (1.05-2.48), respectively] when compared to MY 94-97. MY <94 showed no association [OR 1.24 (0.94-1.63)]. Models stratified by direction of impact revealed accentuated findings in frontal crashes [OR 2.06 (1.15-3.69) and 2.66 (1.19-5.95) for MY 98-04 and MY 05-08, respectively], and a protective effect in near side crashes [OR 0.41 (0.20-0.82) and 0.27 (0.06-1.18) for MY 98-04 and MY 05-08, respectively]. **Conclusion:** Newer vehicles experience higher adjusted odds of AI during frontal crashes and lower odds of AI during near side lateral impacts. Further studies should establish which aspects of newer vehicle design are responsible for this effect.

Poster # 9

PATIENT SAFETY IN ACUTE CARE SURGERY: THE NEED FOR A CONCURRENT REGISTRY

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Background: Trauma has benefited from registry data to assess outcomes and guide interventions to improve patient care. Acute Care Surgery (ACS) is similar to trauma in that patients are often very ill predisposing them to multiple complications especially nosocomial infections. We hypothesized that our current process of reporting data for ACS patients is inadequate suggesting the need for a standardized registry. We sought to characterize the complication profile on an ACS service with focus on infectious complications as the primary outcome.

Methods: Resident reported M&M complication lists were analyzed according to JCAHO patient safety event taxonomy. *(Chang A et al, Int J Qual Health Care.2005;17:95–105)*. Data on infectious rates of complications were then compared with hospital epidemiology records.

Results: During 2009-2010, 2100 surgical procedures were performed on the ACS service. 122 patients had complications, with the 61 major complications presented in table. There was a 22.6% infectious complication rate and a mortality rate of 6.6%. Comparison of infectious complications with hospital epidemiology statistics demonstrates a 19-fold under-report of UTIs (2 resident-reported vs. 38 epidemiologic) and 5-fold for catheter-related blood stream infections (0 vs. 5).

COMPLICATION	No of Patients
Abscesses	13
Wound Complications (infection, dehiscence)	12
Anastomotic leak	5
UTI	2
Iatrogenic organ injury	4
Resuscitation, ICU errors	17
Death or withdrawal of care	8

Conclusions: Infectious complications represent a significant portion of complications on an ACS service. These complications appear to be underreported by our current process of identification. A distinct ACS registry is necessary to support the continued surveillance of all outcome measures such that effective protocols may be developed to improve patient safety, minimize complications, and improve outcomes.

Poster # 10

NEGATIVE PRESSURE WOUND THERAPY (NPWT): AN ADJUNCT TO HEMOSTATIC TREATMENT OF LARGE SOFT-TISSUE WOUNDS

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Objective: NPWT was initially developed for treating chronic nonhealing wounds but recently has been used for treatment of traumatic wounds. We investigated the potential hemostatic benefit of NPWT for control of refractory hemorrhage from a large soft-tissue wound in a swine model.

Methods: Prior to injury, coagulopathy was induced in pigs (n=38, 36 kg) by ~50% hemodilution and moderate hypothermia (core temp. 34.5±0.5°C). A large soft-tissue wound (~20 cm diameter) with multiple bleeding sites was created by slicing and removing a large portion of the gluteus maximus muscle and was allowed to bleed freely for 1 min to measure initial blood loss. Wounds were then randomly treated with either laparotomy gauze (GZ) or TraumaPad (TP, a kaolin-coated hemostatic dressing) alone or with a combination of these dressings and negative pressure (NP, ~ -500 mmHg). All wounds were covered and tightly sealed with adhesive sterile drapes. Fluid resuscitation was administered and titrated to a mean arterial pressure (MAP) of 60 mmHg. Pigs were observed for 150 min or until death and tissues were collected for histology.

Results: No differences were found in baseline measures. Induced coagulopathy measured by increases in PT (17%) and aPTT (24%), and initial blood loss (4.5 ml/kg) were similar in all groups. Other outcomes (mean ± SEM) are seen below (*P<.01 vs. GZ or TP; $^{\#}$ P<.05 vs. GZ).

Endpoints	GZ, n=8	TP, n=10	GZ+NP, n=10	TP+NP, n=10	*p* value
Hemostasis Achieved	0/8	1/10	7/10*	9/10*	<0.0001
Time to Hemostasis, min	N/A	95	34.4 ± 8.0*	25.1 ± 9.2*	<0.0001
Blood Loss, ml/kg	95 ± 10.9	97 ± 9.1	33 ± 13.3*	19 ± 8.4*	<0.0001
Fluid Infused , ml/kg	72.6 ± 5.3	70.2 ± 6.3	25.3 ± 9.3$^{\#}$	17.9 ± 7.1*	0.0008
MAP at 1 hr post-injury	37.8 ± 7.0	34.3 ± 5.5	62.9 ± 1.9*	59.3 ± 2.7*	<0.0001
% Survival	0	10	80*	90*	< 0.0001
Survival Time, min	70.7 ± 7.8	91 ± 13.0	145.3 ± 4.2*	146.3 ± 3.7*	<0.0001

Examination of treated muscle tissues showed superficial myofibril damage in all groups.

Conclusion: To our knowledge, the current data provide the first evidence that NP combined with standard hemostatic dressing serves as an effective hemostatic adjunct and stops lethal coagulopathic bleeding in large soft-tissue wounds.

Poster # 11

EMERGENCY DEPARTMENT NON-INVASIVE CARDIAC OUTPUT IS ASSOCIATED WITH TRAUMA ACTIVATION PATIENT INJURY SEVERITY AND HOST CONDITIONS

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Objectives: A non-invasive cardiac output monitor (NICOM), using bio-reactance technology, has been evaluated in several non-trauma patient studies. We hypothesized that NICOM cardiac output would have significant associations with traumatic injury severity and host conditions.

Methods: This is a prospective observational study of consecutive trauma activation patients during the first 10-60 minutes after emergency department arrival. We evaluated NICOM cardiac output relationships with systolic blood pressure, red blood cell (RBC) transfusion, major blood loss, end-tidal CO_2, Injury Severity Score, age, pre-existing medical conditions, illicit drug status, and body surface area.

Results: Analysis includes 270 consecutive trauma activation patients with 1,568 observations.

	Cardiac output (L/min.)**:**		
	Yes	**No**	**P-value**
Systolic blood pressure < 100	5.4 ± 2.4	6.5 ± 1.9	< 0.0001
RBC transfusion ≥ 3 units	4.5 ± 1.3	6.5 ± 1.9	< 0.0001
Major blood loss	5.8 + 2.1	6.5 + 1.9	0.0020
End-tidal CO_2 ≤ 25	4.7 ± 2.1	6.7 ± 2.0	< 0.0001
Injury Severity Score > 20	6.0 ± 1.8	6.6 ± 1.9	< 0.0001
Age ≥ 65 years	5.8 ± 2.0	6.7 ± 1.8	< 0.0001
Pre-existing medical condition	5.9 + 1.9	6.9 + 1.7	< 0.0001
illicit drugs	7.3 ± 1.8	6.1 ± 1.8	< 0.0001
Body surface area ≤ 1.7 m^2	5.1 ± 1.6	6.8 ± 1.8	< 0.0001

Conclusions: Emergency department NICOM cardiac output has a significant association with indicators of traumatic injury severity in acutely injured trauma activation patients. Early, non-invasive cardiac output also has a statistical relationship with host conditions commonly seen in at-risk trauma patients. The NICOM provides objective, discriminate hemodynamic information that may enhance early trauma patient evaluation and resuscitation.

Poster # 12

ENDOVASCULAR REPAIR OF THE THORACIC AORTA FOLLOWING BLUNT TRAUMA: OCCLUSION OF THE LEFT SUBCLAVIAN ARTERY DOES NOT CAUSE ARM ISCHEMIA OR STROKE

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Objectives: Thoracic endovascular aortic repair (TEVAR) has become the standard of care for treatment of traumatic rupture of the aorta (TRA) following blunt trauma. When used in the management of other aortic abnormalities, TEVAR with planned coverage/occlusion of the left subclavian artery (LSA) can result in symptomatic left arm ischemia or stroke. This may not be true in trauma patients as they are often younger and free of arterial disease. This study evaluates the incidence of left upper extremity (LUE) symptoms and stroke in patients with TRA after TEVAR with or without occlusion of the LSA following blunt trauma. **Methods:** Blunt trauma patients admitted between January 2001 and May 2011 with ICD-9 codes for vascular injury or CPT codes for thoracic aortic procedures were identified using trauma and vascular surgery registries. Patient demographics, injury severity score (ISS), TEVAR procedure data, outcome and follow-up data were collected.

	Uncovered LSA N=18	Covered LSA N=13
Average age (yrs)	36±18	41±21
Average ISS	32±10	37±10
Average ICU LOS days	14±14	16±15*
Average ventilator days	5±5	9±10*
LUE injury	6 (35%)	5 (38%)#
LUE neuro symptoms	2 (11%)	3 (23%)#
LUE claudication	0 (0%)	1 (8%)#

*P<0.05 #P=NS

Results: Thirty-one patients (61% male, 73% MVC) underwent TEVAR for blunt aortic injuries, with at least partial LSA occlusion in 13 patients. TEVAR was performed on average on PID 0.7 (0-6 days). Age, gender, mechanism, ISS, incidence of LUE injury and timing of TEVAR were similar between the two groups, while ICU length of stay, and ventilator days were greater in the covered patients. (Table) Mean length of follow-up was 9 months (0-42 months) for the un-covered group and 21 months (1-108 months) for the covered group. 11% of uncovered patients vs. 31% of covered pts reported LUE symptoms (one with claudication). (Table) All patients in the covered group with LUE neurologic symptoms also had LUE injuries. At most recent follow-up, no patient had symptoms attributable to the stent graft. No patients required vascular re-intervention. None of the covered LSA group developed vertebro-basilar insufficiency. C**onclusion**: Planned coverage/occlusion of the left subclavian artery during TEVAR for blunt thoracic aortic rupture does not appear to result in symptomatic left arm ischemia or stroke in trauma patients.

Poster # 13

FASCIOTOMY REDUCES COMPARTMENT PRESSURES AND IMPROVES RECOVERY IN A PORCINE MODEL OF EXTREMITY VASCULAR INJURY AND ISCHEMIA/REPERFUSION

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Objective: The objective of this study is to establish a model of extremity compartment syndrome following vascular injury, hemorrhage and ischemia/ reperfusion. An additional objective is to determine the effect of fasciotomy on measures of neuromuscular recovery.

Methods: Yorkshire swine (75+/-5kg) underwent 35% blood volume hemorrhage, followed by 1, 3 and 6 hours of ischemia (n=17; 1HR, 3HR, 6HR) via iliac artery occlusion followed by repair and reperfusion. A second cohort (n=18) underwent fasciotomy of the anterior compartment of the hind limb following vascular repair (1HR-F, 3HR-F, 6HR-F). Compartment pressures and measures of electromyographic (EMG) recovery were performed throughout a 14 day survival period and tissue histology examined at the completion of the study.

Results: Increasing ischemic intervals resulted in incremental increases in compartment pressure ($p<0.05$) which were directly related to degree of muscle degeneration ($p<0.05$) and inversely related to nerve recovery (Figure 1; $p<.05$). Fasciotomy prevented increases in compartment pressure ($p<.05$) and improved nerve recovery in the 3HR-F but not the 6HR-F group (Figure 2). Fasciotomy following 6 hours of ischemia (6HR-F) resulted in apparent decreases in muscle degeneration ($p=.15$).

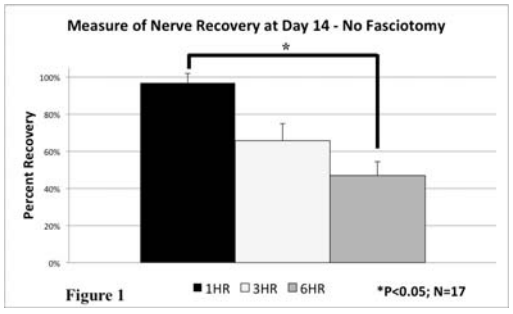

Figure 1

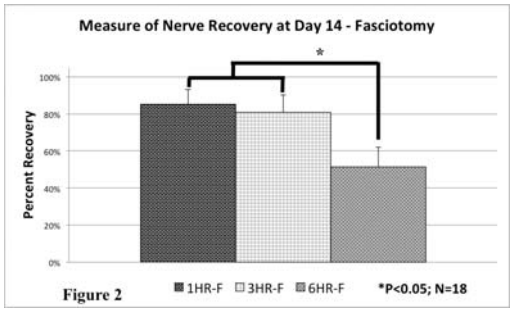

Figure 2

Conclusion: This study demonstrates a model of vascular injury, hemorrhage and compartment syndrome supporting the effectiveness of prophylactic fasciotomy. In this model, elevated compartment pressures limit nerve recovery following extremity vascular injury; a negative effect which is mitigated by fasciotomy in conjunction with restoration of flow within 3 hours of injury.

Poster # 14

IMPLEMENTATION OF EVIDENCE-BASED GUIDELINES FOR THE PREVENTION OF VENOUS THROMBOEMBOLISM IN TRAUMA PATIENTS: WHAT DO THEY ACTUALLY PREVENT?

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Objectives: In 2008 the American College of Chest Physicians (CHEST) published the 8th edition of their evidence-based clinical practice guidelines for the prevention of venous thromboembolism. In response, our institution implemented the CHEST guidelines for major trauma patients admitted to the hospital. The objective of this study is to investigate the effect of implementing the CHEST guidelines on the rates of deep vein thrombosis (DVT) and pulmonary embolism (PE). We hypothesized that implementation of the CHEST guidelines would reduce the incidence of DVT and PE in our major trauma patients. Methods: We performed a retrospective review of trauma patients admitted to our urban, level I trauma center. We studied only major trauma patients, defined as trauma patients requiring admission to the intensive care unit. We studied two time periods, one prior to implementation of the CHEST guidelines from Jan 2007 – June 2008 (before group) and one after implementation of the CHEST guidelines from Jan 2009 – June 2010 (after group). The before and after groups were compared and the primary outcomes were DVT and PE, while secondary outcomes included the rate of venous doppler ultrasonography (DUS), inferior vena cava filter (IVCF) placement, hospital charges, and mortality. Results: There were a total of 1588 major trauma patients admitted to our ICU during the two study periods, 770 (48%) were admitted before and 818 (51%) were admitted after implementation of the CHEST guidelines. The before and after groups were comparable with regards to age, gender, mechanism of injury, and ISS. After implementation of the CHEST guidelines there was an increase in the diagnosis of DVT (0.2% → 1.2%, p=0.03) but no difference in the incidence of PE (0.6% → 0.8%, p=0.7). Furthermore, there was an increased use of DUS (5% → 26%, p<0.001) but a decrease in the placement of IVCF (8% → 3%, p<0.001). The after group had higher average hospital charges ($147,197 vs. $112,543, p<0.001) but there was no difference in mortality (11% → 14%, p=0.11). Conclusions: Implementation of the CHEST guidelines in our trauma population was associated with increased the use of DUS, increased detection of DVT, and an increase in hospital charges without a significant improvement in the incidence of PE or mortality.

Poster # 15

THE IMPACT OF ANTI-PLATELET DRUGS ON TRAUMA OUTCOMES

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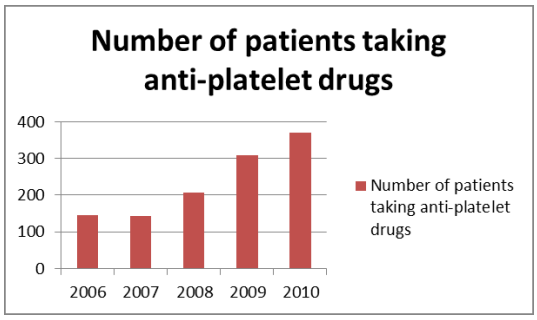
Objective: Anti-platelet drugs (APD) are commonly prescribed. We wondered whether trauma victims receiving pre-injury APD have worse outcomes.

Methods: We interrogated our institutional database to evaluate preoperative risks and trauma outcomes in patients taking APD before traumatic injury. We used propensity balancing scores in order to adjust for preoperative risks in assessing outcomes in clopidogrel-treated patients.

Results: Over a five year period, 1327 (11.7%) out of 11,374 adult trauma victims took APD before injury. The use of APD in trauma patients increased significantly during the study period (Figure). APD patients were older and had significantly increased Injury Severity Score & GCS. Cardiac, pulmonary, and renal co-morbidities were significantly more common with APD. Multivariate regression indicated that pre-injury APD predicted significantly worse composite morbidity and mortality (odds ratio = 1.9). After propensity adjustment for pre-injury risk factors, APD treatment conferred significantly increased risk of certain, but not all, adverse outcomes (Table).



Variable	APD	No APD	p-value
Cardiac complications	28.00%	13.60%	0.017
Composite morbidity	39.00%	24.60%	0.037
Mortality	5.10%	4.20%	N.S.
Length of stay (days)	8.5 ± 9.3	7.2 ± 7.8	N.S.

Conclusions: APD-treated trauma victims have significantly more co-morbidities compared to those not taking APD. After adjusting for preoperative risks, APD-treated patients have significantly worse outcomes. The number of trauma patients taking APD increased during the 5 year study period, so we speculate that trauma management of patients taking APD will occur more commonly in the future.

Poster # 16

DISTRACTED DRIVING AND IMPLICATIONS FOR INJURY PREVENTION IN ADULTS

Jane S Hoff, MSN, CNM, RN, April Simons, RN, ONC, Jennifer Grell, BSN, RN, Nicole Lohrman, MSN, RN, Christy Stehly, BS, Jill Stoltzfus, PhD, Gail Wainwright, MSN, RN, NE-BC, William S Hoff, MD, FACS

Objective: Distracted driving, a significant public safety issue, is typically categorized as cell phone use and texting. The increase of distracted driving behaviors (DDB) has resulted in an increase in injury and death. The purpose of this study was to identify the frequency and perception of DDB in adults.

Methods: An 11-question SurveyMonkey™ questionnaire was distributed to a convenience sample of adults = 18 years-old. Standard demographics included age, gender, and highest levels of education. Primary outcome questions were related to frequency of DDB, and overall perceptions specific to distracted driving. Results were compared based on demographics. Chi-square testing and the Kruskal-Wallis analysis of variance were applied, with statistical significance defined as $p < .05$.

Results: There were 1857 respondents to the survey: 1721 age 23-64 years old (93%); 1511 were female (81%); 1461 = high school education (79%). 168 (9%) reported being involved in a car accident while distracted. The highest reported frequency of DDB included cell phone use (69%), eating/drinking (67%) and reaching for an object in the car (49%). Younger age (18-34 years) and higher level of education (= bachelor's degree) was statistically associated with these DDB; gender demonstrated no statistical significance. Text messaging was reported by 538 (29%), with a statistically significant association with age (18-34 years), higher education (= bachelor's degree) and gender (males). 1143 (63%) respondents believed they could drive safely while distracted.

Conclusion: This study demonstrates that DDB in adult is not restricted to reading and sending text messages. Moreover, these results indicate that people fail to perceive the dangers inherent in distracted driving. Prevention and outreach education should not be limited to texting and cell phone use, but should target all forms of DDB. The age group 18-34 years-old should be the primary target in the adult population.

Poster # 17

TIMING OF DEFINITIVE FIXATION IN HIGH-ENERGY PELVIC RING INJURIES: DOES ON-GOING RESUSCITATION PRECLUDE OPERATIVE INTERVENTION?

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Objective: Physiologic parameters, such as serum lactate and base deficit, are often used as markers of hemodynamic resuscitation. Few studies have evaluated the timing of fixation in high-energy pelvic ring injuries with regard to these markers. The purpose of this investigation was to compare early (<24 hours) delayed (= 24 hours) fixation of unstable pelvic ring injuries.
Methods: Retrospective investigation, January 2004-October 2009 at an academic Level-1 trauma center. Inclusion criteria: age =18 years, pelvic ring disruption manageable with minimally invasive open reduction internal fixation (ORIF) of the symphysis and/or percutaneous sacroiliac screws, and Injury Severity Score (ISS) >15. Demographics, ISS, 24-hour blood transfusion requirements, initial physiologic parameters (emergency department systolic blood pressure (EDSBP), serum lactate, and base deficit), angiography, ventilator days, intensive care unit (ICU) length of stay (LOS), hospital LOS, and mortality were collected.
Results: Fifty-one patients met inclusion criteria: 13/51 (25.5%) had acute definitive fixation and 38/51 (74.5%) staged delayed fixation for a high-energy unstable pelvic ring injury. No demographic differences noted; patients with staged delayed fixation had greater ISS scores (36.1±11.4 vs. 27.2±10.6, p=0.02). Initial physiologic parameters were similar between acute and delayed groups (EDSBP: 118.5±24.5 vs. 114.5±27.4, p=0.64; Lactate: 2.8±1.6 vs. 3.1±1.7, p=0.51; Base deficit: 6.5±4.8 vs. 7.2±5.6, p=0.69). There were no angiographic differences (1/13, 7.7% vs. 3/38, 7.9%; p=0.98) or 24-hour transfusion requirements (6.2±13.4 vs. 6.3±9.9, p=0.97). Patients with acute definitive fixation demonstrated a trend towards fewer ventilator days (2.5±3.7 vs. 6.3±6.3, p=0.05), ICU (3.5±4.2 vs. 6.8±6.2, p=0.08) and hospital (11.2±6.9 vs. 18.7±13.0, p=0.05) LOS. Mortality rates were not significantly different (1/13, 7.7% vs. 1/38, 2.6%; p=0.42).
Conclusion: Acute definitive minimally invasive fixation of unstable pelvic ring injuries may be safely performed even in polytraumatized patients requiring on-going hemodynamic resuscitation. Patients with definitive fixation within 24-hours did not have significantly worse initial physiologic parameters, required similar transfusion requirements, and demonstrated a trend towards reduced ventilator days, ICU and hospital LOS.

Poster # 18

NOT SO FAST TO SKIN GRAFT...TRANS-ABDOMINAL WALL TRACTION CLOSES MOST "DOMAIN LOSS" ABDOMENS IN THE ACUTE SETTING

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Background: Damage control laparotomy (DCL) and decompressive laparotomy (DL) have revolutionized the surgery of injury. However, with such a paradigm shift, has surfaced the dilemma of the un-closable abdomen. Within every trauma population exists a sub group of patients, who, after resuscitation and subsequent diuresis, have lost domain and are not closable.. Prior to the adoption of our Open Abdomen Protocol (OAP) and use of Trans-Abdominal Wall Traction (TAWT), these patients required skin graft and acceptance of a planned ventral hernia (PVH). **Methods:** Over an eighteen-month period all DCL and DL patients in our urban trauma center were placed into our OAP. Twenty-one were deemed "domain loss abdomens" and were non-closable after achieving physiologic steady state (PSS) near dry weight (NDW). Abdominal wall defects were measured at the mid-wound gap (width), and by length. All patients received the TAWT device when NDW was achieved. Wound size, days to closure, days to TAWT and TAWT to closure were tracked. **Results:** Over an 18-month period, using the OAP, TAWT was applied to 21 patients (ISS >30, 100% penetrating trauma). All patients demonstrated domain loss precluding fascial closure. Average wound size was 18.30 cm width by 30cm length. At time of placement, in all patients, TAWT decreased initial wound width by an average of 10.4cm (55%). All patients achieved primary fascial closure using this method. No components separation or biologic bridge operations were performed. Mean time TAWT to closure was 8.83 days. Mean time admission DCL surgery to TAWT was 9.33 days. Patients returned to the OR for tightening /washout an average of 2 times (excluding TAWT insertion and final closure operations). The mid wound fascial gap (width) decreased an average of 2.0 cm with each tightening. Mean time from admission surgery to primary closure was 18.17 days. **Conclusion:** OAP with TAWT has revolutionized the way we manage our "domain loss" open abdomen patients and has virtually eliminated the acceptance of planned ventral hernia. TAWT consistently recaptures lost domain by stretching the oblique muscles. It preserves the leading fascial edge, and it eliminates the need for biologic bridges, components separation and skin grafts.

Poster # 19

EVALUATION OF PATIENT VITAL CAPACITY AND PAIN FOLLOWING RIB OPEN REDUCTION INTERNAL FIXATION FOR FLAIL CHEST

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Objectives:

Of the 15% of patients admitted to trauma centers secondary to blunt chest trauma, one third will present with a unilateral or bilateral flail chest. Surgical stabilization of flail chest has been practiced with controversial indications for the past fifty years. We evaluated patient outcome following open reduction internal fixation (ORIF) of flail chest at our level-I trauma center.

Methods:

Over a period of twenty-two months, twenty intubated and non intubated patients underwent flail chest ORIF. Patients were selected according to our institutional protocol for flail chest and stabilized through a minimal invasive technique. Spontaneous vital capacity and subjective pain scores were measured preoperatively and postoperatively.

Results:

Mean spontaneous VC increased 92% and mean patient reported pain scores decreased 54% following ORIF. To date, no early or late infections or hardware failure have been observed. One case of heterotopic ossification of the chest with chronic pain was noticed 6 months postoperatively. Pain was treated with conservative management.

	All Patients			0-3 Vent Days			>3 Vent Days		
	Preop	Postop	p-val	Preop	Postop	p-val	Preop	Postop	p-val
VC	434	875	2E-05	540	1103	0.001	347	709	0.006
Mean Pain	9.3	4.3	1E-10	10	4.4	1E-06	7.8	4.3	0.003
-Median	10	5	--	10	4.5	--	7.5	5	--
-Range	6-10	2-6	--	10-10	3-6	--	6-10	2-6	--
-Q1-Q3	10-10	3.5-5	--	10-10	3.8-5	--	6-9.3	3.5-5	--

Conclusions:

ORIF of patients with flail chest seems to help improve VC and decrease pain compliance. Further an institutional protocol, as used in our patient population, may aide in better patient screening. Decreased pain is thought to decrease ICU days, ventilator dependency, and length of hospital stay. A prospective, randomized study is needed to evaluate these other endpoints.

Poster # 20

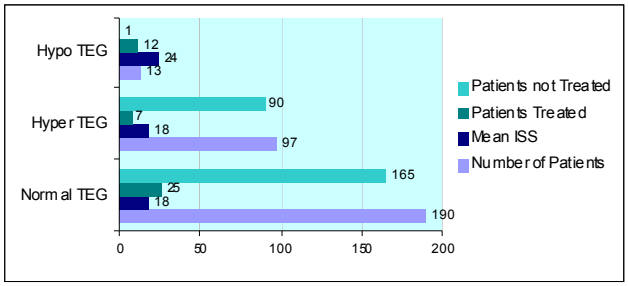
ASSESSMENT OF THE USEFULNESS OF THROMBOELASTOGRAPHY IN TRAUMA PATIENTS

Alexander Axelrad, MD, FACS, FCCM, Marie N Livesey, Atlanticare Regional Medical Center

Objective: Determine if thromboelastography (TEG) has benefit over standard coagulation tests when treating trauma patients.

Methods: A retrospective review of 300 trauma patients was conducted from February 2009-January 2010. The patients were separated based on their type of injury and the results of the initial TEG upon admission. The results of the TEG upon admission were compared to the standard coagulation tests, determining which coagulation test guided therapy.

Results: On admission 4.3% of patients had a hypothrombotic TEG, 32.3% patients had a hyperthrombotic TEG, and 63.3% patients had a normal TEG on admission. Multiple trauma patients had the largest percentage of patients with a hypo TEG on admission. 14.6% of the trauma patients received transfusion therapy. The hypo TEG patients had the most severe injuries and 92% of those patients received transfusion therapy. The majority of the treatments were administered using only the abnormal TEG results as a guide. 37% of treatments were administered using the abnormal TEG and standard coagulation tests as a guide.



Conclusions: Our study supports the use of TEG to guide transfusion therapy in trauma patients. This study reconfirmed previous trauma coagulation studies, that a small percentage of trauma patients will have a hypo TEG on admission. It also reconfirmed that trauma patients who arrive with more severe injuries (greater ISS) are at a greater risk for early coagulopathy. These patients would be more likely to require early aggressive transfusion therapy in order to improve mortality. A further analysis of the 13 patients with an initial hypo TEG demonstrated more patients had transfusion therapy guided by TEG results than standard coagulation tests. In addition, the TEG enabled transfusion therapy specific to the patients' underlying state of coagulopathy and/or thrombocytopathy (platelet transfusions held despite low quantitative numbers with normal qualitative function).

Poster # 21

FIRST TAKE: UTILITY OF PORTABLE CHEST X-RAY IN THE PEDIATRIC TRAUMA PATIENT

Constantine G Saites, MD, W. SCOTT Harmsen, MS, Christopher Moir, MD, Abdalla E Zarroug, MD, Michael B Ishitani, MD, D. DEAN Potter, MD, Mayo Clinic, Department of General Surgery

Objectives: Chest computed tomography (CCT) has become a popular method of trauma evaluation in children despite the risks of radiation to pediatric patients and its cost effectiveness. The indications for CCT are not clearly defined and their results rarely lead to a change in management. We examined our pediatric trauma patients to determine the utility of chest X-ray (CXR) as compared to CCT.

Methods: Records of pediatric patients (<17yoa) who underwent portable CXR during evaluation for non-penetrating trauma between the years 2006-2010 were reviewed. Variables including age, gender, race, admitting vitals, physical exam, mechanism of injury, length of stay, complications, surgical interventions, and discharge information were tabulated. Final radiology reports of initial CXRs and CCT scans were also reviewed and compared.

Results: We analyzed 394 patients, half of whom (n=197) underwent CCT. Patients that underwent CCT had lower mean GCS (14.0 vs. 12.4, p<.0001), higher mean ISS scores (12.6 vs. 7.7, p <.0001) and higher mean Chest AIS scores (0.9 vs. 0.2, p<.0001) than non-CCT patients. Patients who were intubated (54% vs. 18%), had significant CXR findings (35% vs. 10%), suffered high-velocity injury (57% vs. 43%) and had abnormal chest physical exam findings (54% vs. 24%) were more likely to undergo CCT (all p<.01). Our CCT cohort had a mean ICU length of stay (LOS) that was 3.26 times greater than non-CCT patients (1.83 days vs. 0.56, p<.001) as well as an overall longer LOS (4.52 vs. 2.60, p<.001). Eighteen of 197 patients (9.1%) had findings of thoracic injury on CCT that were not noted on CXR (9 pneumothoraces, 7 fractures, 2 with pneumomediastinum, and 1 pericardial effusion). Only 2 patients (1.0%) required an additional intervention (2 tube thoracostomies) due to these CCT findings.

Conclusions: Patients selected for CCT were more severely injured and required longer hospital stays. While CCT was more sensitive in detecting thoracic injury, the findings altered management in only 1% of patients with negative screening chest X-rays. Chest CT should be used judiciously for even severely injured pediatric trauma patients.

Poster # 22

DO TRAUMA PATIENTS NEED AN ASPIRIN? STROKE RISK AND TRAUMA

Jason W Smith, MD, Jason Sciarretta, MD, Jodi Wojcik, ARNP, Karina Pentecost, ARNP, Brian G Harbrecht, MD, Glen A Franklin, MD, University of Louisville

Objective: Acute traumatic injury has been shown to produce a prothromobotic state. Does this state predispose trauma patients to increased risk of cerebrovascular accident (CVA)?

Methods: A case controlled retrospective analysis of trauma admissions from 2008 to 2010 identified 64 patients with CVA in 7633 trauma admissions. A control group of 14,121 med/surg patients were obtained from hospital database. Univariate & multivariate analysis was performed.

Results: The overall rate of CVA for trauma patients was 0.8%. There were 41 patients suffering non-injury related CVA of 64 identified patients. Excluding injury related CVAs (TBI & blunt cervical vascular injury), trauma related CVA patients had more CVA risk factors, significantly higher mortality, & required more frequent SNF placement compared to ISS matched non-CVA trauma controls. (TABLE 1: Trauma Patients matched for ISS)

	n	ISS	Age *	HTN *	Afib	DM *	Tobacco use *	Mortality*	ECF placement *
CVA	41	18 + 10	51 + 24	21 (51%)	3 (7%)	11 (27%)	24 (58%)	9 (22%)	26 (81%)
No CVA	120	18 ± 4	32 ± 26	27 (23%)	2 (2%)	11 (9%)	44 (37%)	8 (7%)	34 (28%)
p		NS	≤ 0.001	≤ 0.002	≤ 0.1	≤ 0.007	≤ 0.02	≤ 0.009	≤ 0.0001

Five patients had patent foramen ovale (PFO) with paradoxical embolism and 5 patients suffered CVA secondary to fat emboli after orthopedic fixation. Controlling for known risk factors for CVA (Age, Hypertension [HTN]; Diabetes [DM]; Atrial Fibrillation [Afib]; & Tobacco Use), trauma patients were 1.6 times more likely to develop a non-injury related CVA than medical/surgical controls.(TABLE 2) The trauma related CVA patients tended to be younger and had higher 6 month post CVA functional assessment compared to med/surg patients with similar risk factors.

	n	# non-injury CVA	Odds Ratio	p
Trauma	7,633	41	1 : 1.6	0.024
Med/Surg	14,121	46		

Conclusion: Trauma appears to be an independent risk factor for CVA. Trauma patients that suffer a CVA have a higher risk of death and increased risk of ECF placement compared to ISS matched controls. CVA prophylaxis may be warranted in select patients.

Poster # 23

IMPLEMENTATION OF A BLUNT TRAUMA IMAGING PROTOCOL DECREASES HIGH DOSE RADIOGRAPHIC STUDIES DURING INITIAL TRAUMA EVALUATION

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Background: Substantial variability exists in the ordering practices of physicians during the initial evaluation of blunt trauma patients, which may result in unneeded exams and unnecessary radiation exposure. We examined the impact of the implementation of an evidence-based radiographic imaging protocol on imaging utilization during the initial evaluation of blunt trauma patients.

Methods: A multidisciplinary group developed a set of evidence-based guidelines for ordering initial radiographic studies of the head, face, neck, chest, abdomen, as well as the cervical, thoracic and lumbar spine. The guidelines were based on the Canadian Head CT Rule, the Canadian C-spine Rule, and other current literature. All adult blunt trauma patients who were admitted to the trauma service at a Level I trauma center during a 3 month period had initial studies ordered according to the protocol. Patients presenting with old trauma or outside imaging studies were excluded. Results were compared to control patients admitted during a 3 month period one year prior to the study period.

Results: A total of 229 study patients were compared to 215 historical controls. All results are reported per 100 patients.

	Study	Control
Total CT scans	271	298
CT head	85	82
CT c-spine	86	84
CT chest	33*	53
CT abdomen	43*	57

Conclusion: Implementation of a blunt trauma radiographic imaging protocol reduced the number of CT scans by 27 studies per 100 patients. The greatest decreases were in CT chest (20 studies/100 patients) and CT abdomen (14 studies/100 patients) ($p<0.05$). Conventional xray of the thoracic and lumbar spine increased since reformatted spine images from CT of the chest and abdomen was less frequently available. There was also a slight increase in CT head, CT angio neck and CT cervical spine due to more uniform adherence to guidelines. There were no missed injuries during either period. Overall, implementation of the imaging protocol resulted in less use of high-dose radiographic imaging studies.

Poster # 24

TRAUMATIC AORTIC INJURY SELECTIVE MANAGEMENT IS SAFE AND EFFECTIVE

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Introduction: Endovascular Repair (EVR) including delayed repair may improve outcomes after traumatic aortic injury (TAI). Some patients may safely be observed. We sought to determine whether CT could help plan management and optimal timing of repair.

Methods: We retrospectively reviewed blunt TAI for the last three years. Demographics, outcome, management choices and timing were recorded. TAI's were classed as grade I, intimal flap or intramural hematoma, grade II, small pseudoaneurysm (PSA) < 50% circumference, grade III, large PSA, >50% circumference, and grade IV, rupture or transaction. All patients with stable vitals were treated with B blockers. Minor injuries were observed. EVR was the preferred therapy and was done urgently for larger injuries. Unstable patients with high grade injuries had emergency open repair.

Results: We treated 57 patients with TAI, 36 were male with a mean age of 47 (± 19.5) years. There were 50 vehicular crashes, 5 pedestrians struck, 1 fall, and 1 crush. Two patients presented in arrest and 28.1% were hypotensive on arrival.

	n (%)	*ISS*	*Grade*	*Survival %*	*Morbidity %*
Total	57 (100%)	39	2.1	82.5	28
Observed	25(44%)	38	1.3	72	0
EVR > 24 h	11(19%)	32	2.1	100	18
EVR < 24h	18(32%)	43	2.8	94	33
EVR 6-24h	10(18%)	42	2.8	90	30
EVR < 6h	8(14%)	45	2.75	100	38
Open	3(5%)	58	4	33	33

No patients observed required later repair. There was no difference in mortality (p=1.00) or morbidity (p=.67) between EVR < 24 h and >24h EVR or between EVR < 6h and EVR 6 to 24h (p=1.00 for both mortality and morbidity).

Conclusion: Therapy for TAI can be effectively guided by CT, and 40% with low grade injuries can be observed. Early repair, including within 6 hours appears equivalent to later repair in an experienced center where EVR is immediately available.

Poster # 25

TRAUMA TRANSFERS AND DEFINITIVE IMAGING: PATIENT BENEFIT BUT AT WHAT COST?

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University of Missouri

Background: Many patients undergo CT scan prior to transfer to definitive trauma care. Formal evaluation of outside imaging is problematic. With concern over radiation risk and healthcare costs, our trauma center implemented an inter-departmental process for formal in-house interpretation of CT scans performed at outside hospitals (OSH) prior to transfer.

Methods: All patients transferred with digital imaging were included. Images were evaluated for adequacy and system compatibility. Images meeting criteria received formal radiographic interpretation from our trauma center radiologists in the electronic medical record and constitute the in-house interpretation (IHI) group. As part of a quality assurance project, a retrospective analysis was performed at the end of the first quarter. Evaluation of patient demographics, missed injuries, number and type of CT scans, cost savings, revenue and productivity loss and extrapolated cancer risk reduction based on BEIR VII data was performed.

Results: Ninety-five patients were transferred with OSH scans. Forty-one (43%) patients met inclusion criteria for IHI. Average age was 50 years (39% female, 61% male). No missed injuries or diagnostic delays were identified with the use of outside CT scans as definitive radiographic evaluation. Head CT was most commonly repeated in both groups. The IHI group was significantly less likely to undergo repeat CT scans (59 vs. 25, p=0.02). Repeat C-spine studies were decreased 8-fold in the IHI group. Though unmatched, there was a significant reduction in patient charges, averaging $3258 in the IHI group. Uncaptured wRVU and professional fee losses from OSH interpretation averaged 3.71 wRVU and $673 per patient. Mean radiation decrease in the IHI group was 0.00231Gy per patient. Based on annual volume and demographics, we would prevent one cancer occurrence every 3 years.

Conclusion: Use of OSH imaging as the definitive evaluation of injured patients is safe and results in and overall decrease in healthcare cost at the expense of trauma center generated revenue and fees for professional services. Radiation risk reduction was minimal. A process of efficient image transfer and interpretation has the potential to further reduce healthcare cost and cancer risk for injured patients.

Poster # 26

REGIONAL VARIATIONS IN COST OF TRAUMA CARE IN THE UNITED STATES: WHO IS PAYING MORE?

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Objective: Regional variations in costs of care have been used to identify areas of savings for several diseases and conditions. This study investigates similar potential regional differences in the cost of adult trauma care using an all-payer, nationally representative sample.

Methods: Trauma patients aged 18-64 years in the 2008 National Inpatient Sample were identified using ICD9 codes. Those with isolated diagnoses for 5 index conditions (ICs): blunt splenic injury, liver injury, tibia fracture, moderate traumatic brain injury, and pneumothorax/ hemothorax (PNHTX) were selected. Costs were estimated from charges using cost-to-charge ratio. Generalized linear modeling compared mean cost for treating these ICs between US regions (Northeast, South, Midwest, West), adjusting for hospital factors (size, teaching status, location), patient demographics, injury severity, length of stay, Charlson comorbidity index, local wage index and payor. Hospital level clustering was accounted for using generalized estimating equation. Differences in adjusted mortality for ICs between regions were assessed.

Adjusted Mean and Relative Costs for Different Index Injuries (95% CI)

	Northeast Mean cost (Reference)	Relative cost increase Midwest	Relative cost increase South	Relative cost increase West
Liver	$ 22,494	1.28(1.11, 1.47)	1.20(1.03, 1.39)	1.39(1.20, 1.60)
Spleen	$ 28,531	1.29(1.09, 1.54)	1.20(1.04, 1.40)	1.30(1.14, 1.47)
PNHTX	$ 17,701	1.31(1.16, 1.47)	1.18(1.04, 1.35)	1.44(1.29, 1.60)
Tibia	$ 11,651	1.23(1.07, 1.41)	1.21(1.08, 1.36)	1.32(1.18, 1.47)
Mild TBI	$ 9,438	1.26(1.12, 1.41)	1.19(1.05, 1.36)	1.40(1.26, 1.57)

Results: Adjusted relative costs were estimated for 147,572 patients (South 63,983; Midwest 30,239; West 29,793; Northeast 23,557). Mean costs for all conditions were lowest in the Northeast, whereas the West appeared to have the highest adjusted costs. No differences in mortality by region were noted for any of the index conditions.

Conclusion: Even after controlling for factors known to influence medical care cost, as well as controlling for geographic differences in pricing, significant regional differences exist in the cost of trauma care. Exploring these variations may assist in identifying potential areas for cost savings.

Poster # 27

RATIO OF THE CROSS-SECTIONAL AREAS OF THE INTERNAL JUGULAR VEIN AND THE COMMON CAROTID ARTERY CORRELATES TO CENTRAL VENOUS PRESSURE

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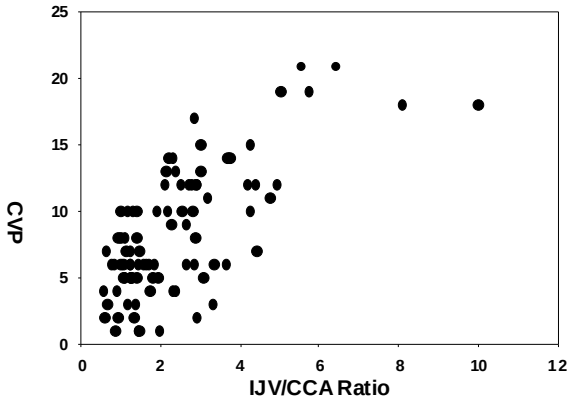
Objective: To determine if there is a correlation between Central Venous Pressure (CVP) and the ratio of the cross-sectional areas of the internal jugular vein (IJV) and the common carotid artery (CCA) determined by external ultrasound (US) measurement.

Methods: After obtaining IRB approval, a series of CVP measurements with concomitant US imaging of the IJV and CCA were obtained from critically-ill patients in our Surgical Intensive Care Unit from April 2010 to April 2011. The US image representing the maximal cross-sectional area of both vessels was selected for analysis, and the cross-sectional areas were measured with the included software. In addition to regression analysis, data was analyzed categorically and grouped by CVP <8 or =8 and IJV/CCA ratio <2 or =2. Significance was defined as $p < 0.05$.

Results: 90 measurements were performed on 29 patients. 35 of 44 measurements with a CVP =8 had a ratio =2 (sensitivity 80%), while 36 of 46 patients with CVP <8 had a ratio <2 (specificity 78%). There was a statistically significant association between CVP =8 and IJV/CCA ratio =2 by X^2 analysis, $p < 0.001$. Regression analysis exhibited a significant association as well ($p < 0.001$, $R^2=0.49$). In a subset of 24 paired measurements, the ability of two physicians to independently obtain reproducible measurements was examined and demonstrated excellent categorical agreement, $\kappa = 0.909$.



Conclusions: This study suggests that an US-measured cross-sectional area of the IJV that is at least twice that of the CCA correlates well to a CVP of at least 8 mm Hg. Additionally, this method is reliably reproduced between independent operators, indicating extended use of this technique may be possible. Although this method should not supplant continuous monitoring practices, it offers promise as a means of rapid, non-invasive assessment of volume status outside of the ICU environment.

Poster # 28

TRAUMA LEAGUES: A NEW CONCEPT TO ATTRACT MEDICAL STUDENTS TO A CAREER IN SURGERY

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Introduction. Trauma Leagues are academic associations in which medical students gather with a supervising physician (professor) to: 1) improve their knowledge in the areas of surgery and emergency care; 2) have an early contact with environments such as the emergency room, operating room, and trauma resuscitation bays; and 3) observe the surgeons at work (apprenticeship). In recent decades a number of studies have demonstrated that the number of surgical applicants for residency has decreased worldwide. Strategies to motivate medical students to choose surgery are needed.

Objective. To evaluate the impact of participation in the Trauma League in the choice for a surgical career.

Methods. The study included 260 students in a Brazilian university hospital who were part of the Trauma League within at least 2 years from graduation. Research of records in universities and medical societies about the specialties choosen during residency were evaluated. A Likert questionnaire was sent to participants to evaluate the impact of participating in the Trauma League in the student's professional career.

Results. Forty one percent of the students chose general surgery (national rate is near 15%). The questionnaire was answered by 69.2% of the participants, with a post graduating time of 6.3 years. Of those, 49.5% chose general surgery, 58% didn't know what medical career to chose when joined the league, 26% were in doubt, and 16% had already decided the future specialty. Among those who did not respond, 34.4% chose general surgery. Participation in the league had an influence on specialty choice in 80.1% of the students. Of those choosing surgery, 96.5% believed that participating in the league had positively influenced their career choice. Overall, 96.2% believed that participating in the league provided knowledge and information which the medical school curriculum was not able to provide.

Conclusion. Participation in Trauma League is an effective strategy to encourage medical students to choose a career in surgery.

Poster # 29

PROTHROMBIN COMPLEX CONCENTRATE FOR RAPID REVERSAL OF WARFARIN COAGULOPATHY

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Objective: To determine if Prothrombin Complex Concentrate (PCC) would achieve a more rapid reversal of the International Normalized Ratio (INR) in warfarin treated patients compared to a historical control that received fresh frozen plasma (FFP) for emergent warfarin reversal.

Methods: A retrospective data review from a Level 1 Trauma Center was conducted from October 2009 to March 2011. Inclusion criteria were: age = 18 years, baseline INR = 1.5, and need for urgent reversal of warfarin coagulopathy. Data collected included warfarin indication, warfarin reversal reason, mechanism of injury, serial INR values, PCC dose, patient demographics (age, height, weight, and sex), adjunct therapy given for INR reversal, surgical interventions, bleeding complications, adverse events, and in-hospital mortality. Statistical differences were determined using the Fisher's exact test, Wilcoxon rank sum test, and the t-test.

	PCC (n=45)	Control (n=18)	p-value
First Repeat INR	1.6 (1.4-1.8)	1.5 (1.3-1.6)	0.12
Time to repeat INR (min)	50 (27-130)	398 (230-493)	<0.001
Time to INR <1.5 (min)	190 (80-730)	513 (332-686)	0.04

Results: 58 patients received PCC during the study period, and of these 45 met inclusion criteria. 18 historical control patients were included for comparison. Patient characteristics were similar between treatment groups. Baseline INR was 2.7 in the PCC group and 2.0 in the control (p=0.04). Median time to attaining a repeat INR <1.5 was 190 minutes in the PCC group and 398 minutes in the control (p=0.04). Median repeat INR at 24 hours was 1.2 in the PCC group compared to 1.3 in the control (p=0.98). The mean FFP requirement for INR reversal was 3.8 units in the PCC group and 5.8 units in the control (p=0.01). A single adverse event of a superficial clot and venous thromboembolism was identified in a patient in the PCC group 9 days following PCC administration. 19 patients underwent surgical intervention following PCC administration with no intraoperative reports of bleeding complications.

Conclusions: PCC provided a significantly shorter time to INR reversal compared to a historical control receiving FFP, which is crucial to slowing hemorrhage in warfarin-treated trauma patients. PCC was associated with a reduction in FFP requirements and a low rate of adverse events.

Poster # 30

IMPACT OF PERMISSIVE HYPOTENSION IN DAMAGE CONTROL RESUSCITATION; TIME FOR ADAPTATION

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Objective: Damage Control Resuscitation (DCR) conveys a survival advantage in patients with severe hemorrhage by targeting effective early delivery of coagulation factors. The role of Permissive Hypotension (PH) when use in combination with DCR has not been elucidated. We hypothesize that PH when use in combination with DCR will convey an intra-operative survival benefit for patients with severe hemorrhage.

Methods: This is a five year retrospective analysis of patients with severe hemorrhage managed with DCR. Only patients with systolic blood pressures (SBP) = 90 mmHg upon arrival to emergency department (ED) were included. Patients managed with intravenous fluid (IVF) upon arrival to ED were compared to PH group. Any patient that received = 150 mL were grouped under IVF group and those treated with < 150 mL were grouped under PH group. Student's t-test and multiple logistic regressions were performed.

Results: Of the 307 hypotensive patients arriving to our trauma center, 43% were managed with PH. There was no difference in demographics between resuscitation modalities. Intra-operative DCR for FFP: PRBC in PH group vs. IVF group showed no statistical difference: 1 to 1.05 vs.1 to 0.98 (p=0.42). After adjustment for DCR, the IVF group displayed an increased rate of intra-operative mortality 32% vs. 9% (p<0.001) when compared to PH group. Logistic regression results for mortality:

Variables	P-value	Odds Ratio (95% CI)
DCR	0.03*	0.30 (0.16-0.35)*
PH	0.01*	0.69 (0.37-0.91)*
ISS	0.23	1.02 (0.99-1.06)
Systolic	0.43	0.99 (0.98-1.01)
Sex	0.57	1.64 (0.29-9.17)

Conclusion: This is the first study that analyzed the impact of PH in combination with DCR in patients with severe hemorrhage. Integration of PH with limitation of IVF into DCR provides an intra-operative survival advantage.

Poster # 31

END-TIDAL CO2: HOW USEFUL FOR MONITORING AFTER SEVERE CHEST TRAUMA?

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Objectives: In the pre-hospital setting, optimally ventilating a patient, particularly after severe chest trauma, is difficult. Our objective was to evaluate the relationship between arterial carbon dioxide ($PaCO_2$) and end-tidal CO_2 ($EtCO_2$) immediately after respiratory failure due to trauma, in a new porcine model of bilateral pulmonary contusion (PC).

Methods: Mechanically ventilated anesthetized swine (n=15) were used in 2-day, 3-phase experiments. On day 1 (Phase 1) they underwent changes in respiratory rate (RR) and tidal volume (TV) intended to cause hyperventilation and hypoventilation. The next day they underwent bilateral PCs and tube thoracostomies, then fluid resuscitation (Phase 2). Phase 3 consisted of the same RR and TV maneuvers as Phase 1. Mean arterial pressure (MAP), ratio of arterial oxygen to fraction of inspired oxygen (PFR), arterial blood gases, and $EtCO_2$ were recorded. After Phase 3, the animals were euthanized. $PaCO_2$ was modeled by multivariate linear regression, with $EtCO_2$, PFR, and MAP as candidate covariates.

Results: Bilateral PC caused acute lung injury (Phase 2 PFR < 200, Phase 3 PFR < 300) and hypotension (Phase 2 MAP < 60 mmHg). During Phase 1, $PaCO_2$ was closely correlated with EtCO2: $PaCO_2 = 1.98 + 0.90*EtCO_2$ ($r^2 = 0.96$, $p<0.0001$). During Phase 2, $PaCO_2 = 42 + 0.43*EtCO_2 – 0.5*PFR – 0.05*MAP$ ($r^2= 0.23$, $p<0.0001$). During Phase 3, $PaCO_2 = 33 + 0.90*EtCO_2 – 0.08*PFR$ ($r^2=0.90$, $p<0.0001$).

Conclusions: In uninjured swine, $PaCO_2$ can be estimated using only $EtCO_2$ with a difference of approximately 2 mmHg. After injury, $PaCO_2$ is linearly related to $EtCO_2$ and inversely related to PFR. Estimation of $PaCO_2$ during the immediate post-injury period remains a challenge and will likely require the inclusion of other physiologic data or monitoring tools.

Poster # 32

CHOLECYSTECTOMY ON FIRST ADMISSION FOR ACUTE CHOLECYSTITIS: EVERY DAY COUNTS

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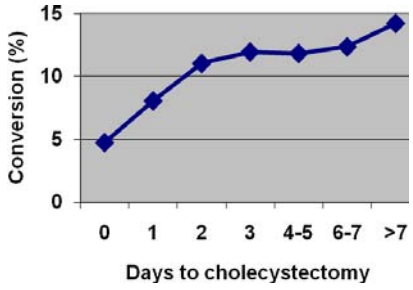
Background: Evidence supports cholecystectomy during first presenting admission for most patients with acute cholecystitis (AC); however, the literature on the timing of intervention during first admission is contradictory. Our objective was to evaluate the relationship between timing of cholecystectomy on first admission and morbidity.

Methods: We performed a retrospective cohort study using population-based administrative databases capturing all hospital admissions and ED visits within a geographic region encompassing 13 million persons. We identified a cohort of adults who underwent cholecystectomy on their first admission for AC over 2004-2009. We examined the association between time to operation (defined as the time interval from ED registration to cholecystectomy) and conversion rate, complications and post-operative length of stay.

Results: 18,652 patients with AC underwent cholecystectomy on first admission. Most cases (87%, n=16,180) were started via laparoscopic approach. The median time from ED arrival to operation was 1 day (IQR 0-2 days). As the time interval to operation increased, the conversion rate increased (p<0.01, see graph), as did the rate of operative complications (5% to 11%, p<0.01). A longer time interval to cholecystectomy was also associated with a greater risk of post-operative biliary tract intervention (BTI) on first admission (1.6% to 3.3%, p<0.01); however, the frequency of readmission for BTI within a 90 day post-operative period was similar. Post-operative length of stay was slightly prolonged in patients undergoing cholecystectomy later on during their admission (p<0.01).



Conclusions: On first admission for acute cholecystitis, cholecystectomy as soon after ED presentation as possible is associated with a morbidity benefit through a lower conversion rate and fewer complications.

Poster # 33

21st CENTURY TRAUMA CARE AND THE SOCIAL MEDIA REVOLUTION.

Elsa M Pichardo, MD, Lilyanne Chen, BA, Stancie C Rhodes, MD, Vicente H Gracias, MD

Objective. We aim to assess the prevalence, risks and potential implications of social media usage among Trauma Related Healthcare Professionals (TRHP).

Methods. All healthcare professionals working at a level one trauma center, including nurses, attending and resident physicians were asked to voluntarily participate in either a print or electronic anonymous survey. Participants were asked about personal demographics as well as there usage of social media, such as digital photography and internet social networking sites (SNS), i.e. Facebook and Myspace. Data were analyzed with χ^2 and multivariate analysis as appropriate.

Results. A total of 42 TRHP participated in the study. Sixty-six percent were under the age of 36 and 73.2% were residents. Eighty seven percent had an independent SNS; 88.6% reported being personally identifiable through a name search. Sixty-four percent of respondents were unaware of any institutional policy restricting the posting of patient information on internet SNS, and in fact half thought regulating SNS usage would constitute a violation of personal rights. Of those surveyed, 76.2% used digital photography for patient care and of those 41.5% currently had clinically related photography on their cellular devices. All 42 respondents denied posting clinically related photography on internet SNS. On χ^2 analysis, TRHP who were 26-30 years old were more likely to implement digital photography in patient care (p=.029). On multiple regression analysis, none of the variables analyzed were statistically significant predictors of Health Insurance Portability and Accountability Act (HIPAA) violations or internet SNS usage.

Conclusion. Social media is frequently utilized by Trauma Related Healthcare Professionals on both a personal and professional level. Usage appears to be highest in younger professionals suggesting that there will be a growing trend at the clinical level in the future. Though preliminary investigations do not link usage of social media with violation of patient privacy future efforts are merited to regulate and potentially promote the use of social media by the trauma community.

Poster # 34

SURGICAL STABILIZATION OF FLAIL CHEST: THE IMPACT ON POSTOPERATIVE PULMONARY FUNCTION

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OBJECTIVES: Flail chest results in significant morbidity. Controversies continue regarding the optimal management of flail chest. No clear guidelines exist for surgical stabilization. Our aim was to examine the association of bed-side spirometry values with operative stabilization of flail chest.

METHODS: IRB approval was obtained to identify patients with flail chest who underwent surgical stabilization between August 2009 and May 2011. At our institution, all rib fracture patients underwent routine measurement of their forced vital capacity (FVC) using bed-side spirometry. Formal pulmonary function tests were also obtained postoperatively and at 3 months in patients undergoing stabilization. Both the Synthes and Acute Innovations plating systems were utilized. Data is presented as median (range) or (%).

RESULTS: 20 patients (13 male: 65%) with median age of 60 years (30-83) had a median of 4 ribs (2-9) in the flail segment. The median Injury Severity Score (ISS) was 17 (9-41) and the median Trauma and Injury Severity Score (TRISS) was 0.96 (0.04-0.99). Preoperative pneumonia was identified in 4 patients (20%) and intubation was required in 7 (35%). Median time from injury to stabilization was 4 days (1-33). The median number of plates inserted was 5 (3-11). Postoperative median FVC (1.8 L; range: 1.3-4 L) improved significantly as compared to preoperative median value (1 L; range: 0.5-2.1 L) (p= 0.003). This improvement continued during the follow-up period at 3 months (0.9 L; range: 0.1 - 3.0 L, p=0.006). There were 3 deaths (15%), none of which were related to the procedure. Subsequent tracheostomy was required in 3 patients (15%). The mean hospital stay and ventilator days after stabilization were 9 and 3 days, respectively. Mean follow-up was 5.6 ± 4.6 months.

CONCLUSION: Operative stabilization of flail chest improved pulmonary function compared with preoperative results. This improvement was sustained at 3 months follow-up.

Poster # 35

SINGLE DATA ENTRY TECHNIQUE FOR TRAUMA & CRITICAL CARE PROCEDURE REPORTING

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Background: The American Board of Surgery (ABS) Maintenance of Certification (MOC) program requires general surgeons to maintain an operative log using the American College of Surgeons Practice-Based Learning System (ACS PBLS). Subspecialty surgery initiatives are paralleling these efforts, sometimes through independent data entry systems. Using only the ACS PBLS system, we have developed a method of high-fidelity data capture, categorization, and reporting of trauma and surgical critical care fellows' experiences.

Methods: Starting in July 2010, our fellowship required our fellows to log their daily clinical experiences into the ACS PBLS system. Cases were entered identically to billable documentation submitted to our electronic medical record. When relevant, in the ACS PBLS free-text "Notes" field, specific keywords were entered that specified unique institutional services (Trauma, Burn, Emergency General Surgery, Reconstructive General Surgery, Thoracic) or resuscitation types (Burn, Blunt, Penetrating). This data was exported in comma separated value format and de-identified. STATA programming was coded to create 13 report types (see table), structured by Current Procedural Terminology (CPT) codes and sub-stratified by fellow and/or graduating class. In the current iteration with this entire technique, quarterly data processing time is one-hour for eight fellows.

REPORT TYPES
Operative Experience by Service
Procedures by Major Category
Total Resuscitations
Ultrasound
Airway
ICU Vascular Access
Other ICU Services
Operative Thoracic
Operative Abdominal Wall
Operative GI & GU
Operative Solid Organ
Operative Vascular
Operative Skin and Soft Tissue

Results: Results are viewable via a secure web application, REDCap (Research Electronic Data Capture; http://www.project-redcap.org), accessible nationally, and exportable to PDF, Excel, SAS, STATA, SPSS, or R.

Conclusion: Using the ACS PBLS system simultaneously satisfies the MOC program and provides a single method for monitoring individual trauma and surgical critical care fellow experiences. This technique has the immediate capacity for fellowships nationwide. As MOC requirements expand, efficient clinical documentation is a must for the busy trauma surgeon.

Poster # 36

EARLY PROTOCOL BASED INFERIOR VENA CAVA FILTER PLACEMENT IN HIGH RISK TRAUMA PATIENTS RESULTS IN DECREASED INCIDENCE OF PULMONARY EMBOLISM

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Objective: Recent studies have shown that pulmonary embolism (PE) following trauma has occurred as early as four days after admission. Based on this we developed a protocol for placement of prophylactic inferior vena cava filters (IVCF) within 72 hours of admission for high risk patients. We sought to determine if our protocol reduced the incidence of PE.

Methods: The records of patients with IVCF placement and those with PE over a 3 year period from January 2008 to May 2010 at a Level I trauma center were retrospectively reviewed using NTRACS. Mechanism of injury, age, injury severity score (ISS), day of IVCF placement, day of PE, PE incidence, and disposition from Trauma center were all reviewed. Statistical analysis was performed using mean and Fisher's exact test, accepting $p<0.05$ as significant.

Results: The average day after admission when PE occurred from 2008-2010 was 9, 14, and 11 respectively, see Table 1. With the protocol in place in 2008 the average day for IVCF placement was noted to decrease yearly from 2008 to 2010 from 9, to 8, to 5 days. In response to the protocol driven earlier placement of IVCF the PE rate was noted to decrease significantly per year from 2008 to 2009 (1.46% vs. 0.75%, p=0.02) and again from 2009 to 2010 (0.75% vs. 0.32%, p=0.03). The overall number of IVCF placed increased significantly from 3.3% (2008) to 5.1% (2010) (p=0.0001).

YEAR	TRAUMA ADM (#)	PATIENTS FILTERED (%)	PE (#)	PE RATE (%)	AVG DAYS AFTER ADM FOR PE (#)	AVG DAYS AFTER ADM IVCF PLACED	PE RATE 2010 vs. OTHERS p VALUE
2008	2392	3.3	35	1.46	9	9	0.0001
2009	2143	3.9	16	0.75	14	8	0.03
2010	2205	5.1	7	0.32	11	5	

IVCF: Inferior Vena Cava Filter; PE: Pulmonary Embolism; AVG: Average; ADM: Admission

Conclusions: Despite limited success in reaching the goal of our protocol, the implementation of protocol driven placement of prophylactic IVCF in trauma patients at high risk for PE still resulted in significantly earlier placement of IVCF and lower PE rate.

Poster # 37

USE OF SERUM BIOMARKERS TO PREDICT SECONDARY INSULTS FOLLOWING SEVERE TRAUMATIC BRAIN INJURY

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Background: The management of severe traumatic brain injury (TBI) focuses on prevention and treatment of intracranial hypertension (ICH) and cerebral hypoperfusion (CH). Predicting which patients will develop these secondary insults is currently not possible. This study investigates the systemic effects of markers of neuroinflammation and their role in helping to predict clinical deterioration following severe TBI.

Methods: Patients with head AIS>3, age>14, "isolated" TBI, and need for intracranial pressure monitor were prospectively enrolled. Serum was collected within 24 hours of injury and twice daily for 7 days. Specimens were analyzed by multiplex bead array assays. Maximum intracranial pressure (ICP), minimum cerebral perfusion pressure (CPP), Pressure Time Dose (PTD), and % time of moderate and severe ICH (ICP >20 and >30) and moderate and severe CH (CPP <60 and <50) were calculated and compared to IL-8 and TNF-? levels drawn prior to periods of monitoring. An adjusted mixed model analysis accounting for longitudinal correlations within patients was applied.

Results: 68 patients were enrolled. 670 12-hour periods of monitoring and 845 serum samples were available for analysis. Correlations were found between serum levels of IL-8 and moderate and severe CH. Levels of TNF-? and moderate and severe ICH and severe CH were also correlated. Specificities of 81-95% were found for optimal cut off points for prediction of ICP >20, >30, and CPP <50 for TNF-? and CPP <60 and <50 for IL-8.

P Values of Significant Correlations

	IL-8	TNF-a
Max ICP	ns	ns
% time ICP >20	ns	<0.05
PTD ICP >20	ns	ns
% time ICP >30	ns	0.01
PTD ICP >30	ns	0.02
Min CPP	0.01	ns
% time CPP <60	0.01	ns
PTD CPP <60	<0.001	ns
% time CPP <50	<0.001	0.04
PTD CPP <50	<0.001	0.03

Conclusions: IL-8 and TNF-? demonstrate promise as candidate serum markers of impending ICH and CH. These data suggest that we may be able to 'predict' imminent events following TBI prior to clinical manifestations. Given the morbidity of ICH and CH, early intervention and prevention may have a significant impact on outcome and help guide decisions about timing of interventions.

Poster # 38

DETERMINING VENOUS THROMBOEMBOLIC RISK ASSESSMENT IN TRAUMA PATIENTS: THE TRAUMA EMBOLIC SCORING SYSTEM (TESS)

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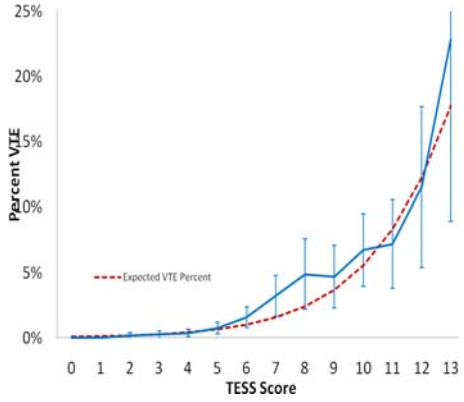
Objective: To determine the relative "weight" of risk factors known to be associated with venous thromboembolism (VTE) in trauma patients based on injuries and comorbidities.

Methods: Retrospective review of 16,608 consecutive admissions to a trauma center. Patients were separated into those who developed VTE (N=141) vs. those that did not (16,467). Univariate analysis was performed for each risk factor reported in the trauma literature. Risk factors that were shown to be significant ($p<0.05$) by univariate analysis underwent multivariate analysis to develop odds ratios for VTE. The TESS was derived from the multivariate coefficients.

Results: Age, ISS, pre-existing obesity, vent days, extrication and lower extremity fracture were associated with VTE (Table 1). To assess performance of the TESS score, we calculated the TESS score for each subject (median = 2; Q1 = 1; Q3=5; min = 0; max = 15). The resulting sensitivity (81.6%) and specificity (84.0%) was optimized at a cutoff TESS score of 6 with an ROC value of 0.902

Table 1: Prediction Factors for VTE in Trauma Patients

Predictor		Odds Ratio	p	Odds Ratio 95%CI	TESS Score
Age	Age: 18-29	1.00		Referent	0
	Age: 30-64	1.61	0.041	1.02-2.55	1
	Age: 65+	2.28	0.001	1.42-3.65	2
ISS	ISS: 1-9	1.00		Referent	0
	ISS: 10-16	4.48	<0.001	2.46-8.13	3
	ISS: 17-25	5.22	<0.001	2.79-9.76	4
	ISS: >25	8.83	<0.001	4.77-16.36	5
Pre-Existing Obesity	No Pre-existing Obesity	1.00		Referent	0
	Pre-existing Obesity	1.74	0.045	1.01-2.98	1
Vent Days	No Vent Days	1.00		Referent	0
	Vent Days	6.50	<0.001	4.25-9.94	4
Extrication	No Extrication	1.00		Referent	0
	Extrication	1.54	0.047	1.00-2.37	1
Lower Extremity Fracture	No LE Fracture	1.00		Referent	0
	LE Fracture	2.40	<0.001	1.62-3.55	2



Conclusion: The TESS could allow informed decision making regarding prophylaxis strategies in trauma patients.