Scientific Posters – Group I
Emergency General Surgery
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 1
#EAST2016P01

FACTORS PREDICTING FAILURE OF NONOPERATIVE MANAGEMENT IN COMPLICATED APPENDICITIS: AN ANALYSIS OF THE NATIONWIDE INPATIENT SAMPLE

Britt J. Sandler, BS, MHS, Kimberly A. Davis, MD, MBA, FACS, FCCM*,
Kevin M. Schuster, MD, MPH*
Yale University School of Medicine

Presenter: Britt J. Sandler, BS, MHS

Objectives: Understanding factors predictive of failed nonoperative management of complicated appendicitis may allow for earlier operative management and shorter length of stay (LOS).

Methods: The Nationwide Inpatient Sample from 2004-2011 was queried for patients ≥15 years old admitted with appendicitis complicated by perforation or abscess. Attempted nonoperative management (NOM) was defined by no surgical procedure on day 0 or 1 of admission. Failure of NOM was defined by appendectomy on day 2 or later. Factors examined were age, gender, smoking status, obesity, hypertension, chronic pulmonary disease, coronary artery disease, congestive heart failure (CHF), diabetes, and appendiceal abscess. Data were analyzed using X^2 and multivariable analysis with reverse stepwise logistic regression, $p<0.05$ considered significant.

Results: 94,104 patients with complicated appendicitis were identified. 21,356 (23%) were initially nonoperatively managed. 3,535 patients (17%) failed NOM and were eventually treated with appendectomy (89%), ileocecectomy (7%), or right hemicolectomy (12%). Female gender (OR=1.31, $p<0.001$), age >34 (OR=1.30, $p<0.001$) and a history of diabetes (OR=1.24, $p<0.001$), CHF (OR=1.54, $p<0.001$), and chronic pulmonary disease (OR=1.15, $p=0.019$) predicted failure of NOM. Patients with abscess were also more likely to fail NOM (OR=1.37, $p<0.001$). Percutaneous drainage on day 0 or 1 of admission reduced the odds of failing NOM (OR=0.29, $p<0.001$). Patients who failed NOM had a longer LOS (10.9 vs. 5.4 days, adjusted difference=4.0 days, $p<0.001$) and higher rates of sepsis, pneumonia, UTI, and respiratory failure ($p<0.05$).

Conclusions: Patients with complicated appendicitis who are female, older than 34, have a history of diabetes, congestive heart failure, or chronic pulmonary disease, or present with abscess are more likely to fail NOM and may benefit from immediate operation.

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Poster 2
#EAST2016P02

THE IMPACT OF DIABETES MELLITUS ON EMERGENCY GENERAL SURGERY BURDEN AND OUTCOMES IN THE UNITED STATES: 2001-2010

Jessica Crystal, Shahid Shafi, MD, MPH*,
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Presenter: Jessica Crystal

Objectives: We have previously shown that the burden of disease for emergency general surgery (EGS) exceeds 3 million inpatient admissions per year nationwide and is increasing. Diabetes Mellitus (DM) is known to increase the risk of surgical complications but its impact on EGS outcomes is unknown. We hypothesized that EGS patients with DM would have worse outcomes than those without it.

Methods: The Nationwide Inpatient Sample, 2001–2010, was queried for "EGS patients" using published ICD-9-CM code criteria. All patients aged ≥18 admitted as "urgent" or "emergent" were included (N=27,668,807). ICD-9-CM codes were also used to identify DM and other comorbidities. Patients with DM and without DM were compared using Chi-square, multivariate logistic regression, *t*-test, and the Cochran-Armitage trend test ($p<0.05$ was significant).

Results: The prevalence of DM among EGS patients was 21% (N=5,843,697) and increased annually from 17% in 2001 to 25% in 2010 ($p<0.0001$). Diabetics were older (64±16 vs 57±21) and were more likely to be males and minorities (26.5% vs 19.6%) ($p<0.0001$ for all) than non-diabetics. They less often required surgery (24% vs 30%) and had a 14% lower mortality rate (1.85% vs 2.14%) ($p<0.0001$ for all) during their hospitalization. However, patients with DM had higher rates of sepsis (2.9% vs 2.7%), UTI (8.9% vs 7.2%), acute renal failure (7.2% vs 4.2%) and myocardial infarction (1.03% vs 0.75%)($p<0.0001$ for all) and were hospitalized longer than those without DM.

Conclusions: Among EGS patients admitted to US hospitals over a 10-year period, the presence of diabetes mellitus was associated with lower surgical activity and lower mortality, but higher rates of severe complications during their hospitalization. Further studies using detailed clinical data, are needed to explore the complex relationship between DM and surgical outcomes in this patient group.

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Poster 3
#EAST2016P03

DOES FACILITY LOCATION INFLUENCE OUTCOMES? COMPARISON OF RURAL AND URBAN PATIENTS

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Presenter: Muhammad Ali Chaudhary, MBBS

Objectives: Geographic misdistribution of surgeons between rural/urban centers has led to the creation of "surgical deserts" in rural areas. Lack of a desire to practice in rural locations combined with structural differences (size, services offered) is thought to influence patient outcomes. To examine how such a situation influences the care of emergency general surgery (EGS) patients, the study compared outcomes between rural and urban hospitals using a nationally representative sample.

Methods: The 2007-2011 NIS was queried for adult patients (≥16y) with primary EGS diagnoses, as defined by the AAST. Outcomes included: mortality, major complications, LOS, and cost. Patients were matched for differences in patient-level factors (***Table1***) using coarsened-exact-matching; risk-adjusted logistic/generalized linear models further accounted for differences in hospital factors, operative intervention, and clustering of patients. Counterfactual models examined hypothetical outcomes assuming that all patients were treated at urban centers.

Results: A total of 3,788,269 patients were included. Of 3,259 hospitals, 40.2% were rural (14.6% of patients). Relative to urban centers, rural EGS patients had 1.27 times higher odds of death (95%CI 1.23-1.31) and marginally higher costs (***Table1***). They had 5% lower risk-adjusted odds of major complications and comparable LOS. Differences in presentation are presented in ***Fig1***. Had all patients been managed at urban centers, overall odds of death would be 3.96% lower among EGS patients, while the odds of complications would increase by 0.59%.

Conclusions: EGS patients treated at rural hospitals experienced slightly worse mortality relative to patients at urban centers but fewer complications, after accounting for differences in patient-/hospital-level factors. Such findings, on a national scale, suggest areas for quality improvement initiatives designed to better the outcomes of EGS patients in rural areas.

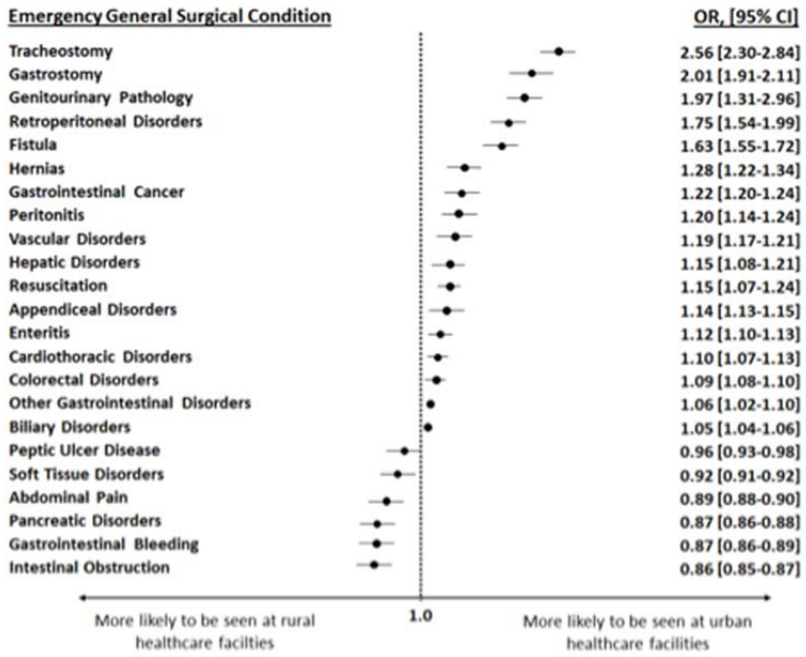

Figure 1. Relative odds of presentation with a specific EGS condition to urban healthcare facilities (rural hospitals as reference)

	Urban Hospitals (n=3,236,721)	Rural Hospitals (n=551,548)
Mortality (OR [95% CI])	0.79 [0.76-0.81]	*Reference*
Complications (OR [95% CI])	1.05 [1.04-1.06]	*Reference*
Length of Stay (Days [95% CI])[1]	4.95 [4.94-4.95]	4.55 [4.54-4.57]
Cost (2014 US$ [95% CI])[1]	11,899 [11,883-11,913]	12,735 [12,699-12,770]

[OR; Odds Ratio, CI: Confidence Interval] Coarsened-exact matching accounted for baseline differences in: age, sex, race/ethnicity, comorbidities, EGS diagnostic category, year of admission, and primary payer status. Risk-adjusted multivariable regression among matched cohorts further accounted for clustering of patients within hospitals and for differences in operative intervention and hospital-level factors: region, teaching status, bed size, and patient volume)

[1]Results represent predicted means and corresponding 95%CI taken from generalized linear models (link log, family gamma) followed by post-estimation commands

Table 1. Risk-adjusted surgical outcomes of EGS patients managed at urban versus rural hospitals

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Poster 4
#EAST2016P04

PREDICTORS OF MORTALITY IN PATIENTS REQUIRING SURGERY FOR PERFORATED PEPTIC ULCER DISEASE

Brittany Fenner, Levi Procter, MD*, Andrew C. Bernard, MD*
University of Kentucky

Presenter: Brittany Fenner

Objectives: To determine co-morbid factors that are predictors of mortality in patients with perforated peptic ulcer requiring emergency surgery

Methods: A retrospective review of patients presenting between January 1, 2004 and November 13, 2013 with perforated peptic ulcer requiring surgery. Patients <18 years of age were excluded. Charts were reviewed to analyze risk factors for increased mortality. Risk factors evaluated were: age, BMI, lactate, albumin, INR, PTT, serum sodium, hemoglobin, and number of subsequent procedures required. Statistical analysis by Mann-Whitney U-test. All tests are two-sided and p values of <0.05 were regarded as statistically significant. Regression analysis was performed on all risk factors versus time to death for patients who survived less than 30 days.

Results: 135 patients were identified (58 female, 77 male). The mean age was 58. 30-day mortality was 14.60%. Multiple comorbidities were evaluated for mortality risk. The following are statistically significant ($p < 0.05$):

Mortality rate:

- 24% vs 1.72% if age > 55 vs ≤ 55
- 14% vs 12.9% if BMI <18.5 or >25 compared to normal BMI
- 21% vs 4.5% if albumin < 3.0 g/dL vs ≥ 3.0
- 28% vs 8% if hemoglobin <12 vs ≥ 12
- 35% vs 6.5% for Cr >1.5 vs ≤ 1.5

Conclusions: Patients requiring surgery for perforated peptic ulcer disease have a high risk of death. This data supports the association of several comorbid factors associated with higher mortality among those patients requiring emergency surgery for perforated peptic ulcer disease. These comorbidities include BMI, age, creatinine and hemoglobin and albumin. Further research is needed to establish a causal relationship among these comorbidities and mortality among patients undergoing surgical repair of a perforated peptic ulcer disease.

Figure 1. *Differences in Risk Factors at 30 Days Survival*

Risk Factor	Survival	Range	Mean	Median	Mode	P value
*Age**	*>30 days*	22 – 91	56.32	57	62	0.001628
	≤30 days	45 – 85	68	70	72	
*BMI**	*>30 days*	13.7 – 57.6	25.431	23.55	20.1	0.042404
	≤30 days	20.3 – 33.6	27	27	29	
Lactate	*>30 days*	0.4–9.2	2.68	2	1.8	0.2623
	≤30 days	0.7 – 8.3	3.7	3.1	3.1	
*Albumin**	*>30 days*	1.2 – 6.0	2.92	2.9	3	0.00088
	≤30 days	1.4 – 3.2	2.2	2.1	1.6	
INR	*>30 days*	0.8 – 10.0	1.28	1.1	1	0.429206
	≤30 days	0.9 – 2.1	1.2	1.2	1	
Na	*>30 days*	21 – 152	136.1	137	138	0.814514
	≤30 days	120 – 150	136	137	145	
*Creatinine**	*>30 days*	0.42 – 6.71	1.43	1.03	1	0.000844
	≤30 days	0.2 – 4.06	2.16	1.96	–	
*Hemoglobin**	*>30 days*	6.6 – 19.5	13.36	13.65	12.2	0.000366
	≤30 days	6.3 – 15.0	11.1	10.9	10.6	
Procedures	*>30 days*	1.0 – 11.0	1.38	1	1	0.38952
	≤30 days	1.0 – 4.0	1.3	1	1	

*Statistically significant

Figure 2. *Mortality Rate by Risk Factor*

Risk Factor	Criteria	Mortality Rate
Age	*≤ 55 years*	1.72%
	> 55 years	24.05%
BMI	*18.5 – 25*	
	<18.5 or >25	12.90%
Lactate	*≤ 2*	8.11%
	> 2	19.44%
Albumin	*≥ 3*	4.55%
	< 3	21.05%
INR	*≤ 1.5*	15.09%
	> 1.5	16.67%
Na	*> 130*	69.57%
	≤ 130	3.67%
Creatinine	*≤ 1.5*	6.52%
	> 1.5	35.00%
Hemoglobin	*≥ 12*	8.14%
	< 12	28.89%
Procedures	*1*	17.17%
	> 1	7.89%

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Poster 5
#EAST2016P05

HIV-INFECTED PATIENTS HAVE POORER OUTCOMES FOLLOWING EMERGENCY GENERAL SURGERY: A STUDY OF THE NATIONWIDE INPATIENT SAMPLE

Britt J. Sandler, BS, MHS, Daniel Bohl, James Tooley,
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Yale University School of Medicine

Presenter: Britt J. Sandler, BS, MHS

Objectives: To determine the association of HIV infection with outcomes in emergency general surgery in the era of highly active antiretroviral therapy.

Methods: Retrospective cohort study of the Nationwide Inpatient Sample. Records of patients who underwent laparoscopic or open appendectomy, cholecystectomy, or colon resection after emergency admission from 2004-2011 were analyzed. Outcomes were mortality, length of stay, total charges, and selected postoperative complications (sepsis, septic shock, pneumonia, surgical site infection (SSI), wound dehiscence, cardiac arrest, myocardial infarction, hemorrhage, transfusion, pulmonary embolism (PE), respiratory failure, urinary tract infection (UTI), and acute renal failure. Data were analyzed using chi-square and multivariable regression, with $p < 0.05$ significant.

Results: 974,588 patients were identified. Of these, 1,549 (0.16%) were diagnosed with HIV. HIV-infected patients were more likely to die during their hospital stay than other patients (4.3% vs. 1.6%, adjusted OR = 3.33, 95% CI = 2.52-4.39, $p<0.001$). HIV-infected patients had longer hospital stays (10.5 vs. 5.5 days, adjusted difference = 3.8 days, 95% CI 3.50-4.04, $p<0.001$) and higher mean total charges than other patients ($83,746 vs. $44,498, adjusted difference = $30,581, 95% CI = $27,917-33,246, $p<0.001$). HIV-infected patients also had significantly higher rates of sepsis, septic shock, PE, pneumonia, acute renal failure, respiratory failure, UTI, transfusion and SSI ($p<0.05$ for each). Differences persisted irrespective of case complexity and over the study period.

Conclusions: HIV-infected patients have a greater risk of death, infectious, and non-infectious complications after emergency surgery regardless of operative complexity. Despite advancing therapy for HIV it continues to negatively impact emergency surgery outcomes.

	Mortality			
Procedure	No HIV	HIV	OR (adj.)	P-value
Laparoscopic Appendectomy	156 (0.08%)	1 (0.41%)	3.87	0.199
Open Appendectomy	**276 (0.26%)**	**3 (1.76%)**	**4.3**	**0.026**
Laparoscopic Cholecystectomy	**1,695 (0.39%)**	**15 (2.23%)**	**7.3**	**<0.001**
Open Cholecystectomy	**1,426 (2.49%)**	**8 (6.78%)**	**3.93**	**<0.001**
Laparoscopic Colon Resection	191 (1.48%)	1 (4.55%)	6.19	0.117
Open Colon Resection	**11,985 (7.1%)**	**38 (11.76%)**	**2.29**	**<0.001**
All Procedures	**15,729 (1.6%)**	**66 (4.3%)**	**3.33**	**<0.001**

	Length of Stay			
Procedure	No HIV	HIV	Beta (adj.)	P-value
Laparoscopic Appendectomy	**2.3 days**	**5.2 days**	**2.5 days**	**<0.001**
Open Appendectomy	**3.6 days**	**5.9 days**	**1.2 days**	**<0.001**
Laparoscopic Cholecystectomy	**4.2 days**	**9.2 days**	**4.3 days**	**<0.001**
Open Cholecystectomy	**8.7 days**	**14.4 days**	**4.8 days**	**<0.001**
Laparoscopic Colon Resection	8.8 days	9.9 days	0.1 days	0.937
Open Colon Resection	**12.5 days**	**18.0 days**	**4.1 days**	**<0.001**
All Procedures	**5.5 days**	**10.5 days**	**3.8 days**	**<0.001**

Mortality and length of hospital stay by procedure type. Bold indicates statistical significance.

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Poster 6
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ACUTE CARE CHOLECYSTECTOMY VS ELECTIVE CHOLECYSTECTOMY: SIMILAR.....BUT DIFFERENT

Greg Hambright, Anita R. Martinez, MD
Methodist Dallas Medical Center

Presenter: Greg Hambright

Objectives: Cholecystectomy is one of the most common surgical procedures performed in the United States. This procedure is unique in that it is performed both electively and on an urgent basis. With changes in healthcare, we anticipate that patients undergoing cholecystectomy will need to be characterized by their manner of presentation. This will allow for the treating physician and his/her outcomes to be fairly evaluated in the context of public reporting.

Methods: Our database was retrospectively queried for patients who underwent cholecystectomy over a 24 month period. The patients were divided into two categories, based on whether they were admitted electively for their procedure (EL) or if they presented to the emergency department (ER). The medical records for each patient were reviewed for specific data points, which were analyzed for statistical significance.

Results: A total of 698 patients were identified. Laparoscopic cases were converted to open 12% in the ER group and 3% in the EL group ($p<0.05$). Length of the operative procedure was significantly longer in the ER group (1.67 hours vs 0.94 hours, $p<0.05$). The ER group underwent a higher number of total procedures (OR, ERCP). The average hospital length of stay for ER patients was 3.8 days, while EL patients were in the hospital 0.81 days ($p<0.05$). Postoperative complications were higher in the ER group, as were 30 day readmission rates, and total costs ($p<0.05$).

Conclusions: Patients in the ER who require cholecystectomy are fundamentally different than those who present electively. They fare worse in every category evaluated . Surgeons who primarily care ER patients need to define quality metrics for this unique population. The public reporting of this data could have a negative impact on the field of Acute Care Surgery. This data suggests the need for an acute care surgery database to define expected norms and identify areas for improvement.

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Scientific Posters – Group II
Performance Improvement and Outcomes
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Poster 7
#EAST2016P07

MULTIDISCIPLINARY COLLABORATION DECREASES THE INCIDENCE OF CATHETER ASSOCIATED URINARY TRACT INFECTION (CAUTI) IN THE SURGICAL AND TRAUMA ICU

Mamoona Arif Rahu, PhD, RN, CCRN, Deborah Burnette, Rahul Anand, MD*,
Michel Aboutanos, MD, MPH*, Paula Ferrada, MD*
Virginia Commonwealth University

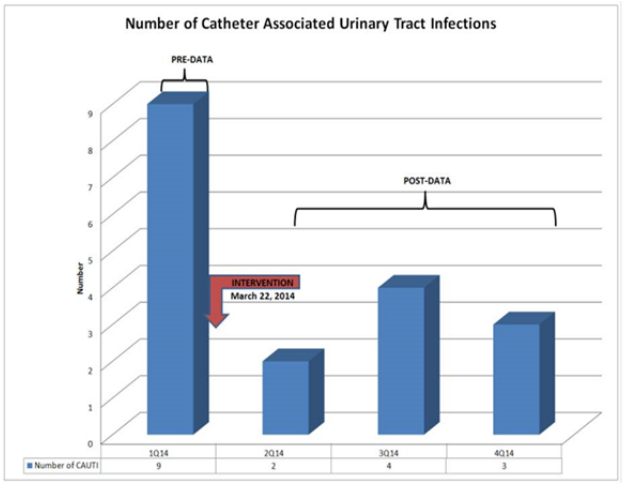
Presenter: Mamoona Arif Rahu, PhD, RN, CCRN

Objectives: Prevention of Catheter Associated Urinary Tract Infection (CAUTI) has become a major focus of health care providers, accrediting agencies, and reimbursement sources. We hypothesize that by implementing an Infection Control RN Liaison (ICRNL), as well as a bladder bundle encompassing collaboration between nursing and medical personnel, we will decrease incidence of CAUTI in the Surgery Trauma Intensive Care Unit (STICU)

Methods: The role of the ICRNL, as well as a bladder bundle, was implemented March 22, 2014 in the STICU. The bladder bundle included nursing and resident education and collaboration with daily questioning regarding catheter need. The ICRNL conducted weekly surveillance and bedside rounds to assess indwelling catheter necessity and/or use. The ICRNL created and implemented the Algorithm for Intermittent Catheterization Post Indwelling Urinary Catheter Removal and provided education to health care team members on the algorithm. Number of CAUTIs were evaluated at the end of the study period (January 2014 to December 2014).

Results: 7745 patients were admitted to the STICU during the study period and compared pre-intervention group (1Q14 - first quarter of 2014) with intervention group (2Q14, 3Q14, 4Q14). The two groups were similar in age, ICU LOS, and mechanical ventilation days. There was a significantly higher percentage of CAUTI in the pre-intervention group as compared to the intervention group ($p=0.0095$). In the pre-intervention group, CAUTI rates per 1000 device days were 7.70 days which significantly dropped by 5.71 days post implementation of ICRNL

Conclusions: Weekly surveillance of indwelling catheter necessity by the ICRNL lead to significant decrease in CAUTI rates.



Number of CAUTI

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Poster 8
#EAST2016P08

THE PROBLEM OF PRECEDENCE: EXAMINING THE COMPOSITION OF THE FAILURE TO RESCUE METRIC IN TRAUMA

Daniel N. Holena, MD*, Brendan G. Carr, MD, MA, MS*, Douglas Wiebe, PhD,
Jason Christie, Patrick M. Reilly, MD*
Hospital of the University of Pennsylvania

Presenter: Daniel N. Holena, MD

Objectives: Failure to Rescue (FTR) is the conditional probability of death after a complication and has recently gained traction as an outcome metric in trauma. The performance of this metric is contingent on the precedence rate, defined as proportion of deaths preceded by complications. The FTR metric was developed elective surgical populations where the precedence rate approaches 100%. This is an important consideration, as deaths not preceded by complications have not been considered as FTR cases in published trauma literature. We hypothesized that precedence rates in trauma would be much lower than 100% and would show significant variation between centers.

Methods: We performed a retrospective cohort study of prospectively collected registry data for all patients presenting to 30 trauma centers in Pennsylvania from 2011-2014 was conducted. Mortality was defined as in-hospital mortality, while FTR was defined as the probability death after any registry-defined complication. Precedence rates were calculated as the proportion of deaths preceded by a complication at each center.

Results: A total of 118,696 patients were included (median age 49(IQR 26-73), 82% Caucasian, 60% male, 87% blunt, median ISS 9 (IQR4-13)). Overall mortality was 4.35% (center range 1.0 -8.1%), overall complication rate was 9.7% (center range 1.3-17.7%) while the overall FTR rate was 11.7% (center range 4.6 - 17.4%). The overall precedence rate was 26.1% (center range 5.9 - 41.6%) (Figure1).

Conclusions: The precedence rate varies widely between trauma centers in a single state trauma system. Only ~25% of deaths were preceded by complications indicating that the majority of deaths at trauma centers are not included when calculating FTR rates. Considering only a small subset of deaths may lead to biased estimates of trauma center quality, and development of an FTR metric specific for use in trauma cohorts is warranted.

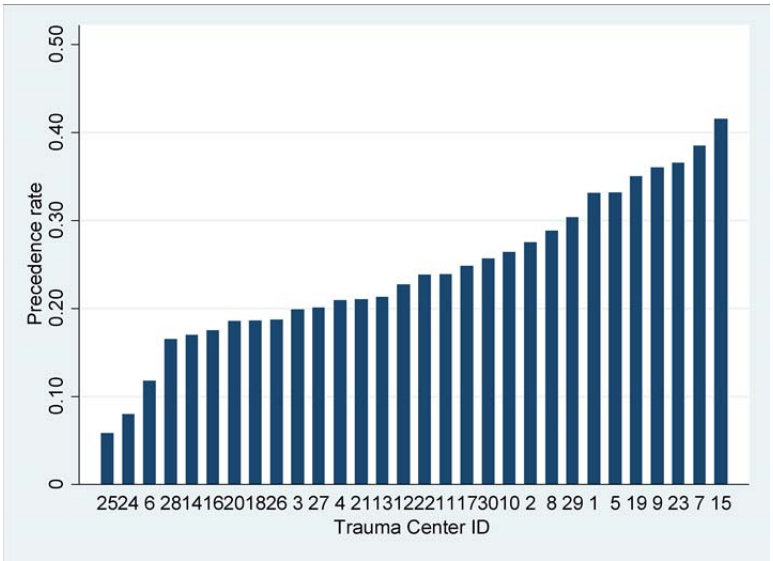

Figure 1 - Precedence rates by trauma center across a single-state trauma system.

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Poster 9
#EAST2016P09

APPLICATION OF FORCED AIR WARMING SIGNIFICANTLY REDUCES HYPOTHERMIA TIME IN TRAUMATICALLY INJURED PATIENTS

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Brian H. Williams, MD, FACS*, Kareem R AbdelFattah, MD,
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Presenter: Frank Zhao, MD

Objectives: The lethal triad of hypothermia, coagulopathy, and acidosis has been well described for decades. Hypothermia impedes activation of clotting factors and platelets, decreases chemotaxis, interferes with oxidative destruction of pathogens and increases the rate of surgical site infections. Forced air warming is easily accessible, but not universally utilized across the trauma patient population during the resuscitation phase. Therefore, we sought to determine if we could improve our application of forced air warming it order to decrease the hypothermic time for trauma patients.

Methods: We performed an internal quality improvement project to identify our current rewarming methods which included warmed blankets, increased ambient temperature, warmed intravenous fluid, and forced air warming. Over a one month period (December 2014), universal application of forced air warming was incorporated to our trauma rewarming protocol. We then compared hypothermic patients in the pre-intervention period (07/01/2014 to 11/23/2014) to hypothermic patients in the post-intervention period (01/01/2015 to 04/30/2015). The pre and post-intervention data was analyzed and compared using SSPS.

Results: There were 114 and 82 hypothermic patients in the pre and post-intervention groups respectively. Demographics were not different in these groups. Forced air warming utilization increased from 11% to 70% ($p=<0.0001$). The mean hypothermia time decreased by 33% from 229 min to 154 min ($p=0.003$). There were no significant differences in frequency or other types of warming methods utilized.

Conclusions: Utilization of forced air warming is an effective method to significantly reduce hypothermic time for trauma patients. Universal implementation of forced air warming can be effectively used as part of a systematic rewarming protocol and easily achieved in a short time frame (1 month) at a major Level 1 trauma center.

Methods	Pre-intervention	Post-intervention	P-value
Warmed Blankets	(110/114) – 96%	(78/82) – 95%	0.633
Ambient Temp	(82/114) – 72%	(59/82) – 72%	0.997
Warmed IV Fluids	(69/114) – 61%	(57/82) – 70%	0.157
Forced Air Rewarming	***(12/114) – 11%***	***(57/82) – 70%***	***<0.0001***
Pts Reaching 36°C	(91/114) – 80%	(70/82) – 85%	0.318
Hypothermia time	***229 min (3:49)***	***154 min (2:34)***	***0.003***

Table 1. Various rewarming intervention usage rates and overall hypothermia time in the pre and post-intervention groups.

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Poster 10
#EAST2016P10

THE IMPACT OF MINOR TRAUMA ON PREGNANCY AND NEONATAL OUTCOMES

Meike Schuster, DO, Lisa M. Jaramillo, Michael J. Paglia
Geisinger

Presenter: Meike Schuster, DO

Objectives: Determine the impact of a single episode of minor trauma during pregnancy on neonatal and pregnancy outcomes

Methods: This was a retrospective cohort study involving patients with viable pregnancies (≥ 24 weeks) who experienced trauma between 2004 and 2014. Women who experienced minor trauma were matched to a control group by gestational age at the time of minor trauma, gravidity, BMI and history of preterm delivery. The primary outcomes were preterm delivery, APGAR scores and NICU admission. Frequency of abnormal lab testing at the time of trauma was also evaluated. A p-value less than 0.05 was considered significant, and a 12% baseline preterm delivery rate was used to calculate power showing a 10% difference between groups which required 500 patients in each group

Results: Risk factors for preterm delivery were analyzed with no statistical differences found. Average gestational age at the time of delivery was equal in both groups as were APGAR scores. Preterm delivery was increased in the control group (11.8% vs 7.85%) as was the rate of NICU admissions (8.6% vs 5%) which was statistically significant. A subgroup analysis was performed to evaluate the rate of spontaneous preterm delivery versus medically indicated preterm delivery which revealed that a statistical difference between the two groups in the rate of preterm delivery was not found (57.6% in the control group, 56.4 % in the case group, p-value 0.9052). A further subgrouping of the rates of preterm labor and PPROM were compared and no statistical difference was found between groups (47% vs 40% PTL, p-value 0.75; 53% vs 60% PPROM, p-value 0.75). 40% of patients in the minor trauma group underwent laboratory testing and no abnormal values were found

Conclusions: One episode of minor trauma in pregnancy does not increase the risk for preterm delivery, PPROM or poor neonatal outcomes. Laboratory test results are unlikely to be abnormal and therefore may not be necessary

	Case (n = 500)	Control (n = 500)	P-value
Gestational Age in Days, median (IQR)	275 (270, 280) 39.28 weeks	274 (267, 280) 39.14 weeks	0.1559
Gestational Age in Days at Trauma, mean (STD)	222.93 (29.88)	NA	NA
BMI, mean (STD)	29.07 (7.91)	28.96 (7.66)	0.3789
OB APGAR 1, median (IQR)	8 (8, 8)	8 (8, 8)	0.5063
OB APGAR 5, median (IQR)	9 (9, 9)	9 (9, 9)	0.7997
Placenta Abruption	5 (1.00%)	3 (0.60%)	0.7266
Pre - Eclampsia	16 (3.20%)	23 (4.60%)	0.3368
Gestational Hypertension	11 (2.20%)	13 (2.60%)	0.8388
Chronic Hypertension	20 (4.00%)	30 (6.00%)	0.1934
Advanced Maternal age	51 (10.20%)	56 (11.20%)	0.6752
Tobacco	135 (27.00%)	153 (30.60%)	0.2384
Drug Dependency	14 (2.80%)	10 (2.00%)	0.5413
Uterine anomaly	3 (0.60%)	2 (0.40%)	0.9999

Table 1 - Demographics

	Case (n = 500)	Control (n = 500)	P-value
Gestational Age in Days, median (IQR)	275 (270, 280) 39.28 weeks	274 (267, 280) 39.14 weeks	0.1559
Preterm	39 (7.85%)	59 (11.80%)	**0.0428**
NICU Admission	25 (5.00%)	43 (8.60%)	**0.0273**
OB APGAR 1, median (IQR)	8 (8, 8)	8 (8, 8)	0.5063
OB APGAR 5, median (IQR)	9 (9, 9)	9 (9, 9)	0.7997
Subgroup analysis			
Spontaneous preterm labor	20 (56.4%)	34 (57.6%)	**0.9052**
Preterm labor	10 (50%)	15 (44%)	**0.6755**
Premature rupture of membranes	10 (50%)	19 (56%)	**0.7463**
NICU Admission	62%	20%	**0.0030**
Length of time between trauma and delivery	50.77 days (SD 29.99) 35.67 days (SD 25.00) for preterm deliveries 52.05 days (SD 30.06) for term deliveries		

Lab Name	Normal range	Total number with lab results	Number of normal
APTT-PATIENT	22-37 sec	101	100 (99.01%)
FIBRINOGEN-PATIENT	178-467 mg/dL	127	45 (35.43%)
HCT	36.0-45.2%	202	43 (21.29%)
HGB	12-15.3 g/dL	202	71 (35.15%)
PLATELET COUNT	140-400 K/uL	202	189 (93.56%)
PT/INR-INR	0.85-1.16	97	93 (95.88%)

Table 2 - Results

Notes

Scientific Posters – Group II
Performance Improvement and Outcomes
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 11
#EAST2016P11

UTILITY OF PROPHYLACTIC ANTIBIOTICS FOR NON-OPERATIVE FACIAL FRACTURES

Jeffrey Wild, MD*, Kelly Bridgham, Kenneth A. Widom, MD, Megan Rapp, MD,
Marie Hunsinger, James T Dove, BA, Denise Torres
Geisinger

Presenter: Jeffrey Wild, MD

Objectives: The majority of patients with facial fractures are managed non-operatively. Patients with facial fractures involving the sinus cavities are often placed on prophylactic antibiotics for 7-10 days to prevent soft tissue infection from the cavity flora. However, no literature exists that shows this practice decreases infection rates. This study aims to compare the duration of antibiotics and the incidence of soft tissue infection found in non-operative facial fractures.

Methods: This was a retrospective review of the trauma database of a rural, level 1 trauma center between 1/1/2012 and 1/1/2015. Patients admitted with non-operative facial fractures were included. Patients were categorized into three groups: group 1 received no antibiotics, group 2 received a short course (1-5 days), and group 3 received a long course (>5 days). All patients were followed through their first outpatient facial trauma clinic visit to survey for soft tissue infections. Outcomes measured include facial soft tissue infections and *C. difficile* infections.

Results: During a 3 year period, 289 patients were admitted with non-operative facial fractures. Basic demographics and ISS between the groups are found on table 1. 50 patients received no prophylactic antibiotics, 63 received 1-5 days, and 176 patients received >5 days. No patients developed facial soft tissue infections (table 2). We found no significant difference in the incidence of C. *difficile* infection between the 3 groups.

Conclusions: Our results show that a short-course or no antibiotics may be just as effective as an extended course at preventing soft tissue infection in patients with non-operative facial fractures. Although not found in our study, prophylactic antibiotics in the surgical literature have led to multi-drug resistant organisms and worse outcomes. A prospective study comparing no antibiotics to a short course in trauma patients with non-operative facial fractures is warranted.

Variable	None (n = 50)	Short Course 1 - 5 Days (n = 63)	Long Course > 5 Days (n = 176)	p value
Age	51.6 ± 21.2	52.6 ± 20.4	52.7 ± 22.4	0.95
Male	33 (66%)	45 (71.4%)	115 (65.3%)	0.67
BMI	28.3 ± 6.7	26.8 ± 5.5	27.9 ± 7.1	0.44
ISS	15.5 (9, 24)	21 (10, 29)	14 (9, 22)	0.04
GCS	15 (14, 15)	15 (9, 15)	15 (14, 15)	0.04
Facial Fracture				
MAXILLARY	19 (38%)	11 (17.5%)	22 (12.5%)	
ORBITAL	21 (42%)	18 (28.6%)	49 (27.8%)	
Both	10 (20%)	34 (54%)	105 (59.7%)	

Table 1 Patient demographics and fracture type

Variable	None (n = 50)	Short Course 1 - 5 Days (n = 63)	Long Course > 5 Days (n = 176)	p value
Soft Tissue Infection	0	0	0	n/a
C Diff	0 (0%)	0 (0%)	1 (0.6%)	0.72
LOS	3.5 (2, 9)	6 (2, 13)	3 (2, 6)	0.004

Table 2 Patient outcomes

Notes

Scientific Posters – Group II
Performance Improvement and Outcomes
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 12
#EAST2016P12

ASSOCIATION BETWEEN BODY MASS INDEX AND PATIENT OUTCOMES 3 MONTHS POST TRAUMATIC INJURY

Ann Marie Warren, Simon Driver, Sonesh Patel,
Megan Reynolds, MS, Monica Bennett, Hayden Smith
Baylor University Medical Center

Presenter: Ann Marie Warren

Objectives: Obesity is a public health issue that impacts more than 1/3 of US adults and costs $150 billion annually, however little is known about the impact of obesity on health following hospitalization for injury. The objective was to examine if Body Mass Index (BMI) during initial admission predicted health outcomes 3-months post traumatic injury.

Methods: Eligible patients admitted to a Level I trauma center March 2012 - May 2014 were approached for participation in this prospective, longitudinal study; 455 patients were consented and enrolled, of which 343 (75.3%) completed 3-month follow-up. Patients were divided into BMI categories (normal, overweight, and obese) based on height and weight at admission. Demographic and injury-related data were collected from patient charts and hospital trauma registry. Health outcomes included depression, post-traumatic stress disorder (PTSD), pain, and return to work. Logistic regression was used to predict health outcomes based on BMI category, and all models controlled for demographic and injury-related variables.

Results: Analysis was completed with 336 participants including 104 normal weight, 105 overweight, and 127 obese; 7 underweight were removed from analysis. Results from the regression analyses indicated that, relative to controls, obese patients had higher odds of screening positive for depression (OR=2.36, p=0.02) and overweight patients had lower odds of returning to work (OR=0.31, p=0.01) 3-months post-injury compared to normal weight (65% vs 40%). No significant differences were found in PTSD or pain between BMI groups.

Conclusions: Results indicate that people who are obese or overweight during hospitalization following a traumatic injury are at greater risk for depression and are less likely to return to work when compared to people who are normal weight. Efforts regarding identification and treatment of depression should be targeted at this population.

Notes

Scientific Posters – Group III
Surgical Practice and Education
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 13
#EAST2016P13

OVERSEAS ORGAN DONATION DURING WARTIME OPERATIONS: BENCHMARKING MILITARY PERFORMANCE AGAINST CIVILIAN PRACTICE

John Oh, MD*, Darren Malinoski, J. Salvador de la Cruz, MD,
David Zonies, MD, MPH, FACS, FCCM*
Portland Veteran Affairs Medical Center

Presenter: John Oh, MD

Objectives: Over the past 12 years of war in Afghanistan and Iraq, U.S. military service members who were eligible for organ donation after neurologic determination of death have selflessly donated organs overseas at a role IV military facility in Germany. The purpose of this study was to identify and benchmark organ donation outcomes from U.S. combat casualties against a civilian matched cohort in the U.S.

Methods: Data from eligible adult U.S. military organ donors at a military treatment facility in Germany were collected. All donors were combat casualties that were declared dead by standard neurologic criteria. Military donors were matched 1:3 with a civilian cohort from the U.S. United Network for Organ Sharing donor registry. Demographic variables, organs recovered, and organs transplanted were compared between groups.

Results: From 2006-2013, 40 military organ donors were compared with 120 civilian matched donors. There were no significant differences in BMI or ABO blood type. Military donors were more commonly male (100% vs 62%, $p < 0.05$) and younger (mean age 25.8 + 0.99 vs. 44.2 + 1.4, $p < 0.05$). Standard criteria donors (SCDs) comprised all of the military donors, while the civilian cohort consisted of 73 SCDs, 34 expanded criteria donors, and 9 donors after circulatory determination of death. There were more organs recovered (4.6 vs. 4.0, $p = 0.02$) and transplanted (4.2 vs 3.5, $p = 0.01$) per military donor. The military group had significantly more transplanted hearts (65% vs 29%), lungs (35% vs 18%), livers (98% vs 73%), and pancreata (48% vs 9%, all $p < 0.05$). There was no difference in the proportion of kidneys transplanted (90% vs 97%, $p = 0.61$).

Conclusions: Despite multiple logistical hurdles, organ donation at a military treatment facility overseas can be accomplished successfully with excellent outcomes. The success should serve as an example for future conflicts.

Table: Univariate analysis of military versus civilian organ donor cohort.

Organ	Military (n=40)	Civilian (n=120)	p-value
Heart			
recovered	29 (73%)	38 (32%)	<0.05
transplanted	26 (65%)	34 (29%)	<0.05
Lungs			
recovered	15 (38%)	27 (23%)	0.06
transplanted	14 (35%)	22 (18%)	0.03
Kidney(s)			
recovered	38 (95%)	114 (95%)	1.0
transplanted	36 (90%)	93 (87%)	0.61
Liver			
recovered	40 (100%)	97 (81%)	<0.05
transplanted	39 (98%)	87 (73%)	<0.05
Split Liver	5 (12%)	1 (0.8%)	<0.05
transplanted			
Pancreas			
recovered	25 (63%)	21 (18%)	<0.05
transplanted	19 (48%)	11 (9%)	<0.05

Notes

Scientific Posters – Group III
Surgical Practice and Education
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 14
#EAST2016P14

CURRENT AND DESIRED PRACTICE PATTERNS OF TRAUMA AND ACUTE CARE SURGEONS (T/ACS)

Nathan Droz, MD, Melissa L. Whitmill, MD*,
Priti Parikh, PhD, Kimberly Hendershot, MD, FACS*
Wright State University

Presenter: Nathan Droz, MD

Objectives: Resident hour restrictions and the addition of emergency general surgery (EGS) have changed how the T/ACS team functions and their work patterns. The purpose of our study is to report current practice patterns of T/ACS and compare those to desired practice patterns of the future workforce in the field (residents/fellows).

Methods: An IRB-approved electronic survey was distributed nationally to EAST members. Attendings were asked about their current work patterns; residents and fellows were asked about the work patterns they desire in a future job as a T/ACS.

Results: A total of 274 participants were analyzed (242 attendings). A comparison of current attending practices and desired resident/fellow practices is shown in Table 1. The current and desired practice patterns are very similar with a few differences. The most notable difference is that residents/fellows want to leave early on post-call days, which happens rarely in current practices. Residents/fellows also desire an attending hand-off which only occurs about half of the time in current practices.

Table 2 shows that current and desired scopes of practices are very similar, with the exception of residents/fellows having less interest in elective general surgery.

The majority of attendings have not developed innovative strategies for improving their work pattern but 68% have changed their practice pattern in the last 5 years, mostly based on the addition of EGS and changes in personnel; 34% state the change was to make the practice more attractive to those entering the T/ACS field.

Conclusions: Current attending practice patterns are similar to desired practice patterns of residents/fellows with notable differences in the areas of the post-call day, attending hand-off, and elective surgery scope of practice. T/ACS must find ways to implement changes to the current practice pattern to keep the field attractive for upcoming residents/fellows.

	Current ATTENDING Practices	Desired RESIDENT/FELLOW Practices
Academic practice	61%	50%
Size of group	94% Mod-Large group (4+ people)	100% Mod-Large group (4+ people)
Function as group (ie shared rounding responsibilities)	90%	100%
Length of call "shift"	57% 1 person/24 hour period	90% OK with 1 person/24 hr period
Calls per month	3-7 24 hr equivalents per month	4-7 24 hr equivalents per month
Post-call day	15% go home after shift 40% stay all day	47% want to go home after shift 50% want to stay to finish rounds/OR 3% want to stay all day
Structured attending hand-off	53% (face to face, verbal)	73% (face to face, verbal, no texts)
Call pay	57% have NO call pay	77% OK with NO call pay as long as base salary is good
Team Composition	88% have residents 94% have NP/PA's	93% want residents 97% want NP/PA's

Table 1: Comparison of current attending practice patterns and desired resident/fellow practice patterns

	ATTENDING Current Scope of practice	RESIDENT/FELLOW Desired Scope of practice
Trauma	99%	100%
Emergency General Surgery (EGS)	96%	90%
Trauma-ICU	90%	97%
Surgical-ICU	90%	87%
Elective General Surgery	75%	53%

Table 2: Comparison of attending current scope of practice and resident/fellow desired scope of practice

Notes

Scientific Posters – Group III
Surgical Practice and Education
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 15
#EAST2016P15

LOST IN TRANSLATION: FOCUSED DOCUMENTATION IMPROVEMENT BENEFITS TRAUMA SURGEONS

Nicole Fox, MD, MPH*, Patricia Swierczynski, Rebecca Willcutt,
Adrienne Elberfeld, Anthony Mazzarelli
Cooper University Hospital

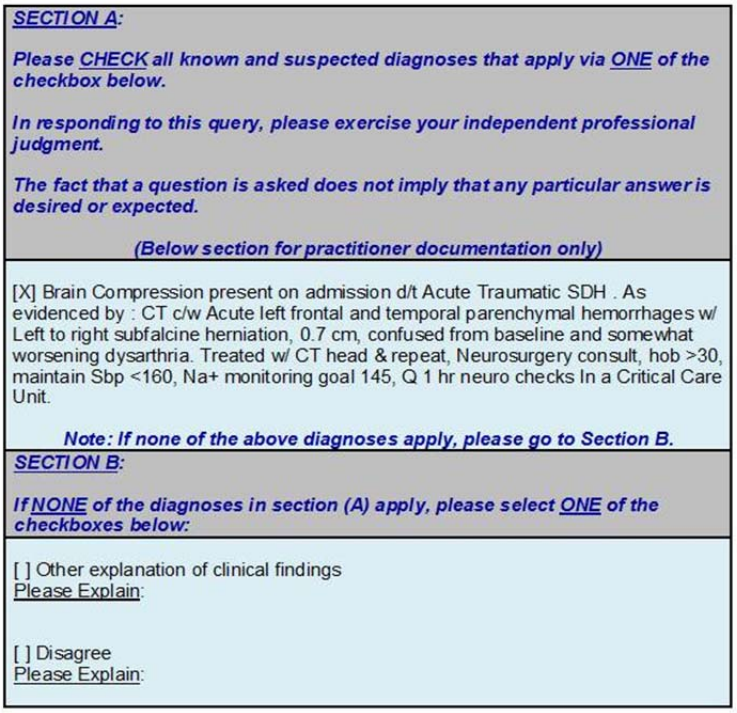
Presenter: Nicole Fox, MD, MPH

Objectives: There is a translational gap between physicians who document in the medical record and coders, who ultimately determine which codes are submitted. This gap exists because physicians are never formally educated about documentation despite the fact that the quality of physician documentation directly affects revenue, outcomes and public profiling. We hypothesized that focused documentation improvement (FDI) for trauma surgeons would bridge this gap, leading to revenue recovery and a shift in the case mix index (CMI) to accurately reflect the clinical complexity of trauma patients.

Methods: FDI is defined as targeted physician education followed by concurrent chart review for documentation improvement opportunities by a clinical documentation specialist (CDS). All trauma surgeons (n=9) at our Level 1 trauma center completed three hours of mandatory training on documentation improvement. A CDS subsequently reviewed charts of Medicare admissions to the trauma service from January-December 2014 to identify documentation improvement opportunities. Requests to clarify documentation and/or confirm diagnoses were generated. These were posted in the electronic medical record (EMR) and physicians were required to respond within 48 hours (Figure 1). Data was collected on change in CMI and revenue recovery.

Results: Medicare patients (n=776) accounted for 28% of all trauma admissions in 2014. Four hundred and eleven of 776 (57%) charts were reviewed during the study period. Opportunities for FDI were identified in 177 (43%) cases. The CMI for reviewed cases increased (1.80±0.15 v. 2.11±0.19;$p<0.001$) after FDI. Overall revenue recovery as a result of FDI was $1,132,581 with an average of $125,842±70,494 in revenue recovery/physician.

Conclusions: Efforts to improve physician documentation are beneficial as FDI resulted in significant revenue recovery and an increase in the CMI for trauma patients.



SECTION A:

Please CHECK all known and suspected diagnoses that apply via ONE of the checkbox below.

In responding to this query, please exercise your independent professional judgment.

The fact that a question is asked does not imply that any particular answer is desired or expected.

(Below section for practitioner documentation only)

[X] Brain Compression present on admission d/t Acute Traumatic SDH . As evidenced by : CT c/w Acute left frontal and temporal parenchymal hemorrhages w/ Left to right subfalcine herniation, 0.7 cm, confused from baseline and somewhat worsening dysarthria. Treated w/ CT head & repeat, Neurosurgery consult, hob >30, maintain Sbp <160, Na+ monitoring goal 145, Q 1 hr neuro checks In a Critical Care Unit.

Note: If none of the above diagnoses apply, please go to Section B.

SECTION B:

If NONE of the diagnoses in section (A) apply, please select ONE of the checkboxes below:

[ ] Other explanation of clinical findings
Please Explain:

[ ] Disagree
Please Explain:

Figure 1. Clarification Request in the EMR

Notes

Scientific Posters – Group III
Surgical Practice and Education
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 16
#EAST2016P16

TRAUMA SURGEONS SAVE LIVES - SCRIBES SAVE TRAUMA SURGEONS!

Joseph F. Golob, MD*, John J. Como, MD, MPH*, Jeffrey A. Claridge, MD, MS*
MetroHealth Medical Center

Presenter: Joseph F. Golob, MD

Objectives: With the advent of the electronic medical record, the documentation burden of the trauma surgeon has become overwhelming. To help, our trauma division added scribes to the rounding team. We hypothesized that scribe utilization would improve our documentation efficiency and offer a financial benefit to our institution.

Methods: A review of trauma surgeon documentation and billing was performed at a Level I trauma center over two time periods: January-May 2014 (no scribes) and January-May 2015 (scribes). The number of notes written by trauma surgeons was obtained, as were documentation charges. Documentation efficiency was determined by noting both the hour of the day in which inpatient progress notes were written and the number of notes written after patient discharge. The hospital charge database was queried for evaluation and management codes specific to inpatient documentation.

Results: In the 2014 period, 9726 total notes were written by seven trauma attendings. In the 2015 period, 10933 were written by eight trauma attendings. Despite there being 407 fewer trauma patient-days in the 2015 period, the group wrote 343 notes/week vs 298 notes/week ($p=0.008$). Specifically, 882 more inpatient progress notes were written with scribe assistance. More inpatient progress notes were written earlier in the working day and fewer were written in the evening hours with scribes (Figure 1). Fewer notes were written after patient discharge when utilizing scribes (12.7% vs. 8.4%). Normalized to trauma patient-days, scribe assistance increased charge capture by $32 per patient-day of documentation (Figure 2). A total of 1664 hours of scribe time was utilized over the five-month period, generating an expense of $32,787. The additional notes generated by scribes resulted in $315,756 in charges. Assuming a 20% charge reimbursement, the cost of the scribes were covered.

Conclusions: The addition of scribes to the daily trauma rounding team improved note efficiency and increased charge capture at our center.

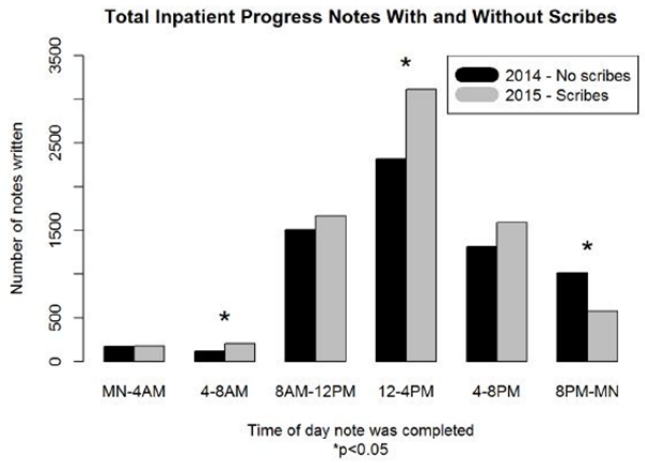


Figure 1: Time inpatient progress notes were written with and without scribe assistance. Statistically more notes are written earlier in the working day and less were written in the evening hours.

Inpatient subsequent care and critical care codes	January – May 2014 No scribes (number of charges)	January – May 2015 Scribes (number of charges)
99224	$390 (6)	$845 (13)
99225	$224 (2)	$560 (5)
99226	$0 (0)	$330 (2)
99231	$158,254 (1181)	$284,884 (2126)
99232	$237,728 (1292)	$268,456 (1459)
99233	$236,812 (811)	$200,604 (687)
99291	$917,488 (1144)	$820,446 (1023)
99292	$25,818 (78)	$12,909 (39)
Total	$1,576,714 (4514)	$1,589,034 (5354)
Trauma Patient-Days	4842	4435
Total charges normalized to trauma patient-days	$326	$358

Figure 2: Total dollars charged and number of charges with and without scribes. Normalized to trauma patient-days, scribe utilization increased inpatient documentation charge capture $32.00 per trauma patient-day.

Notes

Scientific Posters – Group III
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Poster 17
#EAST2016P17

COMFORT WITH UNCERTAINTY IS INHERENT TO ACS SURGEONS AND DOES NOT CHANGE WITH EXPERIENCE: EAST MEMBERS SURVEY RESULTS

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

Presenter: Bishwajit Bhattacharya, MD

Objectives: Acute care surgery (ACS) is a demanding profession that is by its nature unpredictable and requires practitioners to routinely deal with uncertainty and stress. We hypothesized that the field attracts people who are comfortable working in such an environment and their comfort with uncertainty would increase with experience. A surgeon's stress to uncertainty can be assessed using the previously validated Physician Reaction to Uncertainty Scale (PRU scale).

Methods: After approval from our IRB and EAST Research-Scholarship Committee, an online survey was sent to EAST members. The survey included demographic questions and the PRU scale. The PRU scale requires answering 15 questions on a scale of 1-6 (strongly disagree to strongly agree) with four subsections measuring anxiety to uncertainty, concern about outcomes, reluctance to disclose uncertainty to patients, reluctance to disclose mistakes to physicians. The higher the score the greater the discomfort. Survey requests were sent to 1707 members - 424 were complete and used for analysis.

Results: Most respondents were surgeons (92.4%) and male (77.1%). Average total score was 40.4/90. Overall discomfort to uncertainty on the PRU scale did not vary with gender (p=.88), experience (p=.11), age (p=.21) or practice location (p=.26). With increased experience, there was decreased reluctance to disclose uncertainty to patients (p=.03) and a trend to decreased anxiety about outcomes (p=0.09).

Conclusions: Overall discomfort to uncertainty among ACS providers appears to be inherent in their personality and does not change over a career span. This factor may play a role in the development of occupational stress since discomfort with uncertainty appears to persist over time. Future studies looking at other surgical specialties in comparison and longitudinal studies may provide insight into the personality of the community.

Experience (years)		Anxiety due to Uncertainty Sub Total	Concern About Outcomes Sub Total	Reluctance to Disclose uncertainty to Patients Sub Total	Reluctance to disclose mistakes to Physicians Sub total	Total Score
In Training	Mean	14.4	10.0	14.4	4.6	43.3
	N	22.0	22.0	22.0	22.0	22.0
	Std. Deviation	5.7	3.5	2.9	2.4	11.3
< 2	Mean	15.0	9.4	12.8	3.1	40.3
	N	35	35	35	35	35
	Std. Deviation	5.2	4.0	2.6	1.5	10.3
2-5	Mean	15.8	9.3	14.2	3.6	42.9
	N	58	58	58	58	58
	Std. Deviation	5.7	3.4	2.8	1.8	10.0
6-10	Mean	15.0	8.7	13.8	4.0	41.5
	N	94	94	94	94	94
	Std. Deviation	5.3	3.8	2.7	1.8	10.4
11-20	Mean	13.8	8.4	13.4	3.4	39.0
	N	116	116	116	116	116
	Std. Deviation	5.6	3.8	2.7	1.7	10.3
>20	Mean	14.5	8.1	13.0	3.6	39.2
	N	97	97	97	97	97
	Std. Deviation	6.2	3.6	2.7	2.1	11.5
Total	Mean	14.7	8.7	13.5	3.7	40.5
	N	422	422	422	422	422
	Std. Deviation	5.7	3.7	2.7	1.9	10.7
	p	0.353	0.096	0.029	0.023	0.114

Notes

Scientific Posters – Group III
Surgical Practice and Education
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 18
#EAST2016P18

THE ANATOMY OF NURSING INTERRUPTIONS IN A SURGICAL INTENSIVE CARE UNIT AT A TRAUMA CENTER

Pratik Parikh, PhD, Nicole C. Craker, BA, MPH, Robert A. Myers, MSE, Jessy Eid,
Priti Parikh, PhD, Kathy Zink, Mary C. McCarthy, MD*
Wright State University

Presenter: Robert A. Myers, MSE - @fixineer

Objectives: Although interruptions experienced by nurses during intensive care have been indicated to affect patient safety, not much is known regarding the complex situations that drive interruptions to eventually aid in intervention design and implementation. Our objective, thus, is to understand the anatomy of interruptions; i.e., source (person or device), location, activity performed, inquiry, and their interactions that affect the duration of an interruption and switch from the primary activity.

Methods: We observed registered nurses (RNs) in a 23-bed surgical intensive care unit (SICU) at a Level 1 Trauma Center in the Midwest US. Multiple RNs were shadowed for 25 sessions for a total of 75 hours between June and September 2014. A total of 206 interruptions were recorded for two outcomes (interruption duration and switch from primary task), which were analyzed using statistical methods.

Results: RNs were interrupted on average every 18.3 min; mean duration of interruption being 99.8 s. The dominant location was patient room (57.8%), activity was documentation (42.2%), and inquiry was professional communication (56%). Interruptions by attending/residents were less frequent (10%), but significantly longer than the more frequent (30%) caused by other RNs (197.1 vs 74.8 seconds; $p<0.01$). Long durations (although less frequent) led to a higher proportion of switches (correlation, $r = 0.64$). Individually, devices, hall, documentation, and inquiry in form of a task led to significantly higher switches. Interaction between these factors were detrimental; e.g., duration was long by interruption from attending/resident during documentation (202.5 vs. 93.5 s, $p=0.0238$); switches were higher when in the hall (87.5% vs 49.5%, $p=0.0368$).

Conclusions: This work shows that a deeper understanding in the anatomy of interruptions, and the emerging complex situations through their interaction, is imperative. Operational protocols can be devised to avoid such situations from occurring, unless it is benefiting the patient.

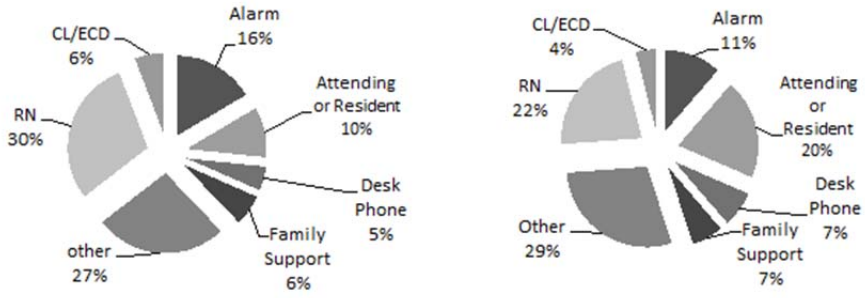

Figure 1. Frequency (left, *n*=206) and duration (right, % of 342 total interrupted minutes) of interruptions for each source (person and device); CL = call light, ECD = electronic communication device.

Figure 1. Frequency (left, *n*=206) and duration (right, % of 342 total interrupted minutes) of interruptions for each source (person and device); CL = call light, ECD = electronic communication device.

Table 2. Situations (modeled via two-way interaction effects) affecting duration and switch; *n*/*q* indicates events and mean (seconds) for duration or events and percentage switched (%) for switch

	Situation		**Situation**	***p*-value**
		Duration (s)		
Person + Activity	*Attending/Res + Documentation (12/202.5 s)*	greater than	*Other situations (194/93.5 s)*	0.0238
Person + Location	*Attending/Res + Hall (8/258.0 s)*		*Other situations (198/93.4 s)*	0.0301
Device + Activity	*Alarm + Documentation (19/55.2 s)*	less than	*Other situations (187/104.3 s)*	0.0323
		Switches (%)		
Person + Location	*Attending/Res + Hall (8/87.5%)*	greater than	*Other situations (198/49.5%)*	0.0368
Device + Activity	*Alarm + Documentation (19/84.21)*		*Other situations (187/47.6%)*	0.0019
Person + Location	*RN + Patient Room (31/25.8%)*	less than	*Other situations (175/55.4%)*	0.0020

Table 2. Situations (modeled via two-way interaction effects) affecting duration and switch; *n*/*q* indicates events and mean (seconds) for duration or events and percentage switched (%) for switch

Notes

Scientific Posters – Group III
Surgical Practice and Education
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 19
#EAST2016P19

REPLACEMENT OF A SWINE MODEL: DESIGN OF A COST EFFECTIVE HEMODYNAMICALLY ADJUSTABLE MODEL (HAM) FOR REBOA SIMULATION

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Presenter: Benjamin A. Keller, MD - @bakeller

Objectives: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is an adjunct technique to salvage patients with non-compressible torso hemorrhage. Current REBOA training paradigms require large animals or human cadavers for acquisition of skills. This adds cost and logistical obstacles to training that may prevent widespread dissemination of REBOA. We propose the development of a low-cost, near-physiologic REBOA simulator, replacing the need for costly animal models.

Methods: A REBOA simulator was designed and assembled. Pulsatile perfusion was achieved using a Harvard Apparatus pump and the anatomic vascular circuit was constructed out of latex and PVC tubing. Retrograde balloon occlusion was achieved using a Cook Coda balloon catheter. Pressure sensors were placed in the proximal aorta and distal iliac artery for pressure monitoring and arterial tracings were obtained.

Results: A pulsatile simulator capable of generating cardiac outputs ranging from 1.7-4.5 liters per minute with corresponding arterial pressures of 89-184/65-121 mm Hg was successfully created. The simulator accommodates an introducer sheath compatible with the Coda balloon catheter. Upon inflation of the REBOA catheter, the arterial waveform distal to the occlusion flattens and distal pulsation within the simulator is lost. Systolic pressures proximal to the inflated occlusion balloon increase by 62 mm Hg, simulating the ability to increase proximal perfusion when the catheter is deployed.

Conclusions: We have designed a cost effective simulator capable of producing near physiologic blood pressure and flow dynamics that respond in real time to balloon catheter manipulation. Further development and validation of this simulator will allow for refinement, reduction, and replacement of large animal models for training purposes, facilitating lower cost, high fidelity simulation and widespread application of REBOA.

Notes

Scientific Posters – Group III
Surgical Practice and Education
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 20
#EAST2016P20

FACTORS ASSOCIATED WITH THE DECISION TO WITHDRAW CARE IN CRITICALLY INJURED PATIENTS ADMITTED TO THE ICU

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Presenter: Fadi M. Balla, MD

Objectives: Between 10-20% of trauma patients admitted to the ICU will eventually die but little is known of the epidemiology and injury patterns of those who die from withdrawal of care (WOC). Up to 42% of trauma mortality may be the result of WOC and these end-of-life decisions can be emotionally and financially trying for families. Injury severity, race, and gender may influence the decision to withdraw care in neurology ICU patients and several studies have investigated factors related to oncologic WOC. We present the only study exclusively investigating trauma ICU deaths from WOC. The purpose of our study is to investigate factors associated with WOC in trauma ICU patients.

Methods: This is a retrospective case-control study with cases being WOC deaths in the ICU and controls being non-WOC deaths. All trauma related deaths from 2010-14 were examined at an ACS verified level 1 trauma center. Only patients who died after admission to ICU were included. Demographic and clinical characteristics were compared between the two groups.

Results: Of the 14,267 total trauma patients seen at our institution, 712 (4.9%) died. 239 (33.6%) died in the ED and were excluded leaving 473 (66.4%) ICU deaths. Of the 473 ICU deaths, 169 (35.7%) underwent WOC. Those undergoing WOC were significantly ($p<0.05$) more likely to be male, white, older, have sustained a motor vehicle accident, had longer hospital stay and ventilator days, and have severe chest injury (AIS≥3). Head injury (AIS≥3) was not different between groups. Non-WOC deaths were more likely to be transfused a greater number of blood products.

Conclusions: There are distinct differences in demographic and clinical characteristics between WOC and non-WOC patients. Knowledge of these differences may aid with early goal directed discussions regarding end-of-life care, thus helping both families and physicians avoid significant emotional and financial burden.

Notes

Scientific Posters – Group IV
Trauma Systems and Prevention
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 21
#EAST2016P21

LATE MIDDLE AGE (55-65): AT THE INTERSECTION OF COMORBIDITY AND HIGH-RISK ACTIVITY

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Presenter: Stephen C. Gale, MD

Objectives: Late middle age (55-64) represents the watershed between young and elderly patients and carries unique changes in physical and social stature. While the elderly are known to have poorer outcomes after injury, little is known regarding outcomes for those injured in late middle age (LMA). We sought to characterize our LMA injured population and compare outcomes for this group to both younger and older patients in rural setting.

Methods: The East Texas Level 1 Trauma Center database was queried for all patients admitted from July 2008 to June 2013. Demographics, injury details, comorbidities and outcomes were compiled and compared. T-test and Fisher's exact test were used; $p<0.05$ was significant.

Results: During the 5-year study period, 6479 patients were admitted; 765 (11.2%) were LMA. Compared the other groups, injury characteristics (mechanism, injury pattern, and ISS) for LMA patients more closely mirrored younger patients (n=3748) while demographics and comorbidities were similar to older patients (n=1966). Interestingly, LMA patients had the highest rate of alcohol abuse (12.9%). Mortality for LMA patients (4.6%) fell between the other groups, while complication rates, hospital charges, and length of stay were all highest among for LMA patients.

Conclusions: Late middle age patients have similar risk factors and injury patterns to younger patients while exhibiting the high comorbidity rates seen in the elderly. Injuries appear to exact a higher toll on this population and require greater resource utilization. Targeted outreach may be of benefit for injury prevention and to identify societal contributors. Future prospective studies across environments are needed to validate our findings.

	< 55	55-64	≥65
# of patients	3478	765	1966
Mechanism of Injury			
MVC	*35.7%	22.1%	*13.6%
MCC	*7.2%	11.6%	*0.8%
ATV/etc	24.4%	18.7%	*6.5%
Fall	*14.6%	35.2%	*75.4%
GSW	5.4%	3.1%	*0.8%
Comorbidities			
Alcohol	9.7%	12.9%	*3.1%
Tobacco	29.2%	24.3%	*9.1%
HTN	*8.1%	37.8%	54.9%
DM	*4.1%	20.9%	24.5%
COPD	*1.4%	7.1%	10.9%
Morbid Obesity	5.3%	9.2%	5.7%
Injuries			
Injury Severity	11.6±9.1	11.5±8.6	*10.2±6.6
Brain Injury	21.3%	23.8%	25.1%
Rib Fracture	18.8%	21.7%	*11.9%
Abdominal	13.2%	12.2%	*5.6%
Pelvic Fracture	9.9%	9.4%	7.3%
Spine Fracture	25.1%	23.5%	*16.5%
Spinal Cord Inj	4.1%	3.7%	2.2%
Complications			
Infectious	8.4%	10.2%	8.1%
Cardiac	*1.1%	2.2%	2.8%
Total	29.6%	33.2%	*23.9%
Outcomes			
Mortality	3.1%	4.6%	5.8%
LOS	7.4±9.5	8.2±9.6	*6.7±6.3
*p<0.001 vs LMA group			

Notes

Scientific Posters – Group IV
Trauma Systems and Prevention
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 22
#EAST2016P22

RECURRENT VIOLENT INJURY

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Presenter: Elinore J. Kaufman, MD - @ElinoreJKaufman

Objectives: While many clinical interventions and research studies have focused on reducing recurrent violent injury, the true magnitude of this problem is unknown. Prior single-center studies have reported recurrence rates varying from 0.8% to 44%. Risk factors for recurrence are also not well established. We used a state-wide, all-payer database to identify the incidence of and risk factors for recurrence after an initial violent injury at the population level.

Methods: We performed a retrospective cohort study of all ED visits for violent injury in Florida from 1/2010-12/2012 using the AHRQ State ED and Inpatient Databases, which together capture all visits to non-federal EDs. We assessed clinical and demographic risk factors for recurrence with logistic regression models and estimated time to recurrence with the Kaplan-Meier method.

Results: Of 53,933 patients presenting to 188 hospitals for violent injury in 2010, 9.9% recurred during the study period. Factors associated with lower odds of recurrence included female sex (OR 0.7; $p<0.001$), Hispanic race (OR 0.7; $p<0.001$), rural residence (OR 0.8; $p<0.001$), and injury severity >=25 (OR 0.5; $p=0.03$). Factors associated with increased odds included homelessness (OR 2.1; $p <0.001$); low income (OR 1.2; $p<0.001$); Medicare, Medicaid or lack of insurance (OR 1.64, 2.07, 1.87; $p<0.001$) ; and comorbid ED visits for alcohol, substance abuse, mental illness, or unintentional injuries (OR 2.62, 1.6, 1.8, 2.2; $p<0.001$). (Table) Median time to recurrence was 6 months. (Figure) Of recurrers, 57% presented to a different hospital for their second injury.

Conclusions: Over 3 years, 9.9% of violently injured patients recurred. The highest risk individuals were the homeless and those with comorbid visits for mental and behavioral health. Contrary to some past research, young age and black or Hispanic race did not increase odds of recurrence. Clinicians can use these risk factors to target violence prevention efforts to those with greatest need.

	OR	95% CI	P value
Race			
White	Ref		
Black	1.1	1.0, 1.1	0.151
Hispanic	0.7	0.7, 0.8	<0.001
Asian/Pacific Islander	0.7	0.4, 1.1	0.120
Native American	1.2	0.6, 2.5	0.668
Other	0.9	0.7, 1.2	0.445
Female	0.7	0.6, 0.8	<0.001
Age			
<18	Ref		
18-34	1.3	1.2, 1.5	<0.001
35-54	1.3	1.2, ,1.5	<0.001
≥55	1.0	0.8, 1.1	<0.001
Insurance type			
Medicare	1.6	1.3, 1.9	<0.001
Medicaid	2.1	1.8, 2.3	<0.001
Private	Ref		
Uninsured/other	1.9	1.7, 2.1	<0.001
Low income (by zipcode median income)	1.2	1.1, 1.3	<0.001
Homeless	2.1	1.6, 2.6	<0.001
Rural residence	0.8	0.8, 0.9	<0.001
Injury severity score			
<15	Ref		
15-24	1.0	0.7, 1.4	0.84
≥25	0.5	0.2, 0.9	0.030
Admitted to the hospital at index injury	0.8	0.7, 0.9	0.001
Other visits			
Mental health	1.8	1.7, 1.9	<0.001
Substance abuse	1.6	1.4, 1.8	<0.001
Alcohol abuse	2.6	2.4, 2.9	<0.001
Unintentional injury	2.2	2.1, 2.3	<0.001

Table: Risk Factors for Recurrent Violent Injury

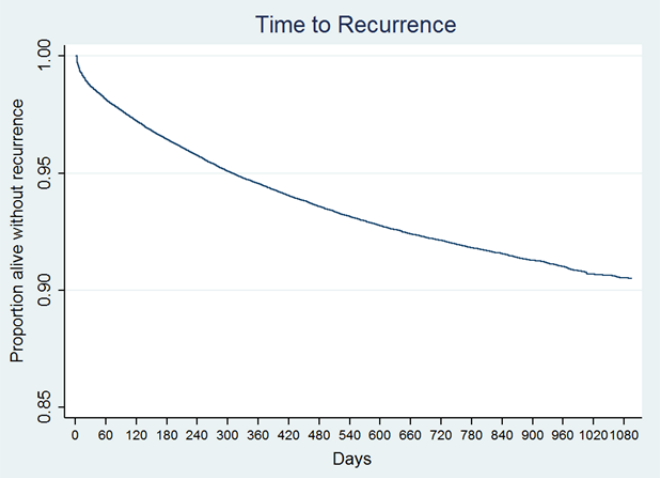

Figure: Time to Recurrence

Notes

Scientific Posters – Group IV
Trauma Systems and Prevention
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 23
#EAST2016P23

PAIN IS AN INACCURATE PREDICTOR OF TOURNIQUET EFFICACY

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Kimberly K. Nagy, MD, FACS*, Stathis Poulakidas, Frederic L. Starr, MD*,
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Presenter: Jonathan D. Alterie - @JonathanDominck

Objectives: Based on anecdotal experience with tourniquet (TQ) application in training, significant pain is commonly associated with successful arterial vascular occlusion. We hypothesize that pain may be a suitable substitute in place of Doppler for confirmation of successful vascular inflow occlusion in training.

Methods: Three tourniquet systems (Pneumatic tourniquet, CAT® and SWAT™) were used to occlude the arterial vasculature of left and right upper arms, forearms, and the right thigh and calf of healthy volunteers between the ages of 20-40. A 4MHz handheld Doppler sonogram (MedLine, Mundelein, IL) was used to confirm successful occlusion with each application at the radial or posterior tibial artery. Once successful occlusion was noted (max 45-60 seconds), subjects rated their pain on a 0-10 numerical pain scale.

Results: Figure 1 illustrates the mean pain values with each TQ model at each anatomical site.

Conclusions: Despite anecdotal evidence to the contrary, successful TQ applications to both the upper and lower extremities need not induce severe pain in order to achieve efficacy. In this study pain was worse in the thigh compared to the upper extremities and calf however average pain consistently remained less than five for all limbs. Contrary to our hypothesis, the use of pain as an indicator for successful arterial vascular occlusion does not appear to be an appropriate substitute tool to Doppler. Additionally, over-tightening of TQs may be common and can lead to adverse circumstances such as nerve and muscle injury. Based on this, the authors recommend the use of distal Doppler signal loss and not pain as a means of validating successful arterial vascular occlusion with TQ in training.

	Pneumatic	CAT®	SWAT™
	Mean(SD) Pressure: mmHg	Mean (SD) # of Turns	Mean(SD) Length used: cm
Left Upper Arm	1.56 (1.53)	1.5(1.63)	2.68 (1.73)
Left Forearm	1.63 (1.48)	1.15 (1.14)	1.92 (1.30)
Right Upper Arm	1.7 (1.73)	1.35 (1.67)	2.57 (1.76)
Right Forearm	1.58 (1.39)	1.15 (1.08)	1.84 (1.52)
Right Thigh	3.18 (1.62)	3.42 (1.84)	3.65 (2.15)
Right Calf	2.75 (1.98)	2.25 (1.71)	2.25 (1.71)

Notes

Scientific Posters – Group IV
Trauma Systems and Prevention
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Poster 24
#EAST2016P24

GEOSPATIAL ANALYSIS OF VIOLENT CRIME AND TRAUMA SYSTEM UTILIZATION

Caleb J. Mentzer, DO, James R. Yon, MD*, Steven Ballesteros, Nathaniel Walsh, P. Benson Ham III, Asif Talukder, Adil Abuzeid, Steven B. Holsten, Jr., MD*, Regina Simione Medeiros, DNP, MHSA, RN*
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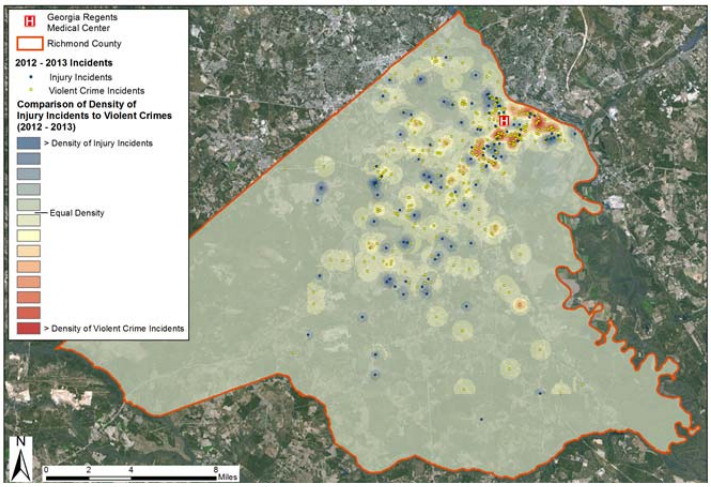
Presenter: Caleb J. Mentzer, DO

Objectives: Descriptive epidemiologic and geographic analysis utilizing geographic information science (GIS) has been used to describe trauma system utilization and to spatially describe patterns of trauma and crime. We examined the relationship between spatial components of criminality and injuries in order to evaluate optimal trauma center location and determine a correlation between violent crime and trauma system utilization.

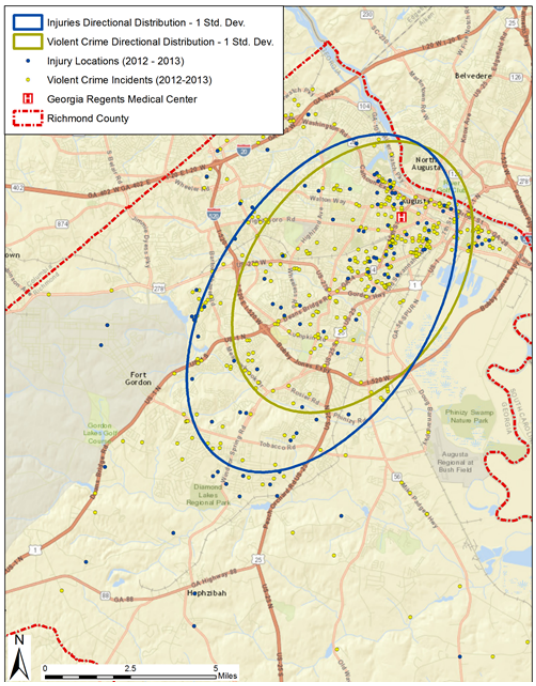
Methods: Retrospective reviews of a trauma registry and a law enforcement database were completed. All adult trauma and violent crime (VC) encounters in a defined area over a single year were included. Demographics, injury characteristics, and crime data were mapped. Geospatial statistics pattern analysis tools of Median Center (MC) and the Average Nearest Neighbor analysis (ANNa) were used to determine if mapped points occurred in complete spatial randomness or were clustered in a significant pattern.

Results: ANNa of VC resulted in a z-score of -20.54 and a p-value of <0.001, indicating a <1% likelihood that violent crimes were distributed randomly. ANNa of injuries yielded a z-score of -5.67 and p-value of <0.001. Our trauma center is 1.45 miles from the MC of VC and 2.28 miles from the MC for injuries. The distance between MC of VC and the MC of injury was 0.85 miles. While the overall directional distributions exhibited a nonrandom pattern, spatial autocorrelation failed to demonstrate a direct point to point relationship between criminality and trauma system utilization with a z-score of 0.030 and p-value of 0.98.

Conclusions: Clusters of injury and violent crime exist in a clear pattern within our area and our institution is well positioned to respond. GIS is a powerful tool for the trauma surgeon, and examination of the local-regional patterns of trauma should be undertaken by health systems to assist with optimizing outreach, expansion, and response times.



Geographic representation of reported injuries and violent crime within Richmond County, Ga represented as density



Directional distribution of reported injuries and violent crime showing a statistically nonrandom pattern.

Notes

Scientific Posters – Group IV
Trauma Systems and Prevention
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Poster 25
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GEOGRAPHIC DISTRIBUTION OF TRAUMA SERVICES IN THE UNITED STATES: DOES AVAILABILITY CORRESPOND TO PATIENT NEED?

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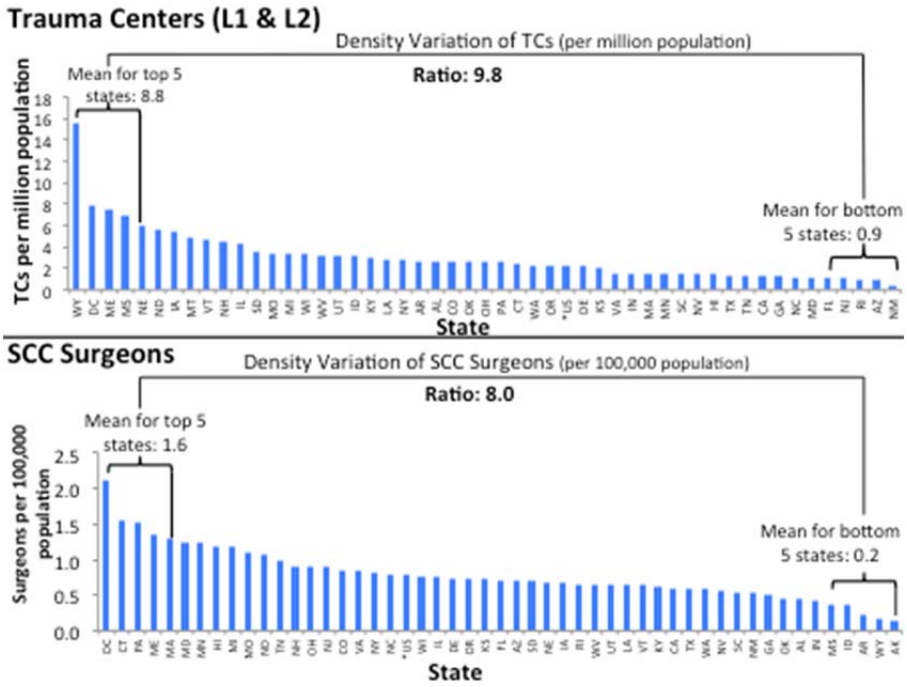
Presenter: Arturo J. Rios Diaz, MD - @ArturoRiosMD

Objectives: To compare the geographic distribution of burden of major trauma, trauma centers (TC), surgical critical care (SCC) surgeons and per capita income across the United States (US).

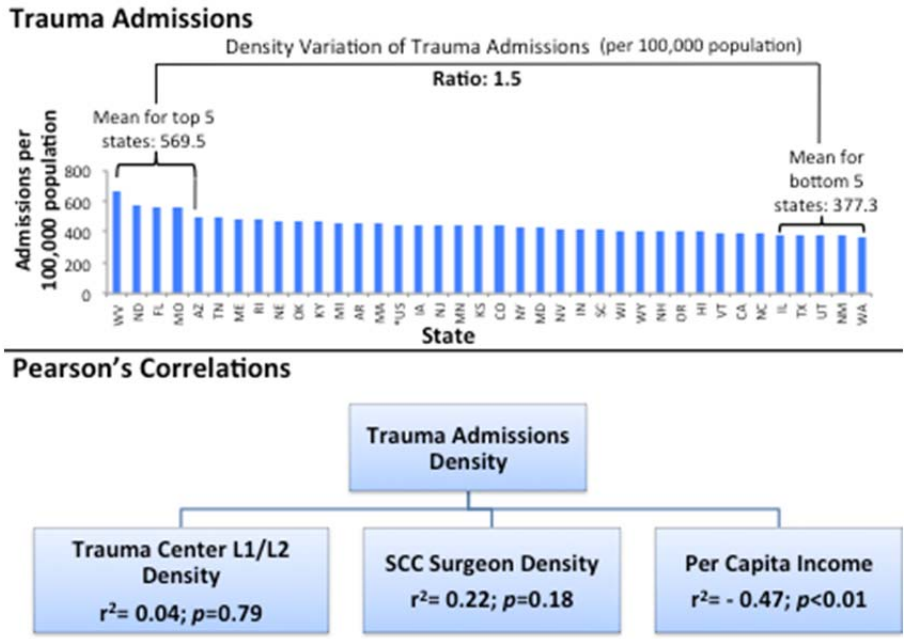
Methods: 2012-2013 data on trauma admissions, hospitals, board certified-SCC surgeons and per capita income were obtained from publicly-available sources, including databases of the Agency for Healthcare Research and Quality (national/state inpatient), American Hospital Association, American Board of Medical Specialties and US Census Bureau. Pearson correlation coefficients were used to examine ecological state-level associations between the density of trauma admissions and (1) TC Level 1 (L1) and Level 2 (L2) per 1 million, (2) SCC surgeons per 100,000 population and (3) per capita income.

Results: Need based assessment determined a burden of 1,398,935 annual trauma admissions and 445 trauma admissions per 100,000 population. 1,674 TC were identified in the US: 16.2% L1 and 25.4% L2; yielding a nationwide density of 2.2 L1/L2 TC per 1 million population. On a national scale, there were 2,496 SCC surgeons, with a density of 0.78 surgeons per 100,000 population. State-level analyses reveal that there was substantial variation between states in terms of TC L1/L2 and SCC surgeon availability (Fig. 1) despite showing little variation in the incidence of trauma requiring hospital admission (Fig. 2). Correlation coefficients for the relationships between density of trauma admissions and (1) L1/L2 TCs, (2) SCC surgeons, and (3) state-level per capita income were 0.04, 0.22, and -0.47 respectively (Fig. 2).

Conclusions: Uneven distribution of trauma services across the US does not correlate with state-level variations in clinical need. States with lower per-capita incomes appear particularly underserved. In the wake of efforts to regionalize TC across the US, efforts are needed to redress discrepancies as they appear.



Surgical critical care (SCC) surgeons (per 100,000 population) and trauma centers level 1 and 2 (per 1 million population) by state



Trauma admissions (per 100,000 population) by state and its correlation with (1) density of trauma centers (level 1 and 2), (2) density of surgical critical care (SCC) surgeons and (3) per capita income

Notes

Scientific Posters – Group IV
Trauma Systems and Prevention
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 26
#EAST2016P26

THE IMPACT OF A STANDARDIZED STATEWIDE PRE-HOSPITAL TRIAGE SYSTEM ON TRAUMA TRANSFERS

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West Virginia University

Presenter: Peter A. Zmijewski, MD

Objectives: The WV trauma system continues to evolve. In 2009, statewide, standardized criteria for pre-hospital triage were introduced. This study was to evaluate the impact of standardized triage criteria on pts transferred in WV.

Methods: The statewide trauma registry was queried for all pts at state trauma centers (Level I – IV) for years 2007/2008 (PRE) and 2010/2011 (POST) implementation of standardized criteria. 2009 was the implementation year and data was excluded. $p < .05$ was considered significant.

Results: 11,181 pts were in the PRE group and 11,419 pts in the POST group. There was an ↑ in pts transported directly to Level 1 centers [63.5% (PRE) vs 71% (POST), p<.0001]. Pts transported to Level III center ↓ [36.5% (PRE) vs 28.8% (POST), p <.0001]. Helicopter use for scene transport ↓ [12.8% (PRE) vs 10.4% (POST), p<.0001]. Pts transported from scene direct to Level I or II via helicopter ↓, 14.2% (PRE) vs 11.4% (POST), p<.0001. The # of pts requiring transfer to a higher level of care ↓, 10.6% (PRE) vs 9.78% (POST), p<.04. Interfacility transfer via helicopter ↓ 8.8% (PRE) vs 6.7% (POST), p<.03. Of transferred pts, there was an ↑ in mechanically ventilated pts, [4.3% (PRE) vs 6.48% (POST), p<.0001]. ED LOS ↑, [188 min (PRE) vs 196 min (POST), p<.0001]. However the # of pts discharged home from the ED ↑ [25% (PRE) vs 30% (POST), p<.0001].

Conclusions: Conclusions: Standardized, statewide trauma triage criteria had a positive effect. Pts requiring transfer from a Level III to a higher level of care ↓ while there was an ↑ of pts taken from scene to a Level I/II. Helicopter use for scene or interfacility transfer ↓, despite an ↑ in # of aircraft in WV during the same period. ED LOS did ↑, but # of pts discharged to home also ↑. This may reflect longer work ups in the ED to complete evaluation and R/O injury. Study limitations include: it is retrospective and includes only hospitals participating in the state system.

Effects of Implementation of Standardized Triage Protocol on Trauma Transfers in the State of West Virginia by Year			
	2007-2008 (%)	2010-2011 (%)	P value
Direct transport to Level I	63.5	71	<0.0001
Primary helicopter transport	12.8	10.4	<0.0001
Primary helicopter transport to Level I/II	14.2	11.4	<0.0001
Transfer to higher level of care	10.6	9.8	<0.04
Mechanically ventilated transfer patients	4.3	6.5	<0.0001
ED LOS	188	196	<0.0001
Discharge from the ED	25	30	<0.0001

Notes

Scientific Posters – Group V
Trauma and Hemorrhage
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

Poster 27
#EAST2016P27

END-TIDAL CO2 ON ADMISSION PREDICTS THE NEED FOR MASSIVE TRANSFUSION AS DEFINED BY CRITICAL ADMINISTRATION THRESHOLD: A PILOT STUDY

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Jacobi Medical Center

Presenter: Edward Chao, MD

Objectives: Critical administration threshold (≥3 units of packed red blood cells/hour or CAT+) has been proposed as a new definition for massive transfusion (MT) that includes volume and rate of blood transfusion. CAT+ has been shown to eliminate survivor bias and be a better predictor of mortality than the traditional MT (>10 units/24 hours). End-tidal CO_2 (ETCO2) negatively correlates with lactate and is an early predictor of shock in trauma patients. We conducted a pilot study to test the hypothesis that low ETCO2 on admission predicts CAT+.

Methods: ETCO2 via capnography and serum lactate were prospectively collected on admission for 102 patients requiring trauma team activation. Demographic data was obtained from patient charts. Excluded were patients with isolated head injuries, traumatic arrests, or prehospital intubations. CAT+/- status as described was determined for each hour up to 6 hours from admission as described; likewise, MT+/- status was determined up to 24 hours from admission.

Results: After exclusion criteria, 67 patients were analyzed (Table 1): mean age 41.2+/-18.5; blunt mechanism of injury (MOI) 33(49.2%); median Injury Severity Score (ISS) 9 (IQR 4-19); and 6 deaths (9%). ETCO2 negatively correlated with lactate(R=-0.303, p=0.01). Twenty (29.85%) and 8 (11.49%) patients were CAT+ and traditional MT+, respectively. Table 2 shows a significantly greater proportion of patients with ISS>15, ETCO2<35, or who died were found to be CAT+. A binomial logistic regression model adjusting for age, systolic blood pressure (SBP), MOI, and ISS revealed ETCO2<35 to be independently predictive of CAT+(OR 9.41, 95% CI 1.47-60.25, p=0.018).

Conclusions: This pilot study demonstrated that low ETCO2 was predictive of patients meeting CAT+ criteria in the first 6 hours after admission. Further study to verify these results and to elucidate CAT criteria's association with mortality will require a larger sample size.

Table 1. Study Cohort Demographics (N=67)

Mean Age	41.2 +/-18.5
Male	51 (76.1%)
Blunt Trauma	33 (49.2%)
Median Admission GCS	15 (IQR 14-15)
Median ISS	9 (IQR 4-19)
ISS>15	19 (28.4%)
Mean Respiratory Rate	20.1 +/-4.2
Mean End Tidal CO_2	33.64 +/-8.499
Median Lactate mmol/L	2.98 (IQR 1.72-5.79)
SBP < 90 mmHg	9 (13.4%)
Massive Transfusion Protocol Initiated	14 (20.9%)
Traditional Massive Transfusion Criteria (≥ 10 units/24hrs) met (MT+)	8 (11.9%)
Critical Administrations Threshold (≥ 3 units/hour) met (CAT+)	20 (29.9%)
Mean # of Units PRBC/24 hours	3.45 +/-6.12
Median Length of Stay (days)	4.1 (IQR 1.8-12.3)
24 hour Mortality	2 (3.0%)
In-hospital Mortality	6 (9.0%)

Table 2. Comparison of MT+ vs. MT- and CAT+ vs. CAT- patients

	MT(+) (n=8)	**MT(-) (n=59)**	p-value	**CAT(+) (n=20)**	**CAT(-) (n=47)**	p-value
Mean Age	59.1+/-20.5	38.8+/-17.0	p=.0029	46.5+/-20.1	39.0+/-17.5	p=.117
Blunt Trauma	7 (88%)	26 (44.1%)	p =0.0272	10 (50.0%)	23 (40.4%)	p=0.6003
ISS>15	7 (87.5%)	12 (20.3%)	p=0.0004	13 (65.0%)	6 (10.5%)	p =<0.0001
SBP<90 mmHg	2 (25.0%)	8 (13.6%)	p=0.3413	5 (25.0%)	5 (8.8%)	p=0.1148
$ETCO_2$< 35 mmHg	7 (87.5%)	33 (55.9%)	p=0.1302	16 (80.0%)	24 (42.1%)	p=0.0174
Lactate > 4 mmol/L	4 (50.0%)	18 (30.5%)	p=0.4231	7 (35.0%)	12 (21.1%)	p=0.2377
Mortality	3 (37.5%)	3 (5.08%)	P=0.0195	5 (25%)	1 (1.75%)	p=0.0039

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Poster 28
#EAST2016P28

VACUOLATED POLYMORPHONUCLEAR NEUTROPHILS ON A STANDARD PERIPHERAL BLOOD SMEAR DIRECTLY CORRELATE WITH LACTATE LEVELS IN HEMORRHAGIC SHOCK TRAUMA PATIENTS: A CASE CONTROL STUDY.

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Presenter: Joao B. Rezende-Neto, MD, PhD, FACS

Objectives: The presence of vacuolated PMNs for more than 36 hours in septic patients correlates with mortality. However, little is known about that finding in trauma patients with hemorrhagic shock (HS). Our objectives were to define the progression of PMN vacuolization in HS patients through Wright-Giemsa stain of peripheral blood smears. Furthermore, given the importance of lactate in trauma, we assessed the correlation between PMN vacuolization and blood lactate levels.

Methods: Consecutive penetrating trauma patients (n=20) in severe HS (SBP<90mmHg) were compared to 20 control patients with minor chest trauma. Wright-Giemsa peripheral blood smears were performed at admission and every 6 hours until 24 hours; subsequently, every 24 hours until 72 hours. Photomicrographs of the smears, magnified 1000 times, were processed with an image analysis software to determine the number and the area (μ^2) of the vacuoles in the cytoplasm and in the nucleus of the PMNs. CBC, coagulation profile, and biochemical assays were performed during all time points.

Results: The average number of vacuoles in the control PMNs was significantly lower ($p<0.05$) in both the cytoplasm and the nucleus compared to HS group in all time points. Vacuolization peaked at 12 and 24 hours post-trauma in HS patients, and at 12 and 72 hours in controls. HS group also had significantly larger vacuoles in the cytoplasm during those time points. Serum lactate, WBC, and heart rate were significantly higher ($p<0.05$) in HS patients. Multivariable linear regression analysis showed significant correlation between lactate and heart rate, with the number and the area of the vacuoles in the cytoplasm of PMNs.

Conclusions: HS provokes PMN vacuolization with two peak times (12 and 24 hours). Moreover, serum lactate and heart rate directly correlated with that finding.

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PELVIC FREE FLUID ON CT OF THE ABDOMEN AND PELVIS: STILL A SIGNIFICANT FINDING?

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Kelsey Fletcher, Preston R. Miller III, MD*
Wake Forest University Medical School

Presenter: Amy Hildreth, MD

Objectives: Computed tomography (CT) with intravenous contrast has become standard in the assessment of abdominal and pelvic injury in blunt trauma. Pelvic free fluid on CT without solid organ injury is thought to indicate potential hollow viscus injury. Patients with this finding often undergo operative intervention or admission for serial abdominal exams. We theorize that, in light of improved CT technology, pelvic free fluid is seen frequently and, without other CT abnormalities, is seldom indicative of bowel injury.

Methods: The trauma registry at our Level I trauma center was queried for all blunt trauma patients from 2011 and 2012 with CT scans of the abdomen and pelvis performed on the day of admission. We recorded all CT scan findings and identified those patients for study inclusion who had pelvic free fluid in the absence of solid organ injury or other abnormal intraabdominal finding. Chart review was then performed to determine whether bowel injury was ultimately diagnosed.

Results: Two thousand seven hundred seventy seven patients evaluated during the study period had a CT of the abdomen and pelvis on the initial day of presentation. Of those, 226 patients (8.1%) had pelvic free fluid without other findings: 107 were male (47%); 119 were female (53%). One of 226 (0.4%) required intervention for bowel injury. This patient had free fluid in the pelvis, but in a more cepahald location than in the remainder of cases.

Conclusions: In our population, a CT finding of free fluid without other associated findings was present frequently and did not routinely indicate the presence of bowel injury or other intraabdominal process requiring intervention. Approximately half with pelvic free fluid were male; free fluid in this population has not previously been considered physiologic. We propose that patients with this CT finding alone without significant abdominal exam findings do not benefit from admission or serial abdominal exams.

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SELF-EXPANDING FOAM FOR RESCUE FROM ABDOMINAL EXSANGUINATION: A QUANTITATIVE HUMAN FACTORS ASSESSMENT ON CIVILIAN AND MILITARY END-USERS. CAN WE TEACH OTHERS?

Upma Sharma, PhD, Janet Komatsu, Adam P. Rago, MS, Elizabeth Kinnal, David King, MD*
Massachusetts General Hospital

Presenter: Upma Sharma, PhD

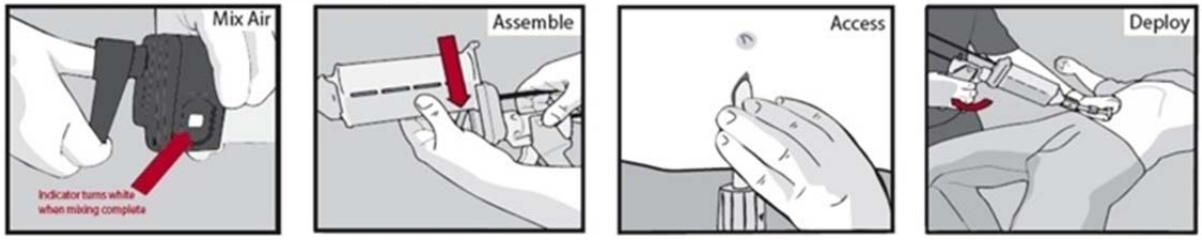
Objectives: ResQFoam is a self-expanding polyurethane foam used as a rescue maneuver for exsanguinating abdominal hemorrhage. The objective of this study was to evaluate the effectiveness of an accelerated training program for end-users to ensure appropriate foam administration outside of our expert development team.

Methods: Physicians and non-physician healthcare providers, with no prior exposure to self-expanding foam, were recruited from military and civilian end-user populations. The 2 hour accelerated training program involved 70 minutes of didactic and hands-on training, a 20-question quiz to confirm training comprehension, and a graded foam injection into a mannequin (divided in 14 critical individual tasks). Task successes, failures, and "close calls" were assessed. Close calls were defined as tasks completed successfully without performance failure, but with difficulty or confusion.

Results: The user population consisted of 10 (37%) physicians and 17 (63%) non-physicians healthcare providers; 12 (44%) military and 15 (56%) civilian, trained in two cohorts. All completed the written quiz with a score above 90%. In the 1st cohort (n=12), 147 successes (88%), 18 close calls (11%), and 1 error (1%) were observed out of 168 observed tasks. Average procedure time was 5:02 min (2:56-9:37 min range). The single error highlighted a deficiency in training and materials were updated. In the 2nd cohort (n=15), 193 successes (92%), 17 close calls (8%), and no errors (0%) were observed out of 210 observed tasks (Figure 1). Average procedure time was 4:04 min (3:07-5:16 min range).

Conclusions: A quantitative human factors evaluation of self-expanding foam confirmed that usability can be exported to naïve end-users successfully within a representative population. End-users can be successfully trained in an accelerated 2 hour program.

Figure 1: ResQ Foam procedural steps. (A) Users mix air into device by rotating crank until indicator turns white; (B) assemble cartridge onto delivery handle; (C) access abdomen with delivery nozzle; (D) attach cartridge to nozzle and deploy foam.



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MESENCHYMAL STEM CELLS LOCATE AND DIFFERENTIATE TO THE TRAUMA SITE IN A BLUNT RAT LIVER TRAUMA MODEL

Mostafa Alhabboubi, MBBS, Domnique Shum Tim, Minh Ngoc Duong, Paola Fata, Jeremy Grushka, MDCM, MSc, FRCSC, FRCPC, Andrew N Beckett, MD*, Dan Deckelbaum, Tarek S. Razek, MD, FACS*, Zu-Hua Gao, Kosar A. Khwaja, MD, MBA, MSc, FACS*
Montreal General Hospital, McGill University Health Centre

Presenter: Mostafa Alhabboubi, MBBS

Objectives: The liver heals remarkably after different forms of injuries. However, healing time can be lengthy following high grade blunt injuries. We hypothesize that injected bone marrow derived mesenchymal stem cells (BMDS) could locate and differentiate to hepatocytes after blunt trauma using a rat liver trauma model.

Methods: Blunt liver trauma was induced to male Lewis rats. BMDS were extracted from Lewis rats' femurs and transfected with LacZ retrovirus so that they express B-galactosidase enzyme, giving their nuclei a blue color on light microscopy. Each rat received a single dose of BMDS (n=6 x 106) within 24 hours of trauma. Route of injection was the tail vein (TV) in 10 rats, the portal vein (PV) in 8 rats and directly to the injured liver (DI) in 6 rats. Rats were euthanized at 2, 7 and 14 days after injection of BMDS. Livers were harvested and examined under light microscopy to identify the BMDS.

Results: Liver sections showed localization and active migration of BMDS to trauma sites in the PV group euthanized at 48 hours (3/5 rats) (Figure 1). Furthermore, some stem cells differentiated to hepatocytes. Although with fewer cells, similar findings were present in 1/3 rats euthanized at 7 days in the PV group. There was no evidence of BMDS localization in TV and DI groups. Cellular debris was found in multiple areas around the trauma sites in 3/10 and 5/6 rats in TV and DI groups, respectively (Table 1).

Conclusions: BMDS can locate and differentiate to hepatocytes at blunt trauma site and may contribute to liver regeneration process. Portal vein injection of BMDS has emerged as the most effective method of delivery to the liver following trauma among different delivery methods studied. This technique has the potential to become an effective therapeutic strategy to improve liver regeneration after severe blunt trauma. Methods of optimizing homing to injured tissue and evaluation of differentiated stem cell functionality are future areas of research.

	Number of rats per group	Time of Euthanasia Days (# of rats)	Findings
Portal vein group (PV)	8	2 (5)	In 3 out of 5 rats, stem cells were found in multiple sites adjacent to the trauma area. Some cells differentiated into liver-like cells.
		7 (3)	Stem cells were found around the trauma area in the first rat. Some differentiated into liver-like cells. Multiple degenerated stem cells with traces of blue staining were found in the second rat. Cellular debris was found in the third rat.
Tail vein group (TV)	10	2 (6)	Cellular debris was found in 3 out of 6 rats
		7 (3)	No stem cells were identified
		14 (1)	No stem cells were identified
Direct injection group (DI)	6	2 (3)	Cellular debris was found in 3 rats
		7 (1)	Cellular debris was found in this rat
		14 (2)	Cellular debris was found in one rat

Table 1: Details of the groups and findings associated with each group.

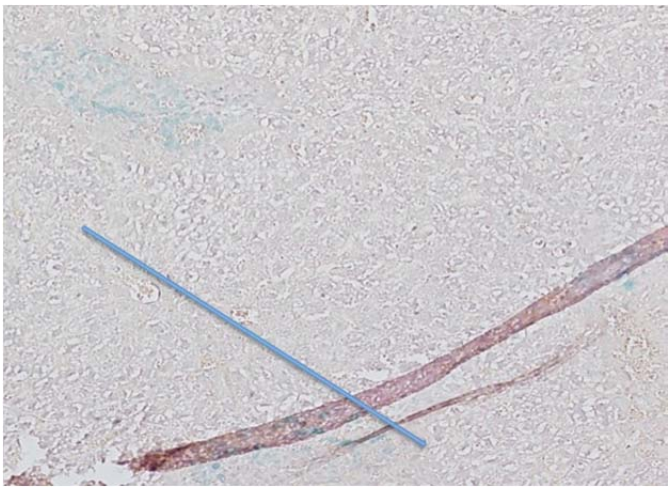

Figure 1: A sample for a rat of the PV group euthanized at two days. Stem cells are seen exiting from around a vessel and migrating to the trauma area (blue arrow), some stem cells differentiated to hepatocytes.

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THE RED BLOOD CELL STORAGE LESION IS PH DEPENDENT

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Aaron Seitz, Timothy A. Pritts, MD, PhD*
University of Cincinnati

Presenter: Alex L. Chang, MD

Objectives: Transfusion of packed red blood cells (pRBCs) is essential during resuscitation after hemorrhage. Prolonged storage of packed red blood cells induces a series of harmful biochemical and metabolic changes known as the red blood cell storage lesion. Red blood cells are currently stored in an acidic storage solution (AS-3, pH 5.8), but the effect of pH on the red blood cell storage lesion is unknown. We investigated the effect of storage pH on the red blood cell storage lesion and on erythrocyte survival after transfusion.

Methods: Murine pRBCs were stored in Additive Solution 3 under standard conditions (pH 5.8), acidic conditions (AS3/pH 4.5), or alkaline conditions (AS3/pH 8.5). Units were stored up to 14 days (the murine equivalent to 42 days in humans) then analyzed. Several red blood cell storage lesion components were determined, including cell-free hemoglobin (Hgb), microparticle (MP) production, phosphatidylserine (PS) externalization, and lactate accumulation. Oxidative damage was measured by thiobarbituric acid reactive substances (TBARS) assay. Erythrocytes were labeled with carboxyfluorescein (CFSE) and transfused into healthy mice to determine cell survival.

Results: As compared to pRBCs stored in standard AS3, cells stored in AS3/pH 8.5 exhibited decreased hemolysis (cell-free Hgb 0.50 vs. 0.82 g/dL, $p=0.01$), PS externalization (29.6% vs. 48.7%, $p<0.01$), MP production (1.23×10^4 vs $2.49 \times 10^4/\mu L$, $p=0.03$) and lipid peroxidation (TBARS 22.3 vs 84.8 pmol/μL, $p<0.01$). Lactate generation was greater at a high pH (21.24 vs 14.58 meq/L, $p<0.01$) suggesting that these cells remained more metabolically viable. Storage in AS3/pH4.5 accelerated erythrocyte deterioration. As compared to standard AS3 storage, circulating half-life of cells was increased by AS3/pH8.5 but decreased by AS3/pH4.5 (Figure 2).

Conclusions: Our data suggest that storage pH significantly affects the quality of stored red blood cells and cell survival following transfusion.

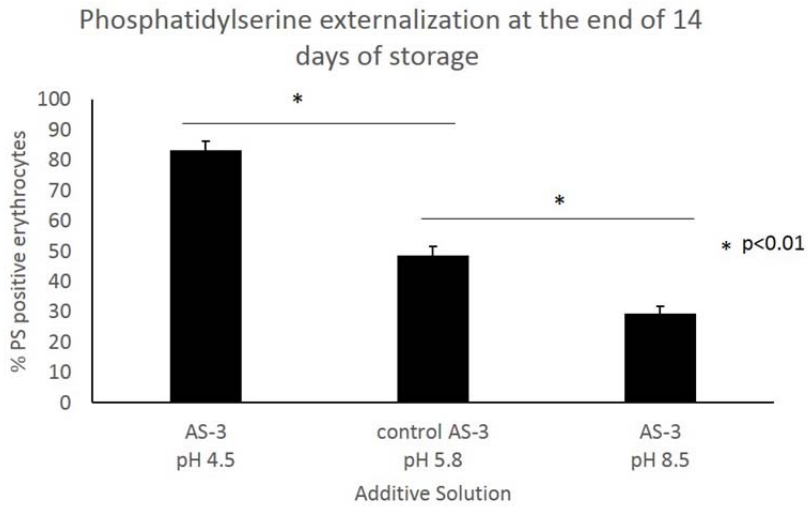

Figure 1: Phosphatidylserine externalization, a marker for eryptosis, is increased at lower pH.

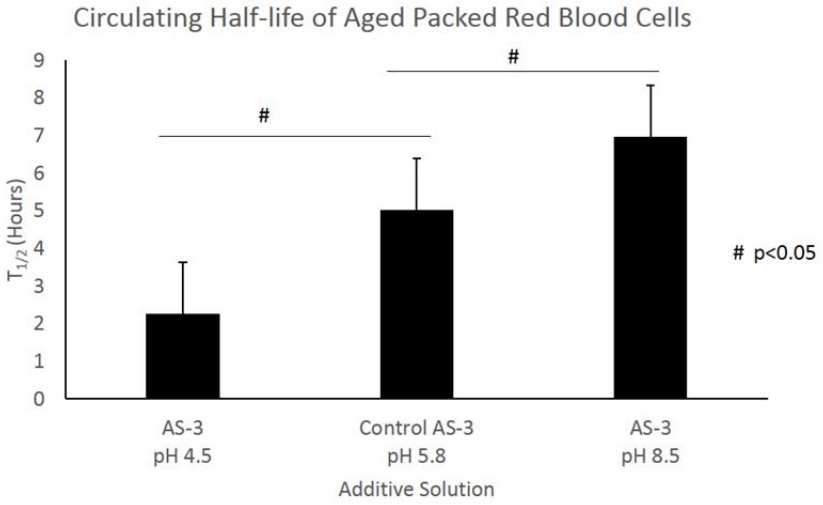

Figure 2: Erythrocytes stored at lower pH have significantly shorter half-life in circulation following transfusion.

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DOES ARGININE VASOPRESSIN EXACERBATE CEREBRAL EDEMA AFTER TRAUMATIC BRAIN INJURY?

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Juliet J. Ray, MD, Jonathan Jagid, M. Ross Bullock, MD, PhD,
Nicholas Namias, MD*, Carl I. Schulman, MD, MSPH*, Kenneth G. Proctor, PhD
University of Miami Miller School of Medicine

Presenter: Jonathan P. Meizoso, MD - @jpmeizoso

Objectives: Arginine vasopressin (AVP) is commonly used as an alternative pressor to catecholamines (CAT); unlike CAT, AVP has powerful antidiuretic actions. AVP contributes to cerebral edema after experimental traumatic brain injury (TBI), but there are no data in humans. We tested the hypothesis that AVP promoted cerebral edema and/or increased osmotherapy use, relative to CAT, in TBI patients.

Methods: We reviewed data on 286 consecutive patients with intracranial pressure (ICP) monitors admitted to a large American College of Surgeons verified level I trauma center from 09/2008-01/2015. Clinical parameters and fluid requirements were retrospectively reviewed. Cerebral edema was assessed by computed tomography using the gray white ratio (GWR) calculation method, where a low GWR indicates the presence of cerebral edema. Significance was assessed at $p \leq 0.05$.

Results: To maintain cerebral perfusion pressure > 60 mmHg, 205 patients required no vasopressors, 41 received a single CAT, 12 received AVP, and 28 required both CAT and AVP. Those who required no pressors were generally less injured, required less osmolar therapy and less total fluid, had lower plasma sodium, lower ICP, less cerebral edema, and lower mortality (all $p<0.05$). Cerebral edema, daily sodium levels (mean, minimum and maximum), and mortality were similar with AVP vs. CAT, but the daily requirement of mannitol and hypertonic saline were reduced by 45% and 35%, respectively (both $p<0.05$).

Conclusions: This is the first radiographic and clinical evidence to suggest that exogenous AVP does not promote cerebral edema and in fact decreases the use of osmotherapy relative to CAT in TBI patients.

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TIMING OF VENOUS THROMBOEMBOLISM PROPHYLAXIS IN SEVERE TRAUMATIC BRAIN INJURY: A PROPENSITY-MATCHED COHORT STUDY

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Sunnybrook Health Sciences Center

Presenter: James P. Byrne, MD - @DctrJPByrne

Objectives: Severe traumatic brain injury (sTBI) is a predictor of venous thromboembolism (VTE). Nonetheless, pharmacologic VTE prophylaxis (VTEP) is often delayed out of concern for extension of intracranial hemorrhage. The purpose of this study was to determine the efficacy of early vs. late VTEP in patients with sTBI, and to characterize risk of subsequent intracranial complication.

Methods: Data on adults with isolated sTBI (headAIS≥3 and totalGCS≤8) were derived from ACS TQIP for 2012–2014. Patients receivingVTEP with low-molecular weight or unfractionated heparin were identified, excluding early (<72h) deaths/discharges. Patients were divided into those who received early prophylaxis (EP, <72h) or late prophylaxis (LP, ≥72h). We used a matched propensity design to adjust for selection bias, with each patient in the EP group matched to a patient in the LP group on demographics, injury characteristics, intracranial lesions, and early neurosurgical procedures. The primary outcome was pulmonary embolism (PE). Secondary outcomes included major intracranial complications (ICC) and death. ICC was defined as late neurosurgical intervention (craniotomy/ectomy or intracranial monitor placement after 48h) occurring after starting VTEP.

Results: We identified 4,106 patients with sTBI. Median time to starting VTEP was 77h (IQR 45–139). Patients with higher head AIS, subdural hematoma, subarachnoid hemorrhage, blood transfusion <12h and early neurosurgery were more likely to receive LP. A well-balanced propensity-matched cohort of 2,918 patients was created. EP was associated with a significantly lower rate of PE compared to LP (0.84 vs 2.0%, P=0.008). There was no significant difference in rates of ICC or mortality between groups.

Conclusions: In patients with sTBI, EP is associated with lower risk of PE, and may be safe, with no significant increase in risk of major intracranial complication or death.

Outcome	Early VTE Prophylaxis (n = 1,459)	Late VTE Prophylaxis (n = 1,459)	Adjusted OR† (95% CI)
Thromboembolic Complication			
Pulmonary embolism (%)	12 (0.82)	29 (2.0)	0.41 (0.21 – 0.81)
Late Neurosurgical Intervention			
Craniotomy/craniectomy (%)	36 (2.5)	24 (1.6)	1.4 (0.82 – 2.4)
Intracranial monitor placement (%)	23 (1.6)	17 (1.2)	1.2 (0.62 – 2.3)
Death	151 (10)	117 (8)	1.2 (0.93 – 1.5)

VTE, venous thromboembolism; OR, odds ratio; CI, confidence interval
† Calculated using mixed multilevel model accounting for paired nature of propensity-matched groups and clustering of patients within trauma centers

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EARLY ANTITHROMBOTIC THERAPY IS SAFE AND EFFECTIVE IN BLUNT CEREBROVASCULAR INJURY WITH SOLID ORGAN INJURY AND TRAUMATIC BRAIN INJURY

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University of Tennessee Health Science Center - Memphis

Presenter: Charles P. Shahan, MD

Objectives: Early antithrombotic therapy (AT) is the mainstay of treatment in the management of blunt cerebrovascular injury (BCVI). In spite of this, optimal timing of initiation of AT in patients with BCVI in the presence of concomitant traumatic brain injury (TBI) or solid organ injury (SOI) remains controversial. The purpose of this study was to evaluate the impact of early initiation of AT on outcomes in patients with BCVI and TBI and/or SOI.

Methods: Patients with BCVI and concomitant TBI and/or SOI over 6 years were identified. Aspirin and/or clopidogrel or low-intesity heparin infusion (AT) was instituted in all patients immediately upon diagnosis of BCVI. Cessation of AT, worsening TBI, need for delayed operative intervention, ischemic stroke, and mortality were reviewed and compared. Worsening of TBI or delayed operative intervention for SOI were compared to patients without BCVI treated at the same institution over the study period.

Results: 119 patients (74 TBI, 26 SOI, and 19 combined) were identified. 71% were treated with heparin infusion (goal aPTT 45-60 seconds) and 29% received antiplatelet therapy alone. Compared to patients without BCVI, there was no difference in worsening of TBI (7% vs 10% with no BCVI, p=0.34) or need for delayed operative intervention for SOI (3% vs 5% with no BCVI, p=0.54). No patients required cessation of AT. A total of 11 (9%) of the patients experienced a BCVI-related stroke.

Conclusions: Initiation of early AT for patients with BCVI and concomitant TBI or SOI does not increase risk of worsening TBI or SOI above baseline. Close monitoring is required, but appropriate antiplatelet or heparin therapy should not be withheld in patients with BCVI and concomitant TBI or SOI. In fact, prompt treatment with either antiplatelet or heparin therapy remains the mainstay for prevention of stroke-related morbidity and mortality in these patients.

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POSTERIOR PARAMEDIAN SUBRHOMBOIDAL ANALGESIA VS. THORACIC EPIDURAL ANALGESIA FOR MULTIPLE RIB FRACTURES

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James Howard, Tracy J. McDonald, MSN, RN, CCRN, NEA-BC,
Annemarie Dalton, Michael Moncure, MD*
The University of Kansas School of Medicine - Kansas City

Presenter: Casey L. Shelley, DO, BS

Objectives: To evaluate if patients with multiple acute rib fractures would benefit from the standard of care, thoracic epidural analgesia (TEA), vs. posterior paramedian subrhomboidal (PoPS) analgesia.

Methods: In a prospective trial at a Midwestern level I trauma center from 2010-2014, 30 patients with ≥3 rib fractures had a PoPS or a TEA placed. PoPS catheters were tunneled into the paraspinal musculature by a trauma surgeon or an anesthesiologist, while anesthesia staff alone placed TEAs. Ropivicaine 0.2% was infused in both devices. Data was collected including patients' pain level, adjunct morphine equivalent use, adverse effects, length of stay, number of ventilator days, lung volumes, discharge disposition, and DVT prophylaxis dosing. Non-parametric tests were utilized and two-sided p-values <0.05 were considered statistically significant.

Results: Patients received TEA 19/30 (63%) or PoPS 11/30 (37%). On initial day of placement, pain rating was lower in the PoPS group (2.5 vs. 5, p=0.03). Although not statistically significant, patients with PoPS reported less pain overall and used less morphine equivalents. Hypotension (SBP ≤90) occurred in 8 patients, 75% with TEA and only 25% with PoPS. Standard ICU VTE prophylaxis dosing was used in patients with PoPS compared to reduced dosing in patients with TEA. No difference was found in number of ventilator days, length of stay, lung volumes, or discharge disposition.

Conclusions: In patients with rib fractures, PoPS analgesia may provide pain control equivalent to TEA while being less invasive and more readily placed by a variety of hospital staff. Additionally, fewer patients with PoPS had hypotension, and patients with PoPS overall used fewer narcotics and were able to receive full dose VTE prophylaxis. This pilot study is limited by its small sample size, and therefore additional studies are needed to prove equivalence of PoPS compared to TEA.

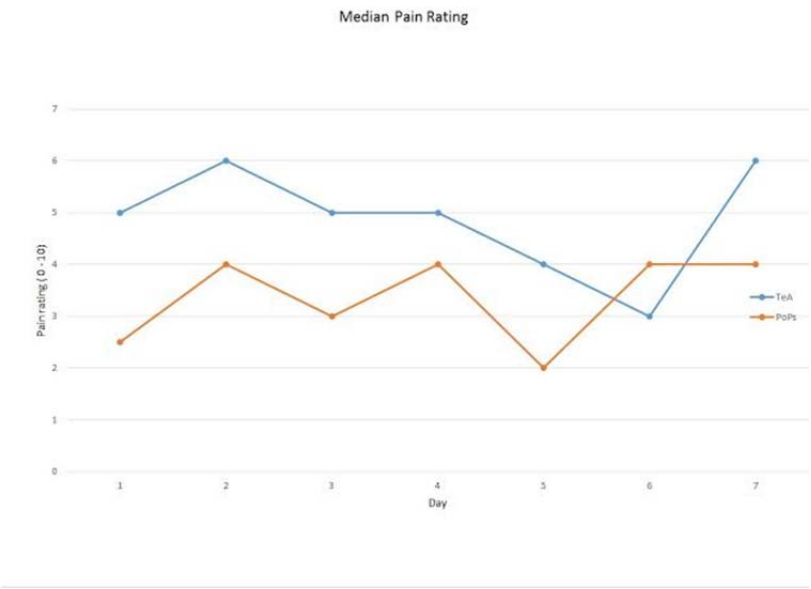

Figure 1 shows the median pain level rated by patients daily on a scale from 0-10.

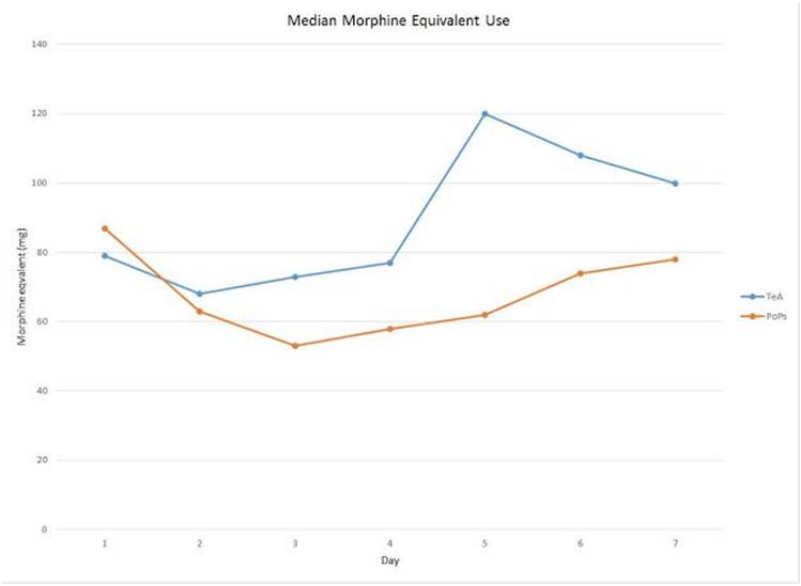

Figure 2 shows the median amount of morphine equivalent adjuncts used by patients daily.

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NOVEL MODIFIED VERESS NEEDLE IS SUPERIOR TO ANGIOCATHETER FOR DECOMPRESSION OF TENSION PNEUMOTHORAX IN A YORKSHIRE SWINE MODEL

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Christopher Gamble, Travis M. Polk, MD, FACS*
Naval Medical Center Portsmouth, VA

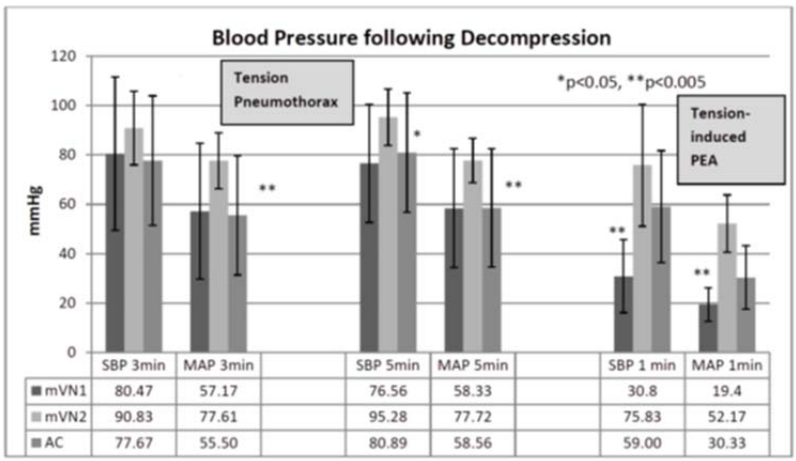
Presenter: Laura Fluke, DO

Objectives: High failure rates have been reported for decompression of tension pneumothorax (tPTX) with angiocatheters (AC) and this remains a major cause of preventable death. Other devices, such as modified Veress needles (mVN), may be more effective. We recently tested a novel mVN with an integral one-way valve (mVN1) with contradictory results. Following pneumatic studies without the valve demonstrating better air flow, mVN1 was re-engineered. We then hypothesized that the new mVN (mVN2) would be at least as effective as AC.

Methods: Using a validated swine model, intrathoracic CO2 was instilled until tension physiology occurred (50% reduction in cardiac output). Decompression was performed with mVN2. Rescue was defined as 80% recovery of baseline systolic blood pressure (SBP) within 5 minutes. Crossover with AC was performed if rescue failed. After recovery, pulseless electrical activity (PEA) was induced and maintained for 30 seconds before decompression. Rescue was defined as return of arterial wave form and mean arterial pressure (MAP) >20mmHg. Success, time to rescue, and vital signs were recorded. Results were compared to AC and mVN1 data from our recent randomized study.

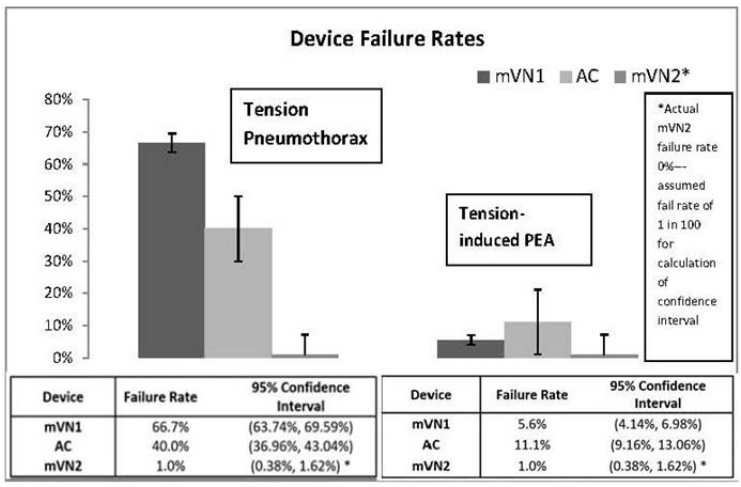
Results: In total, 54 tPTX and 17 PEA events were conducted in 9 Yorkshire swine. Times to rescue from tPTX for mVN1, AC, and mVN2 were 146+/-94 sec, 86+/-84 sec, and 82 +/- 62 sec, respectively. Decompression with mVN2 resulted in higher post-decompression MAP and SBP compared to both mVN1 or AC (Fig 1). For both tPTX and PEA, mVN2 had 100% success at rescue; while the failure rates for AC and mVN1 were notably higher, particularly with PEA (Fig 2).

Conclusions: mVN2 may be an alternative to AC for tPTX with improved hemodynamic recovery and superior rescue from PEA. Experience with the valve on the mVN1 suggests that limitations to airflow during decompression is likely detrimental and should be avoided.



	SBP 3min	MAP 3min	SBP 5min	MAP 5min	SBP 1 min	MAP 1min
mVN1	80.47	57.17	76.56	58.33	30.8	19.4
mVN2	90.83	77.61	95.28	77.72	75.83	52.17
AC	77.67	55.50	80.89	58.56	59.00	30.33

Figure 1. Mean arterial and systolic blood pressures at 3 and 5 min post decompression of tPTX and 1 min post-decompression of PEA.



Device	Failure Rate	95% Confidence Interval
mVN1	66.7%	(63.74%, 69.59%)
AC	40.0%	(36.96%, 43.04%)
mVN2	1.0%	(0.38%, 1.62%) *

Device	Failure Rate	95% Confidence Interval
mVN1	5.6%	(4.14%, 6.98%)
AC	11.1%	(9.16%, 13.06%)
mVN2	1.0%	(0.38%, 1.62%) *

Figure 2. Failure Rates for rescue from tPTX and PEA.

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USE OF HIGH FLOW NASAL CANNULA IN ADULT TRAUMA PATIENTS

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Objectives: High flow nasal cannula (HFNC) is a method of delivering non-invasive respiratory support which provides up to 100% FIO2 and may provide positive expiratory pressure. It is known to decrease mechanical ventilation (MV), reduce incidence of complications, and decrease hospital and ICU days. There are no data, however, regarding use of HFNC in trauma populations. The goal of this analysis is to determine the utility of HFNC for trauma patients admitted to the ICU.

Methods: The retrospective study examined trauma patients admitted to the ICU at a tertiary hospital between April 2013 and December 2014. HFNC was delivered by the Fischer & Paykel Optiflow system, with initial settings at 50 LPM and 50% FIO2. Categorical data are reported as counts and percentages, while continuous data are reported as medians with interquartile ranges (IQR). Correlations between variables were calculated with Spearman rho coefficient. All statistical tests were two-tailed and based on a 0.05 significance level. The study was approved by the IRB.

Results: Ninety-five trauma patients were admitted to the ICU, with 17 receiving MV prior to HFNC and 78 receiving no MV prior to HFNC. The most common injuries were rib fractures (69%), vertebral fractures (40%), and lung injuries (32%). More than 50% were former or current smokers. On average, HFNC was started one day after injury and had a median duration of 1 day and 11 hours (IQR: 0:19:43, 3:00:09). Two-thirds of patients who received HFNC never received MV and 95% of patients were discharged alive. The intubation rate after HFNC was 20%, which is comparable to similar studies in other patient populations. There was a moderate relationship between delay to first HFNC and hospital days (r_s=.42, $p<.001$).

Conclusions: Study results provide preliminary evidence that HFNC is safe and beneficial in a trauma ICU population. HFNC may be a reasonable method to improve pulmonary hygiene and potentially prevent intubation.

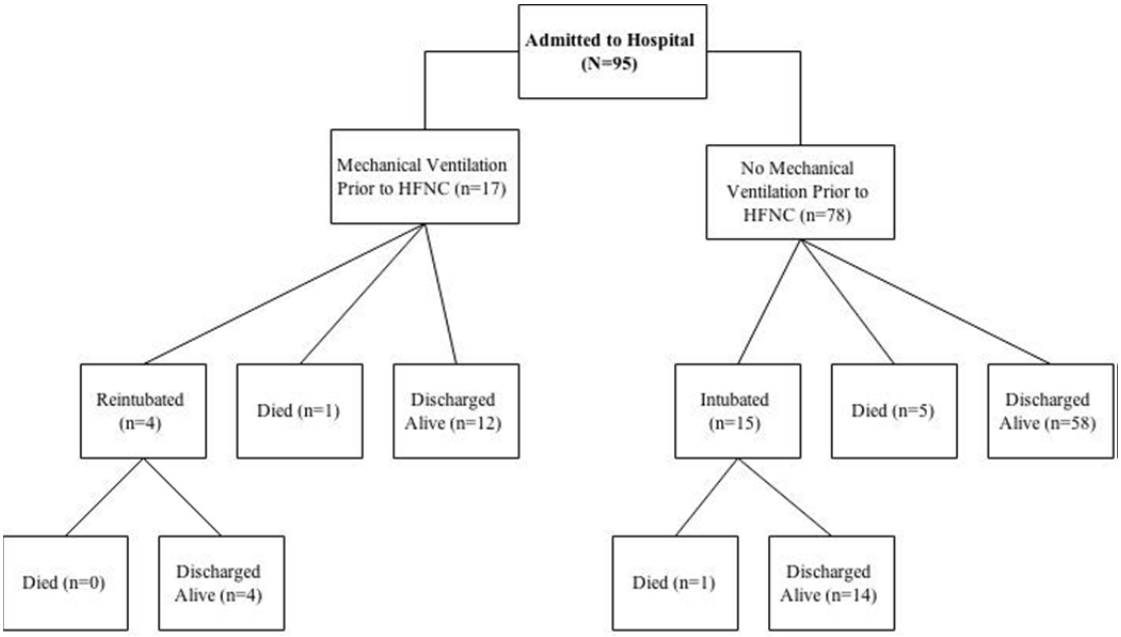

Figure 1. Trauma patients receiving high-flow nasal cannula (HFNC) therapy during hospitalization

Table 1. Diagnoses, comorbidities, and complications (N=95)

	All Trauma Patients
Injuries	
Rib Fracture(s)	65 (68.4%)
Vertebral Fracture	38 (40.0%)
Lung Injury/Contusion	30 (31.6%)
Upper Limb Fracture	27 (28.4%)
Intracranial Hemorrhage	26 (27.4%)
Pneumothorax/Hemothorax	23 (24.2%)
Internal Organ Injury (other than lung)	20 (21.1%)
Pelvic Fracture	13 (13.7%)
Lower Limb Fracture	11 (11.6%)
Skull Fracture	10 (10.5%)
Comorbidities	
Current or former smoker, n (%)	48 (50.5%)
Atrial fibrillation, n (%)	12 (12.6%)
COPD, n (%)	11 (11.6%)
Obstructive sleep apnea, n (%)	9 (9.5%)
Asthma, n (%)	6 (6.3%)
Complications	
Unplanned ICU admission, n (%)	26 (27.4%)
Medical emergency team call on floor, n (%)	11 (11.6%)

Table 1. Diagnoses, comorbidities, and complications (N=95)

Notes

Scientific Posters – Group VI
Trauma-TBI and Thoracic
Location: Nelson Wolff Exhibit Hall Foyer, Level 1

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RIB FRACTURE FIXATION IN THE ≥65 YEAR OLD POPULATION: A PARADIGM SHIFT IN MANAGEMENT STRATEGY

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Objectives: With the advent of plating systems for chest wall stabilization, the practice paradigm for rib fracture management is shifting. We hypothesize that patients ≥65 years old who receive rib plating have decreased mortality and complication rates compared to controls and an accelerated return to functionality.

Methods: A retrospective review of patients(pts)≥65 years admitted from 2009-2015 receiving rib plating (RP) were compared to a randomly selected, non-operative, injury-matched control group (NO) admitted from 2003-2008. Pts were followed prospectively for quality of life. Data was pulled from our trauma registry and pt surveys. Variables studied were ISS, mortalities, hospital/ICU stay days, pneumonias (PNA), respiratory complications, readmissions, and length of rehab time. Group comparisons were made using chi-square or Fishers exact test. Normally distributed variables were compared by Student t-test; non-normally distributed data were compared by Wilcoxon rank sum test.

Results: NO pts (n=50) with age ranges of 65-97, average ISS of 18(14-22) vs age ranges of 63-89, average ISS of 21(15-25) for the RP group (n=23). Average total hospital stay days were 17(10-23) and 18(13-23) for the NO and RP groups respectively. Average ICU stay days were 12(6-16) and 8(5-11) for the NO and RP groups, respectively. 4 readmissions, 2 deaths, 7 PNAs, 7 pleural effusions and 19 recurrent pneumothoraces were noted in the NO group vs 0 in the RP group, $p<0.001$. Average rehab time was 10 days less in the RP group. Pt surveys favored the RP group.

Conclusions: The alarming historical mortality and pneumonia risks for pts ≥65 years with rib fractures are well established. Rib plating in trauma pts ≥65 years demonstrates a measurable decrease in mortality and respiratory complication rates, improves respiratory mechanics and overall clinical outcomes, therefore permitting a more accelerated return to functional lifestyles.

Notes