Quick Shots Session II

Quick Shot 10
January 14, 2021
2:15 pm Eastern

IS MORE BETTER? DO STATEWIDE INCREASES IN TRAUMA CENTERS REDUCE INJURY-RELATED MORTALITY?

Evelyn I Truong, BS, Evelyn I Truong, BS, Vanessa P. Ho, MD, MPH, FACS*,
Colette Ngana, Jacqueline Curtis, PhD, Eric Curfman, BS,
Jeffrey A. Claridge, MD, MS, FACS*, Esther S. Tseng, MD*
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Presenter: Evelyn I Truong, BS

Objectives: Trauma centers (TC) are inconsistently distributed throughout the US. It is unclear if new TC improve access to trauma care and decrease trauma mortality. We theorized that increases in TC would be associated with decreases in injury-related mortality at the state-level.

Methods: We used data from the American Trauma Society to geolocate every state-designated or ACS-verified TC in all 50 states and DC from 2014-2018. These data were merged with publicly available injury-related mortality (IRM) data from the Centers for Disease Control and Prevention. We used geographic information systems methods to map and study the relationships between TC locations and state-level IRM over time. Repeated measures regression analysis, accounting for state-level fixed effects, was used to calculate effect of changes in TC with same-year IRM and 1-year lag IRM; results shown as beta-coefficient (95% CI, p-value).

Results: Nationwide between 2014 and 2018, the number of TC increased from 2039 to 2153. There was notable interstate variation, from 1 TC (Rhode Island, Vermont) to 284 TC (Texas). Four patterns in the number of TC growth within states emerged: static (12), increased (29), decreased (5), or variable (4) (Figure 1). Of states with TC increases, 26 (90%) had increased IRM between 2014 and 2017, while the remaining 3 saw a decline. A weakly negative association was seen between the number of trauma centers and IRM overall (Figure 2). Using regression, TC increases were not associated with IRM (same-year 0.06 (-0.10 – 0.22, p=0.4); 1-year lag -0.04 (-0.28 – 0.19, p=0.7).

Conclusions: Adding new trauma centers is not associated with decreases in state-level IRM, suggesting that more trauma centers alone is not the best strategy to reduce IRM. More work should be done to identify the optimal number and location of trauma centers.

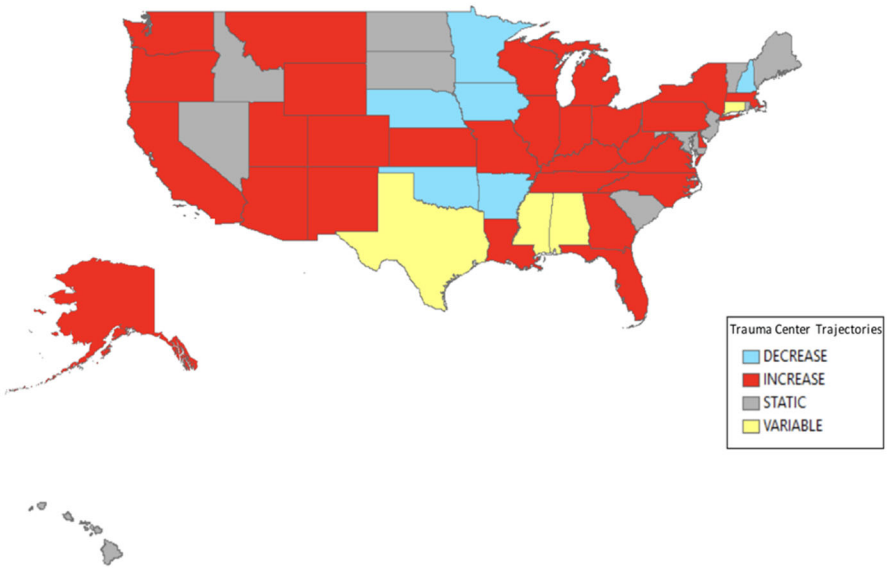

Figure 1. Changes in trauma center distribution by state between 2014 and 2017.

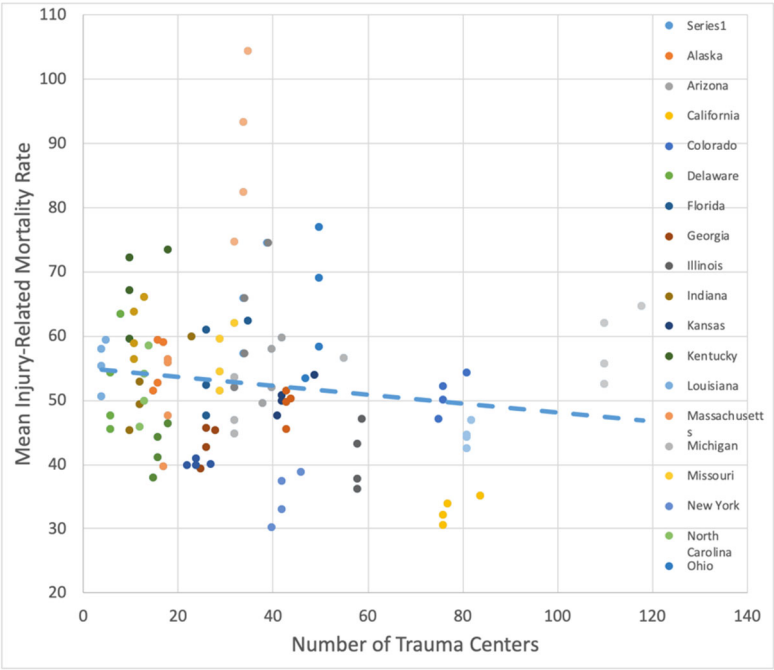

Figure 2. Mortality vs number of trauma centers between 2014 and 2017 in states with increased trauma centers

Quick Shots Session II

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January 14, 2021
2:21 pm Eastern

POLICE TRANSPORT OF FIREARM-INJURED PATIENTS – MORE OFTEN AND MORE INJURED

Zoë Maher, MD*, Jessica H Beard, MD, MPH*, Elizabeth Dauer, MD*, Madeleine Carroll, MD, Steven Forman, BS, Gena Topper, BS, Abhijit S. Pathak, MD*, Thomas A. Santora, MD*, Lars Ola Sjoholm, MD*, Huaqing Zhou, PhD, Amy J. Goldberg, MD*
Temple University School of Medicine

Presenter: Zoë Maher, MD

Objectives: Police transport (PT) of penetrating trauma patients decreases the time between injury and trauma center arrival. Our study objective was to characterize trends in the rate of PT and its impact on mortality. We hypothesized that PT is increasing and that these patients are more injured.

Methods: We conducted a single-center, retrospective cohort study of adult (≥ 18 years) patients presenting with gunshot wounds (GSWs) to a Level 1 center from 2012-2018. Patients transported by police or ambulance (EMS) were included. The association between mode of transport (PT vs. EMS) and mortality was evaluated using chi-square, t-tests, Mann-Whitney u tests, and multiple logistic regression.

Results: Of 2,007 patients, there were 1,357 PT patients and 650 EMS patients. Overall in-hospital mortality was 23.6%. The rate of GSW patients arriving by PT increased from 48.9 to 67.6% over the study period ($p < 0.001$). Compared to EMS patients, PT patients were sicker on presentation with lower initial SBP (98 vs. 110, $p < 0.001$), higher ISS (median [IQR], 10 [2-75] vs 9 [1-17], $p < 0.001$) and more bullet wounds (3.5 vs. 2.9, $p < 0.001$). PT patients more frequently underwent resuscitative thoracotomy (19.2% vs 10.0%, $p < 0.001$) and immediate surgical exploration (31.3% vs. 22.6%, $p < 0.001$). When excluding patients arriving in cardiac arrest, there was no difference in adjusted in-hospital mortality between transport groups. Of patients surviving to discharge, PT patients trended toward higher ISS (9.6 vs. 8.3, $p=0.068$) and had lower SBP on arrival (126 vs. 130, $p=0.002$) than EMS patients.

Conclusions: Police transport of GSW patients is increasing at our Level 1 center. Compared to EMS patients, PT patients are more severely injured and, excluding patients arriving in cardiac arrest, have similar in-hospital mortality. Further study is necessary to understand the impact of PT on outcomes in specific subsets in penetrating trauma patients.

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January 14, 2021
2:27 pm Eastern

GEOSPATIAL ASSESSMENT OF AIR MEDICAL OVERTRIAGE

Andrew-Paul Deeb, MD, Heather Phelos, MPH, Andrew B. Peitzman, MD*,
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University of Pittsburgh Medical Center

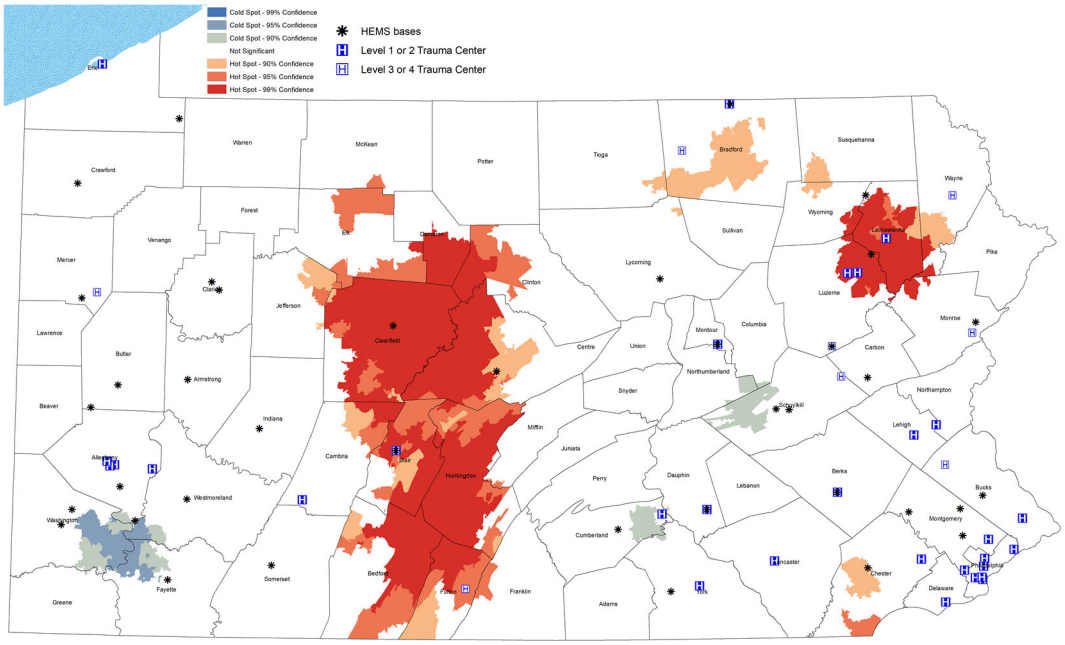
Presenter: Andrew-Paul Deeb, MD

Objectives: Despite evidence of benefit after injury, air medical transport (AMT) overtriage (OT) remains high. Efforts to reduce OT are crucial given the risks and significant cost of AMT. Scene and transfer OT are distinct, as decisions are made by EMS and referring physicians respectively. It is unclear if OT is associated with specific geographic patterns or patient characteristics. Our objective was to identify geographic hot spots and patient-level predictors of OT for scene and interfacility AMT.

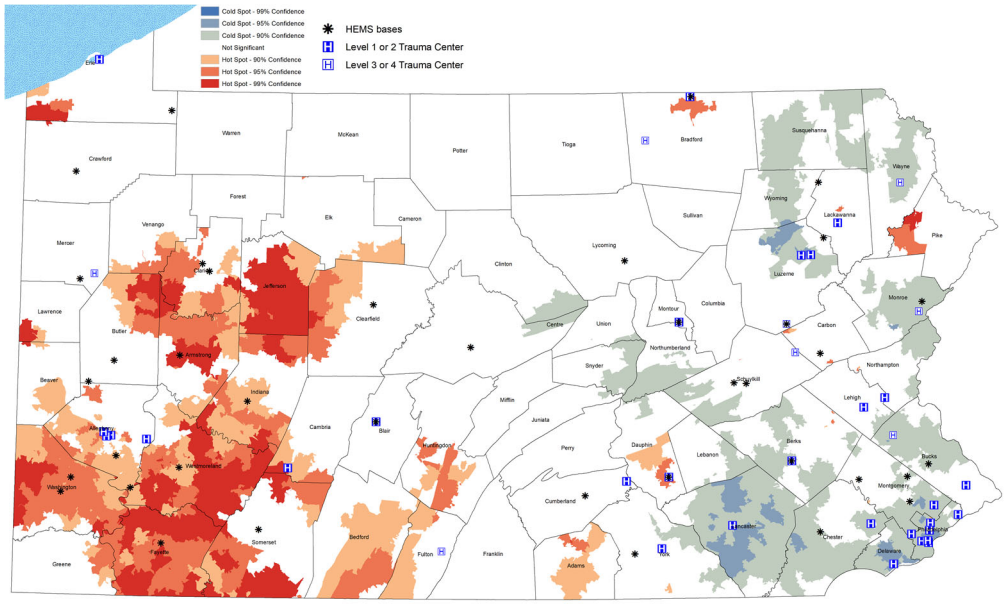
Methods: Patients age>15 undergoing scene or interfacility AMT in PTOS were included. OT was defined as discharge within 24hr of arrival. Patients were mapped to population weighted zip code centroid and rates of OT per 100 AMT patients transported were calculated. Hot spot analysis was performed to identify regions of high and low OT rates across the state. Logistic regression determined patient characteristics associated with OT. All analyses were performed for scene and transfer patients separately.

Results: 85,572 patients were included (37.4% transfers). OT was more common in transfer (11.8%) versus scene (5.5%) AMT ($p<0.01$). Hot spot analysis of scene AMT showed high OT rates in central and northeast regions (Fig 1), while high OT rates for transfers were in the southwest (Fig 2). Some areas had low scene but high transfer OT rates and vice versa. For scene patients, OT was associated with distance (OR 1.03; 95%CI 1.01-1.06 per 10mi, $p=0.04$), neck injury (OR 1.27; 95%CI 1.01-1.60, $p=0.04$), and single system injury (OR 1.37; 95%1.15-1.64, $p<0.01$). For transfer patients, OT was associated with rural area (OR 1.64; 95%CI 1.22-2.21, $p<0.01$), facial injury (OR 1.22;95%CI 1.03-1.44, $p=0.02$), and single system injury (OR 1.35; 95%CI 1.18-2.19, $p<0.01$).

Conclusions: Geographic OT rates vary significantly for scene and transfer AMT. Coupled with unique patient profiles these findings can target areas for individualized process improvement initiatives to reduce AMT OT.



Geospatial hot spot analysis of air medical overtriage rates among patients transported from the scene of injury. Red indicates significantly higher than average rates; blue indicates significantly lower than average rates. Black asterisk are helicopter EMS bases, White on blue hospital symbols are level 1 or 2 trauma centers, Blue on white hospital symbols are level 3 or 4 trauma centers.



Geospatial hot spot analysis of air medical overtriage rates among patients transferred from a referring hospital. Red indicates significantly higher than average rates; blue indicates significantly lower than average rates. Black asterisk are helicopter EMS bases, White on blue hospital symbols are level 1 or 2 trauma centers, Blue on white hospital symbols are level 3 or 4 trauma centers.

Quick Shots Session II

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2:33 pm Eastern

RACIAL DISPARITIES IN TRIAGE OF ADOLESCENT PATIENTS AFTER BULLET INJURY

Erin G Andrade, MD MPH*, Emily J Onufer, MD, MPH, Melissa Thornton, MD, Martin Keller, MD*, Douglas J.E. Schuerer, MD, FACS*, Laurie J. Punch, MD, FACS*
Washington University in Saint Louis

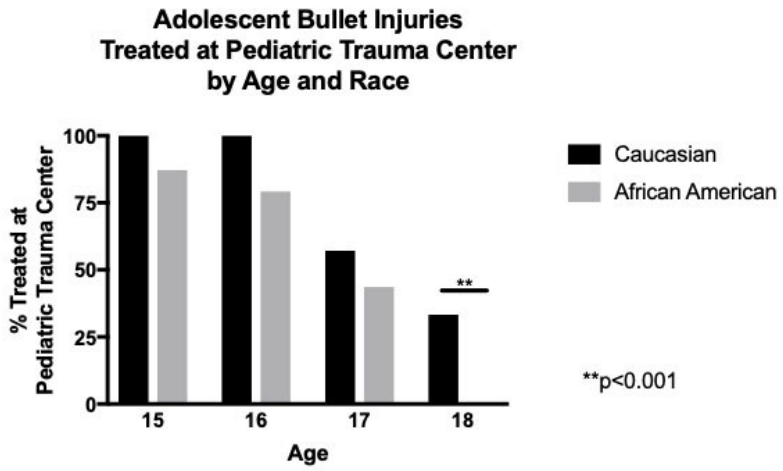
Presenter: Erin G Andrade, MD MPH

Objectives: The optimal care environment for traumatically injured adolescents remains controversial. We hypothesized that race influences whether adolescents are treated at pediatric trauma centers (PTCs) versus adult trauma centers (ATCs) after bullet injury.

Methods: Two institutional trauma databases from an American College of Surgeons verified level one PTC and ATC located next to each other in an urban center were queried for gunshot wounds in adolescent patients (15-18 years old) from 2015 to 2017. PTCs and ATCs were compared in terms of patient demographics, services offered, and clinical outcomes. Results were analyzed using univariate analysis and logistic regression.

Results: Of 315 patients meeting inclusion criteria, 183 were treated in an ATC versus 132 in a PTC. Patients at PTCs were significantly more likely to be younger (16.1 vs 17.5 years old, $p<0.01$), Caucasian (16% vs 5%, $p<0.01$) and privately insured (41% vs 30%, $p<0.01$). Stratified by age, the proportion of Caucasians treated at PTCs exceeded the proportion of African Americans treated at PTCs (Figure 1). Following treatment in a PTC emergency room, patients are more likely to be admitted (58% vs 46%, $p=0.04$), to receive inpatient (94% vs 28%, $p<0.01$) and outpatient social work follow-up (89% vs 1%, $p<0.01$), and less likely to return to the emergency department within 30 days (21% vs 8%, $p<0.01$). No significant difference in mortality existed. On multivariate logistic regression, African American adolescents were significantly less likely to be treated at a PTC (OR=0.28, 95% CI 0.10, 0.80, $p=0.02$) after controlling for age and insurance status.

Conclusions: Race served as a significant factor in triage of adolescent trauma patients to ATC in this study. Patients at ATCs received less social work follow up and had increased emergency room utilization following treatment of bullet injury, potentially contributing to racial disparity in outcome.



Proportion of Gunshot Wounds Treated at Pediatric Trauma Centers out of all Adolescent Gunshot Wounds Triaged Stratified by Race and Age

Variable	Odds Ratio	95% Confidence Interval	p-value
African-American	0.28	0.10, 0.80	0.02
Age, years	0.13	0.08, 0.21	<0.01
Uninsured	0.35	0.15, 0.82	0.82

Logistic Regression: Impact of Race, Age, and Insurance Status on the Treatment of Adolescent Gunshot Wounds at a Pediatric Trauma Center

Quick Shots Session II

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January 14, 2021
2:39 pm Eastern

COMPARING FATAL CHILD ABUSE INVOLVING BIOLOGICAL AND SURROGATE PARENTS

Maxwell J Presser, Hallie Quiroz, MD, Eduardo Perez, MD, Juan Sola, MD,
Nicholas Namias, MBA, MD*, Chad Thorson, MD, MSPH
University of Miami Miller School of Medicine

Presenter: Maxwell J. Presser

Objectives: Nearly half of pediatric homicides under age 5 are attributable to child abuse. Parents are most commonly the perpetrators, but less is known about incidents involving biological vs. surrogate parents. We seek to evaluate the characteristics of fatal child abuse involving biological and surrogate parents using the [STATE] National Violent Death Reporting System (NVDRS).

Methods: This database was used to examine all homicides of children under age 18 from 2011-2017. Demographic and incident characteristics were analyzed using existing NVDRS variables and incident narratives. Chi-squared and nonparametric tests were used to compare fatal child abuse incidents involving biological and surrogate parents (e.g., adoptive, foster, step-parents, intimate partners of biological parent).

Results: There were 452 pediatric homicides and 219 cases of fatal child abuse. Of all cases of fatal child abuse, 60% involved biological and 29% involved surrogate parents. Compared to children killed by biological parents, children killed by surrogate parents were older (4.0 vs. 3.1 year old, $p<0.05$), more often male (71% vs. 51%, $p<0.05$), more likely to survive the initial injury and present to the emergency department prior to death (96% vs. 69%, $p<0.05$), and less likely to have a medical comorbidity (2% vs 11%, $p<0.05$). Surrogate parents were more likely to be male (90% vs. 48%) and use a firearm (20% vs. 13%, $p<0.05$) to inflict the injury. The race/ethnicity of the child was not associated with the relationship of the parent.

Conclusions: Pediatric homicide by biological parents occurs more frequently, but surrogate perpetrators are almost exclusively male and more likely to use firearms. Most children survive the initial injury and present to the emergency department prior to death, leaving an opportunity to intervene on potentially preventable deaths if abuse is identified in a timely fashion.

Quick Shots Session II

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2:45 pm Eastern

DRIVER'S EDGE: AN OUTCOME EVALUATION OF A YOUNG DRIVER ADVANCED TRAINING PROGRAM

Laura Gryder, MA, Samantha A Slinkard, MPH, Deborah A. Kuhls, MD*
University of Nevada Las Vegas School of Medicine

Presenter: Laura Gryder, MA

Objectives: Young drivers (YD; 15-20 years) are disproportionately injured and killed in motor vehicle crashes throughout the US. Driver's Edge (DE) is an advanced driver training program for YD that aims to reduce YD traffic injuries and fatalities in NV through hands-on training with professional drivers. The program curriculum covers YD risk factors and crash facts, emergency maneuvers to avoid a collision, and basic car maintenance for safe driving. The purpose of this outcome evaluation was to determine if the DE program was achieving its stated objectives to improve safe driving behaviors in their YD participants and to measure the program's effectiveness, efficiency, and value to participants.

Methods: The evaluation team was provided with a retrospective database of pre- and post-test responses from YD participants, questionnaire responses from parent participants, and 1 year follow-up survey responses from young drivers and parents for events held in 2018 and 2019. The pre-/post-tests measured changes in safe driving knowledge, attitudes, and behaviors. Quantitative statistical (descriptives and Pearson's Chi-square; significance set at p=.05) and qualitative content analyses were conducted.

Results: Responses from YD participants (n=649), parent participants (n=683), and 1 year follow-up survey responses from YD (n=86) and parents (n=195) were provided for analysis. Aggregate YD participant knowledge of safe driving behaviors increased from a mean of 39% (pre-test) to 77% (post-test). 1 year follow-up demonstrated YD participants felt DE helped them avoid a collision (91.9%), and became a safer, more aware driver (mean score of 4.62/5.00).

Conclusions: DE YD participants improved knowledge of safe driving behaviors, which resulted in self-assessed safer driving behavior at one year follow-up.

Table 1. Comparison of Results of YD Pre-/Post-tests

Selected Driver Knowledge Question Topics	Pre-test Score (% of students selecting correct answer only)	Post-test Score (% of students selecting correct answer only)	X^2 (*p*-value)
Knowledge of contact patches of tires of passenger cars	61.9%	98.3%	23.1 (p=.001)
Threshold braking	6.3%	56.7%	122.328 (p<.001)
Regaining control after a skid	45.6%	79.8%	42.878 (p<.001)
Drunk driver fatal crash statistics	68.7%	87.5%	44.148 (p<.001)
What is understeering?	23.3%	63.0%	65.336 (p<.001)
What is oversteering?	18.8%	66.3%	57.486 (p<.001)
Object avoidance - proper maneuvers	47.5%	82.1%	31.176 (p<.001)
Stopping distance	32.2%	68.3%	88.125 (p<.001)

Table 1. comparison of Results of YD Pre-/Post-tests

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2:51 pm Eastern

EFFECT OF INJURY LOCATION AND SEVERITY ON OPIOID USE AFTER TRAUMA

Craig Brown, MD, MSc, Rachel Baker, MD, John Montgomery, MD, MSc, Charles Mouch, MD, Brooke Kenney, MPH, Michael Englesbe, MD, Jennifer Waljee, MD, MPH, MSc, Mark R. Hemmila, MD*
University of Michigan

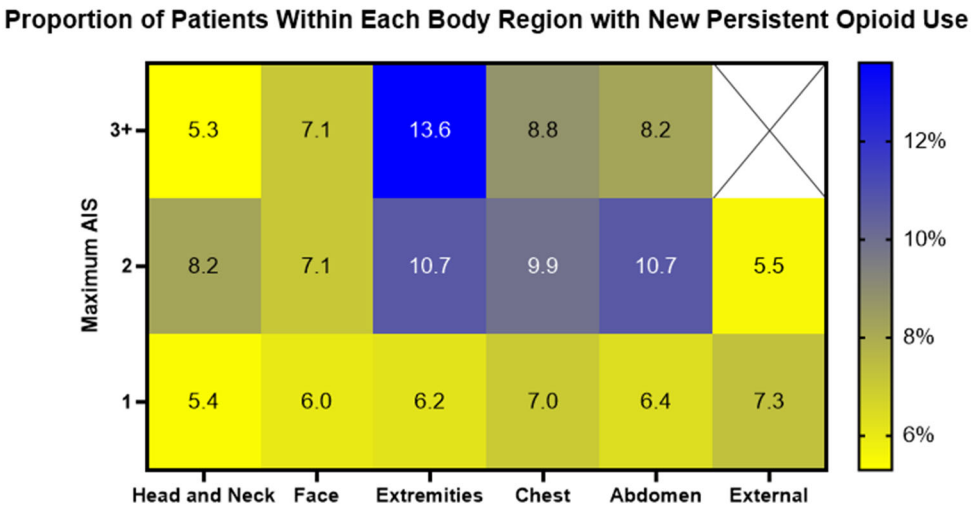
Presenter: Craig Brown, MD, MSc

Objectives: Recent data have suggested that persistent opioid use is prevalent following trauma. The effect of type of injury and total injury burden is not known. We sought to characterize the relationship between injury location and severity and risk of new persistent opioid use (NPOU).

Methods: We investigated post-discharge opioid utilization among patients who were admitted for trauma between January 2010-June 2017 using the Optum Clinformatics™ Database. NPOU was defined as one of the following scenarios: 1) Two separate opioid prescription fills between 0-14 days post-discharge and having 1+ fills in the 91-180 days following discharge or 2) Filling a prescription in the 15-90 days following discharge in addition to a filling in the 91-180 day post-discharge period. Multivariable logistic regression was used to assess the relationship between injury type and severity with new persistent opioid use development.

Results: A total of 26,437 opioid-naïve patients were included in the analysis. Overall, 2,277 (8.6%) patients met the criteria for NPOU. After adjustment for confounding, NPOU was significantly more common for patients with injury to the extremities (aOR 1.75, 95% CI 1.57-1.94) or abdomen (aOR 1.42, 95% CI 1.22-1.64). Importantly, patients with maximum AIS ≥ 2 for any body region had 1.49 fold odds of NPOU compared to patients with score of 1 (95% CI 1.28-1.73), while no difference was seen across groupings of total injury burden based on Injury Severity Score.

Conclusions: NPOU is common among patients suffering from trauma. Additionally, patients suffering from extremity and abdominal injuries are at highest risk. Maximum individual region injury severity predicts development of new persistent use whereas total injury severity does not.



Heatmap Detailing Proportion of Patients within Each Injury Location and Severity Score Category with New Persistent Opioid Use. AIS = Abbreviated Injury Scale

Quick Shots Session II

Quick Shot 17
January 14, 2021
2:57 pm Eastern

DEXMEDETOMIDINE AND PARALYTIC EXPOSURE AFTER DAMAGE CONTROL LAPAROTOMY: RISK FACTORS FOR DELIRIUM? RESULTS FROM THE EAST SLEEP-TIME MULTICENTER TRIAL

Cassandra Krause, MD, MA, Eugenia Kwon, MD, Kaitlin McArthur, BS, Xian Luo-Owen, MD PhD, Meghan Cochran-Yu, MD, Lourdes Swentek, MD*, Sigrid Burruss, MD FACS, David Turay, MD, PhD*, Chloe Krasnoff, BS, Areg Grigorian, MD, Jeffry Nahmias, MD, MHPE, FACS*, Ahsan Butt, BS, Adam Gutierrez, MD, Aimee LaRiccia, DO*, Michelle Kincaid, MD*, Michele N Fiorentino, MD, Nina E Glass, MD*, Samantha Toscano, BS, Eric Ley, MD, Sarah R Lombardo, MD, MSc*, Oscar D. Guillamondegui, MD, MPH*, James M. Bardes, MD*, Connie DeLa'O, MD*, Salina M. Wydo, MD*, Kyle Leneweaver, DO*, Nicholas T Duletzke, M.D., Jade Nunez, MD*, Simon Moradian, MD, Joseph Posluszny, MD*, Leon Naar, MD, Haytham Kaafarani, MD, MPH*, Heidi Kemmer, DO, Mark J. Lieser, MD*, Alexa Dorricott, MD, Grace Chang, MD*, Zoltan Nemeth, MD PhD
Loma Linda University Medical Center

Presenter: Cassandra Krause, MD, MA

Objectives: The use of deep sedation and chemical paralysis has been noted to be associated with increased incidence of delirium. There is limited data on the effects of sedation on patients after a damage control laparotomy (DCL). Therefore we sought to evaluate factors associated with ICU delirium in patients who underwent DCL.

Methods: We reviewed retrospective data from 15 centers in the EAST SLEEP-TIME registry, including age, Charlson Comorbidity Index (CCI), total 24-hour fluid balance, number of takebacks after DCL, duration of paralytic infusion, duration and type of sedative and opioid infusions as well as daily CAM-ICU and RASS scores to analyze risk factors associated with proportion of delirium-free/coma-free ICU days during the first 30 days (DF/CF-ICU-30) using multivariate linear regression.

Results: 181 patients (59% trauma) from the overall 567-patient cohort had complete delirium data. Mean age was 47.5±18.6 yrs, mean CCI was 2.8±3.5 and mean number of take backs was 1.5±1.2. Mean DF/CF-ICU-30 was 63.5±35.5%. The mean duration of propofol was 56.2±75.4 hrs while for dexmedetomidine it was 16.9±41.8 hrs. Mean durations of opioid and benzodiazepine infusions were 93.7±122 hrs and 13.6±52.4 hrs respectively and mean duration of paralytic infusion was 6.6±22.0 hrs.

Each hour of dexmedetomidine exposure decreased DF/CF-ICU-30 by 5.63%(95%CI 0.106-9.42%,p=0.044) while each hour of paralytic exposure decreased the DF/CF-ICU-30 by 7.58%(2.94-21.5%,p=0.010). Age, CCI, number of takebacks, and opioid, propofol and benzodiazepine exposure were not significantly associated with DF/CF-ICU-30.

Conclusions: Although the relationship between paralytic use and delirium is well-established, the observation that dexmedetomidine exposure is independently associated with decreased proportion of delirium-free/coma-free ICU days is novel and bears further study.