

Abstract - Poster

Abstract title:

RELATIONSHIP BETWEEN COMORBIDITIES AND CHILD ABUSE: A NATIONAL TRAUMA DATA BANK STUDY

Author(s):

Modupeola Diyaolu, Chaonan Ye, Christopher C. Stewart, Stephanie D. Chao

Background:

Child abuse is a major cause of mortality in the pediatric population and certain vulnerable populations may be at particularly increased risk. Prior limited studies have suggested physical disabilities and developmental delay may be risk factors for child abuse. This is the first large scale study using data from a national registry to identify whether the presence of comorbidities place certain children at higher risk for abuse.

Methods:

Patients <18 years old were identified from the National Trauma Data Bank (NTDB) for 2010-2014. ICD-9CM codes were used to identify children of abuse and compared to all injured children. The presence of comorbidities and clinical outcomes were analyzed using descriptive statistics and chi-square analyses.

Results:

From 2010-2014, 540508 patients were included in the NTDB registry. Overall, children with documented comorbidities were at greater risk of child abuse when compared to children without documented comorbidities [OR 1.24 (1.16-1.32), $p < 0.001$]. Congenital anomalies, prematurity, functionally dependent health status and liver disease were significantly more common among children of abuse ($p < 0.05$). The presence of liver disease placed children at the greatest risk for abuse [OR 9.25 (5.2-15.79), $p < 0.05$], followed by prematurity [OR 6.62 (5.45-8.05), $p < 0.05$], functionally dependent health status [OR 3.87 (2.73-5.48), $p < 0.05$], and congenital anomalies [OR 2.81 (2.26-3.50), $p < 0.05$].

Conclusion:

Children with comorbidities are at significantly greater risk of experiencing child abuse compared with children without comorbidities. Further studies are needed to better understand the socioeconomic and caretaker stressors that contribute to these risk factors.

Abstract - Poster

Abstract Title:

Epidemiology, socioeconomic analysis, and specialist involvement in pediatric dog bite wounds: a 5-year retrospective review

Author(s):

Christine J Lee, MD; Theodore Heyming, MD; Raj M Vyas, MD FACS

Background:

Dog bites are a significant health concern in the pediatric population. There are few studies that describe surgical specialty involvement as well as external risk factors that contribute to dog bites.

Methods:

An electronic hospital database identified all patients 17 years or younger who were treated for dog bites from 2013 through 2018. Patient demographics, injury characteristics, intervention type, dog breed, and payer source were collected. Socioeconomic data was extracted from the American Community Survey. Estimates on the proportion of dog breed populations were generated from public dog license datasets from Orange County, California. Descriptive statistics as well as relative risk of dog bite by breed were calculated. The mapping of income and frequency of bites was done using the R package ChloroplethR.

Results:

967 patients presented with dog bite-related injuries during this period. Mean age was 6 years with the majority 1-5 years old. Age and proportion of patients bitten had a strong negative correlation (-0.76). Of 1254 injuries identified, 17.1% of patients required a specialist consultation for wound repair in the emergency department or operating room. The most common injury location was the head/neck region (61.8%), which was most likely to require operating room intervention. The relative risk of a patient being bitten in a low-income area was 2.24 in comparison to the baseline risk in Orange County. The relative risk in a high-income area was 0.46. The majority reported dog breed was unknown (61.4%). Pitbull bites were found to be significantly larger and more complex than the general population of dog bites in this study with a relative risk of 5.52 compared to German shepherd (3.74) or unknown breed (4.3).

Conclusion:

Dog bites continue to be prevalent in the pediatric population, particularly amongst the youngest children. The majority of injuries did not require repair and were sufficiently handled at the emergency department level. Repair by a surgical specialist was required less than 20% of the time, usually for head and neck bites. There are disparities in frequency and characteristics of dog bites across socioeconomic levels and dog breeds.

Abstract - Poster

Abstract Title:

Pediatric Suicide by Violent Means: A Call to Action

Author(s):

Christina M. Theodorou MD, Kaeli J. Yamashiro, Sarah C. Stokes MD, Alana L. Beres MD

Background:

Gunshot wounds and hangings are the most common mechanisms of pediatric suicide attempts. We hypothesized that traumatic injury due to intentional self-harm from firearms, hangings, and jumps would have a higher mortality than injuries inflicted by other people or unintentionally by the victim themselves.

Methods:

All pediatric trauma patients < 18 years old at a level 1 pediatric trauma center with gunshot wounds (GSW), hangings, and jumps between 2009-2019 were identified. Charts were reviewed to determine if the injury was a suicide attempt. These were compared to injuries inflicted by others or unintentionally by the victim themselves ('other injuries'). Patients were excluded if it could not be determined if the injury was a suicide attempt. The primary outcome was mortality. Secondary outcomes were previous ED visits or trauma activations.

Results:

Of 6538 pediatric trauma activations, there were 234 gunshot wounds, hangings, and jumps. Of these, 15 were identified as suicide attempts (6.4%) with 4 GSWs, 5 jumps, and 6 hangings. 219 patients had injuries inflicted by others or unintentionally self-inflicted, with the vast majority (n=213) being GSWs, with 3 falls and 1 accidental hanging. Two patients, both with GSWs to the head, were excluded due to inability to determine if the injury was intentional. Patients with suicide attempts had a much higher mortality (46.7% vs. 11.1%, $p < 0.00001$). Self-inflicted GSWs had the highest mortality (75%), followed by hangings (66.7%), with no deaths due to intentional jumps. 40% of patients with suicide attempts were female, compared to 20.7% of patients with other injuries ($p = 0.1$), and median age for both was 15. There was no difference in previous ED visits (33.3% in suicide attempts vs. 20.7%, $p = 0.33$) or previous trauma activations (0% in suicide attempts vs. 3.7%, $p = 1$)

Conclusion:

Intentional self-inflicted traumatic injury is rare in pediatric patients, but highly lethal, with almost half of patients succumbing to their injuries. Suicide by gunshot wound had the highest mortality of 75%, followed by suicide by hanging. Further research is needed to determine how to best prevent these tragic deaths.

Abstract - Poster

Abstract Title:

Nationwide Use of REBOA in Pediatric Patients: An Analysis of the AAST AORTA Registry

Author(s):

Christina M. Theodorou MD, Megan Brenner MD, Jonathan Morrison MD, Thomas M. Scalea MD, Laura J. Moore MD, Jeremy Cannon MD, Mark Seamon MD, Joseph J. DuBose MD, Joseph M. Galante MD, AAST AORTA Study Group

Background:

Trauma is the leading cause of death for children and adolescents and hemorrhage accounts for half of preventable pediatric trauma deaths. Resuscitative endovascular balloon occlusion of the aorta (REBOA) is a minimally invasive method of hemorrhage control, but nearly all reports have been in adults. We aimed to characterize the use of REBOA in pediatric patients in the United States by analyzing patients enrolled in a nationwide registry and compare mortality to adult patients who had REBOA placed.

Methods:

The American Association for the Surgery of Trauma (AAST) Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery (AORTA) registry was queried for patients undergoing REBOA placement from 2013 – 2020. Pediatric patients were defined as <18 years old. The primary outcome was mortality of pediatric patients compared to adult patients. Secondary outcomes were evaluated for pediatric patients and included details of REBOA placement, patient characteristics, injury severity, and complications.

Results:

REBOA was used in eleven pediatric patients with a median age of 17 years old and median weight of 65.8 kg (interquartile range 55-76 kg). The survival rate was 30% which was similar to the survival rate in adults (39.8% of 647 patients, $p=0.7$). Four patients underwent cardiopulmonary resuscitation prior to REBOA placement. Most REBOA catheters were placed via 7 French sheaths ($n = 7$) and inflated in the supraceliac aorta (Zone 1, $n=8$). Inflation of the REBOA balloon resulted in a significant increase in systolic blood pressure (median SBP pre-REBOA 53 mmHg vs. post-REBOA 110 mmHg, $p=0.0007$). Patients were severely injured with a median injury severity score of 29 (interquartile range 16-42). No access-site complications were reported. All surviving pediatric patients had a discharge Glasgow Coma Scale score of 15.

Conclusion:

REBOA is used in patients <18 years old who present in hemorrhagic shock. All reported patients were adolescents, with no use reported in younger children. Survival was similar to adult patients. No REBOA-related complications were reported. Identifying pediatric patients who may benefit from REBOA and modifying currently existing technology for this group of patients is an area of ongoing research.

Abstract - Poster

Abstract Title:

Acupuncture to Mitigate Healthcare Worker Stress and Anxiety During the COVID-19 Pandemic

Author(s):

Dr. William Loudon, Dr. Ruth McCarty, Jennifer Hayakawa, and Julia Afrasiabi

Background:

Burnout and compassion fatigue are experienced by healthcare workers (HCWs) as a consequence of caregiving and may result in emotional exhaustion, diminished performance, and higher absenteeism/turnover. Burnout has become a significant problem within caregiving professions and can translate into an inability to develop caring relationships with patients. Risk for burnout is enhanced during the COVID-19 crisis due to the combined effects of an increasingly burdened healthcare system, the overwhelming isolation this virus has created, and the very real fear HCWs have of placing themselves and their families at risk of infection. Strategies to mitigate impact on the mental health of HCWs are thus critical. The National Acupuncture Detoxification Association protocol (NADA) is one of the most commonly used forms of acupuncture treatment in the United States and involves the insertion of small needles on specific points along the ear. NADA has been used during national disasters and human conflict for purposes of stress and trauma relief. This study examines the efficacy of auricular acupuncture, acupressure, and massage to reduce frontline trauma HCW stress and anxiety and increase their capacity for developing caring relationships with patients and families during the coronavirus pandemic.

Method:

This pre/posttest design randomizes participants into three groups: acupuncture, acupressure, or massage. Participants complete a survey prior to intervention which includes: State-Trait Anxiety Inventory (STAI), Professional Quality of Life (ProQOL), Caring Ability Inventory (CAI). If randomized to acupuncture, intervention consists of 5 NADA treatments; the acupressure group wears externally placed acupressure seeds for a 3-week period; and participants randomized to massage receive 5, one-minute ear massages. All interventions are performed by a licensed acupuncturist. The completion survey is administered once a participant completes all 5 sessions (or 3-weeks wearing the seeds).

Results:

Data are currently being collected and analyzed but preliminary results are promising.

Conclusion:

We hypothesize that acupuncture will yield the greatest results but that auricular pressure seeds and massage will also prove to be useful strategies for the relief of situational stress and anxiety, demonstrating added value to mitigate the impact of a pandemic on trauma HCWs and the capacity to provide compassionate care.

Abstract - Poster

Abstract Title:

Quantifying the Need for Pediatric REBOA: A Gap Analysis

Author(s):

Christina M. Theodorou, Carl A. Beyer, Kaeli J. Yamashiro, Sarah C. Stokes, Jordan E. Jackson, Alana L. Beres, A. Francois Trappey, Jacob T. Stephenson

Background:

Trauma is the leading cause of death for children and adolescents. Resuscitative endovascular balloon occlusion of the aorta (REBOA) is a minimally invasive temporizing measure for non-compressible torso hemorrhage, but there is no data on the proportion of pediatric trauma patients with injury patterns amenable to REBOA use. We hypothesized that there would be a population of severely injured pediatric trauma patients with injury patterns that may benefit from REBOA.

Methods:

Between 2009-2019, all pediatric (< 18 years old) trauma activations at a level 1 pediatric trauma center were queried for patients who died, had pre-hospital cardiac arrest, activation of massive transfusion protocol (MTP), or underwent hemorrhage control surgery, defined as the cohort of severely injured patients. Patients declared dead on arrival without imaging or surgical intervention were excluded. The primary outcome was injuries for which REBOA may provide temporary hemorrhage control, including retroperitoneal hemorrhage, solid organ injury necessitating intervention, intraabdominal vascular injury, or pelvic hemorrhage, identified on chart review of imaging and operative records. The secondary outcome was presence of traumatic brain injury (TBI).

Results:

Of 6538 pediatric trauma activations, there were 123 deaths (1.9%), 37 pre-hospital cardiac arrests, 115 MTP activations, and 37 hemorrhage control operations. 27 patients were declared dead on arrival and were excluded. There were 198 unique severely injured patients with a median injury severity score (ISS) of 25 and a mortality rate of 48.5%. 36 patients (18.2%) of 198 had injuries for which REBOA may provide temporary hemorrhage control. These patients had a median ISS of 30 and a mortality rate of 36% (n=13), accounting for 10.6% of all pediatric trauma deaths at a single center. One-third of patients with REBOA-amenable injuries had concomitant severe TBI (n=11). Patients with REBOA-amenable injuries represented 0.6% of all pediatric trauma activations over 10 years.

Conclusion:

Non-compressible torso hemorrhage contributed to a disproportionate amount of deaths (10%) in this cohort of pediatric trauma patients, and 18% of severely injured patients had injuries that may benefit from REBOA use. Further research is needed to determine the utility and feasibility of pediatric REBOA.

Abstract - Poster

Abstract Title:

Pediatric penetrating thoracic trauma: examining the impact of trauma center designation and penetrating trauma volume on outcomes

Author(s):

James M Prieto, Richard Y Calvo, Kyle D Checchi, Michael J Sise, Romeo C Ignacio, C Beth Sise, Vishal Bansal, Matthew J Martin

Background:

Penetrating thoracic injuries (PTI) in the pediatric population are rare but carry a high risk of morbidity and mortality. It is not known whether there is a volume-outcome relationship in this population. We analyzed the impact of treating center designation and case volume of penetrating trauma on outcomes after pediatric PTI.

Methods:

Using the National Trauma Data Bank (2013-2016), we identified patients <18 years old with PTI. Treating trauma centers were categorized by type (Pediatric or Adult) and designation status (Level I, Level II, and other). Center performance was calculated as the difference between observed and expected mortality and standardized using the total penetrating trauma volume per center. Expected mortality was calculated using the Trauma Mortality Prediction Model. Pearson correlation and linear mixed-effects models were used to evaluate the association between variables and performance.

Results:

We identified 4,134 PTI patients treated at 596 trauma centers, including 879 (21%) at Adult Level I centers, 608 (15%) at Adult Level II centers, 531 (13%) at Pediatric Level I centers, 320 (8%) at Pediatric Level II centers, and 1,796 (43%) at other centers. Patients had a mean age of 14.7 ± 3.5 and a median Injury Severity Score of 10 (IQR: 4-20). Firearm-related injury was the primary mechanism (58%) followed by cut/piercing (42%). Overall mortality was 16% and median predicted mortality was 3.6% (IQR: 1.5% - 11.2%). Among patients with thoracic firearm-related injuries, centers with lower penetrating case volume and total trauma care demonstrated significantly worse outcomes (Fig.1). Multivariable analysis revealed Adult Level I centers had superior outcomes compared with all other non-Level I centers. There was no significant difference in mortality between Pediatric and Adult Level I centers.

Conclusion:

Adult Level 1 trauma center designation and annual case volume of penetrating thoracic trauma are associated with improved mortality after pediatric firearm-related thoracic injuries. Further study is needed to identify factors in higher volume centers that improve outcomes, and interventions to improve outcomes at lower volume centers.

Abstract - Poster

Abstract Title:

IDENTIFICATION OF RACIAL DISPARITY IN PEDIATRIC NON-ACCIDENTAL TRAUMA

Author(s):

Modupeola Diyaolu, Chaonan Ye, Hannah Wild, Lakshika Tennakoon, David A. Spain, Stephanie D. Chao

Background:

Nonaccidental trauma (NAT) continues to be a significant cause of injury and death in the pediatric population. Previous analyses of pediatric NAT, primarily conducted through single institution retrospective studies, focused on demographic disparities affecting non-white, uninsured, and low-income patients. This is the first study to assess for racial disparities in the identification of NAT by using a large, national registry.

Methods:

Trauma patients <18 years old were identified from the 2012 National Trauma Data Bank (NTDB). ICD-9CM external cause of injury and diagnosis codes were used. Our primary outcome measure was to assess if certain races were disproportionately identified with injuries consistent with NAT. Our secondary analyses were to compare outcomes by race, including hospital disposition, injury severity score (ISS), ICU length of stay (LOS), ventilator days, and mortality.

Results:

In 2012, 862 children had injuries consistent with NAT. African Americans (AA) were disproportionately overrepresented, representing nearly 36% of NAT patients while making up only 12.5% of the US population according to the 2010 US Census (Figure 1). Younger children were more likely to be white, while older children tended to be AA ($p=0.04$). There was no statistical significance between all races in ICU LOS, ventilator days and mortality. When comparing AA children of abuse to white, AA had mild ISS (66%vs57%, $p=0.03$). White children of abuse were more likely to have serious or critical ISS (21%vs.29%, $p=0.03$; 14%vs.15%, $p=0.03$). White and AA had similar LOS, except when controlling for ISS where AA children had longer hospitalizations for a lower ISS (mean \pm SD: 6.2 \pm 9.6 vs. 4.0 \pm 5.0, $p=0.002$). In addition, white children of abuse had a higher hospital mortality when compared to AA children (13%vs.7%, $p=0.02$).

Conclusion:

NAT was disproportionately identified among AA children. When compared to white children of abuse, AA children were older, had a lower ISS, and a lower hospital mortality rate. A limitation of this study is the ability to discern whether there is a true disparity in incidence of NAT between races or simply the detection of NAT. More studies are needed to understand the etiology of this disparity, and the possible impact of reporter biases