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Accepted Abstracts**

POSTERS

1 - Pediatric trauma injuries pre and post COVID-19 restrictions: A retrospective review and strategies for injury prevention.

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Background: In addition to the unrelenting morbidity and mortality caused by the COVID-19 pandemic, the ensuing healthcare crisis strained non-COVID areas including access to surgical services. The Stollery Children's Hospital provides Level 1 pediatric trauma care for Edmonton and for Northern Alberta. Although pediatric emergent surgical services, including trauma, were not restricted during the pandemic, the effects of COVID on pediatric injury patterns and on pediatric trauma resources remained previously unknown.

Methods: Data was obtained from the Alberta Trauma Registry for pediatric patients admitted to the Stollery. The following metrics were compared before COVID restrictions were implemented (March 2017-March 2020) and during the COVID restriction phase (March 2020-March 2021): age, gender, injury severity score, injury mechanism, injury type, surgical procedures, complication rates, ICU and hospital length of stay, and death rate. Student t-tests were used to compare pre/post outcomes and ANOVA tests were used to ascertain trends.

Results: There were several differences between the pre- and post-restriction time periods, namely for place of injury, rate of patient transfers, mechanism of injury, length of stay in ICU and complication rates. Post-restrictions, fewer injuries took place in schools (pre-36%, post-32%) and on motorways (pre-37%, post-28%), while there was an increase in injuries occurring in largely outdoor venues (pre-12%, post-29%, $p=0.006$). There was a decrease in the number of patients transferred to the Stollery once COVID restrictions were implemented (pre-56%, post-45%, $p=0.05$). Mechanism of injury was different between the two time periods ($p=0.01$): there were fewer multi-vehicular collisions (pre-25%, post-18%), burns (pre-25%, post-18%), and falls (pre-23%, post-15%) after COVID restrictions were effected. During this time period, there was also an uptick in sports injuries involving bicycles (pre-7%, post-12%), all-terrain vehicles (pre-6%, post-8%), snowmobiles (pre-0%, post-4%), and toboggans (pre-1%, post-4%). An increase in mean ICU length of stay was noted during the post-restriction period (pre-2.5 days, post-4.0 days, $p=0.04$). Of note, mean length of total hospital stay was not different between time periods. Lastly, the rate of complications was greater during the post-restriction period (pre-4%, post-20%, $p=0.0005$). Gender/age breakdown, injury severity score, involvement of alcohol, trauma team activation rates, injury types, surgical involvement, and death rates remained consistent between the time periods.

Conclusions: While the demographic of children getting injured remained consistent, there were considerable differences in the location and outcomes of pediatric traumas before and after implementation of COVID restrictions. These trends can be used to better inform pediatric injury prevention strategies in the future as the prospect of remote learning increases or in the case that restrictive measures are re-implemented. Strategies would be best served to focus on outdoor sport-injury prevention.

9 - Negative and positive experiences of caregiving among family caregivers of older trauma patients

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Background: Family caregiving, linked with both negative and positive experiences for the caregiver, is an important aspect of multi-disciplinary care for older persons. Older blunt trauma patients present a unique combination of emergency disease on a background of physical frailty and cognitive impairment.

Methods: In this nation-wide longitudinal study of Singapore residents aged ≥ 55 , admitted for blunt trauma with an Injury Severity Score (ISS) or New Injury Severity Score (NISS) ≥ 10 , caregiving-related negative (disturbed schedule and poor health; lack of family support; lack of finances) and positive (esteem) experiences were assessed from family caregivers using Caregiver Reaction Assessment (CRA) three months post-injury. Linear regression assessed association of caregiver and patient factors for the four CRA domains (score range: 1-5).

Results: Out of 218 patients recruited, 128 caregivers agreed to participate in the study, 110 completed the survey at 3 months.

Disturbed schedule and poor health

While caregivers of retired (versus working; β -coefficient: 0.48, 95% CI 0.13-0.84, $p=0.01$) and of functionally-dependent (Barthel's score < 80 post-injury; versus independent; β -coefficient: 0.67, 95% CI 0.20-1.15, $p=0.01$) patients reported a worse experience in this domain, male (versus female) caregivers reported a better experience (β -coefficient: 0.39, 95% CI -0.76- -0.02, $p=0.04$).

Lack of family support

Caregivers of patients residing in private or minimally-subsidized housing (versus those living in lower socioeconomic/more subsidized housing) were less likely to lack family support (β -coefficient: -0.36, 95% CI -0.66- -0.06). However, caregivers of male (versus female; β -coefficient: 0.31, 95% CI 0.05-0.57, $p=0.02$) or retired (versus working; β -coefficient: 0.33, 95% CI 0.07-0.59, $p=0.02$) patients were more likely to lack family support.

Lack of finances

Caregivers of patients who were male (versus female; β -coefficient: 0.64, 95% CI 0.19-1.09, $p=0.01$), had Charlson comorbidity score ≥ 2 (versus <2 ; β -coefficient: 0.47, 95% CI 0.02-0.92, $p=0.04$), and were functionally-dependent (versus independent; β -coefficient: 0.79, 95% CI 0.18-1.39, $p=0.01$) reported higher financial strain.

Esteem

Caregivers of male patients (versus female; β -coefficient: 0.36, 95% CI 0.15-0.57, $p<0.01$) and caregivers of patients who died within 12 months of injury (versus those alive; β -coefficient: 0.63, 95% CI 0.12-1.14, $p=0.02$) reported higher caregiver esteem.

Conclusions: Negative and positive experiences of caregiving among caregivers of older trauma patients vary by caregiver demographics and patient demographics, post-injury disability and pre-injury comorbidity status. These factors should be considered when planning post-discharge support.

13 - Assessing the need for resuscitative endovascular balloon occlusion of the aorta for management of non-compressible hemorrhage at a Canadian urban trauma centre: a retrospective chart review.

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Background: Expert consensus suggests that resuscitative endovascular balloon occlusion of the aorta (REBOA) should be considered in the management of select trauma patients; however, there has been a paucity of studies that evaluate the potential utility of REBOA in the Canadian setting. The study objective was to evaluate the percentage of trauma patients presenting to a Level 1 Canadian trauma centre that would have met criteria for REBOA.

Methods: We conducted a retrospective chart review of patients recorded in the British Columbia Trauma Registry (BCTR) who warranted a trauma team activation (TTA) at our institution. We identified REBOA candidates using pre-defined criteria based on published guidelines. Each TTA case was screened by a reviewer, and then each potential candidate was reviewed by a panel of trauma physicians for determination of final candidacy (Likely Candidates).

Results: The BCTR recorded 1237 consults to the trauma service, of which 635 of these were TTAs, during the 3-year study period. Fourteen patients were classified as Likely Candidates (2.2% of TTAs, 1.1% of all trauma consults, median age 46.1 years, 64.3% female). This is a similar percentage to the number of resuscitative thoracotomies performed at our institution in a year (approximately 1% of trauma consults). The Likely REBOA Candidates had a median Injury Severity Score of 31.5 (IQR 26.8). The mean number of blood products received within the first 24 hours of presentation was 39.2 (STD 40.3). The main mechanism of injury in the REBOA candidates was from blunt trauma (78.6%) and the main sources of hemorrhage were from abdominal injuries (71.4%) and pelvic fractures (42.9%). This is consistent with Canadian statistics that show that the majority of trauma in our country is secondary to blunt trauma, in contrast to the United States which has a higher rate of penetrating trauma. Eight of these patients (57.1%) went to the operating room or interventional radiology suite from the emergency department. Three of these patients (21.4%) died from their injuries.

Conclusions: The percentage of patients who met criteria for REBOA was similar to that of resuscitative thoracotomies performed at our Canadian institution. While REBOA would be performed infrequently, it is a less-invasive alternative to resuscitative thoracotomy, which could be a potentially life-saving procedure in a small group of the most severely injured trauma patients. More prospective research is required to determine if the availability of REBOA improves patient outcomes.

14 - Injury patterns following falls down open manholes.

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Background: Manholes left uncovered or damaged due to construction, routine maintenance, or theft, pose a significant hazard to pedestrians. Currently, little is known of the possible injuries caused by a fall through an open manhole or storm drain. Manhole-associated injuries also have the potential for significant litigation. The purpose of this study was to examine the epidemiology, injuries, surgical interventions, and outcomes in patients suffering from a fall through an open manhole or storm drain.

Methods: We performed a retrospective observational study from January 2007 to December 2017 using the National Trauma Data Bank® (NTDB®). Patients admitted to hospital following a fall through an open manhole or storm drain were identified by International Classification of Diseases (ICD) codes (E883.2, W17.1). Patients transferred in were excluded. Studied variables included patient demographics and comorbidities, emergency room physiology, blood and urine toxicology, injury severity and pattern, surgical interventions, and outcomes.

Results: A total of 388 patients were included in our analysis with a median age of 43 years old. The youngest patient was 1 year old. The number of patients injured from open manholes doubled over the study period, from 20 in 2007 to 40 in 2017. Alcohol and illegal drugs were detected in 12% and 10% of admission toxicology studies, respectively. Four (1%) of patients arrived hypotensive (systolic blood pressure < 90mmHg) and 10 patients (3%) had severe brain injuries, based on GCS. The median ISS was 5, with a maximum of 41. A total of 37 patients (10%) were severely injured (ISS > 15). Serious injuries (AIS > 2) most frequently occurred in the lower extremities (13%), chest (12%), and head (8%). Major surgical intervention was performed in 18 patients (5%) and five patients (1%) died.

Conclusions: Despite high-profile litigations and an increase in occurrences in recent years, the number of patients who suffer severe injuries or die following a fall through an open manhole or storm drain is relatively low. Nonetheless, these injuries are easily preventable and increased focus on manhole safety and maintenance by public works and utility companies has the potential to reduce or eliminate falls through manholes as a mechanism of injury.

16 - Does mortality after trauma team activation peak at shift change?

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Background: Prior institutional data have demonstrated trauma mortality to be highest between 06:00-07:59 at our center, which is also when providers change shifts (07:00-07:30). The study objective was definition of patient, provider, and systems variables associated with trauma mortality at shift change among patients arriving as trauma team activations (TTA).

Methods: All highest level TTA patients at our ACS-verified Level I trauma center were included (01/2008-07/2019), excluding those with undocumented arrival time. Study groups were defined by Emergency Department (ED) arrival time: shift change (SC) (06:00-07:59) vs. non-shift change (NSC) (all other times). Univariable/multivariable analyses compared demographics, clinical/injury data, provider response times, and times to investigation/intervention. Propensity score analysis compared outcomes after matching for age, sex, mechanism, SBP and GCS on arrival, and ISS.

Results: After exclusions, 6,020 patients remained: 229 (4%) SC and 5,791 (96%) NSC. SC mortality was 25% (n=57) vs. 16% (n=910) during NSC ($p<0.001$). Blunt trauma was more common during SC (76% vs. 63%, $p<0.001$). More SC patients arrived with SBP <90 (19% vs. 11%, $p<0.001$) or GCS <9 (35% vs. 24%, $p<0.001$). ISS was higher during SC (43[32-50] vs. 34[27-50], $p<0.001$). Time to CT scan (36[23-66] vs. 38[23-61] minutes, $p=0.638$) and emergent surgery (94[35-141] vs. 63[34-107] minutes, $p=0.071$) were comparable. On multivariable analysis, older age ($p<0.001$), SBP <90 ($p<0.001$), GCS <9 ($p<0.001$), need for emergent operative intervention ($p=0.044$), and higher ISS ($p<0.001$) were independently associated with mortality. After propensity score matching, mortality was no different between SC and NSC ($p=0.764$).

Conclusions: Early morning is a low-volume, high-mortality time for highest level TTA patients. Increased mortality at shift change was independently associated with patient/injury factors but not provider/systems factors. Ensuring ample clinical resource allocation during this high acuity time may be prudent to streamline patient care at shift change.

18 - Tranexamic acid use in trauma: an audit of knowledge translation to practice

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Background: The CRASH-2 trial demonstrated that tranexamic acid (TXA) administration reduces all-cause mortality and risk of death due to bleeding. Previous studies at a level-one trauma centre showed low compliance with CRASH-2 TXA administration protocols. We sought to assess the current degree of physician compliance to standard TXA protocols at our centre and to delineate whether knowledge translation regarding TXA use has improved or regressed over time.

Methods: A retrospective review of health records from January 01, 2012 to July 31, 2019 was completed. Trauma patients >18 years-old presenting to a level-one trauma centre were identified via an electronic trauma registry. Patients at risk of significant hemorrhage were included. The primary outcome, TXA compliance, was assessed using patients who received TXA as a proportion of eligible patients. Compliance and non-compliance group differences were assessed using chi-square, Fisher's exact, or a Student's T-test.

Results: Of 582 patients who presented to the trauma program at our centre between January 2012 and July 2019, 445 patients met our inclusion criteria, i.e. one of sBP <90 , HR >110 , requiring transfusion of at least 1 unit pRBC in the Emergency Department. The compliance rate for TXA administration was 26.5% (118/445). Most patients (62.2%) met only one criterion for risk of significant hemorrhage at presentation, and only 2.5% of patients met all three criteria. Compliance rate for patients meeting only one criterion for risk of significant hemorrhage ranged from 0-40.5%, increasing to 54.5% for patients meeting all three criteria. Considering factors that may influence compliance, patients presenting as a CTAS 1 were more likely to receive TXA than those with a lower severity score. No difference was observed for TXA compliance based on age, sex, or injury type. The average sBP of patients who

received TXA was significantly lower (TXA: 106.5±50.1mmHg; No TXA: 126.1±44.8mmHg; $p<0.0001$), and the average number of pRBC transfused was significantly higher (TXA: 10.9±13.1 units, median = 7; No TXA: 2.7±5.8 units, median = 0; $p<0.0001$), compared to patients in the non-compliance group. Over time, TXA compliance rates have improved from 3% (1/36) in 2012 to 46% (18/39) in 2019. However, compliance was significantly less than non-compliance until 2018. In 2019, there was no difference in compliance versus noncompliance rates for eligible patients.

Conclusions: Compliance to TXA administration protocols at a level-one trauma centre remain low, however, are increasing over time. Strategies for improving compliance to TXA protocols are recommended.

23 - Impact of lockdown and physical distancing measures on trauma admissions to a Canadian trauma centre during the first wave of the COVID-19 pandemic.

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Background: The impact of mandatory isolation and physical distancing measures (referred to as “lockdown”) on traumatic injury presentations in Canada has not been studied. We aimed to characterize the volume, demographics, and mechanisms of injury of admitted trauma patients under lockdown measures during the first wave of COVID-19 in the Canadian context.

Methods: This observational study using the Montreal General Hospital trauma registry compared weekly admission rates under lockdown measures (March 11th to July 25th, 2020) to a 3-year historical average (2017 to 2019). Incidence rate ratios (IRR) were generated using Poisson Regression and Wilcoxon Rank-Sum Test of significance. Patient demographics, injury mechanism and characteristics, mortality, length of stay (LOS), trauma team activations and transfers were analyzed using means and standard deviation and chi squared analysis.

Results: There was a decrease in weekly trauma admissions under lockdown conditions (IRR 0.86, 95%CI 0.76 – 0.97, $p=.01$), most pronounced in patients younger than 65 years old (IRR 0.78, 95%CI 0.65 – 0.92, $p=.003$) and with minor trauma (IRR 0.70 95%CI 0.56 – 0.85, $p<.001$). Proportionally, trauma secondary to falls increased by 5.8% ($p= 0.04$) whereas trauma due to blunt and cutting weapons or firearms decreased. Injuries within collective living establishments increased (4.6%, $p=0.005$) and decreased in locations of public interest. Transfers to our institution decreased by 5.1% ($p= 0.04$) but trauma team activations increased by 10% ($p<0.001$). There was no difference in use of intubation, OR, or ICU. While the emergency department LOS was unchanged, hospital LOS increased by 21% (12.0±15.9 vs. 14.5±17.5 days, $p=0.002$). Mortality also increased (5.5% vs. 9.3%, $p=0.003$).

Conclusions: This study is consistent with international data associating lockdown measures imposed during the first wave of COVID-19 with a decrease in trauma admissions. Importantly, severe trauma still occurred; admitted patients were older, and more injuries occurred due to falls within the home setting. In future lockdowns, hospital systems must ensure ongoing trauma care access while allocating resources towards the reduction of falls in the elderly population to prevent hospital strain.

29 - The American Association for the Surgery of Trauma (AAST) Organ Injury Scale (OIS) does not equally predict interventions in blunt and penetrating splenic trauma.

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Background: The American Association for the Surgery of Trauma (AAST) created the Organ Injury Scale (OIS) for the spleen and other organs approximately 30 years ago. AAST OIS for the Spleen is validated for and associated with mortality, need for operative intervention, and length of stay. It can also be used to predict the need for angioembolization. Penetrating and blunt injuries are categorized the same within the AAST-OIS.

Methods: We performed a five-year retrospective review of all spleen injuries at a level-one trauma center. Interventions and outcomes were recorded, and patients were stratified by AAST-OIS and mechanism of trauma. Rates of interventions and outcomes were compared using Fisher's Exact test. Binomial logistic regression was used to assess patient variables and their association with the need for splenic hemostasis.

Results: 156 patients were included; 102 (65%) blunt trauma patients and 54 (35%) penetrating trauma patients. AAST grade was associated with need for laparotomy in blunt ($p<0.001$), but not penetrating trauma ($p>0.05$). Laparotomy was used in 7% of Grade 1, 11% of Grade 2, 18% of Grade 3, 44% of Grade 4, and 71% of Grade 5 blunt injuries. Laparotomy was used in 78-100% of penetrating injuries, not statistically associated with grade.

Angiography (7%, 11%, 38%, 67%, 100%) and embolization (0%, 0%, 27%, 44%, 43%) were associated with AAST Grade in blunt ($p<0.01$) but not penetrating trauma ($p>0.05$). AAST grade was associated with splenectomy for both blunt (7%, 5%, 15%, 44%, 71%) and penetrating (11%, 30%, 67%, 100%, 100%) patients, with a significant difference between the mechanisms ($p<0.001$). Splenorrhaphy was associated with penetrating trauma (33%, 50%, 28%, 0%, 0%, $p=0.04$), but not blunt trauma.

The need for any hemostatic procedure (operative or endovascular) was associated with AAST grade in both blunt (7%, 11%, 38%, 67%, 100%, $p<0.001$) and penetrating (44%, 70%, 94%, 100%, 100%, $p=0.003$) trauma, with statistically different distribution of use ($p<0.001$). On binary logistic regression analysis, mechanism of trauma, AAST grade, the presence of radiographic contrast extravasation, the need for blood transfusion, and the presence of another hemorrhagic source were independently associated with need for a hemostatic procedure for the spleen.

Conclusions: The AAST-OIS for splenic injuries does not assess blunt and penetrating injuries equally. Penetrating injuries more likely require hemostatic procedures, grade-for-grade. Penetrating spleen injuries often need operative exploration to repair diaphragm, stomach, and colon injuries. Splenorrhaphy can be used as splenic preservation in low grade (1-3) penetrating injuries. In blunt trauma, angioembolization can be used to prevent laparotomy and splenectomy. Grade-for-grade, blunt and penetrating spleen injuries are not treated the same.

30 - Traumatic brain injuries in proximal humeral or clavicle fracture studies: the missing link. A systematic review.

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Background: Recent literature has suggested a significant epidemiological association between proximal upper limb fractures and mild traumatic brain injury (mTBI). Indeed, as demonstrated in three different series, up to 40% of proximal upper limb fractures also present with mTBI. Reported clinical impacts of concomitant mTBI are major: three times longer before a return to work, increased pain and decreased function.

Methods: This systematic review was conducted according to PRISMA guidelines within four electronic databases (MEDLINE, EMBASE, EBM Reviews and CINAHL) and grey literature published in English or French between 2008-2018. Two authors independently selected eligible studies based on the inclusion criteria. Methodological quality was assessed with the Cochrane risk-of-bias tool for RCTs and the Newcastle-Ottawa Scale (NOS) for prospective cohort studies. Extracted Data included: demographic information, inclusion criteria and pertinent analysis related to TBI.

Results: Initially, the search yielded 949 citations. Only 42 RCTs or prospective cohort studies met the inclusion criteria: 22 addressed proximal humeral fractures and 18 clavicle fractures. None discussed the possible impact of TBI on their results. Only two studies considered head injuries as relevant demographic data. Forty percent of the reviewed studies excluded, to varying degrees, patients with injuries or mechanisms strongly related to TBI. Some excluded all head injuries (2) while another excluded all patients with a Glasgow < 12 (1). Two RCTs excluded all high energy traumas while two others did not include “concomitant injuries” without any specification. Ten clinical trials did not accept polytraumatic patients.

Conclusions: Mild traumatic brain injuries are discriminated or ignored in prospective clinical trials of proximal upper limb fractures. The exclusion of these cases decreases the generalizability of the studies as prevalence is significant (40%). Considering recent scientific literature that has shown the major impact of mTBI on patients, the presence of mTBI should always be assessed to eliminate its confounding effect and to ensure high-quality evidence.

34 - Trauma skill enhancement for residents: Clinical cadavers as training tools in the Advanced Trauma Life Support course.

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Background: Clinical cadavers offer an invaluable experience for learners by enabling them to simulate procedural skills with high physical and functional fidelity. The Nova Scotia Health Trauma Program uses soft-preserved cadavers to train participants of the Advanced Trauma Life Support (ATLS) course developed by the American College of Surgeons. In this study, we sought to evaluate the effect of using clinical cadavers on the comfort level of trainees with performing specific trauma-related skills.

Methods: Surveys were administered to participants of 2 ATLS courses at the QEII Health Sciences Centre (Halifax NS) in July 2021. In the pre-course survey, participants used a 5-point Likert scale from 1 (“very uncomfortable”) to 5 (very comfortable”) to indicate their comfort level with 10 skills. The post-course survey assessed their comfort level with the same 10 skills after training on clinical cadavers. Responses from pre- and post-surveys were compared using the Wilcoxon signed-rank test.

Results: A total of 32 PGY1 residents completed the pre- and post-course surveys. The majority were female (19/32; 59.4%). Specialties most represented were anesthesia (n=6), obstetrics and gynaecology

(n=5), orthopedics (n=3), emergency medicine (n=3), and general surgery (n=3). Most participants had no previous experience using a cadaver to simulate trauma-related skills (27/32; 84.4%). Prior to the start of the course, when asked to rate how much they believed that use of clinical cadavers would facilitate their learning of ATLS-related interventions and skills on a scale of 1 (“no impact”) to 5 (“high impact”), 28.1% (9/32) gave a rating of 4 and 71.9% (23/32) gave a rating of 5. From the pre-survey, the skills that participants were least comfortable performing were chest tube insertion (mean response = 1.97), insertion of a surgical airway (mean response = 2.00) and needle compression (mean response = 2.00). The mean score for these skills were all significantly higher in the post-course survey ($p < 0.001$). Participant comfort levels with all 10 skills were higher in the post-course survey ($p < 0.001$). Upon completing the course, when asked how the use of clinical cadavers facilitated their learning from 1 (“no impact”) to 5 (“high impact”), 15.6% (5/32) gave a rating of 4 and 81.3% (26/32) gave a rating of 5.

Conclusions: Our findings suggest the inclusion of clinical cadavers in ATLS courses can have a significant positive impact on the comfort level of trainees. The vast majority of trainees indicated they would recommend that all ATLS courses utilize clinical cadavers. Further research is required to determine whether these skills are retained and transferable into the trauma unit.

35 - Twenty years of the CPSC NEISS reporting of home-oxygen related burns

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Background: Home oxygen therapy is frequently prescribed in severe pulmonary disease if a patient has uncorrectable hypoxia. This therapy allows patients independence to continue a lifestyle free of confinement to a medical facility. Oxygen, along with heat and fuel, is an essential component to the combustion triangle. In sufficient concentrations, oxygen can accelerate common household thermal reactions that are part of daily life, putting patients at risk of home-oxygen related burn injuries.

Methods: We performed a retrospective review of 20 years of data (2001-2020) from the National Electronic Injury Surveillance System of the Consumer Product Safety Commission. We selected cases including oxygen in the home and excluded oxygen as an industrial tool. Demographics and factors contributing to the fire were extracted from case narratives. We stratified the data into an early (2001-2010) and late (2011-2020) decades to identify temporal trends in injuries.

Results: 309 cases were identified (44% female, 56% male). The patients were relatively evenly split through the time periods (143 early, 166 late). 57% were admitted, while 43% were treated in an emergency department and discharged. Common sources of heat included smoking (cigar, cigarette, or marijuana, 61%), lighters or matches (43%), cooking sources (15%), and candles or incense (12%). Less frequent (<5%) sources of heat include house fires, heating appliances, electrical sparks, and grinders. Only 1% of cases had no obvious source of heat.

We found two trends when comparing the early and late decades. Smoking was involved in 71% of early cases, which decreased to 54% of late cases ($p=0.002$). Lighters and matches were involved in 36% of early cases but increased to 49% of late cases ($p=0.02$). The remaining heat sources remained statistically unchanged over time. We found in 2% of cases patients reported falling asleep around the time of injury. In 4% of cases patients reported being in bed at the time of injury.

Conclusions: Home oxygen related burns remain a common injury pattern. Smoking-related injuries are decreasing, but education regarding smoking cessation remains essential. Avoidance of lighters, matches, cooking appliances, candles, and incense are all common sources of injury. Rare heat and fuel sources include electrical sparks, grinders, and injuries in bed or while falling asleep. As 99% of cases had an identifiable heat or fuel source, education as a means of injury prevention is essential.

36 - Pediatric injuries during wartime require strengthened efforts to support pediatric surgical training activities among local providers: A systemic review

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Background: Pediatric injuries account for a notable portion of casualties in modern conflict. Pediatric medical care is often disrupted by the impact of conflict and insecurity during wartime however the implementation and accessibility of relevant pediatric surgical skill training for local clinicians residing in conflict settings have not been specifically investigated.

Methods: We conducted a systemic review of databases including PubMed, Embase and Google Scholar to identify records that described pediatric surgical care trainings for local clinicians during wartime.

Results: A total of 1,192 records. 7 eligible reports were selected for review. Each of the reports described pediatric injuries, evaluation of patient outcomes, access to pediatric surgical care and pediatric surgery training in conflict settings. While general accounts of pediatric injury types, pediatric surgical interventions and patient outcomes were discussed few records provided quantitative data or qualitative accounts assessing the implementation of pediatric surgical care trainings among local clinicians residing in conflict.

Conclusions: Currently few reports describing pediatric surgical training activities in conflict settings are available. Efforts to improve access to pediatric surgical skill training activities for local clinicians residing within conflict settings is imperative in order to reduce pediatric mortality and improve patient outcomes during wartime.

42 - Direct healthcare costs for moderate and severe work-related injuries: estimates from the national trauma center of Qatar

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Background: Work-related injuries [WRIs] are recognized as a leading cause of trauma in Qatar. Their epidemiology, high-risk populations and leading mechanisms of injury have already been studied but their economic burden has not been described to date. This study aimed to describe and analyze the direct healthcare cost of moderate and severe WRIs admitted to the national trauma center of Qatar. This study will provide evidence for healthcare prioritization, strategic planning, and future occupational safety efforts.

Methods: A retrospective analysis of trauma registry data and electronic medical records was conducted on a cohort of all WRI patients who were admitted to the Hamad Trauma Center [HTC], in Doha, Qatar, between 2011 and 2017. Collected data included patient demographics, mechanism of injury, length of hospital stay, patient outcomes and healthcare costs [USD] of procedures, hospital stay and radiologic expenses.

Results: A total of 3,757 WRI patients were treated at the Hamad Trauma Center over the 7-year study period. The majority were between 18-39 years [71.2 %], male [98.3%] and the most common mechanism of injury was fall from height [47.7%]. The overall cost for treatment was 124,671,431 USD (18 million USD per year) with a mean cost of 33,134 USD (95% CI 32,610 to 35,686) per patient. Each WRI injury expenditure was 19 times of the mean direct healthcare cost per capita. The mean procedure cost was 13,073 USD (95% CI 12,496 to 13,699), mean hospital stay cost was 19,342 USD (95% CI 18,300 to 20,300) and mean radiology cost was 723 USD (95% CI 707 to 739). There was a positive strong correlation between overall cost and hospital stay cost ($r^2=0.941$, $p=0.00001$) and between overall cost and procedure cost ($r^2=0.861$, $p=0.00001$). Road traffic-related WRIs [RTWRIs], affecting pedestrians [PED], drivers or passengers, had significantly higher mean healthcare costs when compared to other mechanisms of injury. MVC victims who wore seatbelts had significantly lower injury severity, hospital stay and mean total costs. Non-fatal WRIs were not significantly more costly than fatal WRIs due to significantly higher procedural costs.

Conclusions: The direct healthcare costs of moderate and severe WRIs in Qatar was 18 million USD per year. Procedure and hospital stay are the major cost contributors. Fall injuries were the most common and contributed the most to total costs, however the mean cost for each pedestrian and MVC injury was significantly higher. Focusing on proven means to prevent falls and RTWRIs will provide the most impact to reduce the cost of WRIs in Qatar.

43 - Caregiver knowledge, attitudes and practice towards child restraint systems in Qatar: challenges or opportunities?

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Background: High child mortality rates due to road traffic injuries have been reported within Qatar compared with other high-income countries. Child passenger safety and non-use of child restraints in vehicles is a critical public health issue in Qatar. The aim of this study was to identify barriers and factors that may influence use of child restraint systems [CRS] by parents in Qatar, to inform community-based interventions and national policies to improve child passenger safety.

Methods: A cross-sectional survey of caregivers of children under 5 years, from three public well-baby clinics, was conducted. The survey was self-administered on an electronic tablet; responses were anonymized and encoded. Demographic information collected included relation to child, level of formal education, and whether the family had a professional driver for their vehicle [5 questions]. The remaining questions in the survey were classified as Knowledge-based [6 questions], Attitude-based [4 questions] and Practice-based [10 questions].

Results: A total of 593 caregivers completed the survey. Most were mothers (88%), most (70%) had more than one child and half of the children were under 1 year (46%).

Almost half (47%) reported always using a CRS, more than half reported sometimes (28%) or never (25%). Univariate analysis of factors found no difference in CRS use between caregiver type, infants and toddlers (1 to 5 years), Qatari and non-Qatari, and those with a family driver or none. Significantly less caregivers reported CRS use if they had more than one child, less than high school education, a family income < 15,000 Qatari Riyals per month and were from a country without a national CRS law. Additional negative predictors of CRS use were incorrect responses.

Multivariate logistic regression, showed that the odds of CRS non-use increased with: > 1 child (OR 1.9, 95% CI 1.3-2.8), incorrect knowledge of children in adult's lap (OR 2.2, 95%CI 1.5-3.2) and when to transition a child to a front forward facing seat (OR 1.7, 95% CI 1.1-2.6). Caregivers with children who were not driven daily also had 2.1 times increased odds of CRS use (95%CI 1.4-3.0) compared to those who drove their child daily. Personal non-use of a seat belt by caregivers translated to 6.1 times (95%CI 3.9-9.6) the odds of non-use of CRS when compared to seat belt users.

Conclusions: This survey of parental knowledge, attitudes, and practice specific to CRS use in under 5's showed that: Less than half of parents self-reported always using a CRS, and one-fourth never used one. Caregiver seatbelt use, having 1 child and knowledge of when to transition CRS direction were positively associated with CRS use. Educating caregivers to use seatbelts and why CRS are essential should be the focus of efforts to keep child passengers safe in Qatar.

46 - A critical appraisal of the development and measurement properties of the Trauma NON-TECHNICAL Skills (T-NOTECHS) scale

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Background: There is increasing interest in evaluating non-technical skills during trauma resuscitation. The Trauma NON-TECHNICAL Skills (T-NOTECHS) scale is commonly utilized for this purpose. This study sought to critically appraise the development and measurement properties, including sensibility, reliability, and validity of the T-NOTECHS scale.

Methods: *Studies* that described the development process of T-NOTECHS scale were identified. Through a comprehensive literature review, primary studies that presented evidence of reliability and validity were also identified.

Results: A total of 24 studies described the development and measurement properties of the T-NOTECHS. Overall, the T-NOTECHS was developed with robust methodology. It has good sensibility with adequate content, face validity, and feasibility. The T-NOTECHS is a reliable measure of non-technical skills in the setting of trauma video review. Reliability improves with expert raters and more extensive T-NOTECHS focused training. The T-NOTECHS is a discriminative and evaluative instrument that measures non-technical skills of multidisciplinary trauma teams. Cross-sectional construct validity was demonstrated as T-NOTECHS was able to differentiate graded groups of varied non-technical skill level. Longitudinal construct validity was also demonstrated as T-NOTECHS identified changes in the level of non-technical skills pre- and post-non-technical skills training.

Conclusions: Based on the populations and settings identified in this critical appraisal, T-NOTECHS provided reliable and valid measurements of non-technical skills of trauma teams, particularly when assessing trauma video review and non-technical skills training interventions.

49 - A population-based study on the epidemiology of firearm-related injury in Nova Scotia.

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Background: Firearm-related trauma is a significant cause of preventable mortality in Canada. In 2020, Nova Scotia experienced the largest mass shooting in Canadian history. The objective of this study was to describe the epidemiology of firearm-related injury and death in Nova Scotia and to assess for factors associated with mortality.

Methods: Retrospective observational study of all major trauma patients in Nova Scotia who sustained firearm-related injuries (2001-2020). Data was collected from the Nova Scotia Trauma Registry and the NS Medical Examiner Service. Rates of injury were evaluated over time, by age/sex, and by intent. ArcGIS was used for geospatial mapping of injury rates by municipality. Characteristics of survivors and non-survivors were compared using t-tests and chi-square analysis. A multivariate logistic regression model was created to assess for predictors of mortality.

Results: A total of 776 firearm-related injuries occurred over the 19-year study period, for an overall age- and sex-adjusted firearm injury rate of 4.44 per 100,000 population. Patients ranged in age from 6 to 92 years (mean 45.0±19.2 years) and most were male (95.6%; 742/776). Most injuries were self-inflicted (65%; 504/776). The majority of patients died from their injuries (72%; 558/776); 64% (497/776) died at the scene. The overall age- and sex-adjusted firearm mortality rate was 3.18 per 100,000. Most non-survivors had injuries that were self-inflicted (83.2%; 464/558). Increasing age (odds ratio [OR] 1.022, 95%CI 1.001-1.043) and increasing Injury Severity Score (OR 1.106, 95%CI 1.068-1.146) were associated with greater likelihood of mortality. Activation of the trauma team was associated with survival (OR 0.042, 95%CI 0.019-0.092).

Conclusions: Trauma patients with firearm-related injuries were predominantly male and most injuries were self-inflicted. Younger patients tended to be victims of homicide/assault and were more likely to survive their injuries.

59 - Identifying quality indicators for the care of hospitalized injured older adults: a scoping review of the literature

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Background: Older adults are at increased risk for injury and complications following injury, resulting in worst health outcomes than younger adults and a significant economic and healthcare consumption burden. Quality indicators are used to assess the quality of care in trauma systems, but few indicators reflect the specific needs and characteristics of older patients. This study aimed to synthesize knowledge about quality indicators for the acute care of hospitalized older injured adults.

Methods: A scoping review of the scientific and gray literature was conducted to identify quality indicators used to assess the quality of hospital care for injured older adults. Data selection and extraction were performed by two independent reviewers. Extracted quality indicators were classified according to injury type and relevant frameworks: Donabedian classification and Institute of Medicine domains of quality. Information on indicator origin and development was also extracted.

Results: Of 9967 identified documents, 108 were eligible for inclusion. A total of 685 quality indicators were extracted, representing 408 different quality indicators after grouping those identical or very similar. Up to 10 different definitions were found to assess the same process. Over two-thirds of the quality indicators identified were specific to hip fracture care. Globally, 71% of the extracted quality indicators assessed processes of care, while 20% and 9% focused on health outcomes and structure of care, respectively. The most frequently assessed quality domains were safety (36%) and effectiveness (35%) of care. Only 40% of the identified quality indicators were based on literature and expert opinion. No commonly recognized set of quality indicators applicable to the entire population of older injured patients were identified.

Conclusions: Multiple quality indicators were identified, but few were based on evidence and expert consensus. Indicators focused mostly on hip fracture, and gaps were identified for other frequent injuries like TBI. Future work should focus on reaching consensus on a set of quality indicators that can be used to assess the quality of trauma care to older adults, which could be used to identify areas in need of improvement and ultimately improve outcomes in this population.

60 - Assessing the contribution of age on complications and mortality in the healthy trauma population.

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Background: It has been widely established that there is increased morbidity and mortality in older trauma patients. However, it is not completely clear whether this increased incidence is caused by age alone, or a higher incidence of co-existing medical comorbidities. In this study, we investigated the impact of age in relation to posttraumatic outcomes among patients with no comorbidities.

Methods: We selected a cohort of adult patients from the National Trauma Database (NTDB) between 2017 – 2019. Patients who were overweight or had documented comorbidities, smoking history, or a positive drug screen were excluded. Patients were categorized by age groups at 10-year intervals. Age and other patient demographics and injury details were compared. Significant factors were included in multivariate models and the impact of age on complications and mortality was assessed.

Results: The study included 143,199 trauma admissions which were predominantly white (69.5%), male (59.6%) patients with blunt injuries (89.0%), and a mean age of 43.5 ± 21 years. Mean Injury Severity Score (ISS) was 9 (IQR 4, 12). The number of in-hospital deaths was 1,119 (0.8%).

Increasing age was associated with increasing rates of overall complications (2.4% for under 30 years of age, 2.7% for 31-40 years, 2.7% for 41-50 years, 2.6% for 51-60 years, 2.6% for 61-70 years, 2.6% for 71-80 years, 3.0% for over 80 years, $p=0.019$). The adjusted odds of complications for all age groups compared to the under-30-year-old group persisted on multivariate analysis ($p < 0.001$). Increasing age

was associated with greater frequencies of mortality (0.5%, 0.5%, 0.6%, 0.7%, 1.1%, 1.5%, 2.4%, $p < 0.001$). The adjusted odds ratio of mortality became significant over 40 years of age ($p < 0.001$). When applied to mildly injured patients, the multivariate models showed significant increases in complications ($p = 0.002$) and mortality ($p = 0.001$) above 50 years old.

Subset analysis of healthy patients 80 years old and greater revealed a 1.08-fold higher odds of mortality for every year of increasing age ($p = 0.002$). Other covariables associated with mortality included male gender (OR=1.84, 95%CI 1.37 – 2.48), ISS (OR=1.11, 95%CI 1.10 – 1.13), Glasgow Coma Scale (OR=0.67, 95%CI 0.63 – 0.70), and systolic blood pressure on presentation (OR=0.99, 95%CI 0.98 – 0.99).

Conclusions: This study found that in-hospital complications and mortality rates rose with increasing age. Complications in healthy patients became more frequent with each decade beyond 30 years of age. Mortality in healthy patients became more frequent above 40 years of age. Healthy octogenarians have an 8% increase in mortality with each year of age. Age, independent of comorbidity, is associated with worse outcomes in the traumatically injured patient.

61 - A mixed methods study of a paramedic fall referral program.

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Background: Older adults commonly call 911 due to a ground level fall and many are not transported to hospital. In Nova Scotia, paramedic referral to a community-based fall prevention program aims to mitigate risk associated with the non-transport. Our objective was to describe outcomes post paramedic referral and paramedic perception of the referral process in a provincial EMS system.

Methods: We used a mixed methods design comprised of 1) a retrospective matched cohort study of patients with a ground level fall and 2) qualitative analysis of paramedic perception and attitudes towards the referral process. Patients who met eligibility criteria between February 1, 2014, and February 1, 2020 were included. The primary outcome was number of 911 calls post index visit. We used descriptive statistics to compare characteristics of those referred to those not referred.

Results: This analysis included 857 participants (intervention group $n = 289$ and control group $n = 568$) who had a ground level fall and non-transport outcome. Most were female (53%; $n = 451$) with a mean age of 80.8 ± 7.9 years. The majority (69%; $n = 199$) were referred by Advanced Care Paramedics. There was no difference in the number of 911 calls post index visit (0.31 ± 0.94 vs. 0.31 ± 1.28). Twelve paramedics participated in the interviews. Most had ≥ 6 years of experience and they estimated that they attended to 4–6 fall related calls per rotation. Emerging themes included paramedic and patient awareness of the program, the importance of paramedic feedback, and assessment challenges given the level of vulnerability experienced by patients.

Conclusions: Paramedic fall referral services have the potential to identify and refer high-risk patients to community-based fall prevention teams. Re-lapse was lower than anticipated in this analysis. Opportunities for program optimization exist to ensure patients receive access to this consultative service.

62 - Evaluation of the implementation of best practices for pain management and early mobilization to prevent delirium following geriatric trauma.

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Background: The aging population has led to an increase in admissions of elderly in trauma centers. Geriatric trauma can precipitate delirium, which is one of the most frequent complication in this population. Optimal pain management and early mobilization are two strategies recommended in best practice guidelines to reduce the prevalence of delirium. The objective of this study was to describe the implementation of these practices in elderly patients in a level 1 trauma center.

Methods: Sixty medical charts of patients hospitalized the year prior to the implementation of a geriatric trauma program (September 2019-August 2020) were reviewed. Eligibility criteria were: 1) diagnosis of delirium as reported in a national trauma registry, 2) ≥ 80 years, 3) ≥ 65 years with significant comorbidities, and 4) elderly at high risk for complications (determined by the surgeon). Data on pain and early mobilization interventions were collected over the first 3 days of admission. Descriptive statistics were computed.

Results: Participants mean age was 83 ± 7.6 years old and most were female (60%). The patients had various comorbidities, including cardiovascular (90%) and endocrine (70%) diseases and dementia (40%). The most common type of trauma was lower limb injuries (67%) followed by head injuries (30%). The most frequently used methods to assess pain was the Verbal Rating Scale with a mean of 3.2 ± 2.5 evaluations/3 days. Pain assessment prior to administration of analgesics was performed at a rate of 45% (226 assessments/497 administrations), while the assessment was performed at a rate of 14% (72 assessments/497 administrations) after. The administration of coanalgesics was similar to that of opioids (mean: 5.7 ± 2.5 vs 5.3 ± 3.5 times/3 days). Patients received a mean of 32.6 ± 32.7 mg oral morphine equivalence doses during the 3-day period. Non-pharmacological pain relief strategies were not documented. The data collected for mobilization revealed that 60% of patients were dependent on the assistance of 2 healthcare providers and that the mobilization was carried out on average 1.6 ± 0.7 times/8 hrs-shift. The first mobilization occurred on average 4.6 ± 4.9 hours after admission. Mobilization to the chair was most frequently performed (mean: 7.2 ± 2.8 times/3 days) followed by walking in the room (mean: 2.9 ± 3.0 times/3 days) or in the corridor (mean: 2.1 ± 3.0 times/3 days) and exercises in bed (mean: 1.9 ± 2.5 times/3 days).

Conclusions: The results of this study show that pain assessment could be improved in elderly patients who develop delirium. Also, more non-pharmacological strategies could be implemented to limit the use of opioid. Furthermore, mobilization, especially that involving walking, could be optimized. Findings will be corroborated with clinicians which will also identify barriers to the uptake of targeted best practices. Ultimately, clinical practice guidelines could be adapted to local context for preventing delirium in geriatric trauma.

64 - New mobility, new data: the Vancouver Coastal Health e-scooter experience.

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Background: In April 2021, the Government of BC launched an electric kick scooter (e-scooter) pilot project allowing communities to enact bylaws for e-scooter use. Five of the eight participating

municipalities are part of the Vancouver Coastal Health authority (VCH). The VCH Injury Prevention (IP) group developed a surveillance framework to report on the early experience of e-scooter injuries and support the ongoing evaluation of e-scooter pilots in the Vancouver, Richmond, West Vancouver, and North Shore municipalities.

Methods: Emergency department (ED) registration data from nine sites across VCH were used. An algorithm was created to extract any visit where the mechanism of injury, activity at time of injury, and nature of injury variables contained variations of the keyword 'e-scooter'. In addition, an e-scooter drop-down flag was added to the two clinical information systems used across VCH sites in December 2020 and July 2021.

Results: From January 1 to September 30, 2021, there were 121 e-scooter related ED visits to VCH sites, compared to only 4 visits in 2020. The average number of e-scooter related ED visits per month increased from 4 (range 0-12) in January to June 2021 to 35 (range 29-41) in July to September 2021. Fifty-five percent of e-scooter visits were triaged in the ED as emergent or urgent; however, only 3% of e-scooter visits in 2021 were admitted to the hospital.

Of the e-scooter related ED visits in 2021, the majority were male (64%) and aged 20-39 years (55%). Most visits were riders who fell (76%), followed by those involved with a car (16%). Very few presentations involved pedestrians. Incident context was largely unknown (88%), but where context was available, reasons for falling included collision with static objects (e.g. trees, poles, parked cars) or loss of control.

The majority of hospital visits (75%) occurred in Vancouver and Richmond, where e-scooter pilots launched in June 2021 and July 2021, respectively. One quarter of VCH ED visits were to hospitals within a municipality where the e-scooter pilots had not commenced (City of North Vancouver) or the municipality did not plan to participate (District of Squamish). Thirteen percent of e-scooter visits were non-VCH residents (out of region/province/country) or unknown.

Conclusions: Our early experience with e-scooter surveillance indicates an increase in the number of e-scooter related injuries in the VCH region following the introduction of local pilots. Data limitations include incomplete location data and potential misclassification of an e-scooter at registration. To best support municipal partners, future variables of interest include helmet use, rider experience, improved location data, and speed at time of incident.

68 - Development of a novel online turn-based game for mass casualty training

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Background: Traditionally, disaster management training programs are conducted in person. The COVID-19 pandemic has heightened the requirement to conduct business virtually. There is a need for a platform that allows for virtual scenario-based training to manage complex mass casualty scenarios.

Methods: A working group was formed to develop a multi-scenario-based mass casualty training program. The working group evaluated all available virtual meeting technologies and determined that

no current technology existed to allow for simulation of in hospital triage. Using JavaScript, HTML, and CSS programming languages a novel turn based online game was developed to enable groups of students to practice mass casualty decision making.

Results: A novel turn based online game was developed for the training of in-hospital triage. It is accessible to students through a web browser using a URL. This game simulates an external disaster, and the arrival of multiple casualties to the emergency department. The students playing are tasked to use the hospital resources in such a manner that the greatest number of patients possible would survive. The game features patients with differing injuries and physiology that declines as turns of the game are completed unless the proper treatments are given. The hospital resources available to the students include, Trauma bays, OR; ICU, Ward beds, CT scanners, X-ray, and ultrasound. To allow individualized training the types of injuries, number of casualties and the number resources available are customizable. This customizability allows the game to be played at different difficulty levels which may be required for the specific training audience using this simulation. This game was designed to be played by small groups using virtual meeting software (such as Microsoft teams) and is useful as a tool for team training. This simulation game was tested with medical students and physician assistants during a live mass casualty training course. Student feedback indicated a high level of engagement and group participation.

Conclusions: The development of an online turn based in hospital triage simulation game was developed. This allows students and trauma leaders to practice the key skill of in-hospital triage as a group using virtual meeting technologies. This game can be scaled to train students at all medical education levels, including hospital wide training.

70 - Predictors of transfusion in trauma and their utility in the prehospital environment: a scoping review.

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Background: Hemorrhage is a leading cause of preventable mortality from trauma, necessitating adequate resuscitation through blood product transfusions. Early and accurate identification of patients requiring massive transfusions in the prehospital setting can reduce delays in time to transfusion upon arrival to hospital, improving chances of successful resuscitation. The purpose of this study is to characterize existing literature on predictors of massive transfusion and analyze their utility in the prehospital context.

Methods: A search strategy was developed in consultation with medical librarians. A literature search of OVID MEDLINE from 1946 to present was conducted for primary studies evaluating the predictive ability of scoring systems or single variables in predicting transfusion in all trauma settings. 4308 studies were identified, and 20 duplicates removed. 4295 studies underwent title and abstract screening, 107 studies underwent full text review, and 82 studies were included in the final review.

Results: From the 82 studies included, we identified over 30 single predictive variables for transfusion along with their validity and accuracy (ex. sensitivity, specificity, AUC, etc.). These include pulse pressure, lactate, end-tidal CO₂, perfusion index, presence of blunt or penetrating trauma, presence of limb amputation, mean arterial blood pressure, need for intubation, unstable pelvis or pelvic fracture, temperature <35.5C. In addition, 26 scoring systems were also identified, including: Assessment of Blood Consumption (ABC) [BN1] score, Shock Index (SI), Shock Index Pediatric Age-Adjusted (SIPA), Revised

Trauma Score (RTS), FASILA score, Trauma-Associated Severe Hemorrhage Score (TASH), Prince of Wales Hospital Score (PWH), McLaughlin Score, Revised Assessment of Bleeding and Transfusion (RABT), Extremity/Mechanism/Shock Index/GSC score (EMS-G), Dynamic Massive Blood Transfusion (DMBT), Vandromme, Schreiber, Larson, Endotracheal stenosis (ETS), Modified Trauma-Induced Coagulopathy Clinical Score (mTICCS), Traumatic Bleeding Severity Score (TBSS), Modified Traumatic Bleeding Severity Score (mTBSS), Class-4 Hemorrhage Unresponsive to Lactate Ringer's (CHULA) score, Milano score, MTPitt, a Red Flag Alert, a smartphone app model, and a gray zone approach. Of all included studies, 45% (n=37) were applicable in the prehospital setting, 52% (n=43) were potentially applicable (i.e., requiring point-of-care testing) in the pre-hospital setting, and 2% (n=2) were not applicable in the prehospital setting.

Conclusions: In summary, we identified over 50 predictive single variables, validated scoring systems, and derived models for massive transfusion, presented their properties, and identified those with potential utility in the prehospital setting. By further validating applicable scoring tools in the prehospital setting, we may begin to administer more timely transfusions in the trauma population upon arrival to hospital.

73 - Factors associated with severe brain injury in traumatic spinal cord injured patients.

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Background: Polytraumatic event could lead to traumatic spinal cord injury (tSCI) and traumatic brain injury (TBI). Unfortunately, this diagnosis can occur concomitantly. While mild TBI is often reported with tSCI patients, the characteristics of tSCI patients with concomitant moderate and severe TBI remain largely unknown. Consequently, our study aimed to describe the characteristics of a cohort of patients with concomitant tSCI and moderate/severe TBI, in comparison to a cohort of patients with tSCI and mild/no TBI.

Methods: We proposed a retrospective study of tSCI patients admitted to a Canadian Level-1 trauma center between April 2010 and June 2020. Medical charts were analyzed to determine the presence of concomitant tSCI and TBI as well as to categorize its severity. Patients with concomitant moderate/severe TBI were compared to patients with mild/no TBI in terms of trauma, socio-demographic, and inpatient (acute and rehabilitation) characteristics.

Results: Among 539 patients with tSCI, only 13 (2.4%) sustained a concomitant moderate/severe TBI. A total of 78% of patients with tSCI and moderate/severe TBI were male which was similar to the mild/no TBI group. The group with moderate/severe TBI were significantly younger (36.9 ± 18 vs 50.3 ± 19 years, $p=0.02$), with a higher proportion of patients 40 years old or younger (69% vs 33%, $p=0.008$) (which is a highly clinically threshold in TBI). Motor-vehicle accident (62% vs 26%, $p=0.005$) and high velocity trauma (100% vs 45%, $p=0.0003$) occurred in a significantly higher proportion in the group with concomitant tSCI and moderate/severe TBI. There was no significant difference between the neurological level of injury and severity grade of the SCI. Time between trauma and surgery was not significantly different between groups (45 ± 54 vs 60 ± 98 hours, $p=0.33$). The length of stay was significantly greater for patients with moderate/severe TBI in the acute hospital (55 ± 40 vs 27 ± 20 days, $p=0.03$), but not in the rehabilitation facility (93 ± 40 vs 73 ± 37 days, $p=0.12$). However, tSCI with concomitant moderate/severe TBI was more frequently associated with urinary tract infections during intensive functional rehabilitation stay (90% vs 55%, $p=0.03$), but not during acute care.

Conclusions: Moderate/severe TBI occurs concomitantly in less than 3% of patients with tSCI and is more frequent in younger patients, motor-vehicle accidents and high velocity traumas. In addition, concomitant tSCI and moderate/severe TBI requires a prolonged stabilisation in the acute care but does not negatively impact the rehabilitation course. However, the higher incidence of urinary tract infections suggests that these patients may benefit from an individualized bladder dysfunction management approach starting during acute care.

76 - Incidence and burden of care after concomitant traumatic spinal cord and brain injuries.

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Background: Previous studies reported that traumatic brain injury (TBI) frequently co-occurs with traumatic spinal cord injury (tSCI). However, it is unclear how these concomitant diagnoses affect the evolution of the patient through acute care as well as through the rehabilitation period. Consequently, our study aimed to determine the incidence and burden of care of concomitant tSCI-TBI.

Methods: We conducted a retrospective study of tSCI patients admitted to a Canadian Level-1 trauma center between April 2010 and June 2020. Medical charts were analyzed to determine the presence and characteristics of concomitant tSCI-TBI, and its impact on returning home and length of stay. Statistical analyses were used to compare patients with tSCI-TBI to patients with tSCI only.

Results: Among 493 patients with tSCI, 228 (46.2%) had a concomitant diagnosis of tSCI-TBI. A total of 217 patients with tSCI (95.2%) had concomitant mild TBI, 7 (3.1%) a moderate TBI and 4 (1.7%) a severe TBI. Tetraplegia was significantly more frequent ($p<0.001$) for patients with concomitant tSCI-TBI (67% vs. 50%). With regard to the severity of tSCI, there was no difference in ASIA Impairment Scale grade. While motor vehicle accidents (MVA) were more frequent ($p<0.001$) in patients with concomitant tSCI-TBI, sport related events were more frequent in tSCI only ($p=0.02$). Age, height, weight, BMI, sex and level of education were not significantly different between the two groups. The rate of transfer to specialized intensive functional rehabilitation was superior in patients with concomitant TBI (80%) and patients without TBI (71%), and those with concomitant tSCI-TBI were less likely to return home after rehabilitation (11% vs. 22%, $p=0.006$). In addition, the acute length of stay (31.7 ± 22.0 days) and rehabilitation length of stay (78.6 ± 39.9 days) were significantly longer ($p<0.003$) for patients with concomitant tSCI-TBI, when compared to those without TBI (24.1 ± 17.8 and 66.7 ± 34.7 days, respectively). In addition, patients with concomitant tSCI-TBI developed more spasticity (50% vs 33%) and had more pressure injuries (32% vs 19%) during the rehabilitation length of stay.

Conclusions: The high incidence of concomitant tSCI-TBI diagnoses (approximately 50%) suggested the importance of a prompt TBI assessment. The great majority have a mild TBI, and were more often associated to tetraplegia and MVA. The burden of care is increased in patient with concomitant tSCI-TBI as they are more likely to have longer hospitalization and rehabilitation, develop more spasticity and pressure injuries and are significantly less likely to return home after their injury despite functional rehabilitation.

78 - Initiating activity-based therapy (ABT) within 72 hours of traumatic spinal cord injury: results from the PROMPT-SCI trial

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Background: Early ABT of critically ill patients can prevent complications and promote faster recovery. Specifically for patients with traumatic spinal cord injury (TSCI), it could also stimulate neurological recovery. Unfortunately, early ABT has never been attempted in TSCI patients because of potential doubts regarding its hemodynamic and neurological innocuity. This abstract aims to present safety results on the first 15 participants from the PROMPT-SCI trial, the first ever attempt at early ABT after TSCI.

Methods: All adult patients who presented with a tSCI at a Level-1 trauma center in Montreal between April and October of 2021 were screened for eligibility. The intervention consisted in daily 30-min sessions of in-bed leg cycling for 14 consecutive days, starting <72h after the injury. Motor assistance from the ergometer was titrated to achieve target cadence of 40 RPM. During sessions, vital signs were monitored and adverse events were recorded. Neurological exams were performed daily.

Results: 15 individuals completed the protocol. Of these, 10 were able to successfully achieve a full 30 min session of cycling within 72h of the injury with no adverse event. An additional 2 individuals met exemption criteria for the first session (1– Impossible to fit in patient’s schedule due to other clinical interventions; 2– Unwillingness to undergo pedalling session) but performed a full and successful session the next day (within 96h of the injury) with no adverse event. The last 3 patients started a session within 72h of the injury but it was interrupted prematurely due to stopping criteria: 1– desaturation with SpO₂<90% (but full and safe session the next day); 2 and 3– abdominal pain present before cycling and persisting during session (but full and safe session 2 days after, when abdominal pain was resolved). In addition, there were no neurological deteriorations after the first full sessions for any of the participants.

Conclusions: This analysis shows that early ABT after severe tSCI is safe when close hemodynamic and respiratory monitoring is ensured. More specifically, our results suggest that low-intensity passive or active-assisted ABT can be performed successfully as soon as 72h after the injury without neurological deteriorations.

81 - Actigraphy for the monitoring of agitation in acutely ill traumatic brain injured patients

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Background: Agitation affects more than 50% of intensive care unit (ICU) patients following a traumatic brain injury (TBI). Agitation can pose a threat to patient safety and prolong recovery. Actigraphy, which measures movements with an accelerometer, can be used to estimate sleep-wake cycles and measure activity. The aim of the present study is to evaluate the correlation between actigraphy sleep-wake and activity measures and Richmond Agitation Sedation Scale (RASS) scores in ICU TBI patients.

Methods: We prospectively enrolled adults with a TBI between September 2018 and July 2019. We excluded patients with spinal cord injuries, major neurological diseases, no active treatment and ICU

stay <48 hours. Actigraphs were placed on patients' wrists until ICU discharge or death. Activity level was measured with raw actigraphy counts and sleep-wake consolidation was quantified by the Daytime Activity Ratio (DAR). We evaluated the correlation between RASS, activity level and DARs using repeated measures correlation.

Results: A total of 30 patients were recruited with a median age of 64.5 years (IQR 41.3) and a majority of males (73%). TBIs were severe, moderate and mild complex in 30%, 43% and 27% of cases, respectively. As they had less than 24 hours of data, 5 patients were excluded from the analysis. In total, 16 patients were considered agitated (RASS>1) at least once during the ICU stay. The mean level of activity over 24 hours was greater for patients with agitation (34.3 +/- 22.5 vs 9.6 +/- 12.2; p<0.01). The total activity per 24 hours was significantly correlated with median and maximum daily RASS scores in agitated patients (r=0.45; 95% CI 0.31-0.57 and r=0.35; 95%CI 0.20-0.49) but not in non-agitated patients (r=0.24; 95%CI -0.11-0.52 and 0.31; 95%CI -0.02-0.58). When evaluating total activity per 8-hour shift, activity was correlated with maximum daily RASS in both agitated (r=0.36 (95%CI 0.26-0.45) and non-agitated patients (r=0.38; 95%CI 0.21-0.53). In contrast to total activity, DAR wasn't correlated with median (r=0.05; 95%CI -0.22-0.11 and r=0.01; -0.33-0.34) and maximum daily RASS (, in both agitated and non-agitated patients (r=0.02; 95%CI -0.20-0.14 and r=0.01; 95%CI -0.32-0.34), respectively.

Conclusions: An important proportion of TBI patients develop agitation during their ICU stay. We found that daily activity counts were significantly associated with both maximum and median RASS in agitated TBI patients. This data suggests there is a potential for actigraphy to be useful as a monitoring tool for agitation in TBI patients admitted to ICU.

83 - Characteristics and outcomes of violent suicide attempts: a Canadian level one trauma center experience

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Background: The incidence of self-inflicted injuries has been increasing in the last decade. The risk factors for this type of injuries are multifactorial, and multiple specialties and disciplines are involved in these patients' care, which makes it challenging to study. Few data are available on the short and long-term prognosis of this population.

We aimed to describe the demographic characteristics and outcomes of patients admitted for suicide attempts at a single North American Level 1 Trauma Center.

Methods: All trauma admissions were screened from 2010 to 2020 to identify self-inflicted injuries. Demographic characteristics, mechanism of injury, clinical outcomes, and hospital readmission were retrospectively collected.

Results: Out of the 14,455 patients admitted on the trauma service, 343 patients (2.3%) had a self-inflicted injury. 72.0% were male (n=247) and the mean age was 42.8 ±16.4 years. The main mechanism was falls (n=127; 37.0%), followed by knife injuries (n=48; 13.9%), motor vehicle collisions (n=30; 8.7%) and firearms (n=25; 7.2%). The location of the incident was at home in 48.3% of cases (n=167), in the

street or highway in 19.8% (n=68), at the hospital in 1.4% (n=5), and in 2.6% (n=9) at a residential institution. A total of 111 patients (37.8%) were intoxicated, 54 of them (18.4%) with alcohol. Mean ISS scores and GCS scores were 18.7 ± 13.8 and 13.5 ± 3.0 respectively. Total and Intensive Care Unit length of stay was 21.4 ± 24 and 7 ± 6.4 days for survivors. In-hospital death rate was 16.0% (n=55) including 33 patients (9.6%) within the first 24h.

Conclusions: This study exposes the poor outcomes of this young patient population and opens the door for future injury prevention campaigns. Long-term follow-up is needed to measure the rate of re-attempts, risks factors, as well as psychiatric treatment and follow-up.

86 - Cultivating wellbeing among critical care and trauma nurses: A quality improvement initiative *Sonshire Figueira* From the The Ottawa Hospital

Background: Critical Care and Trauma nurses provide specialized care to the hospital's most critical patients in very complex and challenging situations. This may, in turn, directly impact their overall health and perceived wellbeing. Data available from internal Wellness Surveys shows increased perceived stressors, decreased perceived satisfiers and downward trends for perceived wellbeing/health among this vulnerable group of individuals. The objective of this Quality Improvement (QI) initiative is to explore ways that could potentially support their wellbeing.

Methods: After obtaining a Research and Ethics Board exemption and in order to further understand the problem and design an appropriate and feasible wellness initiative, we collected data, assessed staff needs and distributed surveys among critical care nurses. By doing this, we were able to: 1) have a more accurate picture of the situation, 2) measure the interest of the group, and 3) lower the risk of bias/errors and 4) allow participants to co-design the project.

Results: In Sept 2020, a survey was designed and distributed to identify perceived determinant for staff wellbeing as well as attitudes towards different potential interventions. Soon after, process mapping and fishbone exercises were developed, and the following change ideas were identified based on their impact and energy: 1) Share one wellness resource per week (hospital's webpage); 2) Provide physical space for wellness activities; 3) Insert "Mindful Moments" on weekly safety huddles. Plan-Develop-Study-Act (PDSA) Cycles were created for each idea.

A total of twenty-six weekly emails were distributed (process measure). As a result, all nurses working in the Intensive Care Unit received at least one wellness resource per week during the duration of this QI effort (process measure). Moreover, after running the first two PDSA cycles, the scope of this project expanded to include members of the respiratory therapy and mental health teams.

Two of the three initially identified change ideas did not reach final stages of PDSA cycles. Perceived barriers associated with this were related to space, environment, and preferences.

Conclusions: Wellness initiatives that consist of sharing one wellness resource per week, are feasible and sustainable. Other initiatives such as providing physical spaces for wellness and inserting mindfulness exercises as part of weekly safety huddles, may require more effort and pose significant challenges. Preliminary results seem to support the fact that simple, yet effective efforts such as this one, may positively impact the perceived wellbeing of critical care staff members. More data and reports are required to further evaluate impact/trends.

91 - The Montreal Acute Classification of Spinal Cord Injury (MAC-SCI): a new tool to detect and characterize spinal cord injury in the acute trauma patient.

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Background: Spinal cord injury (SCI) is most often secondary to trauma. There is no standard neurological assessment for trauma patients to characterize SCI during the initial evaluation. The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) is the most comprehensive tool for assessing SCI, but it is not adapted to acute trauma patients. The objective is to develop a tool that can be used in the initial evaluation of trauma patients to characterize SCI.

Methods: Using a modified Delphi technique, we designed the Montreal Acute Classification of Spinal Cord Injuries (MAC-SCI). The ability of the MAC-SCI to detect and characterize SCI was validated in a cohort of 35 individuals who have sustained an acute traumatic SCI. The severity grade and neurological level of injury (NLI) were assessed by two independent assessors using the MAC-SCI, and compared to those obtained with the ISNCSCI.

Results: The MAC-SCI includes 53 of the 134 original elements of the ISNCSCI. The severity grade of the SCI was identified correctly in 100% of the cases showing perfect agreement between the MAC-SCI and the ISNCSCI. Accurate identification of the NLI within two levels of that obtained from the ISNCSCI was observed in 100% of patients. The ability of the MAC-SCI to discriminate between cervical (C0 to C7) vs. thoracic (T1 to T9) vs. thoraco-lumbar (T10 to L2) vs. lumbosacral (L3 to S5) injuries was 100% with respect to the ISNCSCI.

Conclusions: The MAC-SCI is a simple tool proposed to detect and characterize acute SCI in polytrauma patients, that is specifically adapted to the acute trauma setting. It is accurate for determining the severity grade and localize the NLI. It could be implemented in the initial trauma assessment protocol to guide the acute management of SCI patients.

92 - The impact of the COVID-19 pandemic on pattern of trauma presenting to a tertiary care trauma center in Oman.

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Background: We noticed a change in the pattern of presentation of trauma cases at SQUH, before the pandemic and during the two waves. Our study aimed at studying this observation.

Methods: This retrospective study was from March 2019 to July 2021. Data of all trauma patients was collected from the hospital information system after ethics committee approval. The pattern of trauma was divided into pediatric, adult, and geriatric age groups. Location of trauma was described as outdoor, home and roads along with the details of mechanism of trauma was collected. Patients with incomplete data were excluded.

Results: Based on the inclusion criteria 589 records were analyzed. The mean age of presentation was 29 years. Majority were male (71%). Adults were (54.2%), pediatrics (34%) and geriatric (11.9%). There

was a gradual increase in percentage of pediatric trauma during pre-covid, covid wave 1 and covid wave 2 (29%, 32%, 51%), respectively. A significant decline in the number of geriatric trauma by almost 50% between precovid and covid phase 2. Increase in trauma at home during COVID phase 2 (65.9%) as was an increase in penetrating trauma during covid phase 2 (16.5%). ICU admissions increased during the first wave of the pandemic (10.5%).

Conclusions: Our observation that there was a change in the pattern of trauma cases before and after the COVID -19 pandemic was proved right. Observations made could lead to better safety guidelines for the pediatric / geriatric age groups and take steps to reduce penetrating trauma.

93 - The impact of out-of-hospital time on return of spontaneous circulation following resuscitative thoracotomy in traumatic cardiac arrest.

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Background: Trauma is a lead contributor to disease burden worldwide. As trauma systems advance, an increasing number of studies are evaluating factors impacting survival in traumatic cardiac arrests (TCA) that require resuscitative thoracotomies (RT). While this informs management guidelines, data has primarily focused on injury mechanism, and patient and in-hospital factors. Prehospital variables have not been extensively explored. Therefore, this study evaluates the impact of out-of-hospital time (OOHT) on return of spontaneous circulation (ROSC) in TCA.

Methods: This was a retrospective cohort study evaluating tier 1 and 2 trauma activations at two level-1 trauma centres in Toronto, Canada (January 1, 2010-December 31, 2020). Trauma patients who experienced a TCA in the prehospital setting or in the trauma bay, and who required a RT within 60 mins of hospital arrival in the emergency department or the operating room, were included. The primary and secondary outcomes were ROSC and survival to hospital discharge, respectively.

Results: A total of 176 patients met inclusion criteria. The mean age of our study population was 34 years (SD 16) and 15% were female, while 85% were male. Ninety-seven percent of RTs occurred in the emergency department setting. Thirty-two percent of patients achieved ROSC following RT, with 5% of all patients surviving to hospital discharge. The median time to RT from trauma bay arrival was 5 minutes (IQR 2-11) and the median OOHT of all patients was 26 minutes (IQR 17-34). For every additional minute of OOHT, the odds of ROSC decreased by 1.2% (OR 0.98, 95% CI 0.96, 1.02), and the odds of survival to hospital discharge decreased by 0.8% (OR 0.99, 95% CI 0.93, 1.06). A total of 40% of patients were intubated in the prehospital setting, with the odds of ROSC being 45% lower in the presence of prehospital intubation (OR 0.55, 95% CI 0.28, 1.11). Similarly, the odds of survival to hospital discharge decreased by 50% in this cohort (OR 0.49, 95% CI 0.09, 2.53).

Conclusions: In summary, increasing OOHT and prehospital intubation were both associated with lower likelihoods of ROSC and survival to hospital discharge in the trauma population. By better understanding the implications of prehospital timing and interventions, we may begin to inform prehospital management guidelines for trauma patients who meet RT indications, in order to optimize patient outcomes.

96 - Rotational thromboelastometry for analysis of coagulopathy in a swine model of severe liver injury.

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Background: Viscoelastic hemostatic assays (rotational thromboelastometry (ROTEM) and thrombelastography (TEG)) have shown faster and more accurate detection of trauma-induced coagulopathy (TIC) than conventional coagulation tests (CCTs) in both swine models and trauma patients. In addition, ROTEM could identify more TIC patients than CCTs. This study aimed to use three ROTEM tests (EXTEM, FIBTEM and INTEM) to characterize TIC in a swine model of severe liver injury.

Methods: EXTEM, FIBTEM and INTEM were conducted with a ROTEM Delta machine, using standard reagents and procedures as recommended by the manufacturer. Citrated whole blood was collected in a swine model of severe liver injury, at 0 min (baseline), immediately before the liver injury (pre-injury), and at the time of death for each animal (final). Intragroup analysis was performed using Wilcoxon test. Significance was defined as $p < 0.05$.

Results: A validated liver injury damage control model in swine was adapted from the literature with the following modifications: transection of approximately 70% of the left lateral lobe of the liver with induced hypothermia prior to the injury and a 1 g bolus of tranexamic acid infused at 2 min after the liver injury.

EXTEM, FIBTEM and INTEM performed on 9, 5 and 5 pigs were included in the analysis, respectively. Compared to baseline, both EXTEM and FIBTEM showed significant decreases in angle Alpha (AA) and maximum clot firmness (MCF) at the pre-injury time point. EXTEM showed further impairment in both coagulation and fibrinolysis as measured by coagulation time (CT), clot formation time (CFT), AA, MCF and maximum lysis (ML) at the final time point. FIBTEM showed fibrinogen deficiency as indicated by reduced MCF at the final time point, resulting in undetectable CFT and AA. INTEM did not show significant changes in the parameter values of the pre-injury and final samples compared to the baseline samples.

In comparison with FIBTEM, EXTEM detected less fibrinolysis as measured by Lysis Index 30 and ML, and showed shorter CFT, larger AA and MCF likely due to the effects of platelets on coagulation and fibrinolysis.

Conclusions: EXTEM and FIBTEM identified significant changes in coagulation and fibrinolysis in a swine model of hemorrhage and TIC. In addition, FIBTEM showed fibrinogen deficiencies in the model. There were differences in parameter values between EXTEM and FIBTEM. Continued use of ROTEM, especially EXTEM and FIBTEM, for further study of TIC in swine models employing a large sample size is recommended.

99 - Trauma education for the low- and middle- income country context: evaluation of the fifteenth West African College of Surgeons trauma management course.

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Background: Trauma is increasingly a formidable cause of mortality and morbidity. The 15th WACS/JUTH Trauma Management Course with the aim of improving trauma care among health workers within the sub-region took place between 6th and 12th December, 2020 at Jos University Teaching Hospital, Nigeria. COVID-19 prevention protocols were adhered to during the in-person training. In this study, we evaluate the course on two Kirkpatrick levels, focusing on the perceptions of course participants, and their knowledge acquisition.

Methods: A prospective evaluation was performed on consenting participants using mixed qualitative and quantitative methods. Pre- and post-course tests, structured questionnaires on Likert scale, and open-ended questions were administered, and focus group discussions were held. Knowledge gain was assessed by paired sample t-test, perceptions of the course was assessed on the Likert scale, and qualitative information from focus groups was thematically analysed.

Results: The attendance was multidisciplinary, with 107 participants, from nine institutions, and 29.0% of attendees were surgeons and surgeons-in-training. Eighty-six (80.4%) participants took both pre- and post-course tests. Participants had a statistically significant increase in score of 12.72% (95% CI, 7.96 to 17.48), $p < 0.0001$, $d = 0.573$ after the training, from an average pre-test score of (35.08 ± 12.19) to (47.80 ± 16.61) post training. Most participants strongly agreed (50.45%) or agreed (47.31%) that the quality of course delivery was good, learning materials were excellent (98.89%), and workload was manageable (96.42%). Practical sessions were seen as most useful, and participants wanted improvement of these sessions (81.92%). Qualitative themes that emerged include the need to recruit multi-disciplinary facilitators and to extend the duration of practical sessions.

Conclusions: The WACS/JUTH Trauma Management Course is promising for significant impact in the region. Participants had a positive perception of the 2020 course and attained significant improvements in knowledge. Higher Kirkpatrick levels will be assessed in the future, and replication of the course in the sub-region will make for a broader scope of impact.

100 - Outcomes of mandatory blood alcohol screening test in trauma patients: A retrospective study from a national tertiary trauma center in the Arab Middle East

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Background: Alcohol consumption is a major risk factor for several types of injuries and remains an important public health problem worldwide. We aimed to describe the pattern and outcomes of mandatory alcohol screening among trauma patients admitted to a level 1 trauma center in a country with partial ban on alcohol consumption.

Methods: A retrospective analysis of data on trauma patients with age ≥ 12 years who required admission to a level 1 trauma center and were tested for blood alcohol concentration (BAC) between 01 February 2014 and 31 December 2019. BAC level=0 was considered negatives while BAC level > 0 was

positive, and a comparative analysis was performed between the 2 groups using Student t and Chi-square tests.

Results: A total of 7,326 BAC screening tests were performed in 7,284 patients during the study period. With slight variation over the years, the compliance rate was 77% (70.4%-85.3%) and the test-positivity rate was 10% (8.6%-12.5%). There were 42 repeated admissions in the study, of these, 7 patients were BAC positives in every admission, but none of them was referred to psychiatric. Young age and non-Arabs were more likely to be screened positive and the main mechanism of injury (MOI) was road traffic related ($p < 0.05$). Assault and self-inflicted injury were significantly higher in BAC-positives patients (18% vs. 4% and 2.7% vs 1.3%, $p = 0.001$). The ISS and mortality were comparable among the study groups. BAC positive patients were significantly more likely to have pan-CT scan in the ED, intubation, and exploratory laparotomy in comparison to BAC negative patients. Among BAC positive patients, ISS was correlated only with the BAC levels in victims of assault, all-terrain vehicles, and motorcycle collision.

Conclusions: Despite the improvement in performing BAC screening tests in all trauma admissions over the years, almost one quarter of cases missed. The ISS was higher in certain MOI among positive BAC patients. Although mortality is comparable, alcohol consumption poses a burden on the resources in terms of excess imaging, intubation, and open abdominal surgery. Further studies are needed to understand the key obstacles and challenges to achieve optimum compliance for screening in trauma.

102 - Trauma in geriatric population at a level 1 trauma center in a Middle Eastern Country: A 10-Year analysis

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Background: Geriatric trauma is challenging in its prevention and management. The associated aging process and decreased physiologic reserve have a negative impact on the hospital outcomes. Nevertheless aggressive management have shown to be successful in helping those vulnerable group of injured patient to gain better quality of life. We sought to analyze the trauma among the geriatric population over 10 years in a level 1 trauma center.

Methods: The Qatar national trauma registry was queried for geriatric-related injury for the years 2010-2021. The data included epidemiologic, type of injury, clinical outcomes (including morbidity, disposition, length of stay and mortality). Patients were categorized based on the age (55-64 vs ≥ 65 ys) and gender (male vs female) and outcome (survivors vs deceased). Data were analyzed using the Student t-test and Chi square.

Results: Out of 15,000 trauma admissions, 1626 (11%) were geriatric patients (≥ 55). The rate of injury for the above 65ys was 24 per 10,000 compared to 10 per 10,000 in the younger group. 35 % of injuries were reported at home. The rate of injury showed a decreasing trend over the study years in both the age groups. Male to female ratio was 4:1. The most common mechanism (MOI) was falls followed by traffic related (MVC passengers and pedestrian hit). The most common injured regions were the chest (45%), lower limbs (31%) head (28%) and abdomen (11%). The median length of hospital stay was 6 days (range 1-182). The ISS was 13 ± 9 . The mortality was 8%. Males had more head, chest, and abdominal injuries and higher mortality (9% vs 4%). The deceased were 3 years older (62 vs 59 yrs) and had more head injury and received more MTP.

Conclusions: One out of ten trauma admissions aged more than 55 yrs with a male predominance (4:1). Falls is the main MOI and one third of injuries occurred at home. There is a significant decrease in the number of geriatric traumas over the years in our population. Head injury and bleeding are the main causes of mortality among the geriatric population.

105 - Crush injuries are a significant risk factor for developing a high grade acute kidney injury.

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Background: Acute kidney injury (AKI) can be a significant source of morbidity for adult trauma patients. While risk factors for development of AKI are well known, predictors of worsening AKI are not well understood. The aim of this study is to delineate which patients who develop a mild AKI are at risk of progression of disease.

Methods: Prospective cohort study at our Level I trauma center from September 2017 to August 2018 to determine the incidence and risk factors for AKI in adult trauma patients admitted to the surgical intensive care unit. Analysis was done comparing patients who developed Kidney Disease: Improving Global Outcomes (KDIGO) Grade 1 AKI to those whose AKI worsened. Primary outcome evaluated was progression of AKI. Secondary outcomes were mortality, hospital and ICU length of stay, and RRT.

Results: In total, 466 patients met our inclusion criteria, and 307 (66%) developed AKI. Of these, 176 (57%) patients remained at a grade 1 AKI, while 131 (43%) worsened to more severe injury. On univariate analysis patients whose AKI worsened were more often male, more tachycardic on admission, had worse extremity Abbreviated Injury Scale scores, and more often had crush injuries compared to those whose AKI did not worsen. There were no statistically significant differences in age, race, Injury Severity Scale score, or other risk factors for AKI between the two groups. Patients with worsening AKI more often required RRT (5% vs 0%, p=0.006) but no difference was noted in mortality or LOS. On multivariate analysis, crush injury was the only variable independently associated with progression of AKI (OR 6.0, CI 1.9 - 18.4, p=0.0018).

Conclusions: Patients presenting with crush injury are at high risk for worsening AKI, and treatment should aim to mitigate this progression. These strategies include diligent hydration and avoidance of other nephrotoxic agents when possible.

108 - Rib series to better identify rib fractures- a prospective cohort study

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Background: Thoracic injuries are frequent complaints in the emergency department (ED) and serious complications may arise from this type of trauma. Current clinical decision tools are primarily based on

the number of rib fractures – which are frequently missed on plain chest x-ray. We sought to evaluate the benefits of rib series on rib fracture identification over plain chest x-rays.

Methods: A prospective cohort study was conducted in four university-affiliated Canadian EDs over a 6-year period. Patients aged ≥ 16 years presenting to the ED with a minor thoracic injury were recruited and underwent both a chest x-ray and rib series. Blinded radiologists' reports were reviewed for concordance of rib fracture identification. Kappa-weighted analysis were performed.

Results: 1332 patients were included. Chest x-ray identified no rib fracture for 1246 patients (93.5%), 1 rib fracture for 36 patients (2.7%), 2 for 31 patients (2.5%) and ≥ 3 for 19 patients (1.4%). Rib series identified no rib fracture for 882 patients (66.2%), 1 rib fracture for 213 patients (15.9%), 2 for 125 patients (9.3%) and ≥ 3 for 112 patients (8.4%). Weighted-kappa (95% CI) was 0.25 (0.20-0.30) between x-ray techniques. For patients with a negative chest x-ray for rib fracture, rib series identified at least one fracture 27.3% of the time.

Conclusions: Nearly 1 patient out of 3 presented an undetected rib fracture on the routine chest x-ray when rib series were added. The agreement between chest x-ray and rib series is weak for the overall number of rib fracture.

112 - Traumatic injuries in circus.

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Background: Contemporary circus is generally perceived to be a risky activity, in part due to the illusion of “death-defying” stunts that require intensive training and mastery to perform safely. In the literature, catastrophic injuries (resulting in death and long-term disability) are classified with severe injuries, and in occupational databases circus performers are classified with other entertainers. As such, the actual risk, and the characteristics of catastrophic injuries in the unique context of circus remain unknown.

Methods: A systematic search of gray literature was used to identify incidents that occurred between 2000-2020 in which a catastrophic injury was incurred by a circus artist, student, or technician. Incidents involving suicide, natural disasters, or circus animals were excluded. Temporal trends were examined. Mortality rates were calculated for the artists and technicians in a professional circus company (/100,000 FTE) and an elite level circus school (/100,000 participants) over a 10-year period (2009-2018).

Results: 38 incidents resulting in 39 catastrophic injuries (n=21 fatal; n=18 non-fatal: n=14 spinal cord injury, n=2 serious head injury, n=2 unknown) were reported, with incidents affecting artists (n=32) and technicians (n=6). The average age was 29.5(8.4) and 26.3(6.5) for fatal and non-fatal injuries, respectively. Females accounted for 33% and 37% of fatal and non-fatal injuries, similar to the sex distribution of artists in professional companies. For artists, incidents occurred during performances (n=22, 69%) and training or rehearsals (n=10, 21%). The majority were in the aerial discipline (n=24), followed by acrobatics (n=5), equilibrium (n=1), and other (n=2) disciplines. For artists, the mechanism of injury with the exception of 1 was a fall (n=31) with intrinsic attribution for 19 (61%) and extrinsic attribution for 12 (39%) incidents (n=1, not reported). For the 6 injuries incurred by technicians, the mechanism of injury was impact (n=4) and electrocution (n=2). There was no apparent temporal trend despite industry growth. Over 10 years, there were no deaths at an elite circus school and 5 deaths at a

professional circus company (3 artists, 2 technicians) resulting in 10-year mortality rates of 0/100,000 students, 37.5/100,000FTE for artists and 25.0/100,000FTE for technicians.

Conclusions: The majority of catastrophic incidents that occurred in circus contexts were characterized as falls during professional performance. Mortality rates were within the range of occupations with a risk of fall from height. An industry-specific trauma registry would enable surveillance of catastrophic injuries in this unique context and allow focused investigation into specific inquiries, such as the differences in injury occurrence in performance vs training, or discipline-specific risks, facilitating an informed risk discourse.

113 - Crash counterparts in severe traffic cyclist injuries in B.C., Canada: patient profiles and trends.

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Background: The importance and burden of single-bicycle injuries, where there is no crash counterpart, are under-recognized and under-estimated. Recent studies show that a considerable proportion of traffic-related severe injuries among cyclists occur in crashes with no counterparts ('non-collision'), as opposed to crashes with other vehicles, cyclists, or pedestrians. The purpose of this study is to investigate patterns and trends in serious traffic injury rates among cyclists in British Columbia (B.C.) from fiscal years 2012/2013 to 2018/2019.

Methods: Cases included cyclists hospitalized for traffic injuries in B.C. from 2012/2013 to 2018/2019 fiscal years, based on the Discharge Abstract Database (DAD) and BC Trauma Registry (BCTR). Variables included admission year, age, gender, crash type (based on crash counterpart), Injury Severity Score (ISS) and outcome. Population estimates from BC Stats were implemented to calculate rates, and trends over time were determined using linear regressions.

Results: A total of 2,913 cyclists were hospitalized during the study period, of whom 74.1% were male and the mean age was 45.72±18.41 (median=48). The overall rate of hospitalization was 8.70 per 100,000 with no significant trend the 7-year study period. The most common crash type was non-collision (48.2%), followed by collision with car, pick-up truck or van (27.5%). The mean age of cyclists injured in non-collision injuries was 47.5±18.4 (median=51); significantly higher than other injured individuals (44.1±18.2, median=46; P<0.001). There were 38 in-hospital deaths, of whom 44.7% were injured in collision with car/truck/van, followed by 21.1% non-collision injuries. Based on the BCTR database, cases with ISS≥12 were 79.0% male with a mean age of 47.31±17.38 years. The collision counterpart in these severe trauma cases was car/truck/van in 40.9%, followed by non-collision in 35.7%.

Conclusions: Non-collision injuries were the most common crash type among hospitalized cyclists in B.C., Canada and the second most common crash type among injured cyclist trauma cases. Research into the contributory factors of severe bicycle crashes and increasing the awareness of the potential severity of single-bicycle crash injuries are essential to inform and support the development of interventions that optimize cyclist safety.

117 - Rapid sequence intubation success rates at a Canadian community emergency department: An EM-AWARE study

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Background: Rapid sequence intubation involves quickly sedating, paralyzing, and introducing an artificial airway in a critically ill patient who requires emergent airway management. This high-risk and complex procedure requires extensive training for the operator and careful selection of sedative and paralytic medications. We are currently unaware of procedural success rates of emergency airway intubations, medications used, and complications that occur with emergency airway intubations among Canadian community emergency departments. Existing emergency airway registries focus on large,

Methods: The first phase of our study determines the first-attempt success rate of emergency intubations at the Saint John Regional Hospital Emergency Department (SJRH-ED) and compares success rate based on use and choice of paralytic medication. All eligible patients requiring emergency intubation at the SJRH-ED from 2015-2019 were included retrospectively in the EM-AWARE registry.

Results: During the study period, 179 intubation events were recorded at our centre (mean age, 55 years; 74 [41.3%] female, 100 [55.9%] male). The overall first-attempt success rate of endotracheal intubations was 83.2% (n=149, 95% CI 77.8% to 88.7%). The first-attempt success rate was 82.4% (112 of 136, 95% CI 76.0% to 88.8%) in the rocuronium group vs 90.9% (10 of 11, 95% CI 73.9% to 107.9%) in the succinylcholine group, with no significant between-group difference (OR=0.4667, 95% CI 0.04133 to 3.057, Fisher p=0.6906).

We found no significant difference in mean age (-8.0 years, 95% CI -19.1 to 3.1, p=0.1406) or weight (-2.2 kg, 95% CI -21.4 to 17.0, p=0.808) between the rocuronium and succinylcholine groups. Sex distribution was also comparable between groups, with female 41.9% (95% CI 33.62% to 50.20%) in the rocuronium group and 36.4% (95% CI 7.94% to 64.79%) in the succinylcholine group.

Conclusions: Among patients undergoing endotracheal intubation in our emergency department, there was no significant difference in first-pass success rate using rocuronium compared with succinylcholine. Continued development of the EM-AWARE database will allow subsequent analyses to inform practice at our centre.

118 - An analysis of prehospital corridors and transfer times of trauma patients arriving at a urban level I trauma center

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Background: Quebec has made significant strides in the development of a mature trauma system since the 1990's including regionalization of care and trauma centre designation. We currently strive to fine tune the prehospital system, including expediting patient access to definitive management care. This study aims to better define injury transfer corridors and transport time in patients arriving to the Montreal General Hospital.

Methods: This work utilized the Système D'information Du Registre Des Traumatismes Du Québec from 2016 to 2019. Data initially analyzed for 2016. Univariate descriptive analyses, were conducted to identify patient demographics, physiological indicators and injury severity scores of patients enduring a trauma injury. Google Maps was used to estimate average transport time from injury site to the first medical facility arrived at. Results are presented as mean (95% confidence intervals), median [interquartile range] and proportions.

Results: During the 2016 fiscal year, there were 1540 trauma cases reported in the SIRTQ database. Of these cases 32.5% (n=500) were identified as a severely injured patient with an ISS of 15 or greater. Among these severely injured patients 72.8% were male and had a median age of 61.0 [36.0, 76.0] years. The most frequent external cause of injury in the severely injured patients, identified using ICD-10 codes, were falls (49%) followed by motor vehicle collision accidents (30%). Over half of patients (56%) were treated at another institution before arriving at the Montreal General Hospital. Of this group, 20% of patients came from the Montréal region, a route that requires taking a bridge or tunnel which has significant impacts on traffic. The mean driving time from the referring hospitals is 56:00 minutes (32:00, 81:00).

Pre-hospital vital signs of these patients were outside of the normal range with a mean systolic blood pressure of 133.7 mmHg (129.8, 137.7) and mean oxygen saturation of 95.8% (95.0, 96.5). The pre-hospital Glasgow Coma Scale (GCS) scores of the severely injured patients in our sample indicated that over half (63.0%) of the patients had near normal levels of consciousness at the scene of the trauma. However, 13.8% had a GCS score between 3-8, and 7.6% had a score between 9-12 indicating more severe states of unconsciousness.

Conclusions: There are a significant number of severely injured trauma patients who depend on the Montreal General Hospital for definitive care. Further details regarding actual transfer times are being analyzed. Methods to improve transfer times to definitive care are necessary to improve patient outcomes.

122 - Is it better to watch or listen? A randomized trial of video modelling versus telementoring for prehospital life-saving interventions performed by search and rescue medics.

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Background: Impacting survival from catastrophic trauma in both the military and civilian environments will require life-saving interventions (LSIs) to be delivered in the prehospital phase of care where provider skills and experience are limited. Informatic technologies may provide a force-enabler capability in potentially allowing less experienced providers to perform LSIs. Two candidate technologies are remote telementoring(RTM) or video modelling(VM). We compared Search and Rescue (SAR) Techs performance of LSIs when randomized to either RTM, VM or neither.

Methods: SAR Techs were asked to perform three tasks: iTClamp, CAT and SAM tourniquet application For CAT Tourniquet application they were randomized to one of three groups i) Video-Modelling (VM) ii) Telementoring (TM) iii) control. For the SAM and iTClamp application they were randomly allocated to one of two groups i) TM or II) VM.

Results: 24 SAR Techs participated. There were 8 SAR Techs in each of the three CAT tourniquet groups. Comparing mentored to control there was no significant difference in time to stop bleeding($p=0.798$), total trial time($p=0.328$) or blood loss($p=0.878$). However, the mentored group was able to obtain significantly more tourniquet pressure than control($p=0.005$). The Control group was significantly faster than Video modelling in controlling the bleed ($p=0.000$) and total trial time($p=0.000$), although tourniquet pressure($p=0.279$) and blood loss($p=0.721$) were not different. There was no control group for SAM tourniquet application (12 VM; 12 RTM). The mentored group was significantly faster($p=0.000$) in both the time to stop bleeding and total trial time. However, there was no difference in tourniquet pressure($p=0.198$) or blood loss($p=0.799$). In those mentored, time to stop bleeding was significantly faster with the CAT($p=0.010$) than the SAM, with a significantly higher tourniquet pressure($p=0.001$). Twelve RTM and 12 VM applied the iTClamp. Tele-mentoring was significantly faster ($p=0.000$) than video modelling.

Conclusions: In this study setting, there were apparent objective and subjective benefits between real-time tele-mentoring versus video modelling. Thus, both techniques may have merits and further controlled studies should continue.

126 - Outcomes of isolated blunt subclavian vein injuries: necessity for intervention.

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Background: Isolated subclavian vein injuries are rare. Subclavian vein injuries cause mortality due to excessive blood loss and embolism. This study aims to evaluate the differences in outcomes between various time to procedures for blunt subclavian vein injuries.

Methods: The National Trauma Databank (NTDB) was queried between 2017-2019. Patients (age ³18 years) who had a subclavian vein injury after blunt trauma were selected and grouped by patients who underwent a procedure and who did not. The timing of these procedures was also studied. The primary outcome measure was 30-day mortality. Secondary outcomes were hospital length of stay (HLOS) and complications.

Results: Total of 154 blunt trauma patients were included. Mean age was 44 ± 20 years. 68 % were male and predominantly White (72%). 11% of blunt subclavian vein injuries were work related. For motor vehicle collisions 15.6% had shoulder belts use. Comorbidities included HTN and smoking (21.4% and 22.1% respectively). Median GCS and mean ISS were 14 (3, 15) and 27 ± 13.7 respectively.

Mean lowest blood pressure was 80 ± 30.7 . For hemorrhage control, thoracotomy and laparotomy were performed in 5.8% (9) and 7.8% (12) patients respectively. Median time for hemorrhage control surgery was 90 (36,263) minutes. Angiogram was performed in 5.8%, angiogram with embolization was performed in 3.2%. The majority of patients (86.4%) did not require a procedure, while 21 (13.6%) patients did have a procedure. Out of these patients, 67% (14) had procedures performed within 6 hours after arrival, while 33% (7) underwent procedure between 6 to 12 hours. For these patients mean hospital length of stay (HLOS) and ICU LOS were 12 ± 18 and 9 ± 11 days.

Mortality for patients who did not undergo procedure was 16.8%, however mortality for patients who underwent a procedure was 23.2%. Univariate analysis comparing procedure and no procedure groups revealed differences ($p < 0.05$) in helmet use (33.3% vs. 10.5%, $p = 0.005$) and DVT (14.3 % vs. 3.0%, $p = 0.021$).

Conclusions: Patients with subclavian vein injury without subclavian artery injury have high ISS and mortality. Subclavian vein injury is a surrogate marker for significant injury burden. While the majority of these patients did not require intervention, mortality was significant in this population.

133 - Quantitative electrophysiological assessments as predictive markers of lower limb motor recovery after spinal cord injury: A pilot study with an adaptive trial design.

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Background: Recovery in patients with traumatic spinal cord injury (SCI) varies greatly, and more objective anatomical and physiological assessments of the injured pathways are needed. Measures of plasticity occurring within various spinal tracts have been shown to correlate with motor abilities in chronic SCI participants (>1 year post-SCI). Our study seeks to determine the feasibility of taking such measures in the acute phase after injury and their predictive ability of motor recovery in the chronic stage.

Methods: Five SCI participants and eight controls were recruited. The lower extremity motor score (LEMS), electrical perceptual threshold (EPT) at S2 dermatome, soleus H-reflex, and motor evoked potentials (MEPs) in the tibialis anterior were assessed during intensive functional rehabilitation (IFR) and in the chronic stage. Admission MRI was used to calculate maximal spinal cord compression (MSCC). Control participants were assessed once. The relationship between electrophysiological data collected in IFR and LEMS at chronic stages were studied.

Results: No adverse events occurred, and data could be collected during IFR. EPT measured at IFR correlated with LEMS in the chronic stage ($r = -0.67$), whereas SOL H/M ratio, H latency, MEP latency and amplitude, as well as MSCC did not.

Conclusions: Electrophysiological assessments can be performed in an IFR setting with proper adjustments. Combining MRI and electrophysiological measures may lead to better assessment of recovery potential early after SCI.

135 - Fevers, pathogens, and antibiotics in severely injured trauma patients with hospital acquired infections

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Background: A new fever in a surgical intensive care unit (SICU) trauma patient may prompt a diagnostic evaluation. The specific aims of this study were to identify pathogens, antibiotics, variables associated with positive culture results, and outcomes in febrile trauma SICU patients.

Methods: This was a retrospective study (2014-2019) of trauma patients admitted to our SICU. Patients were included if they had a fever of ≥ 101.5 F, cultures sent (blood, sputum, or urine), and started on empiric antibiotics. Data collected included demographics, admission physiology, and injury pattern/severity. The primary outcomes were culture results and antibiotic management, while secondary outcomes included mortality, length of stay in the hospital and SICU, and days on the ventilator.

Results: Of the 262 patients who met inclusion criteria, 181 (69%) had a positive culture. The most common organism was *Staph aureus* (47%), followed by *Klebsiella* (18%), *Pseudomonas* (18%), and *Enterobacter* (16%). Patients with a positive culture more often had antibiotics narrowed (69% vs. 24%, $p < 0.0001$) and had a longer course of antibiotics (13 days vs. 7 days, $p < 0.0001$). While there was no difference in age, gender, race, mechanism, or admission vital signs, patients with a positive culture result were more severely injured (ISS: 29 vs. 25, $p = 0.02$) and more often had a severe (GCS

Conclusions: Two-thirds of febrile trauma patients in the ICU who undergo diagnostic evaluation for hospital acquired infection have positive culture results. Patients with severe TBI are twice as likely to have a positive culture. The most common organism is *Staph aureus* followed by a variety of gram negatives. We found opportunities for improvement in narrowing antibiotics and stopping antibiotics in culture negative patients. There should be continued focus on preventing hospital acquired infections.

136 - The management of thoracoabdominal gunshot wounds in trauma patients: a single center retrospective study.

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Background: Gunshot wounds (GSW) are life threatening injuries that account for an increasing number of annual deaths in Canada. According to Statistics Canada, from 2009 to 2019 criminal use of firearms rose by 81% in Canada. The aim of this study is to characterize the evolving epidemiological trends in GSWs over this period and to characterize the contemporary clinical management of thoracoabdominal gunshot wounds in order to identify factors leading to successful management of these injuries.

Methods: All patients above the age of 17 presenting to the Montreal General Hospital (MGH) with gunshot wounds between April 2009 to March 2019 were identified from a prospectively maintained

institutional trauma database. Data pertaining to patient demographics, trauma bay presentation, preoperative findings, intraoperative procedures and outcome, postoperative course and readmission variables were collected and analyzed.

Results: We identified 211 patients presenting with GSWs at our centre. Overall, there was a decrease in cases from April 2010 to March 2015 and an increase from April 2015 to March 2019. The patient population was 95% male with a median age of 28. While the majority(64%) of injuries occurred on the island of Montreal, 36% of patients were transferred from remote regions with 33% of those patients being transferred from far northern communities via fixed wing air transport. Patients presented with a median Injury Severity Score of 14. Self-inflicted injuries were reported in at least 16% of patients. The most commonly injured regions were the chest(34%), abdomen(34%) and lower limbs(32%). Associated injuries, such as pneumothorax(23%), hemothorax(19%), hemopericardium(5%) or traumatic brain injury(12%) were prevalent. Overall, 73% of patients underwent surgery. Common injuries identified intraoperatively included hollow viscus(76%), vascular(16%), diaphragmatic(12%) or liver injury(12%). Among patients with thoracoabdominal gunshot wounds (n=108), 8.3% were declared dead in the trauma bay and 47% had an immediate operation, the most common being an exploratory laparotomy. Half of the patients required ICU admission, with an average length of stay of 3 days. The average total length of hospital stay was 9 days. Overall mortality was 14%, with 52% of deaths in trauma bay, 31% in the ICU and 17% intraoperatively. The most common cause of intraoperative death was hemorrhage.

Conclusions: Young, male patients from northern communities are over-represented in the population affected by GSWs. Patients with thoracoabdominal GSWs require a high index of suspicion for pneumothorax, hemothorax, hollow viscus and vascular injuries. The majority of GSW related mortalities occurred during initial resuscitation in the trauma bay, suggesting the extreme importance of expedited transfer of GSW patients to a trauma center. Intraoperatively, hemorrhage secondary to vascular injury was the most common cause of death.

140 - Coexisting abdominal pathology limits reconstruction options, increases reoperation rates, and increases the need for TPN in duodenal trauma.

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Background: The management of traumatic duodenal injuries is complex and controversial. Much is published upon the use of surgical techniques, including pyloric exclusion, pancreaticoduodenectomy, and mechanism of internal and external drainage. Despite many small- to medium-sized studies, the optimal management of duodenal injuries remains elusive.

Methods: We performed a 5-year retrospective review of patients with a duodenal injury at a level-one trauma center. Injuries were graded based on clinical and radiographic data. The presence and organ of coexisting abdominal injuries, index and definitive surgical interventions, presence and grade of duodenal leak, and the need for and days of tube feeds (TF) and total parenteral nutrition (TPN) were recorded. SPSS was used to calculate the Chi-Squared, Fisher's Exact, and Mantel-Haenszel Tests.

Results: 37 patients were identified, 34 of which survived to operative or radiographic identification and grading of injury, and 27 were victims of penetrating trauma. Coexisting abdominal pathology was common, including gastric (30%), jejunoileal (27%), colorectal (32%), hepatic (70%), cholecystic (19%), pancreatic (30%), renal (30%), splenic (5%), aortocaval (27%), and mesenteric vascular (16%) injuries.

Surgical resection/protective maneuvers included gastroduodenectomy (81%), duodenal closure (81%), and pyloric exclusions (16%). Reconstruction options after duodenectomy included duodenojejunostomy (8%), Billroth Two (22%), and Roux-en-Y reconstruction (3%). There were no pancreaticoduodenectomies performed.

Of penetrating trauma survivors, few factors were statistically associated with outcomes. Coexisting pancreatic (OR 8.9, 95% CI 1.3-59) and jejunoileal (OR 6.3, 95% CI 1.0-38) injuries were associated with the need for reoperation due to duodenal leak. Jejunoileal injuries were associated with the need for TPN (OR 7.0, 95% CI 1.1-45).

Conclusions: Management of duodenal trauma remains difficult to standardize due to the rarity of the injury and the unique combination of coexisting injuries. Concomitant injuries are common, predominantly the surrounding liver and hollow viscera. Injury to the pancreas and small bowel appear most relevant, limiting reconstruction options and forcing the use of TPN as a replacement for oral or enteral nutrition.

141 - Incidence of incisional hernia following trauma laparotomy at a Canadian Trauma and Acute Care Surgery Center: Could we do better?

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Background: The incidence of incisional hernia (IH) after trauma laparotomy remains high and probably underestimated. IH is a costly complication for the healthcare system and has a significant impact on patient's lives. This study aims to quantify the rate of IH post trauma laparotomy as well as to determine the factors most predictive of IH.

Methods: We reviewed all trauma laparotomies between January 1st 2000 and December 31st 2019 by the trauma service of a Level 1 trauma center. Four-hundred and ten patients were identified. We performed a sample analysis of those patients to estimate the incidence of IH and the feasibility of this study. The diagnosis of IH was confirmed by physical examination and/or imagery.

Results: Among the total cohort, 46 patients with a trauma laparotomy were reviewed. Fifteen (32.6%) had a penetrating injury. Three patients (7%) were excluded because of in-hospital death. The total incidence of IH was 19% (n=8). Six patients had their fascia close with continuous and 2 with interrupted sutures. Fifty percent (n=4) were male. Two patients with IH had a past medical history of previous laparotomy before the trauma and two presented with also a traumatic hernia. Among the patients who developed an IH, 5 (62.5%) had a bowel injury at the initial laparotomy, 2 (25%) necessitated an open abdomen, and 3 (37.5%) had a re-intervention during the same hospitalization. All patients in our cohort underwent a hernia repair. Median time for hernia occurrence was 16.3 months [3.7-110.7].

Conclusions: These results reported a higher rate of IH post trauma laparotomy compared to elective cases. Our ongoing study will analyze the type of closure and risk factors associated with the development of IH after a trauma laparotomy. A sample size of 787 patients was calculated to give us 80% power to detect an incidence of 9% of IH.

142 - The old and very old geriatric patients with moderate traumatic brain injury present an increased mortality.

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Background: Trauma brain injuries (TBI) may cause long-term consequences and are still a major cause of mortality. But outcome in patients sustaining specifically moderate TBI (mTBI) have been poorly investigated. Literature has also globally reported increasing incidence of TBI because of the ageing population. Older trauma adults are potentially associated with higher mortality compared to their younger counterparts. The objective was to assess and compare mortality between younger (16-64 years) and older (≥ 65 years) adults.

Methods: We conducted a retrospective cohort study (2003-2017) on patients ≥ 16 years with a moderate TBI (Glasgow Coma Scale, GCS 9-12) admitted to any level I Trauma Centers of the Quebec Trauma Registry database. We created two categories based on extracranial concomitant injury severity (Abbreviated Injury Scale-AIS ≥ 3 vs AIS ≤ 2) and stratified the sub-population in four age groups (<65, 65-74, 75-84, 85 and more). We calculated distribution for mortality and ISS within age group.

Results: A total of 1,247 patients were included. Among those 27.8% (n=347) sustained a severe concomitant (AIS ≥ 3) extracranial injury. In this group, 72.6% were male, median age [IQR] was 50 [28-63], 29.9% had a GCS of 12, 61.3% had a GCS motor response of 5 points and overall mortality was 13.5%. Mortality by age group was respectively, 7.4% in < 65yo, 26.9% in 65-74, 33.3% in 75-84 and 60% in the very old 85+. In patients with a minor concomitant extracranial injury (n=900), 71% were male, median [IQR] age was 59 [41-76] years, 28% had a GCS of 9, and 67.5 % had a GCS motor response of 5 points and overall mortality was 19.9%. Mortality by age group was respectively, 7.0% in < 65yo, 29.5% in 65-74, 36.2% in 75-84 and 51.6% in the very old 85+. The mean Injury Severity Score was similar between age groups of the 2 categories of concomitant injury severity (32.2 to 33.6 and 19.7 to 21.2, respectively).

Conclusions: We showed that despite similar global Injury Severity Score, mortality was heterogeneous among age groups. Older and very old patients sustaining a moderate TBI had higher mortality than their younger counterparts. Further studies are needed to understand this finding and assess factors associated with mortality in moderate TBI patients.

145 - Category two trauma team activation and severity comparison of mechanism injuries involved.

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Background: The category two Trauma Team Activation (TTA) may include a partial trauma team response. It is typically defined by the combination of stable vital signs, select mechanisms of injury, special populations, and emergency medical services (EMS) judgment. We attempted to clarify which mechanisms of injury are more sensitive for significant injury within category two TTA.

Methods: We performed a retrospective study using the National Trauma Data Bank (NTDB) from 2017-2019. Injury severity due to different mechanisms of injury leading to category two TTA were compared. Primary outcomes included Injury Severity Score (ISS) and mortality. Secondary outcomes included length of stay (LOS) and Intensive Care Unit (ICU) LOS. Minors, category one TTA, pregnancy, burns, and unknown mechanism were excluded. Multivariate logistic regression was used to associate injury mechanism with the selected outcomes.

Results: 7,252 activations were identified. 58.2% were male, and median age was 59 years (IQR 36, 77). The most common cause of activation was anticoagulant use (25.6%) followed by automobile vs pedestrian/bicyclist thrown, run over, or car crash >20 mph (15%). Median ISS was 9 (IQR 9, 14). Median LOS was 6 days (IQR 4, 9), and ICU LOS was 4 days (IQR 2, 6). Mortality was 2%. Patients on anticoagulants (78 years, ISS 9) and elderly patients with systolic blood pressure <110mmHg (77 years, ISS 10) were the oldest, but least injured. Patients ejected from an automobile (39 years, ISS 16) and with a death in the same passenger compartment (37 years, ISS 16) were the youngest, but most injured. In adjusted analysis, mortality was significantly associated with age >65 years (OR 3.7; 95%CI 2.2 – 6.1), COPD (OR 2.1; 1.3 – 3.3), diabetes (OR 1.7; 1.2 – 2.5), higher ISS (OR 1.12; 1.10 – 1.14), elderly patients with SBP <110mmHg (OR 2.8; 1.2 – 6.7), and anticoagulant use (OR 3.8; 1.7 – 8.5). Risk factors for major trauma (ISS>15) include vehicle intrusion (OR 1.9; 1.4 – 2.5), crash ejection from automobile (OR 1.9; 1.5 – 2.5), crash death in same passenger compartment (OR 2.0; 1.4 – 3.0), elderly patients with SBP <110mmHg (OR 0.3; 0.2 – 0.5), and anticoagulant use (OR 0.2; 0.1 - 0.2).

Conclusions: Category two TTA criteria appear to identify two distinct populations warranting admission to a trauma center. The first population is an older, anticoagulated, more comorbid, but less injured population at risk for mortality. The second population appears to be younger, more injured patients with risk factors suggesting high energy motor vehicles. Current category two TTA criterion appear well-defined to identify these distinct at-risk populations.

ORAL

3 - A scoping review of nontechnical skill assessment tools to evaluate trauma team performance.

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Background: Most preventable adverse errors in trauma occur during the initial phase of trauma resuscitation. Standardized tools and behaviour are highly effective in improving teamwork and reducing risks of adverse events. This has created interest in the “human factors” of team performance and a need to evaluate nontechnical skills. This scoping review aimed to identify assessment tools of trauma team nontechnical skills and assess the validity and reliability of each tool in assessing trauma team performance.

Methods: We searched Embase, Cochrane Library, Web of Science, Ovid Medline, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) from inception to June 1st, 2021. English studies conducted in a simulation or authentic setting that used a nontechnical skill assessment tool to assess trauma teams were included. Studies were assessed by two independent reviewers for

inclusion/exclusion criteria. Team assessment tool data was extracted and synthesized into behaviour domains, then assessed for validity and reliability.

Results: The literature search returned 4215 articles with 29 meeting inclusion criteria. Our search identified 12 trauma team performance assessment tools. Most studies were conducted in the United States (n=20, 69%). 20 studies (69%) assessed trauma team performance in a simulation setting; Team Assessment Measure (TEAM) and Trauma-Nontechnical Skills Scale (T-NOTECHS) were the only tools to be applied in a simulation and authentic setting. Most studies assessed trauma team performance using video review technology (n=17, 59%). Five overarching themes were designed and verified by an expert in trauma team assessment to encompass behavioural domains captured across the 12 tools: 1) Leadership; 2) Communication; 3) Teamwork; 4) Assessment; 5) Situation Awareness. 100% of the tools assessed communication, followed by 83% assessing teamwork, 75% assessing leadership, and 50% assessing situation awareness, and assessment, respectively. T-NOTECHS, TEAM, and a tool used by Holcomb et al. (2002) were the only measures to encompass all five themes. The reliability and validity of T-NOTECHS was investigated by the greatest number of studies (n=13); however, included studies did not analyze or comment on test-retest reliability and internal reliability. The TEAM tool (n=2) had the most robust evidence of reliability and validity with measurement of test-retest reliability, internal consistency, inter-rater reliability, content validity, and cross-sectional construct validity.

Conclusions: We identified 12 trauma team performance tools which assessed nontechnical skills to varying degrees. Ultimately, tool selection will vary dependent on context; however, T-NOTECHS and TEAM tools had the most evidence to support their reliability and validity in both a simulation and authentic setting. Considering the limited research in the impact of trauma team performance on patient outcomes, future studies could utilize video review technology in authentic trauma cases to further study this important relationship.

4 - Accuracy of the Quebec pre-hospital triage scale (EQTPT) in predicting the need for trauma team activation: a retrospective administrative data study.

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Background: In Quebec, pre-hospital trauma care is provided by ground ambulances staffed with primary care paramedics. Traumas occurring within 60-minute transport time bypass community hospitals and are transported to a Level-1 trauma centre. At the Montreal General Hospital, trauma team activation is at the emergency department physician's discretion OR is based on the patient's condition on arrival. This study aims to understand if, for those patients meeting pre-hospital major trauma criteria, would automatic TTA results in over-activation of the trauma team.

Methods: Primary ambulance transports from 2018/05/15-2020/12/31, in the Monteregie region towards the Montreal General Hospital, were screened to identify patients who met pre-hospital trauma triage (EQTPT) criteria to bypass community hospitals. A retrospective chart review was performed examining the pre-hospital transport times, level of pre-hospital triage, trauma team involvement, ISS scores and final disposition. Patients were evaluated for over and under-triage based on current practice and if automatic TTA would result in over-triage of the trauma team.

Results: There were 371 patients meeting inclusion criteria. The population was predominantly male (70.1%). While all patients met field triage for major trauma, 123/371 (33.3%) did not meet trauma

team activation criteria presently in use at the Montreal General Hospital if the emergency physician's discretion is removed from trauma team activation criteria. Of the charts reviewed, 282 (75.5%) were found to have had trauma team involvement during their stay in the ED, while 214 (57.7%) had a trauma team activation. While 106/371 (28.5%) of the patients were discharged home from the ED, 80/371 (21.6%) were admitted to the Intensive Care Unit, 80/371 (21.6%) went directly from the ED to the operating room, and 8/371 (2.2%) died in the ED. Of the patients reviewed, 49/371 (13.2%) were found to have an ISS \geq 12 (of which 20/371 (5.5%) had an ISS \geq 25) and did not have a TTA (under-triaged).

Patients were considered over-triaged if they had a full TTA; however, they were found to have an ISS $<$ 12 and discharged from the ED. Under the current practice, over-triage of the trauma team occurred in 8.4% of the cases. By automatically activating all patients meeting field triage for major trauma, over-triage increases to 94/371 (25.3%) and under-triage is eliminated. Using the Wilcoxon signed ranks test, the increase in over-triage from 8.4% to 25.3% is statistically significant ($p < 0.001$), as is the decrease in under-triage from 13.2% to 0% ($p < 0.001$).

Conclusions: Based on field triage criteria, trauma team activation eliminates the under-triage of the trauma team and keeps over-triage rates below acceptable rates of 35%. With the current practice, under-triage rates of 13.2% are above the acceptable rate of $<$ 5%. While over-triage rates would increase with the automatic activation of those meeting field triage criteria, eliminating under-triage would ensure that all those requiring care from the trauma team receive it.

5 - Timing of trauma team involvement and the impact on length of stay and time to definitive care in the emergency department: a retrospective administrative data and chart review.

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Background: For patients sustaining major trauma, decreasing time to definitive care remains a primary goal. For these patients, hemorrhage and brain injury are common, and death occurs within hours without treatment. Specialized trauma team involvement is essential for coordinating emergency department care for complex major trauma patients. However, debate remains as to the ideal timing of trauma team involvement. We evaluated if trauma team involvement's timing impacts patient care in a level 1 trauma center in Montreal, Quebec.

Methods: A single-centre retrospective chart review was performed of patients meeting Quebec pre-hospital triage criteria for major trauma from May 15, 2018-December 31, 2020. Times from arrival until departure from the resuscitation room, CT scan, disposition, and length of stay assessed. Patients were classified as to whether the Trauma Team Activation (TTA) was with pre-hospital notification, on arrival to ED, a trauma consult only, or no trauma team involvement. Mean times and standard deviations were calculated between groups and analyzed using non-parametric tests.

Results: We identified 371 patients meeting our inclusion criteria; 33 had missing data points and were excluded from the individual analysis. Patients were primarily male (70%), mean age of 46 years. Primary mechanisms of injury were motor vehicle crashes (50%), falls (25%) and penetrating trauma (11%). Within the population, 241 (70%) patients met EQTPT level 1 criteria, 114 (31%) met level 2 criteria and 16 (4%) met level 3 criteria pre-hospital triage criteria. The Kruskal-Wallis test showed no differences between groups in mean time spent in the resuscitation room based on the timing of trauma team involvement (0:45-0:51 minutes, $p 0.422$). When the trauma team was activated with pre-hospital

notification, time from arrival to CT scan was shorter (1:02-1:21 minutes, $p=0.010$) along with mean time from arrival to disposition (6:37-13:41 minutes, $p<0.001$) and total length of stay (9:22-23:16 minutes, $p<0.001$).

Of the 241 patients who met level 1 field triage criteria (GCS <14 or SBP < 90 , or RR <10 or RR > 29 or requiring ventilation), when using the Independent Sample Mann-Whitney U test, those who had had a TTA with pre-hospital notification or TTA after arrival, there was a statistically significant decrease in time mean time spent in the resuscitation room (0:49-0:44 minutes, $p=0.039$ and time to CT scan (1:11-1:00 $p=0.005$) when the trauma team was activated pre-hospital notification. There were no significant differences for time to disposition (5:07-6:29 $p=0.912$) and total length of stay (7:23-8:35 $p=0.654$).

Conclusions: When trauma team care is required, early involvement of the team through trauma team activation significantly decreases time to CT scan, time spent in the emergency department without a disposition and overall emergency department length of stay. This research suggests that when minutes count, trauma team activation upon receiving the pre-hospital notification from paramedics should be considered the standard of care for all major trauma patients meeting trauma team activation criteria.

6 - Impact of media alert on tobogganing-related injuries

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Background: A media alert went out on January 7th, 2021, reporting on an unprecedented increase in tobogganing-related injuries in Montreal, prompting the mayor to declare on January 11th that she would implement measures to make hills in parks safer. We set out to document the measures implemented by municipalities on the Island of Montreal and determine if these had an impact on tobogganing-related injuries.

Methods: We used retrospective data to calculate the percent change in tobogganing-related injuries before/after January 11th and for winters 1990-1991 to 2020-2021 and used weather reports to document snow conditions for each winter. To assess the city's involvement, we sent surveys to municipalities asking them to document measures they put in place to make hills safer

Results: The 2020-2021 winter season saw the greatest decrease (18.3%) for all tobogganing-related injuries after January 11th compared to past winters with similar snow conditions (which saw an average increase of 143.1%) as well as those that occurred in parks: 23.1% decrease in 2020-2021 compared to an average 87.5% increase for past winters. As to mechanisms, there was 50% decrease in injuries caused by colliding with a solid object (tree, bench, table, rock, fence, pole, or concrete block) 2021 compared with previous years. Of the 10 municipalities who responded to our survey, 5 reported having improved the safety of their tobogganing hills following the media alert.

Conclusions: The January 7th, 2021, media alert on the rise in tobogganing-related injuries in Montreal encouraged municipalities to implement measures to make hills in parks safer. This led to the highest diminution of tobogganing-related injury ED visits at Montreal Children's Hospital Trauma Centre over the past thirty years, strongly suggesting that timely monitoring of emerging trends, then reporting in a real time manner, can lead to legislative bodies to act rapidly.

7 - Low value practices in trauma care: an evidence-based expert consensus study

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Background: The use of quality indicators has been shown to improve injury care processes and outcomes. However, trauma quality indicators proposed to date exclusively target the underuse of recommended practices. We aimed to develop a set of evidence and patient-informed, consensus-based quality indicators targeting reductions in low-value clinical practices in acute, in-hospital trauma care.

Methods: We conducted a two-round RAND/UCLA consensus study comprising an online survey and a virtual workshop led by two independent moderators. Two panels of international experts (Canada, Australia, the USA and the UK) and local stakeholders (Québec, Canada), representing key clinical expertise involved in trauma care and including 3 patient-partners. Panelists were asked to rate 50 practices on a 7-point Likert scale according to four quality indicator criteria: importance, supporting evidence, actionability and measurability.

Results: Of 49 eligible experts approached, 46 completed at least one round (94%) and 36 (73%) completed both rounds. Eleven quality indicators were selected overall, two more were selected by the international panel and a further three by the local stakeholder panel. Selected indicators cover low-value initial diagnostic imaging (head, cervical spine, ankle, and pelvis), repeat diagnostic imaging (post-transfer computed tomography [CT] and repeat head CT), 3) consultation (neurosurgical and spine), 4) surgery (penetrating neck injury), 5) blood product administration, 6) medication (antibiotic prophylaxis and late seizure prophylaxis), 7) trauma service admission (blunt abdominal trauma), 8) intensive care unit admission (mild complicated traumatic brain injury), and 9) routine blood work (minor orthopaedic surgery).

Conclusions: We have developed a set of consensus-based quality indicators informed by the best available evidence and patient priorities, targeting low-value trauma care. Selected indicators represent a trauma-specific list of practices whose use should be questioned. Trauma quality programs in high-income countries can use our results as a basis to select context-specific quality indicators to measure and reduce low-value care.

8 - Pre and post transfer computed tomography imaging in Canadian trauma centers: a multi-center retrospective cohort study.

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Background: Multiple clinical practice guidelines recommend minimizing radiation in trauma patients but there is a knowledge gap on the importance of this problem for trauma transfers. We aimed to estimate the incidence of pre- and repeat post-transfer computer tomography (CT) overall and in patients with an indication for immediate transfer, to assess inter-hospital practice variation, to identify predictors, and to quantify the influence of pre-transfer CT on time to transfer.

Methods: We conducted a multi-center cohort study on patients transferred to major trauma centers from 2013 to 2019. Multi-level generalized linear regression was used to generate intra-class correlation coefficients (ICCs) to assess inter-hospital variation; multi-level logistic regression to generate Odds Ratios (ORs) for each predictor; and geometric mean ratios (GMRs) to quantify the influence of CT on time to transfer.

Results: Of 18244 patients included, 8501 (47%) had a pre-transfer CT and this proportion varied from 55% for traumatic brain injury to 74% for spinal cord injury. One-quarter (26%) of the patients had a repeat post-transfer CT and this varied from 19% for spinal cord injury to 40% for traumatic brain injury. Inter-hospital variation was moderate for pre-transfer CT (5%-66%; ICC=12.5%) and for repeat post-transfer CT (7%-44%; ICC=14.7%). Pre-transfer imaging was more frequent in elders and in males and repeat post-transfer imaging decreased over the study period but was more frequent in patients transferred in from level III/IV centers than non-designated hospitals. Time to transfer were doubled in patients who had a pre-transfer CT.

Conclusions: Results suggest that pre-transfer CT and repeat post-transfer CT are frequent and are subject to significant practice variation. In addition, pre-transfer CT is associated with increased times to transfer though additional studies are needed to demonstrate causation. These results highlight potential opportunities to reduce low-value imaging for trauma transfers.

11 - Vascular contrast extravasation is associated with biliary complications and need for endoscopic retrograde cholangiopancreatography in hepatic trauma

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Background: The need for surgical or endovascular hemostasis in hepatic trauma is associated with hemodynamic stability, associated injuries, mechanism of trauma, and injury grade. The management of biliary complications via surgical drains, percutaneous drains, endoscopic retrograde cholangiopancreatography (ERCP), ampullary sphincterotomy, and biliary stenting has traditionally been indicated by the patient's clinical course. We investigated other factors to seek predictive factors of surgical, percutaneous, and endoscopic biliary procedures.

Methods: We performed a five-year retrospective review of our level one trauma center. Data regarding injury grade, injury location (by hepatic region and Couinaud segment), the presence or absence of radiographic contrast blush, and patient demographics were collected. Chi-squared, Fisher's exact test, Mantel-Haenszel common odds ratio, binomial logistic regression, and receiver operating characteristic (ROC) analysis was performed to assess features predicting biliary complications, surgical drain placement, percutaneous placement, ERCP, sphincterotomy, and stenting.

Results: Injury grade and number of Couinaud segments injured were not associated with the need for surgical drains, percutaneous drains, or endoscopic biliary drainage procedures. Injury location by

Couinaud segment and anatomic region were associated with need for surgical and endovascular hemostasis, but in general not associated with biliary complications or interventions. All ERCP, sphincterotomies, and stents were in central injuries (injuries involving Couinaud segments 1, 4, 5, or 8).

The presence of contrast blush on computed tomography or endovascular angiography was associated with bilomas, abscesses, International Study Group of Liver Surgeons Grade B bile leaks. Contrast extravasation was also associated with the need for surgical drains, percutaneous drains, ERCP, sphincterotomy, and biliary stents.

A blush prior to surgical intervention was associated with an odds ratio of 8 for ERCP (95% confidence interval 2.0-32), 10 for sphincterotomy (2.4-43), and 14 for stenting (2.9-64). A postoperative blush was associated with OR of 10 for ERCP (2.2-42), 11 for sphincterotomy (2.5-52), and 14 for stenting (2.9-70). A blush at any time was associated with an OR of 25 (5-124) for ERCP and 50 for sphincterotomy (6-418). All stents were placed in patients with contrast extravasation. Extravasation was the only variable associated with ERCP on logistic regression (OR 18, 2.2-152). It was 78% sensitive and 88% specific for ERCP, with an area under the ROC of 0.83.

Conclusions: A contrast blush on hepatic imaging has previously been associated with active bleeding requiring surgery or endovascular embolization. This study is the first to show that contrast extravasation, whether before or after surgical intervention, is associated with biliary complications and endoscopic biliary drainage procedures. We infer that the proximity of hepatic arteries to bile ducts within the portal triad explain this biliary clinical correlation of a vascular radiographic phenomenon.

12 - Cushioned on the way up, controlled on the way down. Investigating a novel compliant balloon design for optimizing safe overinflation combined with controlled deflation for Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA)

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Background: The COBRA-OS is an ultra low-profile 4 French aortic occlusion device that was designed to enable safer overinflation and finer deflation control compared to traditional compliant REBOA balloons. This study compares the properties of the COBRA-OS versus a standard compliant balloon device in both in vitro and in vivo models.

Methods: *In vitro:* Control and test devices were incrementally inflated and internal pressure measurements were recorded in 3 differently sized inner diameter (ID) vinyl tubes until balloon rupture. *In vivo:* Control and test devices occluded Zone 1 in 3 non-bleeding anesthetized swine and then were serially deflated by 0.2 mL increments over 30 seconds until full aortic flow and pressure was restored.

Results: *In vitro:* The COBRA-OS balloon generated less maximal internal pressure in all 3 vinyl tubes compared to the control device. Respectively, for the 8mm ID tube, the pressures were 4 vs 14 ATM; for the 9.5mm ID tube, the pressures were 3.5 vs 6 ATM; and for the 13mm ID tube, the pressures were 1.5 vs 4.5 ATM. *In vivo:* The COBRA-OS device had full return of flow and restoration of proximal and distal MAPs over a mean of 4.0 mL of syringe volume removed compared to a mean of 2.6 mL with the control device. Live fluoroscopy video images confirmed that the COBRA-OS maintained its shape throughout inflation and deflation without forming the “teardrop” shape associated with the test device.

Conclusions: The COBRA-OS balloon generated less internal pressure at the time of balloon rupture compared to the control device *in vitro*, suggesting that there is a “cushioning” effect during balloon inflation. In addition, the COBRA-OS allowed for 1/3 finer control during deflation compared to control *in vivo*. Further studies are required to determine if these results translate into better safety when inflating and finer control when deflating the COBRA-OS during REBOA procedures in humans.

15 - Emergency physician and nurse discretion accurately triage high-risk trauma patients

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Background: Prehospital trauma team activation (TTA) criteria allow for early identification of severely injured trauma patients. Although most TTA criteria are objective, one TTA criterion is intentionally ambiguous: emergency provider discretion. The study objective was to define the ability of emergency physician and nurse discretion to accurately triage severely injured trauma patients.

Methods: All highest-level TTAs arriving to our American College of Surgeons (ACS)-verified Level 1 trauma center (06/2015-08/2020) were included. Exclusions were undocumented prehospital vitals or discharge disposition. At our center, TTAs are triggered for standard ACS TTA criteria and age >70 with traumatic mechanism other than ground level fall. Patients meeting ≥ 1 criterion apart from “Emergency Provider Discretion” were defined as Standard TTAs and patients meeting only “Emergency Provider Discretion” were defined as Discretion TTAs. Univariable/multivariable

Results: Over the study period, 4,540 patients met inclusion/exclusion criteria: 3,330 (73%) Standard TTAs and 1,210 (27%) Discretion TTAs. Discretion TTAs were younger (34 vs. 37 years, $p < 0.001$) and more frequently injured by penetrating trauma (38% vs. 33%, $p = 0.008$), particularly stab wounds (64% vs. 29%). Overtriage (ISS <16) was comparable after Discretion vs. Standard TTAs (33% vs. 31%, $p = 0.141$). Blood transfusion <4h (31% vs. 32%, $p = 0.503$) and ICU admission ≥ 3 days (25% vs. 27%, $p = 0.058$) were comparable between groups. Discretion TTA was independently associated with reduced mortality (OR 0.648, $p = 0.045$) and increased need for emergent surgery (OR 1.316, $p = 0.005$).

Conclusions: Emergency provider discretion accurately identifies major trauma, with comparable rates of overtriage as standard TTA criteria. Discretion TTAs were as likely as Standard TTAs to require early blood transfusion and prolonged ICU stay. After controlling for confounders, Discretion TTAs were significantly more likely to require emergent surgical intervention. Emergency provider discretion should be recognized as a valid method of identifying major trauma patients at high risk of need for intervention.

17 - Complications following temporary bilateral internal iliac artery ligation for pelvic hemorrhage control in trauma

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Background: Temporary bilateral internal iliac artery ligation (BIIAL) via exploratory laparotomy is a rapid surgical technique to obtain pelvic hemorrhage control after blunt trauma. With availability of interventional radiology to perform angioembolization, the role for surgical BIIAL in contemporary

practice is unclear and adoption has been limited. Opponents of the technique cite anecdotal reports of gluteal necrosis following BIIAL but no scientific study of complications following BIIAL has yet been performed. The objective was definition of complications following BIIAL.

Methods: All blunt trauma patients undergoing BIIAL at our ACS-verified Level 1 trauma center over a 13-year period (2008-2020) were included without exclusions. Patient demographics, clinical and injury data, local complications of BIIAL (gluteal necrosis, iatrogenic injury to surrounding structures, surgical site infection [SSI], and fascial dehiscence), systemic complications, and outcomes were collected. Descriptive statistics were used to summarize study variables. Multivariable analysis of factors independently associated with mortality after BIIAL was performed.

Results: In total, 77 patients undergoing emergent BIIAL after blunt trauma were identified. Median age was 46 [IQR 29-63] years and 73% were male. Auto vs. pedestrian collisions were the most common mechanism (n=36, 47%) and 91% of patients were severely injured (ISS \geq 16). Nearly half (n=33, 43%) underwent resuscitative thoracotomy prior to BIIAL. No local complications after BIIAL occurred over the 13-year study period. VTE occurred in three patients (4%), AKI in two (3%), and there was one (1%) cerebrovascular accident, upper gastrointestinal bleed, and SSI from a spine procedure in three separate patients. In the first 28 days after injury, median hospital-, ICU-, and ventilator-free days were 0. In-hospital mortality was 70% (n=54). On multivariable analysis, older age was the only variable independently associated with in-hospital mortality (OR 1.081, p=0.028).

Conclusions: Zero cases of gluteal necrosis, iatrogenic injury to surrounding structures, laparotomy SSI, or fascial dehiscence occurred following BIIAL during the study, although local complications may have been more frequent if BIIAL were used more liberally among patients with greater survival. We therefore conclude that high concern for gluteal necrosis after BIIAL in severely injured trauma patients is unfounded and should not prevent a surgeon from obtaining prompt pelvic hemorrhage control with this technique among patients *in extremis*.

19 - Transforming Injury Prevention for Youth (TRIPY): An intersectionality model for youth injury Brandy Tanenbaum¹, Alyssa Miles² From the ¹Sunnybrook Health Sciences Centre, the ²Brock University

Background: Injury is deadly and expensive, and the rates are increasing. The cost of injury is not only a financial burden; individuals, families, and communities suffer the human costs of physical and emotional injury. For children and youth in Canada, injuries are the leading cause of death and disability. However, the risk of preventable injury is not equal for all youth. The Transforming Injury Prevention for Youth (TRIPY) model aims to recognize and remediate these inequities.

Methods: TRIPY aims to conceptualize injury prevention in an innovative way through an intersectionality lens. We developed the model with diverse youth in mind, and the intended users include injury prevention practitioners, partners, stakeholders, communities and decision makers. The model was developed from a transformative perspective and built on core concepts within public health, injury prevention, intersectionality, gender analysis, youth risk, health equity, and systems of privilege and oppression.

Results: TRIPY helps to analyze intersecting inequities along multiple dimensions, to improve injury prevention for diverse youth with unique identities, skills and lived experiences. The end goal of implementing intersectionality within injury prevention is to find out whom we are missing, to

understand and address existing inequities concerning youth injury such that no matter what a person's unique social location or lived experience, they have the opportunity to prevent injury and achieve their full health potential.

Conclusions: Critically evaluating injury prevention programs through an intersectionality lens is needed to understand better the unique factors that interact to influence an individual's risk for injury. However, there is a need for more research that explores the unique experiences of youth at the intersection of various identity factors, including gender, race and ethnicity, and socioeconomic status. With this knowledge, programs can be more culturally responsive, gender-transformative, inclusive, and engaging for all diverse youth.

20 - Surgeon versus non-surgeon trauma team leaders: a multicenter cohort study of major trauma outcomes

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Background: While trauma care was traditionally overseen by general surgeon trauma team leaders (TTLs), non-surgical TTLs now provide care to severely injured patients at many level 1 trauma centres in Canada. Previous studies which examine the effect of TTL training on patient outcomes have not found differences in patient mortality but have been underpowered. Our study sought to investigate patient outcomes when care is provided by surgeon TTLs compared to non-surgeon TTLs.

Methods: We performed a multi-centre retrospective cohort study using provincial trauma registry from six level 1 trauma centres in Canada between 2006-2019. Adult trauma patients ≥ 18 yrs were included if they triggered a trauma team activation and had an Injury Severity Score (ISS) of ≥ 9 for penetrating trauma or an ISS ≥ 12 for blunt trauma. The primary outcome was a difference in unadjusted and adjusted mortality between surgeon and non-surgeon patients.

Results: A total of 12,691 patients met our inclusion/exclusion criteria. Of these patients, 7,487 (57.8%) were cared for by surgeon TTLs and 5,474 (42.2%) were cared for by non-surgeon TTLs. Unadjusted mortality rates were 11.6% for patients treated by surgeon TTLs and 12.6% in patients treated by non-surgeon TTLs ($p=0.03$, OR 0.88, 95%CI 0.78-0.99). The risk adjusted mortality using TRAM methodology was not different between patients who received care from surgeon TTLs compared to non-surgeon TTLs ($p=0.21$, OR 0.91, 95%CI 0.79-1.05).

Among subgroups analyzed there was a reduced unadjusted mortality in patients treated by surgeon TTLs were injured by a blunt mechanism ($p=0.02$). There was no difference in unadjusted mortality among patients with head injuries, thoracic injuries, abdominal injuries, and those that were hypotensive on arrival. There was no difference in risk adjusted mortality among any of these subgroups. There was no difference in hospital length of stay or intensive care unit length of stay between patients cared for by surgeons and non-surgeons.

Non-surgeons were more likely to treat patients who arrive at night time (defined as 5pm-6:59am) than surgeons ($p < 0.0001$).

Conclusions: We observed no difference in mortality for patients treated by surgeon and non-surgeon TTLs after adjusting for factors known to be associated with risk of death. Unadjusted mortality was lower in patients treated by surgeon TTLs than non-surgeon TTLs. We suspect this is due to imbalances in patient population as non-surgeons were more likely to treat patients at night when mortality rates are higher.

21 - The impact of the COVID-19 pandemic on the incidence, precipitants, and outcomes of self-inflicted injuries.

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Background: The COVID-19 pandemic has limited social gatherings since March 2020. It has affected most daily activities and has been associated with isolation, financial stress, and job losses. Given this confluence of risk factors for suicide – isolation, economic uncertainty, and increased anxiety – the pandemic may be associated with an increased risk of suicide. The objective of this study was to quantify the impact of COVID-19 on the incidence, precipitants, and outcomes of self-inflicted injury.

Methods: This retrospective cohort study included patients presenting to a Canadian Level I trauma centre with serious self-inflicted injuries between March 2015 and February 2021. Primary outcomes included the number and proportion of presentations for self-inflicted injuries and resultant mortalities during the COVID-19 pandemic. Secondary outcomes included pre-existing mental health diagnoses and stressors precipitating self-inflicted injuries. Differences were compared using Mann-Whitney U tests, chi-squared tests, or Fisher's exact tests. $p < 0.05$ was considered significant.

Results: A total of 248 patients were included; 48 during the pandemic and 200 during the five preceding years. There was no significant increase in the proportion of traumatic injuries that were self-inflicted (OR 1.05, 95%CI 0.76-1.46; $p = 0.76$). In total, 66 patients (26.6%) died as a result of their injuries. Patients presenting with self-inflicted injuries during the pandemic were not more likely to die (OR 0.78, 95%CI 0.37-1.64; $p = 0.52$). Their injuries were equally severe during the pandemic, with a median Injury Severity Score (ISS) of 16 both during and prior to the pandemic ($p = 0.68$). No significant differences existed in proportions of patients with any mental health diagnosis (OR 1.44, 95%CI 0.68-3.05; $p = 0.33$). There were significant increases in reporting of social stress (OR 2.29, 95%CI 1.07-4.88; $p = 0.03$) and isolation (OR 2.85, 95%CI 1.39-5.85; $p = 0.003$) during the pandemic. There were no significant differences in reports of financial concerns, job loss, physical or mental health stress, family or relationship stress, stress related to substance use, or barriers to accessing mental health care. After March 2020, 25.6% of patients reported that the COVID-19 pandemic was a significant stressor prior to their self-inflicted injury.

Conclusions: There was no apparent increase in self-inflicted injury presentations or resultant mortality in the first year of the COVID-19 pandemic. There has been no significant change in the prevalence of pre-existing mental health diagnoses among these individuals, but stress due to social isolation was significantly more common. It will be important to continue to study the impact of the pandemic on self-inflicted injury and suicide, particularly as life returns to a degree of normalcy.

22 - Injury outcomes across Canadian trauma systems: a retrospective cohort study

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Background: Most Canadian provinces have designated trauma centers including level I (ultraspecialized high-volume metropolitan centers), level II (specialized medium-volume urban centers) and/or level III (semi-rural or rural centers). However, there is significant variation in the configuration of trauma systems across Canada. Our objective was to compare the patient distributions and risk-adjusted outcomes of adult trauma patients admitted to level I, II and III trauma centres across trauma centers and provinces.

Methods: Data on patients with major trauma treated in all designated level I, II or III trauma centers in BC, AB, QC, and NS, level I and II centers in NB and 4 trauma centers in ON (2013-2018) were extracted from provincial trauma registries. We used multilevel generalized linear models to compare mortality and intensive care unit (ICU) admission and competitive risk models for hospital and ICU length of stay (LOS), adjusting for patient case mix.

Results: The study sample comprised 56,794 patients. The case mix of patients treated in level I and II centers was similar across provinces but we observed significant inter-provincial differences in volumes and case mix for level III trauma centers. We observed little variation in risk-adjusted mortality and LOS across provinces and trauma centers but inter-provincial and inter-center variation in risk-adjusted ICU admission was high.

Conclusions: We observed significant variations in patient distributions and outcomes between Canadian trauma centers and systems in this national study. The results highlight opportunities to improve the quality of Canadian trauma care. They also underscore the limitations of current trauma data collection and reporting for national comparisons and demonstrate the need for standardized population-based injury data across Canada to support national quality improvement efforts.

24 - Examining the independent risk factors for withdrawal of life sustaining treatment in trauma patients.

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Background: Withdrawal of life sustaining treatment (WLST) occurs when intervention no longer supports the patient's goals for care. The incidence of WLST in the trauma patient population is not well understood. The purpose of this study was to examine the incidence and independent risk factors associated with WLST. We hypothesized that age, pre-existing comorbidities, and injury burden including traumatic brain injury would be associated with WLST.

Methods: The Trauma Quality Improvement Program was utilized to capture all injured patients admitted from 2016-2017. Patients who arrived without signs of life or without mortality or WLST data were excluded. Demographics, injury data, and outcomes were analyzed. Categorical variables are presented as number (percentage) and continuous variables as median [interquartile range, IQR]. WLST patients were compared to all study patients. Early (<24 hours) WLST patients were compared to all other WLST patients.

Results: Of the 749,754 trauma patients, 35,464 (4.7%) died. Of these, 19,424 (2.6%) died after WLST, constituting 54.8% of all deaths. Median age 67 [50-79], 67.6% male, 17,557 (90.4%) blunt injuries, 11,334 (58.4%) GCS < 9. Median ISS 26 [17-30]. Median head AIS 4.0 (3.0-5.0). The WLST group had a much higher incidence of elderly (60+) patients (65.1% vs 41.0%), blunt mechanism of injury (90.4% vs 76.9%) and hypertension (43.5% vs 26.5%). Black patients (8.2% vs 19.5%) and hispanic patients (7.9% vs 12.2%) were less likely to undergo WLST. On multivariate analysis, patients 80+ years old (OR 12.939, p<0.001), GCS < 9 (OR 15.621, p<0.001), and head AIS = 5, head AIS =6 (OR 3.886, p<0.001 and OR 5.283, p<0.001) were independently associated with WLST. GCS < 9 (OR 4.006, p<0.001) and penetrating injury (OR 2.825, p<0.001) were independently associated with early WLST within 24 hours.

Conclusions: A significant proportion of trauma patients die after WLST. Elderly patients and those with severe TBI and low GCS scores are at high risk of experiencing WLST. Further prospective evaluation is warranted.

25 - Diagnosis and management of bile leaks after severe liver injury: A Trauma Association of Canada (TAC) multicenter study

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Background: One sequela of severe (AAST grade ≥III) liver trauma is bile leakage from the injured hepatic parenchyma. Optimal management of bile leaks after severe liver injury is unknown and practice patterns vary widely. The study objectives were to define bile leak rates after liver trauma, delineate the timing and use of therapeutic interventions, and identify independent risk factors for bile leak and need for ERCP.

Methods: This multicenter retrospective study of six North American trauma centers included all patients with blunt or penetrating AAST grade ≥III liver injury (02/2011-01/2021). Exclusions were age <16, transfers, pregnancy, concomitant injury precluding ERCP, cirrhosis, or prior gastric bypass surgery. Demographics, clinical/injury data, bile leak data, and outcomes were collected. Bivariate analysis compared patients who developed biochemically proven bile leak vs. those without bile leak. Multivariate analyses determined risk factors for bile leak and ERCP.

Results: Of 1,706 study patients with AAST grade ≥III liver injury, bile leak occurred in 66 patients (4%). Penetrating liver injuries were more likely to develop a bile leak (7% of penetrating injuries vs. 3% of blunt injuries, p<0.001). Median ISS was 26 [20-32]. Bile leaks were most commonly grade B (n=41, 62%) and were diagnosed on hospital day 6 [4-8], typically based on output from existing surgical drains (n=33, 50%). Most patients with bile leak underwent ERCP (n=36, 55%), which was undertaken a median

of 5 days [3-8] post bile leak diagnosis. Bile leaks were managed operatively in 10 patients (exploratory laparotomy, n=9, 14%; laparoscopy, n=1, 2%) and with percutaneous transhepatic cholangiography (PTC) and internal/external biliary drain in one (2%). Nineteen (29%) bile leaks were self-limited and managed with drains alone.

After ERCP, the bile leak failed to resolve in 7 cases (20%), which necessitated repeat ERCP (n=3, 43%), additional percutaneous drains (n=3, 43%), and/or exploratory laparotomy (n=2, 29%). On multivariate analysis of risk factors for bile leak, penetrating mechanism (OR 2.562, p=0.002), AAST grade IV (OR 6.256, p<0.001) and V (OR 11.367, p<0.001) liver injury, and admission hypotension (OR 3.774, p<0.001) were independently associated with bile leak. Multivariate analysis of need for ERCP after bile leak did not reveal any variables independently associated with need for ERCP after bile leak (p>0.05).

Conclusions: Bile leaks after severe liver trauma were most frequent after penetrating mechanisms and high grade (IV-V) injuries. Even with multicenter evaluation, optimal management of bile leaks after severe liver trauma remains elusive. One third of bile leaks in this series were self-limited, suggesting that intervention may not be required for all patients. However, no variables predicted which persistent bile leak patients might necessitate ERCP. Therefore, ideal management of bile leaks remains at the surgeon's discretion.

26 - Timing of pharmacologic venous thromboembolism prophylaxis initiation for trauma patients with nonoperatively managed blunt abdominal solid organ injury: a systematic review and meta-analysis.

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Background: Blunt abdominal solid organ injury is common and is often managed nonoperatively. Clinicians must balance risk of both hemorrhage and thrombosis. The optimal timing of pharmacologic venous thromboembolism prophylaxis (VTEp) initiation in this population is unclear. The objective was to evaluate early (<48h) compared to late (≥48h) initiation of VTEp in adult trauma patients with blunt abdominal solid organ injury managed nonoperatively.

Methods: EMBASE, MEDLINE, and the Cochrane Central Register of Controlled Trials were searched from inception to March 2021. Studies comparing timeframes of VTEp initiation were considered. The primary outcome was failure of nonoperative management (NOM) after VTEp initiation. Secondary outcomes included odds of transfusion, other bleeding complications, odds of deep vein thrombosis (DVT) and pulmonary embolism (PE), and mortality. Data collection was performed independently and in duplicate. A random-effects model was used for meta-analysis.

Results: Nine retrospective cohort studies and one prospective cohort study met inclusion criteria, with a total of 4,642 patients. One study using the TQIP database contributed 69% of patients to the included cohort (3,223/4,642). ISS was generally higher in groups with later VTEp initiation, and three studies excluded patients with significant head injuries. Meta-analysis revealed a statistically significant increase in the odds of failure of NOM among patients receiving early VTEp (OR 1.76, 95%CI 1.01-3.05, p=0.05). There was no significant difference in odds of transfusion (OR 1.56, 95%CI 0.55-4.48, p=0.41) or PE (OR 0.58, 95%CI 0.27-1.25, p=0.16). Odds of DVT were significantly lower in the early group (OR 0.36, 95%CI

0.22-0.59, $p < 0.0001$). There was no difference in mortality (OR 1.50, 95%CI 0.82-2.75, $p = 0.19$). All studies were at serious risk of bias due to confounding.

Conclusions: Initiation of VTEp at <48 hours is associated with an increased risk of failure of NOM but a decreased risk of DVT. Absolute failure rates of NOM are low. Initiation of VTEp at 48 hours among patients with low-grade injuries may balance the risk of bleeding complications and mitigate the risk of VTE associated with later prophylaxis initiation. Prospective research with careful control of confounding is needed to further evaluate the safety of this threshold.

27 - Evaluating the effectiveness of Stop the Bleed training in law enforcement officers

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Background: Severe bleeding second to injury is the leading cause of death in trauma. Immediate intervention of a bystander has been shown to significantly improve outcomes of those experiencing life-threatening hemorrhage. In 2018, law enforcement officers in London, ON began carrying tourniquets on their person for this reason. The purpose of this study aimed to evaluate the comfort levels and application skills of officers carrying tourniquets, and whether Stop the Bleed (STB) offered significant improvements.

Methods: Pre and post-training observations were made on participant's ability to appropriately apply direct pressure, wound pack, and use a tourniquet. Observations were evaluated as: did not perform (1 point), partially correct (2 points), or correct (3 points). Maximum scores of 6 were possible for direct pressure and wound packing, and 18 for tourniquet application, related to the number of items scored in each task. Pre- and post-training scores were compared using the Sign test.

Results: Twenty participants were trained and enrolled over the course of one session. The majority of participants were male ($n = 17$), with an average age of 35 ± 5 years. The average years of service from this sample was 11 ± 5 years. All participants reported having previous formal training related to tourniquet application, but not STB training. Only one quarter (25%) of participants had ever used a tourniquet in an emergency field setting. Five participants were excluded from the tourniquet analysis and seven were excluded from the direct pressure and wound packing analyses due to incomplete pre- and post-training data. The median change in scores between pre- and post-training showed significant improvement for wound packing (5 (3, 6) vs 6 (6, 6), respectively) ($p = 0.022$) but not for application of direct pressure (6 (5, 6) vs 6 (6, 6), respectively) ($p = 0.125$). When considering wound packing and direct pressure together, significant improvement occurred from pre- to post-training, 15 (13, 16) to 22 (21, 22), respectively ($p = 0.0002$). The median change in scores between pre- and post-training showed significant improvement in tourniquet application specifically (16 (16, 18) vs 18 (18, 18), respectively) ($p = 0.011$) but not for the total score (22 (22, 24) to 24 (23, 26), respectively) ($p = 0.388$). The time to apply the tourniquet was similar pre- and post-training 28.2 s (21.2, 36.6) to 24.6 s (22.7, 32.3), respectively ($p = 0.679$).

Conclusions: Stop the Bleed training significantly improved the application of, but not the time to apply, a tourniquet. Significant improvements were also seen in the direct pressure and wound packing observations. These findings demonstrate the significance of participating in formal STB training. Furthermore, although officers carry a tourniquet and have formal training, additional training to intervene in the absence of a tourniquet is imperative. Further research should be conducted with a larger and more diverse sample.

28 - Pupillometry for evaluation of analgesia requirements in critically ill sedated patients with traumatic brain injury

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Background: Regular monitoring of analgesia is essential to prevent complications in critically ill sedated patients with traumatic brain injury (TBI). While pupil dilation (PD) and pain behaviors can be used to assess analgesia in critical care, these indicators require application of noxious stimulations for elicitation, potentially exposing TBI patients to additional stress. Here, we investigated whether pupillary light reflex (PLR: a non-noxious parameter) can be used for evaluation of analgesia in critically ill sedated TBI patients.

Methods: Fifteen consecutive cases of mechanically ventilated TBI patients (11 men; 54±20 years old) under continuous analgesia and sedation perfusions were assessed at predefined time within 72 hours of ICU admission. Data collection was performed using video-pupillometry and the Behavioral Pain Scale (BPS). At each assessment, pupil size and PLR at rest were recorded followed immediately by the documentation of PD and pain behaviors elicited by a calibrated noxious stimulation. Blood concentrations of fentanyl and propofol were monitored periodically.

Results: One hundred and three assessments were completed. All participants had equal pupil size (right eye= 2.30 ± 0.41 mm and left eye=2.30 ± 0.39 mm, $t=-0.02$, $p=0.57$) and a BPS=3 at rest (the minimal score of the scale). PLR prior noxious stimulation resulted in an average decrease of -19% in resting pupil diameter. Conversely, PD during the noxious stimulation resulted in average increase of +10% in resting pupil diameter. Percentages of variation in PLR (-34% vs. -17%) and PD (+19% vs. +8%) were significantly more pronounced in TBI participants who showed a BPS score >3 (a recognized sign of sub-analgesia) after noxious stimulation compared to TBI participants with no behavioral reaction. While PLR and PD accurately predicted the potential presence of sub-analgesia during noxious stimulation ($\beta=0.071$, $p=0.022$ and $\beta=0.040$, $p=0.049$, respectively), consideration of participants' blood concentration of fentanyl (but not propofol) in an alternative model reduced their predictive values to the point of non-significance leaving fentanyl as the sole predictor of sub-analgesia. In our sample, percentages of variation in PLR and PD were found to be directly representative of TBI patients' fentanyl blood concentration. Considering information about blood drug concentration is generally not available at bedside, PLR could be used with further validation to assess analgesia requirements before a nociceptive procedure in critically ill sedated TBI patients who are vulnerable to stress.

Conclusions: There is an urgent need to develop alternative methods of pain assessment in critically ill TBI patients who are deeply sedated. Considering the PLR is a marker of brainstem functions, including those involved in sensory awareness, it may predict TBI patients' responsiveness to pain and analgesic therapy. Supporting this assumption, our results show that analgesia requirements can be assessed without reliance on noxious stimulations using measurements of PLR in critically ill sedated TBI patients.

32 - Longitudinal add-on effects of a neurostimulation intervention protocol on the clinical recovery of patients recovering from an isolated upper limb fracture.

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Background: Bone fractures are common and frequently associated with painful symptoms as well as functional disability. Current treatments rely heavily on pharmacological agents (e.g., opioids), despite significant pitfalls (misuse; bone healing issues). Theta burst stimulation (TBS), a safe non-invasive neurostimulation technique, has shown promising results in alleviating chronic pain symptoms. This study rather focuses on the efficacy of TBS in alleviating acute pain symptoms and reducing risks of chronic pain development when implemented acutely post-fracture.

Methods: Three groups were included: I) patients with an isolated upper limb fracture (IULF) enrolled in the active TBS protocol; II) IULF patients enrolled in the SHAM/placebo protocol; III) healthy individuals. Groups I and II were matched (fracture/surgery/age/sex) and took part of the intervention phase (two blocks of five consecutive daily sessions separated by two days off). Clinical measures were collected at three time points (baseline assessment/72h post-intervention/3-months post-injury). Group III only completed the baseline assessment.

Results: A total of 79 participants were enrolled in the current study, of which 27 were assigned to the pc-TBS group (group I), and 23 to the SHAM group (group II), and 29 were healthy controls (group III). Groups I and II had statistically similar demographic and baseline clinical measures. No differences on pain intensity (Numerical rating scale/NRS; $F=1.911$ ($p=0.173$)) and functional disabilities (DASH questionnaire; $F=0.920$ ($p=0.342$)) were found between Group I and II at 72h post-intervention. However, at 3 months post-injury, Group I reported significantly reduced pain symptoms ($F=5.837$; $p=0.020$) and functional disabilities ($F=4.712$; $p=0.035$) compared to Group II. Moreover, the proportion of individuals who displayed clinically significant pain levels (NRS $\geq 4/10$) was statistically higher in Group II (17.39%) compared to Group I (0%) at 3-month post-injury ($\chi^2=5.104$; $p=0.024$). A between group-difference was also found on the DASH questionnaire ($\chi^2=5.062$; $p=0.024$), such that 43.48% of patients from the SHAM group had disabilities to some extent (either “problem but working” or “unable to work”), whereas only 14.81% from the active pc-TBS group presented with similar disabilities. Also, group I displayed similar clinical values compared to controls (Group III), suggesting a near complete recovery, which was not the case for group II. Psychological (Depression scale: $\chi^2=0.2208$; $p=0.137$; Anxiety scale: $\chi^2=1.348$; $p=0.246$) and sleep disability ($\chi^2=0.130$; $p=0.718$) symptoms did not differ across groups when measured at 3-month post-injury.

Conclusions: This SHAM controlled study found long-term beneficial therapeutic effects of a 10-day pc-TBS intervention on key recovery markers when implemented in the acute phase post-trauma (on average 10 days post-injury) in patients who sustained an IULF. Ultimately, pc-TBS presents with multiple key assets (short duration, rare minimal side effects, can tackle a wide array of symptoms) and could potentially be considered as an additional treatment option to current treatments which are associated with adverse effects.

33 - Traumatic primary pulmonary thrombosis: a novel entity?

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Background: Multi-system trauma leads to several risk factors for thrombosis including pro-thrombotic states, systemic inflammation, immobility, and contraindications to prophylaxis. Traditionally, pulmonary thrombi were believed to occur several days to weeks following trauma, secondary to deep venous thrombosis (DVT) in the lower extremities that embolize to the pulmonary arteries. CT imaging during initial trauma resuscitation, within hours of injury, has identified pulmonary thrombi, raising the possibility of primary pulmonary thrombosis as a distinct clinical entity.

Methods: Retrospective review of trauma and radiology registries at London Health Sciences Center from January 2010 to April 2021 was completed for patients who received CT imaging of the thorax. The radiology registry was queried for studies containing reference to pulmonary thrombi. Identified studies were cross-referenced with the trauma registry to identify patients with pulmonary thrombi on initial CT imaging. Baseline demographics, description of injury, diagnostic procedures, treatments, and outcomes were derived, and descriptive analysis completed.

Results: 25 patients (14 males and 11 females) with an average age of 55 (SD 18.5) met the inclusion criteria of pulmonary thrombus identified on initial trauma imaging. All patients had suffered blunt trauma with an average ISS of 23.7 (SD 10.7). Five patients died as a result of their injuries (20%). Most pulmonary thrombi were segmental (n = 21, 84%), with 48% of patients having multiple thrombi (n = 12). In patients with pulmonary thrombus, rib fractures (n = 11, 44%), pneumo/hemothorax (n = 8, 32%), and spinal fractures (n = 8, 32%) were common. Only 4 patients had a concomitant diagnosis of DVT, and only 6 had a prior history of clotting disorder or medical condition predisposing to clotting. Treatment was initiated in 19 patients (76%), with average time from diagnosis to treatment of 37.8 hours (SD 27.6 hours). Therapeutic dalteparin was the most common method of treatment, with 44% of patients (n = 11) receiving dalteparin monotherapy and 1 patient receiving both dalteparin and IVC filter. IVC filter in isolation was used in 24% of patients (n = 6), and IVC filter with IV heparin was used in 1 patient. Most common reasons for delay in treatment or not initiating treatment were severe brain injury and death.

Conclusions: This study identified 25 patients with proposed primary pulmonary thrombosis following trauma and outlined patient characteristics and injury mechanisms and patterns associated with primary pulmonary thrombosis. Chest injuries, including rib fractures and pneumo/hemothorax were commonly associated with pulmonary thrombi, while only 4 patients were diagnosed with a concomitant DVT. These findings challenge the traditionally held view of DVT embolization as the primary cause of PE following trauma and provide a starting point for further research.

37 - Predictors of survival among adult traumatic cardiac arrest patients in Nova Scotia: a retrospective analysis.

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Background: Historically, traumatic cardiac arrest (TCA) studies have described poor survival rates and argued that resuscitation is futile. However, recent reports are finding that survival rates may be higher than previously thought. Our objectives were to determine survival rates in TCA patients and assess for factors associated with survival to hospital discharge.

Methods: We conducted a retrospective cohort study of adult TCA patients (≥ 17 years old) in Nova Scotia over an 11-year period (2007-2018). Data was collected from the paramedic electronic Patient Care Record (ePCR) and the Nova Scotia Trauma Registry (NSTR). The primary outcome of interest was survival to hospital discharge. We compared characteristics between survivors and non-survivors and assessed for predictors of survival. Descriptive statistics, t-tests, chi-square analysis, and multivariable logistic regression models were used.

Results: A total of 754 patients were included in the analysis. Ages ranged from 17 to 96 years (mean 49.4 \pm 19.5 yrs), and 80.4% were male. The overall survival rate was 5.3% (40/754). Compared to non-survivors, patients who survived to hospital discharge had a lower mean Injury Severity Score

(17.55±10.68 vs. 33.81±20.77, $p<0.001$) and higher mean Glasgow Coma Score prior to cardiac arrest (11.77±4.91 vs. 5.55±4.43, $p<0.001$). Survivors were also more likely to be injured in an urban location (67.5% vs. 45.0%, $p=0.016$). Likelihood of survival was increased in patients with lower Injury Severity Scores (odds ratio [OR] 0.90; 95% CI 0.87-0.94), patients who were intubated (OR 7.69; 95% CI 1.62-36.48), and patients transported by air ambulance (OR 30.92; 95% CI 6.35-150.57).

Conclusions: Among adult TCA patients in Nova Scotia, 5.3% survived to hospital discharge. Intubation and air transport were strongly associated with survival.

38 - Efficacy of high dose tranexamic acid for hemorrhage: a systematic review

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Background: In patients who present with trauma, standard-dose IV tranexamic acid (TXA) $\leq 1g$ is beneficial. The role of high-dose IV TXA, $\geq 2g$ or $\geq 30mg/kg$ as a single bolus, has been evaluated in surgical settings, however, it has not been studied in trauma. We sought to review the available evidence for high-dose IV TXA with the goal of informing its use in the adult trauma population.

Methods: A systematic review was conducted to investigate the effects of high-dose IV TXA compared to standard-dose IV TXA on blood loss and transfusion requirements. We searched MEDLINE, EMBASE and unpublished sources from inception until Aug 18, 2021. Screening for studies and data extraction were executed independently and in duplicate. We assessed the quality of evidence using the Cochrane Risk of Bias for randomized control trials and the Newcastle-Ottawa Scale for cohort observational studies.

Results: A total of 3082 publications were identified by our search strategy. 57 full text reviews were performed, and 18 studies met our inclusion criteria. 13 randomized control trials, 2 prospective cohort studies and 3 retrospective cohort studies included a total of 9450 patients. Of the 18 studies, 8 were derived from the cardiac surgery literature and 10 from the orthopaedic literature. 29% of studies demonstrated a reduction in blood loss, 12% of studies depicted a significant reduction in blood transfusion requirements, and 70% of studies found no differences in blood loss or transfusion requirements between high-dose IV TXA and standard-dose IV TXA. Amongst studies that included secondary outcome data on mortality, thromboembolic events and seizures, no differences were identified between the intervention group and the comparator.

Conclusions: This review demonstrates that high-dose IV TXA may be superior to standard-dose IV TXA for reducing bleeding and transfusion requirements in elective surgical patients without increasing the rate of thromboembolic events or other complications. Future work is needed to examine the effects of high-dose IV TXA in trauma patients.

39 - CounterFlow hemostatic technology demonstrates high survival rates in large animal models of lethal non-compressible hemorrhage

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Background: Hemorrhage is the second-leading cause of death overall and the leading cause of preventable death in trauma. Combat mortality analysis indicates that 24% of pre-hospital deaths were potentially survivable, of which 90.9% were attributable to hemorrhage. Self-propelling CounterFlow technology, consisting of bioabsorbable calcium carbonate and tranexamic acid (TXA), propels and disperses hemostatics against the flow of blood to halt hemorrhage. Here, CounterFlow leads to high survival rates in swine models of lethal, non-compressible hemorrhage.

Methods: CounterFlow was tested in two models. CounterFlow Gauze, with and without thrombin, was tested in a swine model of junctional hemorrhage, induced by a 6 mm femoral arteriotomy. Wound pockets were packed with either CounterFlow Gauze or Combat Gauze, without compression. CounterFlow Powder was tested in a swine model of non-compressible intra-abdominal hemorrhage (NCIAH) where pigs underwent a Grade V liver injury and CounterFlow Powder was delivered percutaneously with a novel minimally invasive spray system.

Results: We compared CounterFlow-Gauze to Combat Gauze, which is the first-line treatment recommended by CoTCCC. Combat Gauze is indicated for use with compression, but our studies tested the products following junctional hemorrhage without compression. This study was carried out with two different users. When this study was carried out by a civilian physician, 100% of animals (8/8) that received CounterFlow Gauze survived to three hours whereas just 37.5% (3/8) animals receiving Combat Gauze survived ($p < 0.01$). This experiment also validated that the effervescing mechanism of action of CounterFlow Gauze increases the efficacy of its hemostatic cargoes (thrombin and TXA) since a non-effervescing formulation of the same achieved only 25% survival. When this study was carried out by a Canadian Armed Forces Trauma Surgeon, the survival rate of animals in both groups was 100% at 3 hours without compression. Blood loss was the same between CounterFlow Gauze (12.4 ± 8.3 , mean \pm SEM; $n=4$) and Combat Gauze (14.12 ± 6.4 ; $n=5$, $p=0.87$) over the course of the experiment. In the model of NCIAH, CounterFlow Powder was successfully administered into a closed, actively bleeding abdomen by placing a 14 Fr catheter attached to a spray system, using a modified Seldinger technique. CounterFlow Powder plus fluid resuscitation showed improved median survival time (2.5 hours) post-injury when compared to fluid resuscitation alone (0.8 hours) (95% CI 0.9798 to 10.52 hours).

Conclusions: CounterFlow is a promising new technology for managing non-compressible hemorrhage. The effervescing, self-propelling formula carrying Health Canada approved hemostatic agents throughout flowing blood in wounds and cavities also lends itself to minimizing user variability, key for high-risk, life-or-death procedures. Further studies with more severe models of hemorrhage and prolonged field care are required to verify CounterFlow Gauze's capacities. Further optimization of the CounterFlow platform for NCIAH is ongoing.

40 - Current trauma team activation processes at Canadian trauma centres: a national survey

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Background: Trauma team activation (TTA) allows the provision of specialized and timely care to improve outcomes for severely injured patients. Several structured tools and processes are recommended by professional associations and health authorities for optimal TTA implementation, surveillance and compliance. Given there is little information on the current practices surrounding the activation of trauma teams from a national perspective, a survey was conducted at Canadian trauma centres.

Methods: Interdisciplinary Trauma Network of Canada (ITNC) designed and pre-tested a survey on the REDCap platform. Quantitative and qualitative open-ended questions addressed survey domains: 1) TTA criteria; 2) the processes for activation; 3) data collection and analysis of TTA; 4) quality improvement initiatives. The online survey link was distributed to ITNC members of level I and II adult and pediatric trauma centres with initial survey invitation and two reminders. Descriptive statistics and theming analyses were performed.

Results: Twelve ITNC members were contacted to pilot the survey, of which 9 responded (75% response rate). Respondents came from 7 provinces with the majority (89%) from adult trauma centres. Regarding TTA criteria, half of respondents (56%) review their TTA criteria on as needed basis, with only one-third of respondents having last reviewed their criteria in 2021. Most (78%) of the trauma centres had one level of TTA criteria for activation, as opposed to a tiered response. Several centres had TTA criteria for special trauma populations including geriatric (22%), pregnant women (22%) and anticoagulant and bleeding disorders (11%). The most frequently produced TTA reports were TTA compliance rate (89%), missed TTA (78%), with reasons for non-compliance and overtriage (67%). While the trauma centres for all respondents collected data on TTA and Trauma Team Leader (TTL) arrival time, fewer centres collected if patients met the TTA criteria (78%) and specifically, what criteria were met (44%). Reported successes with quality improvement initiatives included improving compliance with ED RN initiated TTA, the development of provincial criteria and TTA integration with EMS. Several respondent challenges were identified including data collection, lack of quality improvement processes for reviewing compliance and how to report TTA non-compliance when a missed TTA was considered acceptable.

Conclusions: Preliminary findings of this survey highlight the variability in the TTA criteria and processes across the country, with need for further standardization of TTA processes, data collection and analysis. Dissemination of the survey to all ITNC membership in Canada is currently underway. Responses will set the groundwork for further study and multidisciplinary collaboration across the country to enhance the TTA processes, maximize compliance and improve patient outcomes.

41 - Operative vs. non-operative treatment of acute unstable chest wall injuries: a multi-centred randomized controlled trial

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Background: Unstable chest wall injuries have high rates of mortality and morbidity. These injuries can lead to respiratory dysfunction, and are associated with high rates of pneumonia, sepsis, prolonged ICU stays, and increased health care costs. Several studies have demonstrated improved outcomes with surgical fixation compared to non-operative treatment. However, an adequately powered, multi-centre, randomized controlled study using modern fixation techniques has been lacking.

Methods: This is a multi-centre, prospective randomized controlled trial comparing surgical fixation of acute, unstable chest wall injuries to non-operative management. Patients were seen in follow-up for one year. The primary outcome was ventilator free days (VFDs) in the first 28 days following injury. Secondary outcomes were days in the Intensive Care Unit (ICU), rates of pneumonia, sepsis, need for tracheostomy, mortality and surgical complications.

Results: A total of 207 patients were recruited from 15 sites across Canada and USA, from 2011-2018. Ninety-nine patients were randomized to non-operative treatment, and 108 were randomized to surgical fixation. Overall, patients had a mean age of 53 years, 75% were male, and sustained a mean of 10 rib fractures. Mean VFDs was 22.7 days for the surgical group and 20.6 in the non-operative group, with a mean difference of 2.1 days between the two groups ($p=0.089$). Mortality was significantly higher in the non-operative group, 6% vs. zero in the surgical group ($p=0.011$). There was no difference between the two groups with regards to complications, or length of ICU or hospital stay. A pre-specified sub-group analysis of patients who were intubated and mechanically ventilated at the time of randomization demonstrated a mean difference of 2.8 VFDs in favour of surgery ($p=0.04$), as well as a shorter total hospital stay (Hazard Ratio 1.36, $p=0.02$).

Conclusions: The results of this study demonstrates a lower rate of mortality with surgical treatment, with no improvement in VFDs or other outcomes compared to non-operative treatment in all patients. The results however show an improvement in VFDs and length of hospital stay in the sub-set of patients who were mechanically ventilated at the time of randomization. Given this, we believe this study suggests potential improved outcomes with surgical fixation in patients who require mechanical ventilation shortly after presentation.

45 - Evaluating the 1st Decade of Action for Road Safety [DoARS] in Qatar: we need to go beyond counting the dead

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Background: The goal of the 1st Decade of Action for Road Safety was to halt or reverse the predicted increase in road traffic fatalities around the world during the decade of 2011-2020; it was based on concerted national efforts that applied the 5-pillars approach: Road Safety Management, Safer Roads and Mobility, Safer Vehicles, Safer Road Users and Post-Crash Response. This study will conduct a thorough evaluation of the outcome of Qatar's efforts to achieve those goals.

Methods: The study period was for the 1st DoARS, from 2011-2020. Data on moderate to severe road traffic injuries [RTIs] admitted to the national trauma center was extracted from the Qatar national Trauma Registry. Data on RTI deaths and the national population, reported by the National Statistics office, were collected retrospectively. Location of the deaths, pre or in-hospital, population-based death and injury rates and their temporal trends were analyzed.

Results: The population of Qatar increased from 1,599,323 in 2011 to 2,749,215 in 2020, a 72% increase. From 2011 to 2020, there were 1,925 RTI deaths and 9,209 RTIs recorded. The annual number of road deaths decreased by 30% with a 61% reduction in the rate of RTI deaths per 100,000 population. The majority, 81%, of these road deaths occurred in the pre-hospital setting in 2011 and this increased to 84% in 2020.

There was a 7% increase in the number of RTIs but a 38% percent reduction in the rate of RTIs per 100,000 population. A 34% reduction in the in-hospital RTI death rate per 100,000 population was noted. In-hospital RTI deaths made up 19% of all RTI deaths in 2011, 16% in 2020.

With the DoARS-related improvements for road safety in Qatar, it is estimated that as many as 858 potential road deaths and 2,274 moderate to severe RTIs were prevented from 2011 to 2020. There was a 60% reduction in the pre-hospital RTI death rate and a 65% reduction in the in-hospital RTI death rate.

Conclusions: Based on population-based metrics, road safety has improved dramatically in Qatar during the 1st DoARS, exceeding the decade's goals. We do not recommend using absolute numbers to evaluate the DoARS in any country. A deeper analysis and comparison of RTIs and RTI deaths by road user type and location can provide more evidence to inform road safety efforts for the 2nd DoARS.

48 - Mandatory gunshot wound reporting in Nova Scotia: a pre-post evaluation of firearm-related injury rates.

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Background: Mandatory reporting laws have elicited much debate over whether they improve public safety and injury prevention, and if so, whether that improvement is worthy of the breach in patient-physician confidentiality. Our objective was to determine if implementation of the Gunshot Wounds Reporting Act in Nova Scotia in 2008 was associated with a reduction in firearm-related injuries.

Methods: Retrospective study of all major trauma patients who sustained a firearm-related injury in Nova Scotia between 2002-2019. Data were collected from the Nova Scotia Trauma Registry and the Nova Scotia Medical Examiner Service for a 7-year pre-period (2002-2008) and an 11-year post-period (2009-2019). Patient characteristics were compared between the pre- and post-periods using t-tests and chi-square analysis. We used Poisson regression (a log-linear model) to model firearm-event counts in the pre- and post-periods.

Results: There were a total of 752 firearm-injuries during the study period (289 in pre-period, 463 in post-period). Trauma patients in the pre- and post-periods were similar in age, sex, intent of injury, prehospital mortality, and overall mortality. Patients in the post-period had a lower mean Injury Severity Score (22.93 ± 18.46 vs. 27.41 ± 19.42 , $p = 0.006$), a higher mean Glasgow Coma Scale score on arrival at the Emergency Department (14.35 ± 2.46 vs. 12.43 ± 4.76 , $p = 0.001$), and a greater proportion required trauma team activation (29.2% vs. 19.7%, $p = 0.004$). The incident rate for firearm-related injury in the post-period was 1.02 times that of the pre-period but this was not statistically significant ($p=0.82$). The percent change in the incident rate of firearm-related injury was a decrease of 0.1% for every unit increase in age ($p=0.92$).

Conclusions: The Gunshot Wounds Reporting Act did not have any effect on firearm injury incidence and mortality. Policymakers should consider adopting provisions that explicitly describe the purpose of the policy and determine how outcomes will be measured. This study highlights the responsibility of physicians to advocate for comprehensive and transparent public health and safety measures to prevent firearm-related injuries.

50 - The effect of legislation on firearm-related injuries and deaths in Canada: a systematic review.

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Background: Firearm misuse is common in cases of homicide, suicide, and unintentional injury. This is a major public health issue with societal and economic costs extending beyond the immediate injury or loss of life. We sought to determine the effectiveness of Canadian legislation in reducing injuries caused by firearms.

Methods: Five databases (PubMed, Embase, CINAHL, Web of Science, Scopus) were searched from inception to July 2021 for studies evaluating the effect of Canadian gun control laws (Bill C-51 [1997], Bill C-17 [1991], Bill C-68 [1995]) on firearm-related injuries (PROSPERO 2020: CRD42020192486). Data was synthesized using descriptive statistics. The primary outcome of interest was the rate of injury due to firearm misuse. Study quality was assessed using the Newcastle Ottawa Scale.

Results: A total of 1479 articles were screened, from which we identified 18 studies assessing the effectiveness of Canadian firearm control laws in reducing rates of injury or death. Ten studies examined the effect on homicides, of which five reported a reduction during the post-legislation period; only one study reported evidence of substitution from firearms to other methods of homicide. Eleven studies evaluated the effect on suicide, with nine finding a reduction in suicide rates in the post-legislation period. Eight of these studies reported evidence of substitution from firearms to other suicide methods. Two studies investigated the effect on accidental deaths; neither study reported any benefit post-legislation.

Conclusions: Evidence supporting the effectiveness of Canadian firearms legislation in the reduction of homicide and accidental death rates is inconclusive. Existing studies are limited in design and present conflicting results. A decrease in firearm-related suicide rates was observed by most studies but evidence of method substitution was also identified.

51 - Impact of the simulation environment on cognitive load and teamwork skills development in novice trauma healthcare professionals

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Background: Simulation to improve trauma teamwork skills can occur in laboratories or in real-world settings (in situ), but the influence of the environment on cognition and learning is poorly understood. Specifically, the simulation environment can affect learners' cognitive load, which is composed of three subtypes: 1) intrinsic load, i.e., the demands associated with the learning task; 2) extraneous load, i.e., the demands that distract from the learning task; and 3) self-perceived learning.

Methods: A controlled before-and-after study was conducted to examine the impact of the simulation environment on cognitive load and teamwork skills of novices in the trauma bay. Physicians, nurses, and respiratory therapists with <18 months of experience were assigned to laboratory or in situ simulations. They participated in two 15-minute simulations separated by a 45-minute debriefing on teamwork. After

each simulation, they completed validated cognitive load and teamwork questionnaires. A mixed ANOVA was used for analyses.

Results: Twenty-four participants (79% female; 28±5 years old) were included: 12 were assigned to laboratory simulations, and 12 to in situ simulations. No interaction effects were found between simulation environments and time on any of the cognitive load subtypes, as measured by the Cognitive Load Questionnaire, or teamwork skills, as measured by the Mayo High Performance Teamwork Scale. Nonetheless, there was a statistically significant effect of time on intrinsic load ($p = 0.011$), showing that this subtype of cognitive load decreased between the first and second simulations in both groups. There was also a significant difference in simulation environments for self-perceived learning ($p = 0.025$) as participants in the laboratory simulations perceived that they had learned more than those in the in situ simulations. However, no difference in the development of teamwork skills was found between simulation environments. Finally, regarding the teamwork skills between the two-time points, we observed a statistically significant difference ($p = <0.001$), as teamwork skills improved between the first and second simulation in both groups, suggesting that the simulation intervention was effective in increasing teamwork skills independent of the simulation environment.

Conclusions: Aside from perception of learning, no difference in novice trauma professionals' cognitive load was found between the two simulation environments. Also, teamwork skills improved similarly in both groups. For the first time, we showed that laboratory simulations—which are simpler to organize than in situ simulations—can be just as effective as in situ simulations for enhancing teamwork skills of novice trauma professionals. These results could guide educators in the development of future trauma simulations.

52 - To reverse or not to reverse? A multicenter analysis of selective anticoagulation reversal on outcomes among elderly patients with traumatic intracranial hemorrhage.

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Background: Traumatic intracranial hemorrhage (ICH) in elderly patients on anticoagulation (AC) is a common problem. Administering AC reversal agents has both potential risks and benefits, and factors or protocols for selecting patients with traumatic ICH who do not require reversal are not well characterized. We analyzed outcomes with selective AC reversal and predictive variables for ICH progression under a protocol of routine repeat head CT scans.

Methods: AC patients ≥55yr with isolated head injury and confirmed ICH from two trauma centers were divided into three groups: immediate reversal (IR), no reversal (NR), and delayed reversal (DR, received reversal after repeat head CT). Patients with non-survivable/futile head injuries or death unrelated to ICH were excluded. Multivariable Cox proportional hazards models were used to analyze outcomes related to reversal status. Demographic, injury, and clinical predictors of ICH progression and neurosurgical intervention (NSI) were identified.

Results: 238 patients were included, 116 (49%) were not reversed (NR), 109 were immediately reversed (IR), and a small subset of 13 patients (5.4%) received DR based on ICH progression on repeat CT. The unadjusted rate of progression of ICH was similar between IR and NR groups (52% vs 48%), however IR patients were more likely to require NSI (14.7% v 1.7%, $p=0.001$) and had significantly higher mortality

(11% v 4%, $p=0.04$). There were no deaths in the DR group and the rate of NSI was lower than the IR group (7.6% vs 14.7%). In a Cox regression model, worst head AIS and warfarin (versus other agents) were significantly related to progression of ICH (adjusted hazard ratios= 1.8 and 2.0), while transfer patients transferred were significantly more likely to undergo DR ($p<0.01$). Patients with isolated subarachnoid hemorrhage were significantly less likely to have IR at 23% versus epidural (100%) or subdural hemorrhage (46%) and were less likely to require NSI. On comorbidity analysis there was a significantly higher rate of ICH progression among patients with congestive heart failure (CHF) regardless of reversal status, an association that was not present with any other comorbidities. There was no difference in thrombotic events between groups, with deep venous thrombosis (1.8%) and stroke (1.8%) rates that were equivalent between IR and NR groups.

Conclusions: A selective strategy of withholding AC reversal in patients with traumatic ICH appears safe and was associated with low rates of progression or need for NSI. Key factors in this decision process should include the size and type of ICH, the AC agent (warfarin vs DOAC) present, and high-risk comorbidities including CHF. There was no difference identified in the incidence or types of thrombotic complications between reversal groups.

53 - Predictors of adverse outcomes in elders hospitalized for isolated orthopedic trauma: a multicenter cohort study.

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Background: Patients 65 years of age or older now represent more than 51% of injury hospitalizations in Canada. There is a knowledge gap on the characteristics of elderly injury patients who could benefit the most from an interdisciplinary treatment approach to improve outcomes and reduce resource overuse. We aimed to identify variables that are associated with adverse outcomes in elders admitted to a trauma center for an isolated orthopedic injury.

Methods: We conducted a multicenter retrospective cohort study between April 2013, and March 2019 on elders hospitalized with a primary diagnosis of isolated orthopedic injury ($n=19928$). Data were extracted from the provincial trauma registry (Registre des traumatismes du Québec - RTQ). We used a multi-level logistic regression to estimate the associations between potential predictors and adverse outcomes (extended length of stay, mortality, complications, unplanned readmission, and adverse discharge destination).

Results: The study population included 19,928 patients 65 years of age or older who were admitted for isolated orthopedic injuries. Overall, 18.5% patients had an extended LOS, 5.5% died in hospital, 19.5% had complications, 8.6% had unplanned readmission, and 10.8% were transferred to a long-term care facility. The following factors were associated with increased odds of adverse outcomes according to our composite outcome measure and the relative weights analyses: comorbidities, type of orthopedic injury, admission in the year before the injury, increasing age, Glasgow Coma Scale, severe orthopedic injury, concomitant head injury, and biologic sex. Comorbidities were the most important predictor accounting for 47% of explained variation, followed by the type of orthopedic injuries (25%), admission in the year before the injury (8%), age (6%), and the GCS (2%). Other predictors accounted for less than

1% of explained variation. When we modelled adverse outcomes individually, increasing age and male sex were statistically significant predictors of all specific adverse outcomes whereas selected comorbidities, selected types of orthopedic injury, mechanism of injury, severe orthopedic injury, concomitant head injury, and admissions in the year before the injury were predictors of at least two adverse outcomes. Predictors of specific adverse outcomes that were not predictors of our composite outcome included admission for surgical care, presence of rib fractures, mechanism of injury, and regular use of steroids.

Conclusions: We identified predictors of adverse outcomes for elders admitted for isolated orthopedic injuries. In future work, these variables will be used to derive and validate a clinical decision rule to identify elders who could benefit the most from interdisciplinary care. Such a tool has the potential to guide patient orientation, and improve trauma management in this population, thus improving resource utilisation and outcomes in an increasingly large proportion of trauma admissions.

55 - Decreasing the gap in open abdomens using the abdominal fascia closure device “AbCLO”: interim analysis of a prospective, randomized clinical trial.

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Background: The fascia is left open in approximately 25% of all emergency laparotomies. Subsequent primary fascial closure is achieved in only 65% of the cases. Midline traction of the fascia increases primary closure. However, current methods are invasive and engage only the rectus abdominis. AbCLO is a non-invasive device applied externally to the abdominal wall, at the bedside, for gradual midline traction of the abdominal fascia. We report an interim analysis of a clinical trial.

Methods: Open abdomen patients were randomized into Group 1: Vacuum assisted closure (VAC) alone vs. Group 2: AbCLO used in conjunction with VAC.

Results: N= 13 patients, 6 in the VAC group and 7 in AbCLO group. No significant difference in BMI between the groups. Initial widths of the fascial defects were $9.6 \pm 5.5\text{cm}$ and $10.1 \pm 4.3\text{cm}$ at the widest point, and initial defect areas were $144 \pm 82\text{cm}^2$ and $152 \pm 66\text{cm}^2$; respectively VAC vs. AbCLO ($p > 0.05$). AbCLO resulted in a 50% decrease in the maximum width and the area of the fascial defects on day 4; respectively 10.1 ± 4.3 vs. $5.5 \pm 3.3\text{cm}$ and 152 ± 66 vs. $82.5 \pm 49.6\text{cm}^2$ ($p = 0.0002$). In contrast, no reduction in maximum width and area of the fascial defects were seen with VAC alone (Group 1) compared to baseline ($p=0.8654$). Primary fascial closure by direct suture of the fascial edges was achieved in 6 out of 7 patients with AbCLO without mesh or component separation and in 5 out of 6 VAC Group patients; one patient in that group required component separation. There were no complications related to the use of AbCLO.

Conclusions: AbCLO gradually decreased the size of the fascial defect and facilitated primary fascial closure of the “open abdomen”.

56 - The “shock airbag” a novel device to temporize non-compressible intra-abdominal hemorrhage: a pilot study.

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Background: Over 50% of combat casualty deaths in the battlefield occur minutes to hours after the point of injury. The appraisalment of the anatomic source of the bleeding shows that 64% originate in the abdominopelvic region. Nonetheless, there is a lack of technologies to temporize non-compressible intra-abdominal hemorrhage (NCIAH) in role 1 military medical treatment facilities. The shock airbag is a pneumatic intra-peritoneal device. We tested the device in a swine model of NCIAH.

Methods: N=8 swine underwent splenectomy and hemorrhagic shock; removal of 35% of the total blood volume from the carotid over 20min. Subsequently, fluid resuscitation was performed for 20min. Afterwards, a 3x10cm liver injury was created for intra-abdominal hemorrhage and the laparotomy was closed. Ultimately, 4 animals underwent intraperitoneal insertion and inflation of the shock airbag through a 2cm abdominal incision. Hemorrhage was left uncontrolled in the other 4 animals; mean arterial pressure was recorded continuously.

Results: The initial hemorrhagic shock caused significant reduction in MAP compared to baseline (77.7 ± 5.7 mmHg) vs. shock (44.25 ± 10.9 mmHg; $p < 0.05$). MAP returned to baseline levels after resuscitation in all animals. Intra-abdominal hemorrhage caused a significant decrease in MAP compared to post-resuscitation in all animals (39 ± 13.2 mmHg; $p < 0.05$). However, the inflation of the shock airbag led to an increase in MAP for 60 minutes compared to pre-injury levels (61.2 ± 9.7 mmHg) vs. shock airbag inflation (55 ± 4.1 mmHg; $p > 0.05$). In contrast, the MAP decreased significantly in uncontrolled bleeding animals (15.2 ± 2.8 mmHg; $p < 0.0001$); all animals in that group died within 30 minutes after the injury. The mean air pressure inside the shock airbag was 12.9 ± 4.4 mmHg.

Conclusions: The shock airbag increased MAP in animals with non-compressible intra-abdominal hemorrhage for at least 60 minutes. All animals in the uncontrolled hemorrhage group died within 30 minutes from intra-abdominal bleeding.

58 - Two Minutes for Roughing: A National Analysis of Hockey Injuries

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Background: Hockey is a high-impact sport that carries a risk of injury including head trauma, facial fractures, and lost teeth, but no national-level studies defining the burden of hockey injuries have been performed. This study sought to analyze patient demographics, injury types and severity, need for operative intervention, and outcomes after trauma sustained while playing hockey.

Methods: Retrospective analysis of all hockey-related injuries was performed using the National Trauma Data Bank (NTDB) (2007-2018). Patients were identified based on ICD-9 and -10 codes without exclusions. Demographics, clinical and injury data, and outcomes were collected and analyzed with univariate analysis and exploratory statistics. Bivariate analysis compared clinical and injury data between male and female patients.

Results: Hockey injuries (n=306) comprised <1% of all trauma patients in the NTDB. The median age was 15 [IQR 13-25] and ranged from 5-71 years. Most patients (n=279, 91%) were male. Few were comatose (n=2, 1%), tachycardic (n=4, 1%), or hypotensive (n=3, 1%) on arrival. The median Injury Severity Score (ISS) was 4 [IQR 4-9]. The lower extremities were by far the most frequently injured body region (n=88, 29%), especially tibial and fibular fractures (n=38), while abdominal injuries were the most severe on

average (Abbreviated Injury Scale [AIS] score 3 [IQR 2-3]). Head injuries occurred in 19% (n=57), with median AIS Head 2 [IQR 1-2]. Facial injuries occurred in 6% (n=17), with median AIS Face 1 [IQR 1-2]. Tooth loss was infrequently reported (n=2, 1%). Few patients required emergent nonorthopedic surgery after hockey injuries (craniectomy, n=1, <1%; neck exploration, n=3, 1%; thoracotomy, n=1, <1%; laparotomy, n=0, 0%; extremity vascular procedure, n=2, 1%), although orthopedic procedures were common (n=90, 29%). One patient (<1%) died in hospital after a hockey-related injury. There were no differences in patient factors, vital signs, injury severity, or associated injuries between male and female hockey players, apart from a significantly higher rate of upper extremity (radial and ulnar) fractures among female patients compared to the male cohort (22% vs. 4%, p<0.001).

Conclusions: Perceptions that hockey players frequently sustain head, face, and tooth injuries from collisions, fighting, or stick/puck impacts were not supported by this national-level study, wherein lower extremity fractures were the most common injury. However, minor injuries treated and discharged from the ED are not represented since only admissions were captured. While hockey injury prevention equipment has primarily focused on head/face protection (e.g. helmets, mouthguards), this analysis suggests increased attention to extremity protective measures is warranted.

63 - The prehospital transfusion of plasma by critical care paramedics in British Columbia, Canada.

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Background: The current body of evidence suggests that prehospital transfusion of plasma and packed red blood cells (PRBCs) has the greatest mortality benefit in major-trauma patients when transport times were greater than 20 minutes. Although prehospital transfusion of PRBCs has been widely adopted, ongoing logistical, and safety concerns have prevented widespread adoption of prehospital plasma. The objective of this service evaluation was to describe the introduction of prehospital thawed plasma into a critical care paramedic (CCP) response program in Canada.

Methods: A service evaluation utilizing a retrospective review of electronic patient care records for all patients who received a prehospital transfusion of group A thawed plasma by British Columbia Emergency Health Services (BCEHS) critical care paramedics between March 8, 2021, and October 31, 2021, was conducted. This represents the beginning of the program through to the last possible date that the data could be analysed for the purpose of this abstract.

Results: Seventeen patients received a prehospital transfusion of group A thawed plasma. The median age of the patients was 43.3 years, 64.7% were male, and most patients were victims of blunt trauma. During the study period Vancouver Coast Health Transfusion Medicine (VCH-TM) issued 429 units of PRBCs and 428 units of thawed plasma to BCEHS, 65 (7.6%) units were transfused (31 units of PRBCs and 34 units of thawed plasma), eighteen (2.1%) units were wasted (5 units of PRBCs, and 13 units of thawed plasma), and the remaining 774 (90.3%) units were returned to the TM inventory for future use, resulting in 100% traceability. For those thawed plasma units returned to TM inventory prior to expiration, an additional 47 units were discarded for various reasons. The total wastage rate for thawed plasma units initially issued to BCEHS CCP teams was 14.0% compared to the benchmark wastage rate of 11.5% for thawed plasma units that remained within hospital. There were no patient-related adverse events associated with the prehospital transfusion of plasma.

Conclusions: The results of this service evaluation demonstrate the first successful introduction of prehospital plasma into a CCP response program in Canada with acceptable product utilization, no patient-related adverse events, and complete traceability. Further prospective research is needed to assess the impact of such a protocol on patient-oriented outcomes in this patient population.

65 - Hospital-based injury prevention: defining the role of injury prevention professionals at Canadian trauma centres.

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Background: Injury prevention (IP) is a fundamental component of trauma care delivery. Trauma program accreditation standards in Canada include IP requirements; however, the exact role of IP in a trauma program remains undefined. The Trauma Association of Canada (TAC) IP Committee conducted a national survey to assess the current structure of IP at trauma centres, describe the qualifications and experience of individuals filling those roles, and identify opportunities to advance IP in the Canadian trauma system.

Methods: An expert working group from the TAC IP committee developed the survey. It was modelled on a survey from the American Trauma Society and adapted to the Canadian context. The survey included 24 questions categorized into 4 domains: 1) trauma centre information; 2) current position; 3) injury prevention work; and 4) personal demographics (experience). The survey link was shared over email with TAC members and other national committees with an initial invite and one reminder.

Results: A total of 17 survey responses were received from Ontario (41%), British Columbia (18%), Nova Scotia, and Alberta (12% each), with 6% from each of New Brunswick, Quebec, and Saskatchewan. Forty percent of respondents work at a pediatric trauma centre or a combined adult and pediatric trauma centre (40%), and the remainder at an adult trauma centre (20%). The majority of respondents were associated with a Level I trauma facility (67% pediatric; 56% adult), with 38% identified as an IP Lead/Specialist or an IP Program Coordinator (19%). Most respondents work in a full-time capacity (65%) in the trauma program (63%) or ED (19%), with half reporting to be the only IP member on their team. Approximately half of respondents (47%) report having a Master's degree, with nearly a third (29%) of whom are professionally licensed as an RN. The top IP priorities were falls (71%), motor vehicle collisions (65%), followed by concussions, home safety, and youth injuries, each reported by 38% of respondents. One-quarter of respondents report prioritizing Indigenous-focused programming at their centres. Respondents reported public education (71%), advocacy (65%), community engagement (59%), and research (59%) as common responsibilities of their position. The top barrier to injury prevention work was limited resources (personnel and budget), with 82% of participants reporting this as a challenge, followed by a lack of program strategy/direction (35%).

Conclusions: While standardization and common frameworks strengthen trauma systems in Canada, there are gaps in the area of IP infrastructure that impede efforts to reduce the incidence and severity of injury, a vital responsibility of trauma centres. TAC and the TAC IP Committee are uniquely positioned to develop a standard for IP practice and advocate for improved support across Canada. This survey will help to establish the foundation for IP practice in Canadian trauma systems.

66 - Current use and perceived effectiveness of strategies to prevent long-term opioid therapy following trauma: A Practice Survey

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Background: The opioid crisis is a major national health issue. Long-term opioid use is associated with decreased quality of life, increases in healthcare costs, and may cause more deaths than motor vehicle accidents. Worryingly, up to 20% of trauma patients receiving health services in Canada will use opioids over the long term. However, the optimal preventive strategies are unknown. We sought to describe clinicians' perceived use and effectiveness of strategies aimed at preventing long-term opioid use

Methods: A practice survey was sent to clinicians from three Canadian provinces (Quebec, Ontario, British Columbia) who oversee opioid prescriptions, including physicians, pharmacists and nurse practitioners, in acute care, rehabilitation or community centers. The survey questions were generated based on a previous knowledge synthesis and assessed clinicians' perceived use and effectiveness of strategies to prevent long term opioid therapy. Descriptive statistics were used.

Results: From 776 potential respondents identified, a total of 244 clinicians completed the survey (response rate of 30%). Seventy-five percent of the respondents were from Québec and 25% from Ontario and British Columbia; 63% were medical specialists, 20% were nurse practitioners, and 11% were pharmacists. Most respondents (73%) practiced in teaching hospitals (level 1 or 2 trauma centers). The preventive strategies most often cited were multimodal analgesia (93%), physical stimulation and physiotherapy (76%), downward adjustment of the quantity of opioids according to patient characteristics (72%), and cryotherapy (62%). The least commonly mentioned strategies were pre-established communication mechanisms between professionals outside the practice setting (10%), professional mental health follow-up (10%), alternative pain management strategies (10%), and cannabinoids (6%). The following strategies were believed to be potentially very effective by respondents but were reported to be underused: assessment of risk factors for opioid use, professional follow-up in physical health, training for professionals on opioid prescribing, and communication mechanisms between professionals outside the practice setting. The five strategies ranked as most important for systematic implementation and evaluation of effectiveness were: 1) multimodal analgesia, 2) assessment of risk factors for opioid use, 3) guidelines or protocols for the judicious opioid prescribing, 4) limiting the prescription of opioids according to patient characteristics, and 5) professional follow-up in physical health.

Conclusions: In our survey, we highlighted several strategies for mitigating long-term opioid use currently implemented in the care trajectory of trauma patients in three Canadian provinces and identified those considered most effective. This information will be used to conduct further

research to specify strategies suitable for development and testing to prevent long-term opioid use in this population, while considering key barriers/facilitators to their implementation.

67 - A Canadian experience with the use of REBOA at a level-1 trauma centre: lessons learned from the first 45 cases

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Background: Retrograde endovascular balloon occlusion of the aorta (REBOA) has been used increasingly in severely injured trauma patients as a temporizing measure to control non-compressible hemorrhage until definitive surgical control is achieved. We describe our clinical and institutional experience with the deployment and use of REBOA at a Canadian level-1 trauma centre.

Methods: We performed a retrospective review of a prospectively maintained trauma database at a Canadian level-1 trauma centre. All adult trauma patients in whom a REBOA catheter was deployed were included. Demographics, Injury-Severity Score (ISS), mechanism of injury, initial clinical parameters, details of REBOA insertion, open operative and percutaneous interventions, complications, and clinical and administrative outcomes were reviewed.

Results: Between May 2018 to April 2021, 46 patients were treated with REBOA: 72% were male, median age was 46 years, 87% had a blunt mechanism, and 9.1% in traumatic arrest. A REBOA catheter was successfully placed in 43 cases (93%) with initial aortic occlusion in Zone 1 in 48.8% (n=21) and Zone 3 in 39.5% (n=17). REBOA was most often performed in the trauma bay (n=31, 67.4%) with the remainder performed in the operating room (n=15, 32.6%). Median time to aortic occlusion from arrival at the trauma centre was 39 minutes (IQR 23.5-67.5 minutes). Failed procedures were related to difficulties with arterial access (n=2) and incorrect equipment (n=1). One patient underwent resuscitative thoracotomy for traumatic arrest during attempted REBOA deployment. Nearly all patients survived to surgical intervention in the operating room (n=42, 91.3%), and approximately half underwent a concomitant angioembolization procedure (n=21, 48.8%). Complications of REBOA (n=1, 2.2%) included common femoral artery thrombosis requiring surgical thrombectomy and lower extremity fasciotomy. In-hospital mortality was 47.8% (n=20).

Conclusions: From our experience, REBOA was safe to use, with high rates of procedural success and a low complication rate consistent with other published series. Among critically injured patients managed at our institution, aortic occlusion could be considered earlier in initial trauma resuscitation. The prospective collection of quality and outcome measures may help to further promote the timely and effective use of this intervention.

71 - Compliance with the massive hemorrhage protocol in trauma: a quality-improvement initiative

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Background: Massive bleeding is a leading preventable cause of death worldwide, and its management centres on damage control resuscitation with prompt transfusion of blood components. In 2021, Ontario implemented its first ever provincial evidence-based standardized Massive Hemorrhage Protocol (MHP).

The objective of this study is to assess the compliance with the provincial MHP on pre-identified quality metrics at Sunnybrook Health Sciences Centre – the largest level 1 trauma centre in Canada.

Methods: A retrospective chart review was performed of the most recent 54 consecutive MHP activations before and the first 59 consecutive MHPs after the provincial MHP implementation on April 12, 2021. Fischer Exact Tests and t-tests were used to compare differences between the two groups on seven quality indicators.

Results: In the pre-implementation group, the average age was 53 years, 63% were traumas, and the average length of stay (LOS) was 17 days (16 discharged home, 7 to rehab, 7 to chronic care and 24 (44%) deceased). In the post-implementation group, the average age was 60 years, 56% were traumas, and the average LOS was 21 days (10 discharged home, 12 to rehab, 11 to chronic care, 23 (39%) deceased and 3 were still admitted at the time of data extraction). In terms of (1) red blood cell (RBC) transfusions (goal initiation <15min), faster transfusions were given after the standardized MHP implementation (\bar{x} =4.31 min) compared to before (\bar{x} =20.73 min) (p =0.01). No difference between groups was found for the remaining 6/7 quality indicators: (2) Transitioning to group specific blood products (goal <90min) (61% vs. 81%, p =0.08) (3) Received tranexamic acid within 1 hour (58% vs. 60%, p =0.51), (4) Core temperature >35°C at protocol termination (86% vs. 76%, p =0.44), (5) Patient's hemoglobin >60g/L in the first 24h (92% vs 81%, p =0.89)? Below 110g/L at 24h (64% vs 83%, p =0.05)?, (6) MHP activation appropriate (>6RBC within 24 hours) (70% vs. 76%, p =0.53), and (7) Blood products wasted (13% vs 22%, p =0.23)?

Conclusions: Our study demonstrates that the implementation of the standardized MHP at Sunnybrook resulted in faster RBC transfusions being initiated. Other quality indicators were unchanged, likely because a mature MHP was already in place. Nevertheless, there is room for improvement in more appropriate use of MHP activation and decreased wastage of blood products. This quality audit allows centres to measure and compare compliance with the new Ontario MHP, and flag areas in need of targeted improvement.

75 - High school teen road safety program goes virtual

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Background: During the 2020-2021 pandemic school year, the Montreal Children's Hospital Trauma Centre's Injury Prevention Program effectively adapted its innovative high school road safety program to a virtual format in order to continue offering the program during the global covid-19 pandemic. The *Is The Thrill Worth It?* High School Program aims to reduce the burden of injury in young Quebec drivers by combining a peer-leader program with an interactive school presentation.

Methods: In order to determine the effectiveness, usefulness and level of engagement of the virtual program, 3 separate questionnaires were conducted: (1) to students in grades 10 and 11 who received the *Is the Thrill Worth it?* Presentation, (2) to student peer leaders who ran year-long prevention campaigns and (3) to high school staff involved with the *Is the Thrill Worth it* Program

Results: All of the staff and the majority of students found that the program was engaging and worthwhile. The students who received the presentation appreciated the use of videos, testimonials and trauma simulations to teach and engage them despite the online format. 95% of the students who

received the presentation reported that they found the presentation worthwhile and found that the use of videos, testimonials and using the chat function of zoom to communicate was effective in keeping their attention. When asked what they liked least about the presentation, approximately 10% of students felt that they had already learned the material through driving school and other sources of information; 10% commented on school technology issues such as slow internet connections creating lag within the videos impacting the flow of the presentation. The student peer leaders and staff felt that the virtual orientation session was interactive and informative. Despite its virtual nature, the students completed the assigned tasks and were creative in sustaining engagement of their peers throughout the pandemic. Overall, the peer leader program continued to run and while the students needed to think outside of the box to engage with their peers, they felt that overall it was a positive experience and the presentation was impactful.

Conclusions: Despite the challenges of Covid 19, our Is The Thrill Worth it Program was well received by students and staff. To continue to improve, we will incorporate kahoots games and role-playing activities in order to further encourage student participation for the 2021-2022 school year. Furthermore, to account for overlapping content with mandated discussions of prevention within Quebec driving schools, the presentation is currently being reformatted to cover a wider variety of topics related to risk taking.

77 - Pivoting injury prevention efforts during a pandemic.

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Background: Declaring COVID-19 a pandemic on March 11, 2021, changed the world. Public health directives to stay at home, socially distance, and lockdown by restricting access to businesses, schools, and recreation facilities, fundamentally changed our exposure to injury risk factors, resulting patterns of injury, and conducting injury prevention (IP). The objective of this study was to determine the impact the COVID-19 pandemic on injury and its prevention at trauma centres in Canada and the United States.

Methods: A survey was created and pre-tested on the REDCap platform. Survey domains were: 1) IP initiatives; 2) injury data; 3) staffing and funding; 5) IP pandemic pivots; 6) facilitators and barriers; 7) training; and 8) demographics. The online survey was distributed through trauma/IP associations: Pediatric Trauma Society, Trauma Association of Canada, and Injury Free Coalition for Kids. An initial survey invitation and two email reminders were distributed to members. Descriptive statistics were calculated on responses.

Results: A total A total of 59 responses were received from pediatric (43%), adult (12%), and combined (34%) trauma centres, from 22 states and 4 provinces. Most respondents were female (71%), in an IP Specialist role (68%), averaging 10.5 years IP experience. The majority (89%) of programs targeted age groups from birth to 15 years old. Nearly one-third reported IP to be less of an institutional priority with 18% of centres having funding changes [median -17% (-41, 8.5)], resulting in staffing changes at 37% of centres (36% redeployments and 15% terminations). IP efforts decreased at 63% trauma centres during the pandemic, particularly with in-person programs, including community events (-87%) and school-based programs (-83%). Overall, 85% of respondents reviewed injury data to keep current with changing injury epidemiology. The top reported increased mechanisms were mainly intentional: GSW (78%), abuse (73%), assaults (70%), self-inflicted (70%). Leading increased unintentional injuries were home

(65%), ATV (64%), and cycling (56%) injuries. Leading pivots and innovations were presenting (75%) or participating (73%) in IP education virtually, posting on social media (61%), adding technology (31%), and combining COVID-IP messaging (17%). Virtual programming was the leading training requested (77%). Top barriers to pivoting were redeployment of partners (46%) and staff (31%), and lack of technology (39%) in the target population. Facilitators were technology at centre (76%), support of trauma program (66%), and having funding maintained.

Conclusions: Nearly two-thirds of trauma centres decreased IP efforts during the pandemic due to staffing and funding reductions. The leading increased injury mechanisms were intentional, so further intentional and violence prevention is needed, along with support for mental health. While trauma centres successfully pivoted by using technology and going virtual, access issues in the target population were a barrier resulting in health inequities. This needs addressing to be able to prevent injuries for all subpopulations equally.

79 - The Cost of Firearm Injuries in British Columbia, 2012-2016

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Background: Firearm incidents can devastate lives, incite fear, and impose heavy social, psychological, and monetary burdens on the victims, their families and communities, and exact considerable costs on health care and criminal justice systems. Estimating the cost of firearm incidents is complicated and challenging as outcomes and consequences vary widely from case to case. This study aimed to quantify the total cost of firearm-related injury and death in British Columbia over a five-year period, 2012 to 2016.

Methods: Firearm-related injury and death data were extracted using the ICD-10 CA for the period 2012 – 2016. Direct and indirect human costs were calculated using an incidence costing, human capital approach covering the lifetime of the injured individual. Criminal justice costs were estimated by applying weighted average costs to aggregate expenditures using costing methodology consistent with STATCAN. Violence prevention and intervention programming costs were retrieved from the BC Ministry of Public Safety and Solicitor General.

Results: There was a total of 539 deaths and 438 hospitalizations resulting from firearm-related injuries (Table 1). The total cost of all firearm injury and death averaged \$161.4 M per year; human costs, which includes health care costs and productivity losses, averaged \$55.5 M per year, and criminal justice system costs averaged \$105.0 M per year, and accounted for 83% of the total violent crime costs. The average costs of firearm violent crime, unintentional acts, and self-harm totaled \$127.2 M, \$2.9 M and \$31.3 M per year. Violent crime accounted for 79% of the criminal justice system costs, while self-harm represented 19% of the total criminal justice system costs. Productivity losses were highest for self-harm injuries and deaths, representing 62% of the total productivity costs and averaging \$29.9 M per year.

Conclusions: This study is the first to estimate the cost of firearm injury in B.C., and clearly demonstrates the significant cost of firearm injury and impacts on health care, criminal justice, and society at large. Deliberate investment and intervention can decrease rates of firearm violence, but initiatives must be malleable and aligned with the fast-changing illegal firearm environment. This study highlights the scope of opportunities available to policy makers and government for investment in prevention programs.

80 - Normotension in older trauma patients is not reassuring – a multicentre, observational study of a trauma registry

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Background: The population of older trauma patients is increasing. Systolic blood pressure (SBP) is commonly used to assess severity and some authors advocated adjusting SBP threshold. However, the literature is heterogenous and there is no consensus on which threshold is the most appropriate for older patients. We aimed to describe and compare the relationship between mortality and prehospital SBP in older patients (65-74 years and ≥ 75 years) and their younger counterparts (16-64 years).

Methods: Data from the Quebec Trauma Registry including patients admitted in three level I trauma centres (2003-2017) were analysed. We performed logistic regressions with age and SBP to obtain mortality curves. We calculated sensitivity, specificity, positive and negative predictive values for each SBP cutoffs from 90 to 130 mmHg in 10-mmHg increments. Subgroup analyses were performed for major trauma admissions (ISS \geq 12) and severe traumatic brain injury admissions (GCS \leq 8). Primary outcome was in-hospital mortality.

Results: We included 47,661 trauma admissions. Mean ISS and mortality rates were 14 and 3.9%, 14 and 8.1%, 12 and 11.7% in the 16-64, 65-74, ≥ 75 years age groups, respectively. The relationship between prehospital SBP and mortality was nonlinear. Mortality proportionally increased with each 10-mmHg SBP increments across all age groups, and this increase was greater in older patients. The maximum combination of sensitivity and specificity was found at a SBP of 130 mmHg for both older groups (37.5% and 69.5% in the 65–74-years group; 31.7% and 76.0% in the ≥ 75 years group).

Conclusions: A SBP threshold of 130 mmHg may be more accurate to triage older patients with an increased risk of mortality compared to the standard 90 mmHg. However, relationship between SBP and mortality is nonlinear. Hence, binary cut-off should be abandoned, and risk prediction model studies are required to develop senior-friendly triaging tools where SBP should be integrated as a continuous variable and compiled with other predictors because of its low sensitivity to predict mortality.

82 - Clinical launch of the next generation pREBOA-PRO catheter designed for partial resuscitative endovascular balloon occlusion of the aorta (REBOA).

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Background: Partial REBOA has the potential to address the significant ischemic limitations of zone 1 REBOA. We report the launch of a new partial REBOA catheter (pREBOA-PRO) at seven level 1 trauma centers with a focus on partnership, case review, and multidisciplinary education to rapidly disseminate best practices.

Methods: A consensus guideline for early arterial access was created with a focus on hemodynamic and physiologic triggers. REBOA was used after transient or no response to blood product resuscitation. Real-time data analysis and case review across centers was implemented for continuous process improvement.

Results: Femoral access was obtained in 226 patients and progressed to REBOA in 39 (16%) patients. In 21 (54%) cases, complete occlusion was initiated followed by partial REBOA. Partial occlusion was initiated in 10 (26%) cases. Blunt trauma was the most common injury mechanism with 25 (64%) cases, followed by 10 (26%) penetrating trauma and 4 (10%) non-trauma hemorrhage. Zone 1 placement occurred in 33 (85%) cases, with average total occlusion time of 53 minutes and average partial occlusion time of 39 minutes. In the seven cases exceeding 70 minutes, 85% and 71% of surgeons reported that partial REBOA extended their safe occlusion time and reduced or eliminated distal ischemic insult, respectively.

Conclusions: We report deliberate, multi-center clinical launch of a new catheter designed for partial REBOA along with consensus guidelines for patient selection. The device functioned as intended, enabling simple and reliable manual control of partial REBOA. Partial REBOA was reported to mitigate distal ischemia in cases exceeding 70 minutes.

84 - Burn patients with concomitant injuries: are we overusing CT scans?

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Background: A combination of burn and non-thermal injury is a rare occurrence. The prevalence of combined burn-trauma injuries varies between 0.44 and 5.8%. This study aims to evaluate the use of computed tomography (CT) imaging during the initial evaluation of burn patients and to examine the proportion of burn patients with concomitant head, chest, abdominal and pelvic injuries among those who had CT scans performed.

Methods: Adult burn patients were identified from the National Trauma Data Bank (NTDB) from 2017 – 2019 with CT imaging performed within 24 hours of arrival. Patient demographics, Glasgow Coma Scale (GCS), Shock Index (SI), Injury Severity Score (ISS), Abbreviated Injury Scale (AIS) for burn, head, chest, abdomen, and pelvis, blood transfusions, and surgery for hemorrhage control were evaluated. Using multivariate logistic regression, we identified predictors of mortality.

Results: A total of 2,463 predominantly male (66.7%) patients met inclusion criteria. The median age was 52 years (IQR=36, 64). 54.9% were admitted to a Level I trauma center, and 7.5% had work-related injuries. Laparotomy and thoracotomy were performed in 0.8% and 0.1% of patients, respectively.

Median length of hospital stay was 4 days (IQR= 2, 13). Severe injuries to the head (3.1%), chest (0.04%), abdomen (8.6%), and pelvis (0.5%) were noted. Complications were identified in 15.4% of cases, with a 3.1% rate of acute kidney injury. Overall mortality was 9.9%.

Compared to those who survived, non-survivors were older (59 vs. 51 years, $p < 0.001$), with a higher proportion of patients that had second or third-degree burns with Total Burn Surface Area (TBSA) of 20% or greater ($p < 0.01$). Non survivors had more severe injuries to the head (14.3% vs. 1.8%, $p < 0.001$), abdomen (28.7% vs. 6.4%, $p < 0.001$) and pelvis (2% vs. 0.3%, $p < 0.001$). A greater proportion of non-survivors had blood transfusions (4.5% vs. 0.8%, $p < 0.001$).

Multivariate logistic regression analysis revealed age (OR 1.045, 95% CI: 1.033 – 1.058), GCS 3-8 vs GCS 13-15 (OR 3.165, 95% CI: 2.107 – 4.756), higher SI, increased burn severity, head AIS>3 (OR 8.221, 95% CI: 4.198 – 16.099), and abdomen AIS>3 (OR 4.185, 95% CI: 2.576 – 6.799) to be independent risk factors for mortality.

Conclusions: The results of this study indicate that head and abdominal injuries are not only prevalent but have a significant impact on mortality. Thoracic and pelvic injuries are less prevalent. Routine imaging of head and abdomen of burn patients with blunt trauma is justified.

87 - The sim of Theseus: Longitudinal trauma simulation creates a richer and more complex communication network among trauma teams

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Background: Simulation is commonly used to provide training for trauma teams. We previously showed a correlation between the non-technical, *i.e.* communication, performance of teams in a trauma simulation and their technical performance. However, the nature of the communication in each team, and what might make one better than another remains unclear. We investigated the changes in the communication network during trauma simulation in a general surgery residency program over its first five years.

Methods: Data were collected from 2016 to 2021. Audio and video recordings from each simulation session were analyzed. Instances of communication were counted between all members of each team. This was used to create a directed graph that represents communication during the session. Analysis was done using graph theory. Elapsed time to critical events in each session was recorded. We compared results statistically between 2016 and 2021.

Results: 59 separate simulation sessions were analyzed. Session duration did not change (810 ± 181 vs. 714 ± 97 s, $p = 0.08$). The total number of communication events during each session was 248 ± 61 in 2016 and 223 ± 107 in 2021 ($p = 0.23$), however there was a shift between the patterns of communication that occurred. The number of communications between the TTL and confederate decreased (60 ± 23 vs 43 ± 17 , $p = 0.037$). The percentage of communication that was between the trauma team leader (TTL) and the simulation confederate appeared to decrease ($13 \pm 11\%$ vs $10 \pm 4\%$, $p = 0.09$). The graph centrality of the TTL also appeared to decrease between 2016 and 2021 (161 ± 43 vs 133 ± 53 , $p = 0.08$). This is consistent with a larger proportional role of the other team members than the TTL. 2021 simulations were not quicker to complete critical events in each session, but the variation between teams decreased suggesting teams become more similar in performance over time.

Conclusions: Our main result is that as our trauma simulation program goes on, the level of communication among each team has changed markedly. In the beginning of our program, the TTL would communicate primarily with the session confederate and then issue commands to the team. As the simulation program has evolved, team communication has evolved into a richer more complex network. This shift demonstrates that longitudinal trauma simulation enhances the complexity and richness of team dynamics.

89 - Do we need neuroimaging in every case of strangulation and near-hanging: Contemporary experience from a Canada level 1 Trauma Center

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Background: Computed tomography (CT) is highly sensitive for injuries in the neck and can be used to rule-out cervical spine, cerebrovascular, and aerodigestive injuries after blunt and penetrating trauma. However, the use of CT imaging may be overutilized in the context of hanging or strangulation injuries. The objective of this study was to determine the diagnostic yield of CT imaging among patients evaluated for hanging or strangulation mechanisms at a Canadian Level-1 trauma centre.

Methods: All adult patients evaluated for hanging or strangulation injuries at our Level-1 trauma centre over a ten-year period were reviewed. The primary outcome was the diagnostic yield of CT imaging for major aerodigestive, cervical spine, cerebrovascular, and neurological injuries. Multiple logistic regression was performed to determine predictive factors for the use of CT imaging, and for the presence of significant injury identified on imaging.

Results: Among 103 patients evaluated for hanging (n=81) or strangulation (n=22) injuries during the study period, 44 (42.7%) were transfers accepted by the trauma team leader (TTL), and 36 (35%) were transferred from a community in northern Quebec. 80 (77.7%) were evaluated with CT imaging (n=66 CT angio neck, n=66 c-spine, and n=59 head). A total of 10 injuries in 8 patients were identified on imaging (7 anoxic brain injuries, 2 aerodigestive, 1 cerebrovascular, and 0 cervical spine injuries) with an overall diagnostic yield of 9.9%. Most injuries were identified among intubated patients with depressed level of consciousness. The diagnostic yield for cerebrovascular injuries was 1.5%. (1 injury in 66 scans). The most common physical exam findings were neck tenderness and ecchymoses or ligature marks. Factors predicting the use of CT imaging were hanging vs. strangulation mechanism (OR 4.56 95% CI[1.10, 22.2]), abnormal physical exam findings (OR 16.3 95%CI[4.83, 67.6]), and transfer accepted by the TTL (OR 7.77 95%CI[1.99, 36.7]). There was an insufficient number of events to meaningfully evaluate risk factors for incidence of injury identified on imaging.

Conclusions: CT imaging is frequently used in the evaluation of trauma patients presenting with hanging or strangulation mechanisms at our institution. Factors predictive of imaging use included transfers accepted by the TTL, hanging mechanism, and abnormal physical exam findings. Only three cerebrovascular, aerodigestive, or cervical spine injuries were identified among the 80 patients imaged. The low diagnostic yield (2.5 injuries identified per hundred patients imaged) should prompt the development of tools and institutional protocols to guide the evaluation of hanging and strangulation injuries.

90 - Management of retained traumatic hemothorax: barriers, beliefs and practice patterns. A survey of surgeons at level 1 trauma centers in Canada.

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Background: Retained hemothorax is a common sequelae of chest trauma, and recent guidelines recommend management with Video Assisted Thoracoscopic Surgery (VATS). The degree to which this practice has been adopted clinically and the barriers that exist in the Canadian setting remains unknown. We conducted a survey to evaluate current practice patterns of Canadian surgeons at level 1 trauma centers with regards to the definition, workup, and management of retained hemothorax.

Methods: Between May and October 2021, we conducted an internet-based cross-sectional survey of surgeons caring for adult trauma patients at level 1 trauma centers across 8 provinces in Canada. Using a questionnaire designed and tested for this study, we identified self-reported practice patterns in the management of retained hemothorax as well as perceived barriers and facilitators to the use of VATS. Three reminders to complete the survey were sent at 3-week intervals.

Results: Forty-nine (70% response rate) Canadian surgeons across 15 level 1 trauma centres responded. Central Canada (33% n=23) followed by the Prairie Provinces (23% n=16) were the most common sites of respondents. The majority (56% n=27) defined a retained hemothorax as greater than 500 ml in volume and/or occupying greater than one-third of the thoracic cavity on XR, US, or CT after 48 hours of chest tube placement. Although 94% (n=46) state VATS is an effective management strategy and 86% (n=42) state VATS improves outcomes, only 49% perform (n=24) perform VATS as first-line management of retained hemothorax in young patients, followed by 29% (n=14) intrapleural fibrinolytic therapy. In elderly patients, intrapleural fibrinolytic therapy (43% n=21) was the most common management strategy followed by VATS (20% n=10). Of the 40% (n=19) of respondents who do not currently perform VATS, 63% (n=12) have considered implementing it. Fifty percent (n=24) of respondents indicated that VATS is performed by thoracic surgeons at their sites; however, most reported a model of off-site thoracics coverage (65% n=32). Availability of operating room time was the most commonly listed barrier (60%, n=29), followed by surgeon skill/comfort (50%, n=24), and colleagues' opinions/practice patterns (40%, n=19). Additional evidence for VATS was the most commonly listed facilitator (47%, n=22), followed by surgical skill training (40%, n=19).

Conclusions: The management of retained hemothorax by Canadian surgeons at level 1 adult trauma centers remains heterogeneous; although the vast majority agree VATS is an effective first line therapy less than half currently use VATS as first line. System and provider barriers exist to the use of VATS, and respondents indicated a need for additional resources (VATS equipment, OR time), institutional support, and skills training to increase its use.

101 - In-hospital prescribing practices for opioid and non-opioid analgesia at a level one trauma center: a retrospective review

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Background: Alberta has the highest rate of weak oral opioid distribution in Canada. Opioid use in hospital can lead to subsequent opioid use disorder, and many surgical procedures are associated with

increased odds of developing chronic opioid use. Unfortunately, non-opioid analgesics remain underutilized post operatively. Our objective was to evaluate opioid and non-opioid prescribing patterns in hospitalized trauma patients at a level one trauma center in Edmonton, Alberta.

Methods: Retrospective review of patients admitted to University of Alberta Hospital Trauma Service June 1st - August 31st, 2020. Exclusion criteria: <18 years, >65 years, and length of stay >10 days. We extracted demographics, injury characteristic, daily morphine milligram equivalents (MMEs) use, NSAID use and contraindications. Univariate and multivariate analyses evaluated relationships between opioid and NSAID prescribing in hospital, injury severity score (ISS), injury mechanism, chronic pain or opioid use history, and prescriber group.

Results: A cohort of 123 patients was identified. Three quarters (92) identified as male. Average length of stay was 3.7 days (SD 2.5). The most common mechanism of injury was blunt trauma (82%), followed by penetrating (17%) and burns (1%), with mean ISS of 10. Chronic pain disorders were identified in 6% of patients with 2% reporting opioid use on admission.

All patients were prescribed opioids in hospital while 73% were prescribed NSAIDs, despite few patients having contraindications to NSAIDs (4.1%). On univariate analysis, mean days of prescribed opioids was significantly greater than mean days of prescribed NSAIDs (3.6 vs 2.1 days, $p<0.01$). This significant difference held across prescriber groups (trauma surgery, other surgical services), mechanism of injury, and increasing ISS. However, patients with a chronic pain disorder or history of opioid use on admission revealed no difference between mean opioid prescription days and mean NSAID prescription days.

Multivariate analysis confirmed that higher Injury Severity Score (ISS) had a significantly larger difference in mean days of prescribed opioids vs mean days of prescribed NSAIDs ($p<0.05$).

Daily MME prescribing significantly decreased during the hospital stay, from mean 111 MMEs on post-admission day 1 to 15 MME on post-admission day 10 ($p<0.05$). No difference in opioid prescribing based on prescriber group was identified.

Conclusions: All patients admitted to our trauma service received opioids in hospital. Only 74% received NSAIDs; <5% had contraindications. Those receiving NSAIDs still had significantly more days of prescribed opioids, except patients with chronic pain or opioid use disorder, who had similar days of opioids and NSAIDs. Hospital opioid use is a risk factor for chronic opioid use. Although MMEs decreased daily, we identified an opportunity to improve non-opioid analgesia prescribing and further reduce hospital opioids.

103 - Bicycle helmet use during the COVID-19 pandemic in Montreal

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Background: Helmets play a crucial role in preventing traumatic brain injuries (TBIs) in cyclists. The COVID-19 pandemic has led to an increase in bicycle use; however, the increased prevalence of bike-sharing programs may have led to decreased helmet use. Therefore, the purpose of this study is to

evaluate proper helmet use among Montreal cyclists during the Covid pandemic in comparison to historical data to help guide injury prevention programs.

Methods: Using a cross-sectional study design, cyclists were observed during cumulative 60-minute periods at 18 locations on the island of Montreal from June to September 2021. Proper helmet wear was assessed at one location over 5 hours. Unadjusted and adjusted odds ratios (aOR) were calculated for both helmet use and properly fitted helmet use. Findings were compared to those from previously available data collected in 2011 to assess trends over time and during the COVID pandemic.

Results: Among 2,200 cyclists observed, 1100 (50%) were wearing a helmet. When adjusting for gender, age, ethnicity and type of bicycle, males (aOR 0.78, 95% CI 0.65-0.95), young adults (aOR 0.65, 95% CI 0.51-0.84), visible minorities (aOR 0.38, 95% CI 0.28-0.53) and bike-sharing program users (aOR 0.21, 95% CI 0.15-0.28) were significantly less likely to be wearing a helmet. Children (aOR 3.92, 95% CI 2.17-7.08) and cyclists using racing bicycles (aOR 3.84, 95% CI 2.62-5.62) were significantly more likely to be wearing a helmet. Among 213 cyclists observed at a single location, 139 (65%) were found to have properly fitted helmets. There was a trend for males (aOR 0.73, 95% CI 0.40-1.34) and visible minorities (aOR 0.74, 95% CI 0.33-1.65) to have less properly fitted helmets as compared to females and Caucasians, respectively. Observed children (aOR 0.13, 95% CI 0.04-0.41) had lower rates of properly-fitted helmets compared to adults and seniors. As compared to 2011, helmet use during the Covid pandemic increased significantly [1100/2200 (50%) vs. 2192/4789 (46%); $p=0.049$].

Conclusions: Helmet use in Montreal cyclists during the COVID-19 pandemic increased as compared to 2011 and was associated with age, gender, ethnicity, and type of bicycle. However, children were less likely to have properly fitted helmets. These findings can help better target future injury prevention programs. The recent increase in popularity of cycling and expansion of bike-sharing programs reinforce the need for bicycle helmet awareness initiatives, legislation, and funding priorities.

104 - Discharge prescription and filling practices for opioid and non-opioid analgesia in a trauma population: a retrospective review at an Alberta tertiary care center.

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Background: Canada is experiencing a dual pandemic of COVID-19 and opioid misuse. Trauma patients have pain-inciting injuries. Inadequate pain control can cause negative outcomes, including decreased quality of life, delayed return to work, and psychological distress. Multi-modal pain control can provide effective analgesia while sparing opioid use. Alberta physicians are amongst the highest opioid prescribers in Canada. Our objective was to characterize trauma provider discharge prescriptions and patient prescription filling practices for opioid and non-opioid medications.

Methods: We performed a retrospective chart audit for 18–64-year-old patients admitted to the University of Alberta Hospital Trauma Service from June 1 to August 31, 2020. 176 patients were identified: length of stay <10 days was excluded (53). Variables included demographics, injury characteristics, discharge prescription, prescription filling, and repeat prescriptions. Univariate analyses were performed to identify relationships between injury, history of chronic pain or opioid addiction, analgesia discharge prescriptions, and refills.

Results: The 123-patient cohort included 92 males (75%). Average length of stay was 3.7 days (SD 2.5 days; range 0-10 days). Most patients (101; 82%) sustained blunt trauma; 21 (17%) sustained penetrating trauma, and 1 burn injury. Average Injury Severity Score (ISS) was 10. History of opioid addiction (3; 2.4%) or chronic pain (7; 5.7%) was uncommon.

Sixty-eight patients (55%) were discharged with an opioid prescription; 6 were unfilled. Average Morphine Milligram Equivalents (MMEs) of discharge prescriptions was 139 (range 37.5-600). Three quarters (48/68; 74%) discharged with an opioid prescription received a second opioid prescription within 3 months, from a different provider. Average MMEs for second prescriptions was 321 MMEs (range 60-2700). Univariate analyses did not identify any relationship between ISS, mechanism of injury, history of opioid use or chronic pain and discharge opioid prescription or refilling opioid prescriptions.

Fifty-five patients (44%) were discharged with a non-opioid prescription (NSAIDs, gabapentinoids, and/or muscle relaxants). Similarly, there was no relationship between ISS, injury mechanism, or history of opioid use or chronic pain and non-opioid prescriptions identified. Muscle relaxants were the most frequently prescribed non-opioid medication (55/124) but filled less than 1/3 of the time (17/55 patients). Despite only 2/124 having contraindications to NSAIDs, NSAIDs were the second most often frequent non-opioid discharge prescription (45/124) and filled only 2/3 of the time (30/45). Gabapentinoids were the least frequently prescribed.

Conclusions: Multi-modal analgesia is recommended after injury. Over 50% of our cohort received a discharge opioid prescription, but <50% received non-opioid prescriptions. Surprisingly, injury mechanism, severity, and chronic pain or opioid addiction history did not influence discharge prescriptions. Further, patients filled non-opioid prescriptions variably and repeat out-patient opioid prescriptions were common. Reducing opioids following injury requires a multi-pronged approach including trauma providers, primary care providers, and patients to inform prescribing practices while optimizing patient analgesia.

107 - Repeat CT imaging increases detection of delayed pseudoaneurysms in patients with high-grade solid organ injury following abdominal trauma

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Background: Abdominal trauma can be complicated by the development of delayed pseudoaneurysms. Early intervention reduces the risk of rupture, increases organ salvage, and potentially decreases mortality. The objective of this study is to examine the utility of repeat CT imaging for the detection of latent pseudoaneurysms in patients with injury to the spleen, liver, or kidney post abdominal trauma. This is particularly significant with the recent shift towards non-operative management of these patients.

Methods: A retrospective cohort study reviewing the local trauma registry between the period 2013-2019. Patients with high-grade (AAST grade 3 or higher) solid organ injury following abdominal trauma were identified from the registry at the Montreal General Hospital (MGH). A chart review was completed and data examining basic demographics, mechanism of injury, ISS score, AAST injury grade, CT imaging radiologist reports, and interventions were collected. Descriptive analysis was done.

Results: After excluding low-grade injuries, we found 283 patients with 334 solid organ injuries. Of those, 84 cases were excluded because of a lack of repeat imaging or incomplete chart. The average age was 38.4 years, 28% were female, 90.5% had blunt trauma and 9.5% had penetrating trauma. The average ISS score was 25 in patients without pseudoaneurysms, and 20.5 in those who subsequently developed pseudoaneurysms. Organ injuries were 26% kidney, 39.3% spleen, and 34.7% liver. The management was 55.5% nonoperative, 29.6% had initial angioembolization, and 12.8% went to the operating room which represents the liver injuries in the cohort. Of the non-operative injuries, 11.9% had pseudoaneurysms detected on repeat CT imaging within 72 hours. Grade 3 represents the majority of the injuries at 65.4%. The majority of these patients underwent angioembolization.

Conclusions: In patients with high-grade solid organ injury following abdominal trauma, repeat CT imaging, within 72 hours, increased detection of delayed development of pseudoaneurysms in 12% of injuries. The majority of the patients were asymptomatic and required angioembolization.

109 - Relationship between anti-Xa level achieved with prophylactic low-molecular weight heparin and venous thromboembolism in trauma patients: a systematic review and meta-analysis.

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Background: Trauma patients have a simultaneously high venous thromboembolism (VTE) and bleeding risk. Optimal chemoprophylaxis regimens remain unclear. This study aims to answer three questions for trauma patients. Is there any association between anti-Xa level and clinical VTE? Do dose adjustment protocols improve prophylactic anti-Xa rates? Do dose adjustment protocols improve anti-Xa adequacy and VTE compared to standard dosing?

Methods: Systematic search was conducted in May 2021 and trauma studies were included that: evaluated low-molecular-weight heparin chemoprophylaxis, reported anti-Xa levels, and evaluated outcomes of interest. Analysis #1 compared patients with adequate anti-Xa levels to inadequate anti-Xa using VTE as the primary outcome. Analysis #2 reported effects of dose adjustment on anti-Xa. Analysis #3 compared standard dosing to dose-adjustment with the primary outcome being anti-Xa adequacy; secondary outcomes being VTE, pulmonary embolism, and bleeding complications.

Results: 3401 studies were evaluated with 24 being included (19 retrospective case or cohort studies, 4 prospective cohort studies, 1 prospective observational study). In analysis #1, achieving peak anti-Xa levels ≥ 0.2 IU/ml or trough levels ≥ 0.1 was associated with reduced odds of VTE (4.0% to 3.1%, OR 0.52, $p = 0.03$). Analysis #2 demonstrated that a substantial number of patients ($n = 768$, 75.3%) achieved prophylactic anti-Xa following dose adjustment protocols. Analysis three showed that dose adjusted chemoprophylaxis achieved peak anti-Xa levels ≥ 0.2 IU/ml or trough levels ≥ 0.1 more frequently (66.0% vs 44.8%, OR 4.05, $p = 0.007$) but without statistically significant difference in VTE (3.1% vs 4.5% OR 0.72, $p = 0.15$) or PE (0.4% vs 1.2%, OR 0.48, $p = 0.10$). In subgroup analysis, anti-Xa dose adjustment also showed no VTE reduction, although a non-statistically significant trend was noted (2.8% vs 4.7%, OR 0.68, $p = 0.08$).

Conclusions: Patients with higher anti-Xa levels are less likely to experience VTE and anti-Xa guided chemoprophylaxis increases anti-Xa adequacy. However, dose adjustment, including anti-Xa guided dosing, may not reduce VTE. Future prospective studies evaluating the use of anti-Xa guided chemoprophylaxis are needed.

110 - Mental health in public safety personnel with traumatic workplace injuries requiring surgery: A longitudinal, population-wide administrative data analysis.

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Background: Public Safety Personnel (PSP; police, firefighters, paramedics) suffer from mental disorders (MDs) at higher rates than the general population (GP). Traumatic injury requiring surgery is a risk factor for MD development in the GP but there is limited literature on it as a risk factor in PSP. This study asks: accounting for pre-injury mental health, do PSP with workplace-injuries (WPI) requiring surgery have higher post-injury rates of MDs compared to the GP with similar non-WPI?

Methods: This is a retrospective, longitudinal cohort study. PSP with WPI requiring surgery were identified (n=293) from the Manitoba Workers Compensation Board registry and matched up to 1:5 on age, sex, geographic region, and surgical procedure code with a cohort of the GP with similar non-WPI (n=1198). Prevalence of MDs between the groups were compared for 2 years pre- and post-injury date using deidentified-linked, administrative healthcare data. Rates were adjusted for sex, income, and geographic region.

Results: This study analyzed \$8,499,932.00 worth of Workers Compensation Board claims that resulted in 43,181 workdays lost for the 293 PSP workers studied. The only significant demographic difference between the PSP with WPI and GP with non-WPI cohorts was income in which the PSP with WPI cohort had a higher proportion of individuals in the high-income bracket (73.72% vs 64.02%; p=0.0017). This study analyzed rates of depressive, anxiety, and substance-abuse disorders, as well as suicide attempt hospitalizations. Rates of the latter 2 were not presented due to low case numbers. This study found that PSP with traumatic WPI had a significantly higher prevalence of depressive disorders in the 2 years following injury compared to the GP with similar non-WPI (RR (relative rate) = 1.49; 95%CI 1.02-2.17). When age, sex, geographic region, income, and follow-up length were adjusted for, there was no significant difference in the prevalence of post-injury depression between cohorts (ARR (adjusted relative rate) = 1.37; 95%CI 0.99-1.89). The significant group by care period interaction term for depressive disorders (p = 0.0142) indicates a significantly higher relative rate in PSP compared to GP after adjustment.

Conclusions: Traumatic WPI in PSP substantially impacts finances and productivity for individual workers and their organizations. This study suggests WPI requiring surgery may be a risk factor for PSP developing depression and that there may be factors unique to PSP that contribute to the increased rate of depression following injury compared to the GP. PSP have a unique mental-health trajectory following WPI that should be considered when creating improved rehabilitation strategies for this important population.

111 - How to establish an internal data validation process with limited resources: Experience from a Level 1 Trauma Centre

Derek Goltz¹, Sonshire Figueira¹, Jacinthe Lampron¹ From the ¹The Ottawa Hospital

Background: Administrative human resources for our Trauma Program at a Level 1 Trauma Center are limited. All pre-submission and submission efforts related to TQIP® were solely done by our single trauma registrar. Until recently, our center was not using a formal method to perform internal validations before submissions. Not validating our data internally before submission proved to be an incredibly cumbersome process to verify data integrity retrospectively and potentially misleading. As a result, a quality improvement project was initiated.

Methods: Since our center was identified as an outlier for certain “Hospital Event(s)”, a systematic internal validation process was initiated to evaluate cases that were internally flagged as occurrences in these indicators. As part of the implementation strategy, the team developed a comprehensive process: bi-weekly scheduled reviews and an excel tool to ensure at least two-assessors (minimum one clinical and one registrar) reviewed TQIP® “Hospital Event(s)” before submissions.

Results: Sequential and observable testing was carried out through bi-weekly touch base sessions, clinical case reviews and PDSA cycles. Subjectively, our registrar feels supported and more enthusiastic about submissions and less concerned about the drill-down process after receiving reports. Moreover, trauma team members feel more confident about data interpretation with these steps in place.

Objectively, reduced drill-down time and the ability to prospectively identify potential errors/discrepancies and tentative trends before receiving benchmarked reports proved efficacious. Triggering reviews for all cases that developed a “Hospital Event(s)”, including those not accepted/included in TQIP® reports, ensures a comprehensive approach. From an educational/engagement perspective, all members of the team became familiar with NTDS/TQIP® definitions which should facilitate future pre-submission reviews and report interpretation.

Additionally, there is potential to improve our electronic medical record’s system to ensure consistency in data collection and foster clear documentation to facilitate interpretation.

All steps of the intervention were preformed as planned, project milestones remain on track and submissions were completed prior to set deadlines.

As expected, excluding the first PDSA cycle, all hospital events were review prior to submissions, all events identified by the registrar were validated by at least one clinician and all discrepancies were resolved prior to submissions.

Conclusions: Development of an internal validation process (pre-submission) and tool with minimal resources is feasible depending on current volumes and ability to access cases on a bi-weekly basis. This, in turn, positively impacts perceived confidence, engagement, collaboration and proactiveness. Moreover, this tool and process could also positively impact drill-down efforts after receiving reports. More data/reports are required to establish trends/impact.

114 - How do simulated emergency airway scenarios differ from clinical encounters - an observational study using the Emergency Medicine - AirWAY REgistry (EM-AWARE). Jillian Allan, Mario Jones, Dr. James French, Dr. Kavish Chandra, Jacqueline Fraser. From the S

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Background: Rapid sequence intubation (RSI) is a method of airway control involving the administration of sedatives and paralytics, followed by endotracheal intubation. While it is considered an essential skill for emergency physicians, it is not performed routinely. Physicians may rely on simulated training to maintain their skills. For these simulations to be effective, they must accurately represent clinical encounters. In this study, we evaluated the fidelity of simulations through creation and analysis of an emergency airway.

Methods: We created an airway registry database using retrospective data from the past 5 years of emergency department RSIs performed at a tertiary care hospital, as well as data from RSI simulation training. Information collected included data surrounding the intubation event such as patient demographics, clinical presentation, intervention metrics, and outcomes. These data points were then analyzed to compare real life cases to simulation vignettes to evaluate their effectiveness. Recruitment bias was minimized using multi-method analysis.

Results: Based on our analysis of clinical and simulated cases, we found that our simulated scenarios were not representative of the patient population coming into the ED. Of the 179 patient charts that were reviewed, the proportion of medically related indications for RSI was 87.15% (95% CI: 81.40%-91.34%), and 10.06% (95% CI: 6.38%-15.41%) were trauma related. This is compared to 2.78% (95% CI: <0.01%-15.42%) and 75.00% (95% CI: 58.74%-86.44%) in the simulated cases, respectively. Simulations were geared towards trauma events, such as falls, motor vehicle collisions, and penetrating injuries, and clinical encounters were predominantly medically related, with stroke, overdose and sepsis being the biggest contributors. Demographics of the patient population also differed significantly between simulated and clinical cases. Based on biological sex, 55.90% of real-life patients were male, and 41.30% were female, as opposed to 91.70% male and 2.78% female in the simulations. The average age of patients seen in the ED was 55.42, compared to 36.47 in the simulated scenarios. In comparing patients' hemodynamic status, 7.82% (95% CI: 4.62%-12.79%) in clinical cases and 25.00% (95% CI: 13.56%-41.26%) in simulations were hypotensive, and 17.88% (95% CI: 12.92%-24.19%) and 50.00% (95% CI: 34.47%-65.53%) were hypoxic, respectively. These findings suggest that our simulations are inadequately designed to mimic real life, and thus may fail to provide physicians with appropriate practice and training.

Conclusions: The findings from this study will allow us to improve the approach to RSI simulated training by improving the fidelity of case vignettes. The discrepancy seen in this study may be well guided, as trauma related events are often very complex cases requiring additional training and expertise. However, a strong case can be made for aligning simulations to reflect clinical encounters, focusing more on the management of medical indications for intubation.

116 - The changing face of Canadian trauma patients: a 15-year retrospective study of a multicenter trauma registry

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Background: Trauma is a major concern in young adults but the increase in life expectancy has contributed to profound changes in the demographics of trauma patients and older adults have become a rapidly expanding age segment of this population. Exploring the specificities of this population to optimize trauma care is crucial. We assessed the evolution of incidence, epidemiological and trauma pattern characteristics, and outcome of trauma patients in a 15-years period.

Methods: We conducted a multicentre retrospective observational study, which included data extracted from the Quebec Trauma Registry. All patients aged 16 years and over admitted to level-I adult trauma centres with a primary diagnosis of injury between 2003 and 2017 were included. The population was stratified into two age groups: 16 to 64 years and 65 years and older. Descriptive analyses were performed.

Results: 53,324 patients were included and 9,907 (39.9%) were aged ≥ 65 years. Median age increased from 57 [36-77] to 67 [46-82] years. The proportion of older adults (≥ 65 years) significantly increased from 41.8% in 2003 to 54.1% in 2017; and since 2014 they represent more than 50% of admissions. Falls were constantly the main injury mechanism among older adults (minimum was 84.7% in 2010) and this is also the case among younger adults since 2009. The proportion of motor vehicle accidents slightly decreased in both groups (from 9.9% to 7.8% among older adults and from 41.6% to 37.8% among younger adults). Severe injuries (AIS ≥ 3) to the thorax (3.2% to 12.1% and 9.1% to 19.6%) and the spine (2.4% to 7.4% and 8% to 13.1%) increased in both groups (≥ 65 and 16-64 years) while upper (3.6% to 0.8% and 6.1% to 2.4%) and lower extremities injuries decreased (52.9% to 28.6% and 23.4% to 17.8%). Severe head trauma significantly increased from 16.8% to 25.5% among older adults. The proportion of severely injured (ISS ≥ 12) older patients almost doubled from 17.6% in 2003 to 32.3% in 2017. Among those, mortality varied from a minimum of 16.1% (2017) to a maximum of 21.8% (2005). With regards younger adults, the proportion of severely injured patients increased (41.8% to 53.9%) but their mortality decreased (9.4% to 5.3%).

Conclusions: It is undeniable that the demographic changes deeply affected the characteristics and injury patterns of Canadian trauma patients. These findings emphasize the urgent need to optimize prevention and injury care in the older patient's population.

119 - Re-assault and associated factors: A population-based analysis in Ontario, Canada

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Background: Individuals who experience a violence-related injury are at high risk for subsequent assault. The extent to which characteristics of initial assault are associated with the risk and intensity of re-assaults is not well described yet essential for planning preventive interventions. We sought to describe the incidence of re-assault and associated risk factors in Ontario, Canada.

Methods: In this population-based retrospective cohort study using linked health and demographic administrative databases, we included all individuals discharged from an emergency department or hospitalised with a physical assault between 1 April 2005 and 30 November 2016 and followed them until 31 December 2016 for re-assault. A sex-stratified Andersen-Gill recurrent events analysis modelled associations between sociodemographic and clinical risk factors and re-assault.

Results: 271 522 individuals experienced assault (mean follow-up=6.4 years), 24 568 (9.0%) of whom were re-assaulted within 1 year, 45 834 (16.9%) within 5 years and 52 623 (19.4%) within 10 years. 40 322 (21%) males and 12 662 (17%) females experienced re-assault over the study period. Groups with increased rates of re-assault included: those aged 13–17 years versus older adults (age 65+) (males: relative rate (RR) 2.16; 95% CI 1.96 to 2.38; females: RR 2.79; 95% CI 2.39 to 3.26), those living in rural areas versus urban (males: RR 1.22; 95% CI 1.19 to 1.24; females: RR 1.32; 95% CI 1.27 to 1.37) and individuals with a history of incarceration versus without (males: RR 2.38; 95% CI 2.33 to 2.42; females: RR 2.57; 95% CI 2.48 to 2.67).

Conclusions: One in five who are assaulted experience re-assault. Those at greatest risk include youth, those living in rural areas, and those who have been incarcerated, with strongest associations among females. Timely interventions to reduce the risk of experiencing re-assault must consider both sexes in these groups.

120 - Introducing the Safety Threats and Adverse events in Trauma (STAT) taxonomy: a standardized classification system for evaluating safety during trauma resuscitation.

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Background: Adverse events (AEs) during trauma resuscitation are common and heterogeneity in reporting limits comparisons between hospitals and systems. A recent modified Delphi study developed a taxonomy of 67 AEs that occur during trauma resuscitation. We further refined this tool to yield a 65 metric classification system: the Safety Threats and Adverse events in Trauma (STAT) Taxonomy. The objective of this study was to evaluate the inter-rater reliability of the STAT Taxonomy using in-situ simulation scenarios.

Methods: Two reviewers utilized the STAT Taxonomy to score 12 in-situ simulated trauma resuscitations. AEs were reported as either occurrence (1) or non-occurrence (0) for each simulation and timestamped in the case of multiple occurrences of a single AE. Inter-rater reliability was assessed using Gwet's AC1. Gwet's AC1 provides a similar value of agreement but also works when the two raters have one unique value across all cases (e.g., all 0's or all 1's).

Results: The overall percent agreement on all AEs between reviewers was 90.1% (973/1080). Inter-rater reliability scores were determined utilizing Gwet's AC1 as it provides a similar value of agreement but also works when the two raters have one unique value across all cases (e.g., all 0's or all 1's). Gwet's AC1 scores are interpreted according to the following accepted standards: values ≤ 0 as indicating no agreement and 0.01–0.20 as none to slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as

substantial, and 0.81–1.00 as almost perfect agreement. The Gwet's AC1 across AE categories were: Airway and breathing (median 0.91, IQR 0.60, 1.0), Assessment of Injuries (median 0.80, IQR 0.24, 0.91), Circulation (median 0.91, IQR 0.72, 1.0), Disposition (median 1.00, IQR 1.00, 1.00), EMS handover (median 0.72, IQR 0.54, 0.82), Management of injuries (median 1.00, IQR 1.00, 1.00), Patient monitoring and access (median 1.00, IQR 1.00, 1.00), Procedure related (median 1.00, IQR 0.81, 1.00), Team communication and dynamics (median 0.803, IQR 0.62, Q3 1.00).

Conclusions: Overall, the STAT Taxonomy yielded 90.1% agreement and demonstrated strong inter-rater reliability between reviewers. The STAT Taxonomy may serve as a standardized evaluation tool of latent safety threats and adverse events in the trauma bay. The next steps are to further refine this tool and demonstrate its effectiveness by piloting its use with live trauma patients.

121 - Smarter Faster Just-in-Time Hemorrhage Control: a pilot evaluation of unmanned aerial vehicle delivered STOP-THE-BLEED Equipment with just-in-time remote telementored deployment

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Background: Hemorrhage is the most frequent cause of potentially preventable death, which typically occurs prior to formal medical intervention. Unmanned Aerial Vehicles (UAVs/ Drones) can deliver life-saving equipment well before expert assistance can physically arrive to utilize the equipment. Just-in-time remote telementoring (RTM) of naïve users to self apply the hemorrhage control equipment, before medical care can arrive, may address both delivery and deployment challenges in responding to exsanguination particularly in austere environments.

Methods: Three volunteers were equipped with simulated wounds utilizing training simulators. A Remote Mentor 94 km away was called by each volunteer (like a 911 call) to report they were injured while hiking alone and were hemorrhaging. The mentor dispatched a UAV with a hemorrhage control kit containing a STOP-THE-BLEED kit (STB), an iTClamp and a cellular phone holder. Once the kit was delivered the mentor directed the volunteers how to stop the bleeding. Feasibility was analyzed.

Results: Limited cellular connectivity in the wilderness area where the study was conducted meant video streaming was impossible. However, while waiting for the UAV to deliver the hemorrhage control kit the study participants were able to text pictures of the wounds. The mentor received an image of a wound that needed packing, an amputation requiring a tourniquet and a laceration requiring an iTClamp. The UAV was able to autonomously deliver the hemorrhage control kit within arms-reach of the volunteer. Thereafter, all volunteers were able to unpack the kit and to deploy the hemorrhage control adjuncts under the verbal direction of the mentor. All hemorrhage control adjuncts were utilized by the volunteer from the seated position, simulating self-application. All volunteers were able to pack the wound sufficiently, although the technique used by one volunteer would not have kept consistent pressure. All volunteers were able to successfully apply both the iTClamp and tourniquet. Two of the volunteers have previous training in packing and one had previous training in tourniquet application however, none of the volunteers had deployed hemorrhage control adjuncts in a real-life situation. All volunteers agreed that the mentor made the tasks easier and that they would have been uncomfortable completing the task without the mentor. All saw merit in mentoring STB and all preferred a live mentor over the option to watch a training video.

Conclusions: UAVs can deliver medical supplies to isolated victims in austere or hazardous environments long before human rescuers can reach them. Making potentially life-saving equipment available without anyone knowing how to utilize it. However, if the victim is conscious and has cellular connectivity, they can be remotely mentored to potentially save their own or someone else's life. Limitations were primarily cellular connectivity and further development of more robust connectivity allowing video communication should be pursued.

123 - Cost-effectiveness estimates of a mass casualty training: comparing virtual to in-person delivery. *Spencer Ashby¹, Rich Hilsden², Joseph Culjak², Shane Smith³, Vivian McAlister⁴* From the ¹Schulich School of Medicine and Dentistry, Western University, the ²Western University, the ³Royal Canadian Medical Service; Department of Surgery, Western University, London, ON, the ⁴University of Western Ontario

Background: Virtual communication has been increasingly used throughout the COVID-19 pandemic and may continue to be an important method of education delivery. We have developed a platform to remotely deliver scenario-based team training to prepare trauma professionals for a mass-casualty event. Its use after the pandemic will depend on its cost-effectiveness compared to in-person training.

Methods: We utilized a cost-effectiveness model that projected costs for organizers and participants of the mass casualty exercise while weighing the effectiveness of both in-person and virtual settings. Sensitivity analyses were used to project three separate situations: low, intermediate, and high-cost conditions across both virtual and in-person formats. Fidelity to a specific role in an actual mass casualty response was the primary metric used to determine effectiveness of the virtual and in-person training.

Results: In the low-cost condition, virtual delivery provided no meaningful cost savings for organizers or participants of the training. In the intermediate-cost condition, virtual costs incurred by organizers were 21% lower than in-person costs. Additionally, large savings were recognized for participants, as virtual costs were 42% lower than in-person. In the high-cost condition, savings were realized in the virtual format for organizers, but even more so for participants. Without the need to host participants in-person, organizer costs and participant costs were 31% and 55% lower than in-person costs respectively. Both virtual and in-person training effectively provided fidelity when decision making is the emphasis of the training exercise. However, in-person training is more effective if a technical component dominates. In the future, virtual communication may continue to become the means in which many tasks are undertaken in an actual mass-casualty response; for which the virtual training may provide even greater benefit to participants. As the main task of the curriculum is to provide participants with an opportunity to build decision making skills in preparation for mass casualty events, both platforms provide equivalent effectiveness in that regard.

Conclusions: Scenario-based team-training may be delivered remotely as effectively as in-person training when decision making is emphasized. However, a technical component cannot be replicated virtually. In-person training provides equivalent cost when hosting the training in low-cost conditions, but cost savings are realized, especially for participants through the virtual format in both intermediate and high-cost conditions.

124 - Searching for resilience: self-assessed cognitive and psychomotor factors related to the performance of damage control surgery in weightlessness

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Background: The performance of resuscitative surgical procedures is an extremely technically and psychologically demanding undertaking. Even terrestrial surgical training programs are concerned about the ability of surgeons to maintain skills and manage stress. Performance of such interventions may be required as humans explore and undertake construction in space. We analyzed the self-perceived stress and perceptions of trained surgeons undertaking simulated damage control laparotomy (DCL) in weightlessness.

Methods: Ten surgeons performed DCL on a simulator in weightlessness during parabolic flight. Surgeons provided demographic, Dundee Stress State information (DSSQ) and psychological and physiological experience data.

Results: In terms of the subjective physiological performance and the relative subjective difficulty of DCL, surgeons rated both their personal overall ability to perform in parabolic flight and their overall abilities to physiologically perform DCL as harder (2/5) in 0g compared with 1g. These feelings were likely more impacted by subjective feelings of nervousness (7/16) and motion-sickness (median Likert, 6/16) than by dizziness (2/16) or disorientation (median Likert, 3/16). Motion-sickness being the most challenging if the surgeon was unable to finish due to incapacitation with vomiting. However, when examining DSSQ statements despite feelings of nervousness participants were determined to succeed (3.8/4), felt in control (2.5/4), had their attention directed towards the task(3.6/4), were confident about their performance(3.1/4) and felt that they could handle any difficulties they may encounter(2.9/4).

Conclusions: Despite significantly increased subjective stress and anxiety regarding their own performance the general psychological response was to focus on the task and the mission and to minimize any personal motives to focus upon mission success. Ultimately these perceived coping strategies appear to have succeeded as despite self-rated perceptions of increased technical and psychological difficulty in performing DCL, the objective performance was adequate. We therefore recommend that further studies of resiliency characteristics in extreme environments attempt.

125 - Association between fentanyl treatment for acute pain in the emergency department and opioid use two weeks after discharge.

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Background: Analgesia with fentanyl can be associated with hyperalgesia (higher sensitivity to pain) and can contribute to escalating opioid use. Our objective was to assess the relationship between emergency department (ED) acute pain management with fentanyl compared to other opioids, and the quantity of opioids consumed two-week after discharge. We hypothesized that the quantity of opioids consumed would be higher for patients treated with fentanyl compared to those treated with other opioids.

Methods: Patients were selected from two prospective cohorts. Patients ≥ 18 y treated with opioid in the ED for an acute pain condition and discharged with an opioid prescription were included. Patients

completed a 14-day paper or electronic diary of pain medication use. Quantity of 5mg morphine equivalent tablets consumed during 14-day follow-up by patients treated with fentanyl compared to those treated with other opioids during their ED stay were analyzed using multiple linear regression and propensity scores.

Results: We included 707 patients (mean age \pm SD: 50 \pm 15 years, 47% women) in this study. During follow-up, patients treated with fentanyl (N=91) during their ED stay consumed a median (IQR) of 5.8 (14) 5mg morphine equivalent pills compared to 7.0 (14) for those treated with other opioids ($p=0.05$). Results were similar using propensity score sensitivity analysis. However, after adjusting for confounding variables, ED fentanyl treatment showed a trend, but not a statistically significant association with a decreased opioid consumption during the 14-day follow-up ($B=-2.4$; 95%CI= -5.3 to 0.4; $p=0.09$).

Conclusions: Patients treated with fentanyl during ED stay did not consume more opioids after ED discharge, compared to those treated with other opioids. If fentanyl does cause more hyperalgesia compared to other opioids, it does not seem to have a significant impact on opioid consumption after ED discharge.

127 - Preliminary results of a Beta prototype of the Ontario provincial quality metrics for massive hemorrhage protocol activation

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Background: Death from massive hemorrhage is often preventable and is managed by damage control resuscitation, which includes activation of hospital massive hemorrhage protocols (MHP). The Ontario Regional Blood Coordinating Network (ORBCoN) developed and released the first provincial evidence-based adult and pediatric MHP in May 2021, including 8 quality metrics. This study reports the results of the testing of a Beta prototype of the MHP quality metric tool across 3 Level One Trauma Centres in Ontario.

Methods: A retrospective review (Jan 2019–Oct 2021) was conducted of 288 MHP activations (151, Kingston; 112, Sunnybrook; 12, Thunder Bay; 13 from Children's Hospital of Eastern Ontario and several non-academic centres). Data was entered into a REDCap data collection tool (patient demographics, outcomes, and quality metrics). Differences between trauma vs. non-trauma MHP quality metrics were assessed using Fisher's exact tests. Similarly, differences on the metrics between the three centres were assessed using Chi Square tests.

Results: 288 activations were reviewed (169 non-trauma and 119 trauma). 281 (97.6%) patients were adults. 63.3% and 54.1% of trauma and non-trauma patients were alive at discharge, respectively. Trauma vs. non-trauma 8 quality metrics were as follows: (1) Received tranexamic acid within 1 hour (74% vs. 82%, $p<0.001$); (2) RBC transfusion initiation <15 min (89% vs. 89%, $p=0.80$); (3) Transitioning to group-specific components (<90 minutes) (92% vs. 94%, $p=0.70$); (4) Temperature >35°C at termination

(66% vs. 76%, $p=0.08$); (5) Patient's hemoglobin >60g/L throughout the first 24h (92% vs 91%, $p=0.89$), below 110g/L at 24h (69% vs 75%, $p=0.50$); (6) MHP activation appropriate (≥ 6 RBC within 24 h or death from hemorrhage prior to unit 6) (69% vs. 63%, $p=0.50$); (7) Blood components wasted (18% vs 27%, $p=0.08$); and (8) Initiation of transfer within 60 minutes or care at definitive hospital (78% vs. 94%, $p<0.001$). Significant differences between the 3 centres with more than 10 MHP activations in the quality indicators were as follows: (1) Transitioning to group-specific components (goal <90 minutes) (A=96.0%, B=87%, C=100.0%, $p<0.001$); (2) RBC transfusion initiation <15min (A=92%, B=86%, C=73%, $p=0.002$), (3) Temperature >35°C at protocol termination (A=94%, B=84%, C=64%, $p<0.001$); (4) MHP activation appropriate (A=57%, B=76%, C=55%, $p=0.01$); (5) Hemoglobin >60g/L in the first 24h (A=94%, B=90%, C=64%, $p<0.001$) and below 110g/L at 24h (A=68%, B=79%, C=55%, $p=0.02$).

Conclusions: Testing of the MHP quality metric tool provided valuable Ontario hospital-specific information. High performance was observed across all metrics, except tranexamic acid administration within 1 hour of MHP activation and temperature over 35°C at termination. There was substantial variability between sites for several MHP-related quality metrics suggesting the tool will provide valuable benchmark data to inform site-specific quality improvement initiatives.

129 - Hypertonic saline infusion is associated with increased mortality in patients with severe traumatic brain injury

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Background: Despite lacking evidence to support its use, hypertonic saline infusion (HTSI) is commonly used to reduce cerebral edema in severe traumatic brain injury (TBI). The primary aim of this study was to evaluate the effect of HTSI on outcomes in this patient population. We hypothesized that HTSI would have no effect on outcomes.

Methods: We performed a retrospective, single center study of patients admitted to our Level I trauma center from 2014 to 2020 with a TBI (Head AIS ≥ 3). Patients who received HTSI were compared to patients who did not. Subgroup analysis was performed to evaluate outcomes throughout a spectrum of TBI severity. Primary outcome was mortality. Secondary outcomes were hospital length of stay (LOS), ventilator days and intensive care unit (ICU) LOS.

Results: A total of 2,547 patients met criteria, and 366 (14%) received HTSI. On univariate analysis, patients receiving HTSI did worse in all outcomes. After controlling for age, injury severity, admission hypotension, Glasgow Coma Scale score, intracranial pressure monitoring, and craniotomy, HTSI was independently associated with increased mortality in all patients (OR 2.14, CI 1.36- 2.99, $p=0.0005$), and subgroups of patients who received an ICP monitor and craniotomy (OR 4.13, CI 1.29 - 13.23, $p=0.917$) and patients who required neither intervention (OR 2.10, CI 1.19 - 3.69, $p=0.01$).

Conclusions: HTSI is independently associated with increased mortality and resource utilization in patients with severe TBI. We recommend against the routine use of HTSI in this patient population.

130 - The effect of a multi-modal chest trauma protocol on patients undergoing rib fixation surgery

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Background: Rib fractures are common in the trauma population and increase morbidity and mortality. Respiratory therapy and optimal analgesia are the cornerstones of management. Surgical stabilisation of rib fractures (SSRF) also improves outcomes in selected patients. A multi-modal chest trauma protocol (CTP) has recently been implemented at Vancouver General Hospital. The aim of this study is to assess the effect of this algorithm on patients who undergo SSRF.

Methods: This is a retrospective observational cohort study comparing outcomes in patients undergoing SSRF before and after the CTP was implemented. The CTP was implemented in September 2020. The outcomes were: time to pain management consult by an anaesthetist; length of stay (LOS) in intensive care, high acuity unit and hospital; time on mechanical ventilation; and rates of pneumonia and delirium.

Results: 361 patients were admitted to Vancouver General Hospital (VGH) with rib fractures in 2019, prior to implementation of the CTP. Of these, 9 patients underwent SSRF. Since implementation, 264 patients were admitted with rib fractures, and 8 underwent SSRF.

The two groups were similar in age, sex distribution, injury mechanism, and rib injury score. The mean time to anesthetic consult for specialised pain management was significantly shorter for patients on the CTP – 14.6 hrs (45.8 hrs for patients prior to CTP; $p = 0.009$). Though not statistically significant, patient outcomes were better for patients on the CTP: LOS in hospital was shorter, (9.8 v. 17.6 days); fewer ICU days (3.0 v.6.0 days); fewer HAU days (2.0 v. 3.8 days). Patients on the CTP also spent less time on mechanical ventilation (0.25 v. 5.3 days; $p = 0.027$). There were also lower rates of pneumonia (2/8 v. 3/9) and delirium (1/8 v. 2/9) in the CTP group.

Conclusions: While statistical analysis is limited by the small sample size, this study demonstrates that a dedicated protocol for patients with rib fractures benefits those selected for SSRF. This is achieved by enhancing the involvement of anaesthesia and may improve patient outcomes. More data is being collected, and this will show how the CTP can continue to improve management of patients undergoing SSRF.

131 - A dedicated protocol for patients with low-risk traumatic brain injury improves venous thromboembolism prophylaxis

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Background: Patients suffering trauma are at high risk of venous thromboembolism (VTE). Studies have shown that early chemical prophylaxis is safe in those with low-risk traumatic brain injury (TBI). Some clinicians may be uncertain as to who can receive chemical prophylaxis, and when to start it. We

introduced a dedicated protocol at our institution, with the primary aim of safely decreasing time to initiation of prophylaxis.

Methods: A dedicated protocol for patients with low-risk TBI was implemented at a level one trauma hospital in Canada, starting in April 2021. After 6 months, these patients' charts were reviewed. The outcomes of interest were: i) time to chemical VTE prophylaxis, ii) progression of TBI after prophylaxis, iii) rates of VTE, iv) neurosurgical workload and v) number of CT scans performed prior to starting prophylaxis. Comparison was made with a historical cohort from 2020.

Results: Twenty-eight patients had a low risk TBI between March and September of 2020. During the same timeframe in 2021, 41 patients had low risk TBI. The groups were similar in age, sex distribution, injury mechanism, risk of VTE and injury severity score.

Differences in outcomes between the cohorts were demonstrated, but without statistical significance.

There was an improvement in time to prophylaxis after the protocol was introduced, with patients receiving prophylaxis on average 70.4 hours after admission (range = 24 – 240 hours). In 2020, the mean time = 92 hours (range = 24 – 312 hours); $p = 0.28$.

Time to prophylaxis decreased in the 6 months after the protocol was introduced – in April 2021, time on average = 64 hours; by September 2021, on average = 40 hours.

TBI did not progress in any patient in either cohort after prophylaxis was started.

The rate of VTE in 2020 = 4 out of 28; after the protocol was introduced, the rate was 7 out of 41.

A specialist neurosurgeon was involved in 35.7% of cases in 2020; and in 39% of cases in 2021.

The average number of CTs performed prior to prophylaxis in both cohorts was 1.

Conclusions: Although this study was unable to demonstrate statistical significance, likely because of small numbers, it does appear to show that a dedicated protocol for patients with low risk TBI is safe. It improves time to chemical VTE prophylaxis, though does not appear to reduce neurosurgical workload. Assessment of the protocol is ongoing and may demonstrate improved outcomes in the future.

132 - A national survey on trauma team leaders across Canada's level 1 trauma centres: preliminary results.

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Background: Trauma Team Leaders (TTLs) play a critical role in coordinating and leading complex trauma resuscitations. While TTL's are currently represented within the Trauma Association of Canada (TAC), a unified Canadian TTL network does not exist. We believe that the creation of a TAC TTL sub-committee will allow TAC to know the TTLs professional backgrounds and work environments and will

permit the dissemination of clinical, educational, and quality improvement resources to TTL's across Canada.

Methods: A detailed survey was sent out to 225 TTLs across Canada. The survey was designed to capture demographics, educational and professional background, workplace information, participation in quality improvement and educational activities, and trauma resuscitation practices. In addition, a specific section for trauma directors was designed to collect information on trauma team composition, the involvement of TTLs in different aspects of the Trauma Program, and other specific characteristics Program characteristics.

Results: Ninety-eight survey responses were recorded, with a response rate of 43.5% (98/225). The median/IQR age of respondents was 42.1 (28 – 61) and 72.2% were male. Roughly one third of respondents had 1-5 years of TTL experience (n=35, 35.7%). Most TTLs had a background in emergency medicine (n = 51, 52.0%) or general surgery (n = 28, 28.6%), and 63.3% (n=62) underwent TTL training: 50.8% (n=33) completed a trauma surgery fellowship, 76.9% (n=50) underwent TTL rotations within a general surgery program, and 15.4% (n=10) completed a TTL fellowship. In the workplace, 22.5% (n = 22) of TTLs work more than five 12-hour shifts per month. Most centres have educational programs to train residents as TTLs (68.5%) and 92.4% (n = 85) of TTLs stated that they participate in trainee trauma simulations. Lastly, TTLs are heavily in favour of the creation of a national TTL network (n=93, 94.9%) and 82.7% (n=81) intend to participate in a TTL group associated with TAC (n=81, 82.7%). Although a slight majority of TTLs have attended a TAC conference, (n=54, 55.1%), most are not TAC members (n=57, 58.2%).

Conclusions: This survey provided important information about TTLs, who are heavily interested in participating in a national TTL group via TAC. Future directions will focus on increasing response rates and expanding the survey to Level 2 and 3 centers. This survey is the first initiative of the recently created TAC TTL sub-committee which aims to provide opportunities for education, research, and dissemination of best practice guidelines to TTLs and their institutions across the country.

134 - Effect of a standardized patch framework on the quality of trauma team activation pages
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Background: Trauma team activation (TTA) is an important process in high-functioning trauma centres. To increase situational awareness surrounding the TTA, many centres use text-based pagers to broadcast information. These pages, however, may cause errors through both omission and commission. To combat these problems, we instituted a standardized patch framework at our institution. Our goal was to examine whether this intervention had improved the quality of TTA pages.

Methods: All pages sent to the trauma team over a one-year period were collected. Their content was reviewed and categorized for presence of key variables including age, sex, vital signs, GCS, mechanism of injury, significant pre-hospital interventions, estimated time of arrival, and presence of editorialization. Pages were excluded if they were in error, updates, or cancellations. Basic descriptive statistics were compiled. The study period was divided into an early and late period to test for improvement.

Results: Over the study period, 667 TTA pages were broadcast and 590 met inclusion criteria. Information about HR and BP was included in 204 (34.6%), sex and age in 375 (63.6%), and mechanism

in 571 (96.8%). Editorialization that could bias the trauma team was identified in 62 (10.5%). Only 28 (4.7%) of pages included all basic information. Comparing the first six months after the intervention to the subsequent six months, the proportion of pages including vital signs increased significantly, but not mechanism, ETA, sex, age, or other measured variables. Editorialization increased.

Conclusions: Text-based TTA activation pages at our institution rarely contain all basic elements that could help the team prepare for patient arrival. The standardized patch framework improved the number of notifications including vital sign data, but not other types of data. Understanding where information is being lost could help guide future interventions and quality improvement initiatives.

137 - Developing a multidisciplinary clinical pathway for rib fracture patients to reduce unnecessary admissions to the Intensive Care Unit

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Background: Rib fractures are increasingly common and can be resource intensive. Current clinical management guidelines have a low threshold for admitting isolated rib fracture patients to the Intensive Care Unit (ICU), based upon age and number of rib fractures. We hypothesized that by adapting this protocol, we can provide cost-effective, comparable quality of care on monitored ward level of care.

Methods: A multidisciplinary team of quality improvement leaders across Departments of Surgery, Anesthesia, and Medicine (Geriatrics) convened to develop a standardized clinical management protocol for admission of rib fracture patients to different levels of care (regular ward, monitored ward bed, and ICU). This was based upon age, comorbidities and clinical stability. Patients who had other indications for ICU admission were excluded. Outcomes measured were ICU length of stay (LOS), hospital LOS and difference in costs.

Results: Our pre-intervention rib fracture protocol defined ICU admission for rib fracture patients as patients over the age of 45 with four or more rib fractures and patients 65 years and older with two or more rib fractures. Current barriers identified included multiple transitions of care (from the Emergency Department to ICU to the floor), longer length of hospital stay, delays in discharge, and increased hospital costs. Post-implementation, patients were admitted to the ward with more frequent monitoring capabilities with q2-4hr respiratory vitals (for 24 hours) and 3:1 nursing. Training was provided to the trauma floor nursing staff to perform more frequent vital checks and closer patient monitoring. Key emphasis was placed on immediate analgesic optimization, incorporating early advanced regional pain modalities (e.g., erector spinae plane block, serratus anterior plane blocks, and epidural catheter), early mobility, and discharge planning. Rib fixation was considered where clinically appropriate. Pain was measured at rest and with deep inspiration q2-4hrs, pre and post analgesic administration. Pulmonary toilet was emphasized q2h, and early geriatric consultation was performed where indicated. Patient and family education was performed regarding breathing exercises. Within the first year of our study, we observed a reduction in ICU LOS (0.9 to 0.2 days; -0.7), and hospital LOS (3.6 to 3.2 days, -0.4). Total cost savings were measured at \$162,000 for the year.

Conclusions: Ongoing quality improvement initiatives through the re-evaluation of already established hospital processes is crucial as needs and priorities change. Utilizing a multidisciplinary approach, the rib fracture pathway is one such example. Opportunities at the patient, provider and system-level were identified and targeted with our intervention. By selecting measurable outcomes, we were able to

quantify significant improvements in ICU and overall length of stay and cost savings with the implementation of our protocol.

138 - Competence to perform critical surgical interventions for trauma: a survey of practitioners in British Columbia.

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Background: In an inclusive provincial trauma system such as British Columbia's, acute major trauma may present to any hospital for stabilization. Provincial mortality reviews confirm that some uncommon emergent conditions require prompt surgical intervention by a local practitioner rather than transfer to prevent death and disability. In order to address potential gaps in professional development, we undertook to ascertain how competent provincial general surgeons and trainees considered themselves to provide this essential care.

Methods: A multidisciplinary steering group including general, trauma and orthopedic surgeons, resident trainees and family physicians with enhanced surgical skills training (FP-ESS) was assembled to oversee development of a web-based survey exploring perceptions of competence to provide time-critical surgical interventions for trauma. The vetted 8 question, 5-minute survey was distributed electronically to the members of the UBC Division of General Surgery, its residency training program, and FP-ESS practitioners in British Columbia. Participatory consent was confirmed.

Results: Of 244 potential participants (175 practising general surgeons (GS-P), 54 resident or fellow trainees in general surgery (GS-T), and 15 FP-ESS), 31 completed the survey (42% GS-P, 48% GS-T and 10% FP-ESS). Twenty-three (74%) practiced in urban centres (55% in a lead trauma centre) and 42% practiced in a rural or remote setting. Most GS-P (85%) felt comfortable performing the 14 listed life or limb saving procedures identified by the advisory group when transport to higher level of care would likely result in deterioration or death. Most FP-ESS and GS-T respondents felt somewhat uncomfortable with this. Nearly all (97%) respondents were willing to perform critical procedures if equipment and support were available locally.

Self-assessed overall competency to perform listed life or limb saving surgical procedures varied between respondent groups with means on a 5-point Likert scale (1=not competent, 5=fully competent) of 3.4, 2.3 and 2.3 for GS-P, GS-T and FP-ESS, respectively. Perceptions of competence also varied among the 14 key procedures. Respondents felt most competent with damage control laparotomy and control of external soft tissue hemorrhage, and least competent with craniectomies, burr holes, lateral canthotomies, escharotomies, and caesarean sections in trauma. FP-ESS felt more comfortable than GS-P and GS-T to perform caesarean sections in trauma.

Conclusions: This learning needs assessment has identified an opportunity to address a perceived competence deficit among practicing general surgeons, general surgery trainees and ESS family practitioners in British Columbia, in the effective performance of time-critical surgical procedures required to prevent death or disability in major trauma patients presenting across an inclusive provincial trauma system. While practical skills training in uncommon procedures is problematic, a just-in-time web-based educational program would likely be of value, practicable and welcomed.

139 - Contemporary Trauma Education: how do nurses learn?

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Background: The purpose of this innovative project is to establish a trauma educational program to challenge existing trauma nursing education. Canada vast geography creates inequities in accessibility of trauma education. Northern or rural clinical care settings are an example of such places. Another challenge consists of delivering learning adapted to meeting adult learning needs. The purpose of this innovation is to develop an interactive continuing education program that is accessible for emergency nurses across Canada.

Methods: We developed a flexible educational trauma program for the target audience in multiple stages. Content experts were sought throughout the country keeping the subject matter local and relevant. Framework from an existing foundational course was used as well as required as a prerequisite to standardize a problem-based model of learning and thinking. Crisis resource management themes and a framework for ongoing care of the patient were also added to increase the effectiveness of team-functioning.

Results: In 2017 the first EPICC-Trauma program was launched in New Brunswick to an audience of frontline emergency nurses. Since then, the EPICC Trauma education program has successfully been delivered to over 1300 nurses in many Canadian Provinces in both national languages. This innovative education program was found to be a cost-effective, low-resource, high fidelity program. Nurses in their feedback were able to describe satisfaction with the alternate delivery, learning and evaluation methods of this trauma education program. Specifically, the development and application of an ongoing care planning and re-assessment model was felt to be extremely beneficial. There were some early frustration with the online learning platform but it was equivocal with the logistics of timely paper textbook delivery. In the end, the benefits of a live, dynamic platform for theoretical content far outweighed the disadvantage of some learners' struggles with electronic learning platforms. Some of the factors affecting program accessibility, delivery and effectiveness include: geography, instructor and teaching supply availability. Through its initial development and rollout, the program identified the lack of standardized trauma education competencies across Canada. This identification launched a project outside of the EPICC arena to define a standard Nursing trauma educational competency list which will be incorporated into future revisions of the program.

Conclusions: The development of this innovative course was found to be equivalent to existing trauma education. Utilization of an online learning platform allowed course information to be readily accessible and easily updated. Methods integrating adult-centered learning principles and themes of crisis resource management produced satisfied learners. High fidelity, low technology allowed the program to be more easily dispersed throughout the nation and was offered bilingually creating additional equity.

144 - Don't wait to anticoagulate with traumatic brain injuries: a national trauma database analysis

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Background: Chemical venous thromboembolism prophylaxis (VTEP) is often held in patients with suspected brain injuries. Traumatic brain injury (TBI) is independently associated with a 3-4-fold risk of venous thromboembolism (VTE). Recent literature supports early VTEP. This retrospective study examines bleeding and clotting risk in relation to time VTEP and VTEP type.

Methods: The National Trauma Database (NTBD) 2019 was retrospectively analyzed for cases that sustained a TBI identified by diagnosis codes indicating a severe head injury and received VTEP. Clinically significant bleeding starting within 14 days of starting VTEP were identified (NSXaVTEP). Control cases had no hemorrhage after VTEP and no VTE or PE. Cases were compared by demographics, type of VTE prophylaxis and time to prophylaxis using Kruskal-Wallis, Chi-square test and multivariable logistic regression.

Results: A total of 95,830 cases met inclusion criteria. Overall, the population was 65.6% male, 78.2% had mild TBI and 15.8% had a severe TBI. Moderate injury severity score (ISS) was the most common (32.7%), followed by severe ISS (27.4%). 17.6% had a subdural hemorrhage during their admission, 15.4% had a combined subdural/subarachnoid and 1.2% had an epidural. VTEP for 68.4% was Enoxaparin or similar (LMWH) and 27.5% Unfractionated Heparin (UH). The median time to VTEP was 3 days and the median hospital length of stay (LOS) was 7 days. Overall mortality was 5.00%.

2.20% of the population developed VTEs. As compared to the controls, they were similar in age, but proportionally more male (74.6% vs 65.4%), more had severe TBI (41.2% vs 14.7%) or received UH (38.8% vs 27.2%). The median time to VTEP was longer (4 vs 3 days).

The NSXaVTEP group was 0.30% of the population. As compared to controls, they were younger and more likely to have severe TBI (55.7% vs 32.1%). In multivariable logistic regression controlling for age, sex, ISS, GCS and time to VTEP; LMWH was protective of NSXaVTEP (OR 0.613) when compared to UH. Those with an ISS in the profound category were significantly associated with NSXaVTEP (OR 30.97) as compared to those with mild ISS.

Conclusions: Overall, 2.20% of the population had VTE while 0.30% had clinically significant intracranial hemorrhage. Patients that developed VTE were more likely to be on UH or have a severe TBI and had a one-day delay in initiation of VTEP. In contrast, patients that developed a clinically significant intracranial hemorrhage had significantly worse injuries. This supports early initiation of VTEP in this population. Severe TBI is a significant risk factor for both VTE and intracranial hemorrhage.

146 - Assessing surgical, trauma and telehealth capacity in Indigenous communities in Northern Quebec: A cross-sectional survey.

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Background: Delivering high-quality trauma and surgical care to Northern Quebec presents unique challenges due to its remoteness, extreme weather conditions, delays in patient transport, and shortage of health care professionals. The expansion of telehealth could help address some of these difficulties. We therefore aimed to evaluate the current availability of trauma and surgical resources in Nunavik as well as the region's readiness for telemedicine.

Methods: Validated assessment tools including the Personnel, Infrastructure, Procedures, Equipment, Supplies (PIPES) survey for surgical resources; the International Assessment of Capacity for Trauma (INTACT) index for trauma resources; and the Maryland Health Care Commission Telemedicine Readiness tool were adapted to the context of Northern Quebec through discussions with local

healthcare and community leadership. These surveys were then implemented at two main hospitals (Inuulitisivik Health Centre (IHC) and Ungava Tulattavik Health Centre (UTHC)) and six villages on the Ungava Coast.

Results: Surgical capacity as measured by PIPES was highest in the IHC (6.57) and lowest in the villages of the Ungava Coast (5.52). Personnel (range 0%-0%) and procedures (range 15%-28%) were the least available criteria. Similarly, trauma capacity as measured by the INTACT index was highest in the IHC (6.75) and lowest in the smaller villages (6.00). Although equipment (range 90-100%) and supplies (range 100%-100%) were readily available, personnel (range 0%-0%) and procedures (range 31%-44%) remained lacking. The UTHC was deemed most prepared for telehealth (68%) with the smaller villages achieving lower scores (51%), although all fell within the moderate range of preparedness as per the assessment tool. Although the need for telehealth was deemed high at all facilities (range 78%-100%), identified areas for improvement included funding (range 33%-67%), administrative support (range 33%-67%), quality improvement (range 33%-67%) and physical spaces (range 33%-67%).

Conclusions: Surgical and trauma capacity in Nunavik appears heterogeneous, with readily available equipment and supplies but lacking skilled personnel capable of performing life-saving procedures. There is a dire need to develop telehealth support. To address this need, future initiatives should focus on improving funding, administrative support, quality improvement programs and physical spaces.

147 - Optimizing the electronic medical record to improve efficiency of TQIP Ventilator Associated Pneumonia identification and decrease misclassification

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Background: The Trauma Quality Improvement Program (TQIP) provides benchmarking data to provide hospitals with metrics to guide improvement efforts. Ventilator-associated pneumonias (VAP) in critically ill trauma patients is a key quality indicator. Our tertiary care trauma center reported a higher rate of TQIP-defined VAP in than national and international peer sites. Recent introduction on an electronic medical record negatively impacted TQIP complications. We initiated a quality improvement project to evaluate our disparately increased TQIP VAP rate.

Methods: A retrospective dataset of sequentially identified VAPs in trauma patients as documented by trained data analysts was generated from May 2020 to February 2021. Cases were reviewed by a trauma and critical care trained clinician using the EMR and compared to the TQIP VAP definition. A "VAP Map" guided case identification and data locations within the EMR. Cases were classed as 1) TQIP VAP 2) Probable VAP not meeting TQIP definition 3) Misclassified as VAP.

Results: A data abstraction form collated individual patient level data supporting or refuting a diagnosis of VAP by the TQIP VAP definition at each stage of the "VAP Map." Workflows in our EMR were explored to identify patient data for VAP diagnosis. In the nine-month study period, 15 VAPs were identified by non-clinician analysts following the TQIP algorithm. Ten of fifteen (66%) were VAP (8) or probable VAP; nine were cases involving neurotrauma. Five cases (33%) were deemed to be misclassified as VAPs by the TQIP definitions. Three cases were related to misinterpretation of non-invasive ventilation as ventilation. Two cases were diagnosed as VAP by the care team, but on clinician review were deemed to have insufficient supporting evidence meeting VAP criteria. The 2 probable VAPs did not meet the strict TQIP definition based on chest imaging or respiratory symptoms.

Drill-down of cases based on analyst EMR access was inefficient. Seven places within the EMR were searched to assess for TQIP VAP criteria, which still missed some information. Conversely, a single flowsheet available to clinicians identified >70% of criteria, with provider notes to complete the case review. This decreased time for chart assessment by 50%.

Conclusions: Elevated TQIP VAP rates can be related to clinical care, misclassification, or both. Our analysis identified a cluster of VAP within our neurotrauma population, warranting further process evaluation. We also identified opportunities to decrease misclassification via analyst education and improved provider documentation. Development of a TQIP VAP specific flowsheet within the EMR has the potential to improve analyst time efficiency, decrease provider documentation errors, and decrease misclassification.