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Abstracts

Outcomes and opportunities for improvement in self-inflicted blunt and penetrating trauma. ***Daniel Roizblatt, *AbdulMohsin Babsail,* Mostafa Alhabboubi,* Fadi Hamadani,* David Benyayer,* Christian Malo,† Dan Deckelbaum,* Kosar Khwaja,* Andrew Beckett,* Tarek Razek,* Paola Fata.*** **From *McGill University, Montréal, Que., and †Montreal General Hospital, Montréal, Que.**

Background: Self-inflicted trauma (SIT) is a public health issue ranking 4th as leading cause of death and disability in young adults. **Methods:** Retrospective descriptive analysis of patients admitted to a level 1 trauma centre with self-inflicted injuries, 2008-2013. **Results:** Over a 5-year period, 268 patients with SIT presented to our hospital, 177 (66%) male, average age 39.4 years (SD 16). The most common mechanism of injury was stabbing, (47%), followed by jumping (26.86%). Jumpers had higher ISS (22 v. 9). Seasonal variation showed summer with highest incidence (34%), winter having the lowest (17%). Patients from rural areas accounted for 28%, these were younger (30 v. 42 years, p = 0.002), had lower ISS (9 v. 14, p = 0.007), presented with more firearm injuries (18.6% vs. 2.3%). Overall, 63 (23%) patients had pre-existing psychiatric disease; these patients had longer LOS (20 v. 7 days, p = 0.002), and had jumping from height as predominant mechanism (p = 0.01). Mortality was 13.8%. Patients that died were older (42 v. 30 years, p = 0.002), had higher ISS (14 v. 9, p = 0.007), longer LOS (13.5 v. 6 days, p = 0.004), with fall being the predominant mechanism associated with mortality (p < 0.0001). **Conclusion:** Our study defines and characterizes the population at risk for SIT in an attempt to implement appropriate prevention strategies and improve the existing post-injury care pathway.

Abdominal compartment syndrome in the child. ***Gilgamesh Eamer,* Ioana Bratu.*** **From the *University of Alberta, Pediatric General Surgery, Department of Surgery, Stollery Children's Hospital, Edmonton, Alta.**

Background: Abdominal compartment syndrome (ACS) is a rise in intra-abdominal pressure with end-organ dysfunction. It is commonly related to massive resuscitation, trauma and surgery. It is not well studied in children. Unfinalized guidelines for pediatric ACS propose a lower pressure threshold. **Methods:** A single-site retrospective review of patients under 17 admitted to Stollery Children's Hospital pediatric ICU (PICU) and cardiovascular pediatric ICU (CVPICU) from January 2001 until December 2011. Patients were identified using ICD-CM diagnostic codes for ACS. Initially 26 patients were identified, and 16 analyzed after exclusion criteria were assessed. **Results:** Patients were grouped into 4 categories: trauma (n = 1), cardiac surgery (n = 4), intra-abdominal process (n = 7) and sepsis (n = 4). Survival was 100%, 25%, 57% and 25%, respectively; overall survival was 44%. Most were diagnosed by clinical suspicion (80%) while four had documented elevated bladder pressure. Survivors' and decedents' mean and median age were similar. Survival was lowest among the 7–24 month age group (25%, n = 4) versus 0–6 month (43%, n = 7) and 2–10 years (60%, n = 5). Intubation, vasoactive support, total parenteral nutrition (TPN) requirement and ACS later in PICU course were poor prognostic signs. Surgical intervention in the PICU had low survival (20%, n = 5). **Conclusion:** ACS is under-recognized in critical illness. Increased mortality may be associated with sepsis and cardiac surgery. Increasing organ dysfunction and delayed presentation predict higher mortality; this may be related to global illness and not predictive of ACS. Early diagnosis of ACS with reliable measurements in high-risk patients and early surgical referral may improve outcomes.

Active negative pressure peritoneal therapy after abbreviated laparotomy: The intraperitoneal vacuum randomized controlled trial. ***Derek Roberts,* Jenne Craig,† Peter Faris,† Chad Ball,† Corina Tiruta,‡ Jimmy Xiao,‡ Paul McBeath,§ Paul Kubes, Christoher Doig,¶ Andrew Kirkpatrick¶.*** **From the *Department of Surgery and Community Health Sciences, University of Calgary, the †Departments of Surgery and Oncology, Foothills Medical Centre and University of Calgary, ‡Regional Trauma Services, Calgary, Alta., §Alberta Health Services, the Departments of Surgery and Critical Care Medicine, University of Calgary, and ¶the Departments of Surgery and Critical Care Medicine, Foothills Medical Centre and University of Calgary, Calgary, Alta.**

Background: Excessive systematic inflammation after abdominal injury or intra-abdominal sepsis is associated with poor outcomes. We sought to determine if active negative pressure peritoneal therapy with the ABThera temporary abdominal closure (TAC) device reduces systemic inflammation after abbreviated laparotomy. **Methods:** We conducted a single-centre, randomized controlled trial. Forty-five adults with abdominal injury (46.7%) or intra-abdominal sepsis (52.3%) were randomly allocated to the ABThera (n = 23) or Barker's vacuum pack (n = 22). On study days 1, 2, 3, 7 and 28, blood and peritoneal fluid were collected. The primary endpoint was the difference in plasma concentrations of interleukin-6 (IL-6) 24- and 48-hours after TAC application. **Results:** There was a significantly lower peritoneal fluid drainage from the ABThera at 48 hours after randomization. Despite this, there was no difference in plasma concentrations of IL-6 at baseline versus 24 (p = 0.52) or 48 hours (p = 0.82) between the groups. There was also no significant intergroup difference in the plasma concentrations of IL-1, -8, -10 or -12 p70 or tumor necrosis factor-α between these time points. The cumulative incidence of primary fascial closure at 90 days was similar between groups (hazard ratio [HR] 1.6, 95% CI 0.82–3.0, p = 0.17). However 90-day mortality was improved in the ABThera group (HR 0.32, 95% CI 0.11–0.93, p = 0.04). **Conclusion:** This trial observed a survival difference between patients randomized to the ABThera versus Barker's vacuum pack that did not appear to be mediated by an improvement in peritoneal fluid drainage, fascial closure rates, or markers of systemic inflammation. **Trial registration:** ClinicalTrials.gov identifier NCT01355094.

Use of a novel combined RFA/saline energy instrument for arresting ongoing hemorrhage from solid organ injuries. ***Chad Ball.*** **From the *Departments of Surgery and Oncology, Foothills Medical Centre and University of Calgary, Calgary, Alta.**

Background: Persistent hemorrhage from solid organ (liver, spleen, kidney) injuries remains a technical challenge without an optimal solution. A bevy of topical hemostatic agents and energy instruments have been previously employed. The purpose of this study was to evaluate the role of a novel energy instrument for arresting ongoing solid organ hemorrhage. **Methods:** The utility

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of a novel combined RFA/saline energy device (Aquamantys, Medtronic) was evaluated in patients who required operative intervention for significant solid organ injuries with associated ongoing hemorrhage. Video confirmation of performance was obtained. **Results:** Sixteen patients with ongoing hemorrhage from solid organ injuries who required operative intervention were evaluated (11 liver, 4 spleen, 1 kidney). Demographic details were consistent with the remainder of our injured patient population (mean age 51 years, mean ISS 27, 15/16 blunt mechanism, mean LOS 11 days). The novel energy device was successful in arresting all ongoing hemorrhage in 15/16 patients. These injuries included capsular avulsions (liver and spleen), blunt lacerations (liver, spleen and kidney), and a deep splenic stab wound. **Conclusion:** This novel combined RFA/saline energy device was successful at arresting ongoing solid organ hemorrhage from a variety of sources in a definitive manner. It is superior to preceding energy technologies in most scenarios.

Health care costs of burn patients from homes without fire sprinklers. ***Joanne Banfield.*** **From *Sunnybrook Health Sciences Centre, Toronto, Ont.**

Background: Burns remain the third leading cause of unintentional injury in the home with the majority of burn fatalities due to inhalation injuries. Treatment of burn injuries requires high-cost services for healthcare and society. Automatic fire sprinklers are a preventive measure to decrease fire injuries, deaths, property damage and environmental toxins. This study's aim was to conduct a cost analysis of patients with burn or inhalation injuries due to residential fires, and to compare this to the cost of implementing residential automatic fire sprinklers. **Methods:** We conducted a cohort analysis of adult burn patients admitted to our provincial burn centre (1995–2012). Patient demographics and injury characteristics were collected from medical records, and clinical and coroner databases. Resource costs included average cost per day at our intensive care and rehabilitation program, transportation and property loss. **Results:** During the study period there were 1557 residential fire-related deaths provincewide, and 1139 patients were admitted to our provincial burn centre due to a flame injury occurring at home. At our burn centre, the average cost was C$84 678 per patient with a total cost of C$96 448 194. All resources totalled C$3 605 775 200. The average cost of installing automatic fire sprinklers is C$1.49 per sprinkler-covered square foot in a new home. **Conclusion:** This study shows the considerable health care costs of burn patients from homes without fire sprinklers.

Penetrating trauma in eastern Ontario: a descriptive analysis. ***Brittany Greene,* Jacinthe Lampron.†*** **From *University of Ottawa and †the Ottawa Hospital, Ottawa, Ont.**

Background: Penetrating trauma is an emerging public health concern in Canada. There are limited data describing its epidemiology. Homicides are at an all-time low; however, front-line workers have voiced concerns that the incidence of penetrating trauma is increasing. The objective of this study is to describe the epidemiology, characteristics of injuries and outcomes of penetrating trauma in eastern Ontario. **Methods:** This retrospective study reviews penetrating trauma assessed by the trauma service at The Ottawa Hospital from 2009 to 2014. Data were collected prospectively for the hospital's trauma database. Patients were included if type of injury was coded as "penetrating" and injury severity score (ISS) was >11 and/or had a trauma code called or died. **Results:** Annually, from 2009 to 2013, there were 46, 43, 56, 54, and 63 cases, respectively. This upward trend in penetrating trauma was not statistically significant. Penetrating injuries represented 6.8% of trauma. Patients were predominantly young men (92.7%, mean age 34.3). Stab injuries (77.1%) were more common than firearm injuries (20%). A total of 64.1% of injuries were intentional assault/homicide. Self-inflicted injuries were more common in older patients. The mean ISS was 12.5 and the mean LOS was 10.2 days; 39.3% of patients required surgical intervention. Overall mortality was 11.8%. Older patients (> 45) had significantly higher mortality (19.4% v. 9.5%, $p = 0.04$). **Conclusion:** Penetrating trauma is increasing in eastern Ontario. It is important to continue to monitor this trend. The magnitude of increase should flag concerns to public health authorities.

Thresholds of rotational thrombelastometry (ROTEM) used for the diagnosis and management of bleeding trauma patients: a systematic review. ***Precilla Veigas,* Sandro Rizoli,† Jeannie Callum,* Barto Nascimento,* Luis Teodoro Da Luz.**** **From *Sunnybrook Health Sciences Centre, Toronto, Ont., and †St. Michael's Hospital, Toronto, Ont.**

Background: The advent of viscoelastic assays such as ROTEM in recent years has been progressively replacing traditional coagulation tests in the coagulation management. We conducted a systematic review to describe the reported thresholds of ROTEM in diagnosing coagulopathy, predicting or guiding transfusion and predicting mortality in trauma patients. **Methods:** A comprehensive literature search was performed using MEDLINE, EMBASE and Cochrane Database for studies published between 1965 and March 2014. Studies that reported the thresholds of ROTEM parameters in the management of trauma were included. Data on demographic, diagnosis of coagulopathy, transfusion and mortality were captured. Quality assessment was performed using Newcastle Ottawa Scale and risk of bias using QUADAS-2 tool. **Results:** Twelve studies involving 2027 adult trauma patients were included. Eight studies were prospective and 4 retrospective. The quality of the included studies was moderate (mean Newcastle Ottawa score 5.91, SD 0.27). Using QUADAS-2, only 1/12 studies (8%) had low risk of bias in all domains (patient selection, index test, reference standard and flow and timing) and 7/12 studies (58%) had low concerns regarding applicability. Outcomes were grouped into 3 categories: diagnosis of coagulopathy ($n = 9$), prediction or transfusion guidance ($n = 6$) and prediction of mortality ($n = 6$). We found reduced clot firmness in EXTEM (CA5). **Conclusion:** There is evidence that the thresholds of ROTEM may be used in the management of trauma patients. Well-designed randomized controlled studies are necessary.

A quality indicator to measure hospital complications for injury admissions. ***Lynn Moore,* François Lauzier,† Simon Berthelot,† Henry Thomas Stelfox,‡ John Kortbeek,§ Richard Simons,¶ Gilles Bourgeois,* Julien Clement.††*** **From *Université Laval, the †Axe Santé des Populations — Pratiques Optimales en Santé (Population Health — Optimal Health Practices Research Unit), Traumatologie — Urgence — Soins intensifs (Trauma — Emergency — Critical Care Medicine), ‡University of Calgary, the §Department of Surgery,**

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University of Calgary, ¶Trauma Services, Vancouver General Hospital, the **CHU de Québec and ††Institut national d'excellence en santé et en services sociaux, Québec, Que.

Background: The rate of complications for trauma patients has recently been estimated to be over 3 times that observed for general admissions. Despite the negative impact of complications on resource use and patient mortality/morbidity, a quality indicator (QI) based on complications has yet to be validated for trauma care. The objective of this study was to derive and internally validate a QI for hospital complications to evaluate acute trauma care. **Methods:** We performed a multi-centre retrospective cohort study in a Canadian trauma system using registry data (57 hospitals; 2007–2012; n = 73 122). The primary outcome was the occurrence of at least 1 hospital complication. Candidate risk adjustment variables were identified by expert consensus and selected using bootstrap resampling. The validity of the QI was evaluated in terms of discrimination, construct validity and forecasting. **Results:** Fifteen percent of patients had at least 1 hospital complication. The risk adjustment model had excellent discrimination (AUC = 0.81). The QI was correlated with risk-adjusted mortality (r = 0.57), readmission (r = 0.32) and LOS (r = 0.68). Hospital performance on the QI in 2007–2009 was predictive of performance in 2010–2012 (r = 0.82). **Conclusion:** We propose a QI to measure hospital complications that can be used to evaluate trauma care with routinely collected data. The QI is based on a comprehensive risk adjustment model with good internal and temporal validity, and demonstrates good discrimination, construct validity and forecasting. This research represents an essential step toward measuring and reducing complication rates in order to improve resource use and patient outcomes following injury.

Thromboelastography (TEG) in the management of trauma: implications for the developing world. ***Morgan Schellenberg,* Kent Stevens,† Amber Mehmood.†* From *Queen's University, Kingston, Ont., and †Johns Hopkins Bloomberg School of Public Health, Baltimore, Md.**

Background: Thromboelastography (TEG) is a coagulation test that is increasingly used in the trauma setting, allowing for goal-directed transfusion and avoiding the risks of massive blood transfusion. Although the benefits of TEG in trauma are documented in developed nations, the vast majority of morbidity and mortality from trauma occurs in low- and middle-income countries (LMICs). The present study was performed to define the role of TEG in the developed world and explore the use of TEG in trauma in LMICs. **Methods:** Two independent searches were performed using PubMed, Cochrane Library, Google Scholar and Ovid MEDLINE. The first search queried the databases for the literature on TEG in trauma. The second search identified the available literature on TEG in LMICs. **Results:** The first search returned 82 relevant articles. The use of TEG in developed countries was associated with a reduction in morbidity and mortality, although TEG in trauma has not been studied in a randomized controlled trial. The search for TEG in LMICs returned 2 relevant articles, which described its use in liver transplant and major obstetric hemorrhage, respectively. No articles on the use of TEG in trauma in LMICs were identified. **Conclusion:** While the benefits of TEG are described in developed nations, TEG has not yet been studied for use in trauma in LMICs. Given the burden of injuries in these settings, TEG in LMICs may be particularly effective at decreasing global morbidity and mortality in developing countries.

Potential role of the rural trauma team development course (RTTDC) in the United Arab Emirates (UAE). ***Jameel Ali,* Subash Gautam,† Imran Zafarm,† Anne Sorvari.‡* From the *University of Toronto, Toronto, Ont., †Fujairah Hospital, Fujairah, United Arab Emirates, and ‡St. Michael's Hospital, Toronto, Ont.**

Background: Annual trauma death in United Arab Emirates is 32/100,000, with an inordinately large number in rural areas with community health centres, of which there are 11 in Fujairah served primarily by primary nonspecialized physicians with minimal resources and located 5–80 km away from tertiary centres. The RTTDC was developed by the American College of Surgeons to train personnel in such centres to resuscitate, package and safely transfer these patients to higher-level centres. The course, based on ATLS principles includes lectures, case scenarios, principles of communication and performance improvement and patient safety (PIPS). We assessed the role of RTTDC in UAE by training instructors, followed by providers and obtaining feedback on its applicability in the UAE. **Methods:** An instructor program for 4 ATLS trained physicians was followed by a one day RTTDC provider course in Gurraiyah community centre 15 km from Fujairah for 20 physicians and nurses. Pre and post MCQ test performances were compared by paired t test, with course evaluation through questionnaires on the educational value using a 5-point Likert scale (strongly agree = 5 to disagree = 1) and rating the relevance of PIPS, Scenario and Communication modules with general comments. **Results:** All MCQ scores improved (out of 20; mean pre: 12.3, SD 1.8; post: 16.1, SD 1.6). Comments were generally positive with consensus of direct applicability in UAE and strong support for expansion countrywide. **Conclusion:** There is a perceived need for widespread RTTDC training in UAE with the expectation of improving trauma outcome.

Applicability of the advanced disaster medical response (ADMR) course, Trinidad and Tobago. ***Jameel Ali,* Rasheed Adam,† Hari Ondiveeran,‡ Henry Bedaysie,§ Ernest Ali,† Anne Sorvari,¶ Susan Briggs.*** From the *University of Toronto, Toronto, Ont., †St. James, Trinity and Tobago Hospital, ‡Saint John Regional Hospital, Saint John, N.B., §Port of Spain General Hospital, Port of Spain, Trinidad and Tobago, ¶St. Michael's Hospital, Toronto, Ont., **Harvard Medical School, Boston, Mass.**

Background: Trinidad and Tobago (T&T) is surrounded by disaster zones, is at risk for natural disasters and has the potential for man-made disasters, making disaster preparedness a necessity. The ADMR course was developed by Massachusetts General Hospital ITDI and is sponsored by the Panamerican Trauma Society in Central and South America. The course consists of interactive lectures, skill stations and a manual by disaster experts on the principles of disaster response, incident command system, priorities of the medical response to disasters (disaster triage, decontamination, chemical, biologic and radioactive agents, blast and crush injuries, and environmental considerations.) The applicability of the train-the-trainer course was assessed through evaluation of instructor candidates and evaluation of the course by the participants.

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Methods: After training Canadian and T&T instructors by ITDI faculty, a provider course was conducted for 20 participants (4 nurses, 4 allied health professionals, 12 physicians) who completed pre- and post-course tests with comparisons by paired *t* tests. Course evaluation covered 18 items (e.g., objectives met, educational value, preparedness, improvement in disaster management, need to widely disseminate course) and general comments. **Results:** All but 3 participants improved MCQ post-course performance (pre: mean 85.1% ± 9.7%; post: mean 91.2% ± 5.8%, p = 0.002). Overall, 65–85% strongly agreed and 20–35% agreed that the course objectives were met. The comments unanimously supported adopting this train-the-trainer course for all disaster management personnel in T&T. **Conclusion:** The ADMR course is well suited for promulgation in T&T and can significantly improve disaster preparedness and response.

Inflammatory mediators in intra-abdominal sepsis or injury: a scoping review. ***Jimmy Xiao,* Crystal Wilson,† Helen Lee Robertson,‡ Derek Roberts,§ Andrew Kirkpatrick.‡*** **From *Alberta Health Services, Trauma Services, †Foothills Medical Centre, the ‡Health Sciences Library, Foothills Medical Centre and University of Calgary, the §Departments of Surgery and Community Health Sciences, University of Calgary, Calgary, Alta.**

Background: Inflammatory mediators (IMs) play an important but still incompletely understood role in the morbidity and mortality of intra-abdominal sepsis/injury. We systematically reviewed preclinical and clinical studies of IMs in intra-abdominal sepsis/injury in order to evaluate their ability to (1) diagnose or predict complications or outcomes; (2) serve as therapeutic targets; (3) illuminate the pathogenesis of sepsis or injury-related organ dysfunction. **Methods:** We searched MEDLINE, PubMed, EMBASE and the Cochrane Library. Two investigators independently reviewed all identified abstracts and selected articles for full-text review. We included original prospective studies assessing inflammatory mediators in intra-abdominal sepsis/injury. Two investigators also extracted data and assessed study level of evidence using the "best-evidence synthesis" method. **Results:** Among 2437 citations, we selected 182 studies in the scoping review, including 79 preclinical and 103 clinical studies. Serum procalcitonin and C-reactive protein appeared to be most useful for monitoring clinical response to therapy. However, the diagnostic and prognostic value of IMs for complications/outcomes of sepsis/injury remains to be established. Peritoneal mediator levels are substantially higher than systemic levels after intra-abdominal infection/trauma. Targeted therapies against mediators remain experimental. Common limitations of current studies included small sample sizes and lack of uniformity in study design and outcome measures. **Conclusion:** Current evidence does not support the use of inflammatory mediators in diagnosing or managing intra-abdominal sepsis or injury. Measurement of peritoneal mediators should be further investigated as a more sensitive determinant of intra-abdominal inflammatory response.

Evaluation of the online Concussion Awareness Training Toolkit (CATT) for parents, players and coaches. ***Shelina Babul.**** **From the *B.C. Injury Research and Prevention Unit, Vancouver, B.C.**

Background: The purpose of the online Concussion Awareness Training Toolkit (CATT) is to: standardize concussion diagnosis, treatment and management among health care practitioners; raise concussion awareness among parents, players and coaches; support educators in return-to-learn protocols. This evaluation is specific to the second component of CATT, for parents, players and coaches. **Methods:** Parents of children/youth registered for an organized sport were recruited via email invitation sent directly from participating sports clubs. Participants completed an online survey before and after receiving a link to the online intervention. A sample size of at least 33 was required to compare the change in pre/post survey scores with the power to detect a large effect size of 0.5. **Results:** Participants were found to have a statistically significant increase in concussion knowledge (p = 0.002). CATT for parents, players and coaches received 5300 visits by 3800 unique visitors (June–October 2014). **Conclusion:** Concussion continues to be an under-recognized, -diagnosed and -treated medical condition requiring both physical and mental rest. Good concussion management will potentially reduce related health problems and may decrease the risk of long-term brain damage, potentially lowering total health care costs among these patients. Based upon established international principles, CATT for parents, players and coaches addresses how to identify and appropriately manage a concussion, including completing a concussion response tool. CATT for health practitioners was also evaluated using a pre/post intervention self-reported survey with significant results. Currently in development, CATT for educators will include a detailed return-to-learn protocol and related resources.

Ultrasound assessment of optic nerve sheath diameter (ONSD) in healthy volunteers. ***Patrick Goeres,* Frederick Zeiler,* Bertram Unger,* Lawrence Gillman.**** **From the *University of Manitoba, Winnipeg, Man.**

Background: Ultrasound assessment of optic nerve sheath diameter (ONSD) has been suggested as a noninvasive measure of intracranial pressure (ICP). Numerous small studies suggest its validity however discrepancy exists around normal values for ONSD due to a lack of standardized measurement technique and the paucity of studies, mostly in unhealthy patients with normal invasive ICP measurements. In this study we sought to define a normal value range for ONSD in a large population of healthy adult volunteers. **Methods:** ONSD was measured in healthy adult volunteers and a normal range was defined using descriptive statistics. Pearson's correlation was used to determine the relationship between ONSD measurements and sex, age, height and weight. **Results:** Sixty-two adults were recruited (age 19–65, mean 29.5), with 50% male. Mean ONSD was 38.3 (95% CI 33.1–45.8 95%) on the left, and 38.0 (95% CI 31.8–44.4) on the right. Mean ONSD did not vary with age but did vary with weight, height and sex. However, when controlling for sex, weight and height no longer contributed to ONSD measurements. Mean ONSD measurements for males were 39.8 (95% CI 34.9–45.8) compared with 36.5 (95% CI 28.6–41.0) for females. **Conclusion:** This study has defined the range of ONSD in a healthy cohort of volunteers. The determined range and lack of relationship to age, weight and height is similar to other studies but this is the first study to find a difference in sex amongst ONSD measurements, suggesting the possible need for separate reference ranges for males and females.

The benefits of epidural analgesia in flail chest injuries. ***Abdul Mohsin Babsail,* Badar Alhadhrami,† Muhamad***

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Elhusseini,† Mostafa Alhalbboubi,† Mohamed Abdulla,† Talat Chughtai,† Paola Fata,† Kosar Khwaja,† Tarek Razek,† Andrew Beckett.† **From *McGill University, Montreal General Hospital, Trauma Surgery Program, McGill University Health Centre, and †McGill University, Montréal, Que.**

Background: Many trauma patients sustain chest wall injuries. Flail chest may increase morbidity and mortality in polytrauma patients by 10–20%. Pulmonary contusions, prolonged mechanical ventilation, pneumonia, sepsis and poor pain control are common among patients sustaining flail chest injuries. We hypothesized that better pain control by the use of epidural analgesia leads to improved clinical outcomes in this group of patients. **Methods:** A retrospective database study was conducted for the years 2008–2013 for patients admitted to our level 1 trauma centre. Patients were diagnosed with flail chest by clinical exam and imaging. Our trauma registry was queried to study modalities of pain control, especially the use of epidural. We divided the patients into 2 groups; ones who received epidural analgesia and ones did not receive epidural analgesia. A logistic regression model was developed to identify independent predictors of 30-day in-hospital mortality. **Results:** A total of 180 patients had flail chest; mean age was 57.4 years. There were 74.4% males. There were 43.3% who had a chest tube, 23.8% who developed pneumonia and 6.7% who had tracheostomy. Seventy-nine patients (44.4%) had epidural analgesia. ISS was 26.19 for patients with epidural analgesia and 30 for patients without epidural ($p = 0.02$). The mean LOS was 18.46 days, and 30-day mortality was 3.8% for the epidural group v. 11.5% for the non-epidural group ($p = 0.058$). Logistic regression analysis for 30-day mortality was significant ($p = 0.002$, 0.006, 0.003 and 0.028) in the group with epidural analgesia for age, ISS, hospital LOS and pneumonia, respectively. **Conclusion:** Epidural analgesia as pain control for patients with flail chest is understudied. This study demonstrates a trend toward reduction in mortality with the use of epidural in patients diagnosed with flail chest in a level 1 trauma centre. Patients with higher ISS received less epidural analgesia. This difference can be attributed to head injuries and other interventions that may restrict the use of epidural analgesia. A large randomized study is needed to evaluate the clinical superiority of epidural analgesia over standard pain control modalities in trauma patients with flail chest.

Mandatory reporting rates of injured alcohol-impaired drivers with suspected alcohol dependence in a level 1 Canadian trauma centre: a single institution's experience. ***Timothy Rice,* Niv Sne,* Jeffrey Rice,† Susan Reid,* Jennifer Li,* Frank Baillie,* Andrea Somers.‡*** **From *McMaster University, Hamilton, Ont., †Queen's University, Kingston, Ont., and the ‡University of Toronto, Toronto, Ont.**

Background: Alcohol is an important predisposing factor for motor vehicle collisions (MVC). In Ontario, physicians have a duty to report patients who they believe are suffering from a medical condition that may make it dangerous for the patient to operate a motor vehicle. Alcohol dependence is a mandatory reportable medical condition according to the Ontario Ministry of Transportation (MTO) Medical Condition Report form. We sought to examine physicians' mandatory reporting patterns of alcohol-impaired drivers involved in an MVC admitted to a level 1 trauma centre with suspected alcohol dependence based on a weighted alcohol marker (WAM) score. **Methods:** We performed a retrospective review from Apr. 1, 2004, to Dec. 31, 2012. All patients >16 years old referred to the trauma service who were drivers involved in a MVC with a serum ethanol level of > 17.4 mmol/L were screened. A WAM score was calculated for patients who had blood samples drawn for measurement of γ-glutamyltransferase and mean corpuscular volume at the time of admission. The medical records of patients with suspected alcohol dependence were assessed for completion of a medical condition report form. **Results:** There were 256 patients with a serum ethanol > 17.4 mmol/L. A WAM score was calculated for 94 (36.7%) patients. Nine died. Of the 85 patients, 81 (95.3%) had suspected alcohol dependence. Mean ISS was 28 ± 10.7. Two (2.4%) were reported for other medical conditions. None were reported for alcohol dependence. **Conclusion:** Alcohol-impaired drivers with suspected alcohol dependence that are involved in MVCs are not being reported to the MTO.

Simulation implementation in a new pediatric residency program in Haiti: trauma specifics. ***Sherry MacGillivray,* Traci Robinson,† Andrea Boone,† Naminder Sandhu,† Ian Wishart.†*** **From *Alberta Health Services, Calgary, Alta., and †Alberta Children's Hospital KidSIM Program, Calgary, Alta.**

Background: Trauma is the leading cause of death and disability in the pediatric population over most of the world, and poverty-stricken Haiti is no different. Since the 2010 devastating earthquake the Haitian ministry of health has tried to rebuild what was a basic medical training program to that of first world standard. Simulation education is a bridge between classroom learning and real-life clinical experiences. The purpose of this project was to implement human patient simulation training into the newly developed Haitian pediatric residency program. **Methods:** Review of the newly developed program curriculum identified several areas in which simulation could be implemented. In 2013 an assessment was done with the first-year residents to see if simulation could be adopted in a culture where simulation has never been tried and a language barrier was a potential problem. Once translation of the curriculum into English was done, scenarios were developed in sets of 3 to build on concepts. Trauma scenarios built on primary and secondary survey assessments with basic and then advanced skills. **Results:** The new residents participated in simulation in January 2014 at 2 hospitals in Haiti: Hospital Bernard Mevs and St. Damien Pediatric Hospital. Two full days of simulation for the R1 and R2 students were very well received. Alberta Children's Hospital KidSIM facilitators found the common issues with Canadian-trained pediatric residents and Haitian-trained pediatric residents. Communication seems to be an area that needs improvement, as well as basic primary survey assessment skills. **Conclusion:** Implementation of a human patient simulation training program for the 2013 developed pediatric residency program in Haiti has been successful for both first- and second-year residents. However, the Alberta Children's Hospital KidSIM facilitators have evaluated their experience and will implement new strategies to make the simulation experience even better for the Haitian pediatric residents.

Management of skull fractures in children younger than 1 year of age. ***Anissa Addioui,* Dickens Saint-Vil,* Louis***

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Crevier, Marianne Beaudinn.** **From the *CHU Ste-Justine, Montréal, Que.**

Background: Since 2010 at our institution, children with skull fractures are admitted to the trauma service. After discharge, they have phone follow-up until symptoms are resolved. The purpose of our study was to review the management of children with skull fractures younger than 1 year of age. **Methods:** Retrospective chart review of all patients 1 year old or younger seen in the ED for a skull fracture was done from 2010 to 2013. Patients with obstetrical trauma, motor vehicle collisions, unknown mechanisms and abuse were excluded. **Results:** We identified 180 patients with a mean age of 4.5 months (1 day–12 months). Of those, 131 patients were admitted (73%) with a mean LOS of 1.6 days. Compared to patients discharged from the emergency department, admitted patients had more depressed (21% v. 8%) and diastatic (43% v. 14%) fractures. Fifty-seven children had intracranial hemorrhages (32%) but only 8 patients required a surgery for depressed fractures or leptomeningeal cyst. Admission specifically to the trauma service steadily increased from none in 2010 to 76% in 2013. Phone follow-up by our trauma nurse increased from 12% in 2010 to 91% in 2013. No patients experienced residual symptoms. **Conclusion:** Although our criteria for admission could be adjusted, instituting a standardized protocol for managing these patients was successful at our institution. Admission could be reserved for patients with persisting symptoms or depressed skull fractures, with phone follow-up for others. Long-term follow-up to evaluate for possible deficits may be needed for all patients.

Resource use in patients who have sustained a traumatic brain injury within an integrated Canadian trauma system: a multicentre cohort study. ***Pier-Alexandre Tardif,*Lynne Moore.†*** **From the *Centre de recherche du CHU de Québec — Hôpital de l'Enfant-Jésus, and †Université Laval, Québec, Que.**

Background: Prolonged LOS, estimated to be approximately 20% of acute care days, leads to important adverse outcomes in terms of complications, morbidity, mortality and costs. However, we lack comprehensive information on hospital resource use for traumatic brain injury (TBI) patients. The objectives of this study were to compare acute care index LOS (in highest designated trauma centre) to total LOS (all consecutive hospitalizations related to the injury) following a TBI and identify the determinants of LOS. **Methods:** Multicentre retrospective cohort study based on all adults discharged alive following a TBI between 2007 and 2012. Data were extracted from the Quebec trauma registry linked to hospital discharge database. LOS determinants were identified using hierarchical linear regression. **Results:** Geometric means of index and total LOS were 11.7 and 12.5 days, respectively. The 6 most important determinants of LOS accounted for 80% of the explained variation in LOS; discharge destination, ICU mechanical ventilation, maximum Abbreviated Injury Scale score of concomitant injuries, age, surgery and number of comorbidities. **Conclusion:** Results suggest that acute care LOS for TBI admissions is slightly underestimated when only index LOS is considered, and that only 6 variables account for 80% of the explained variation in LOS. This information should be taken into account when LOS is used to assess the efficiency and quality of acute care for TBI patients.

Resource use intensity in a mature, integrated Canadian trauma system: a multicentre cohort study. ***Teegwende Valerie Porgo,* Lynne Moore,* Andre Lavoie,† Leon Nshimyumukiza, Alexis Turgeon,‡ Gilles Bourgeois,† Jean Lapointe,† Brahim Cisse,† Julie Duplantie.**** **From the *Université Laval, Québec, Que., the †Institut national d'excellence en santé et en services sociaux, Québec, Que., and ‡Unité de traumatologie —urgence — soins intensifs, Centre de Recherche FRSQ du CHA (Hôpital de l'Enfant-Jésus), Québec, Que.**

Background: To estimate patient-level resource use related to acute trauma care in a universal health system and identify determinants of resource use intensity. **Methods:** We conducted a retrospective cohort study based on adults discharged alive from any of the 57 adult trauma centres of a Canadian provincial integrated trauma system (1999–2012, n = 155 430). Data were abstracted from the Quebec Trauma Registry and the provincial costing database. Resource use was estimated with activity-based costs whereby units of resource use were multiplied by corresponding unit costs. Determinants of resource use intensity were identified using a hierarchical linear model. **Results:** Mean costs were 2014 C$9974 (95% CI C$9813–10 135) per admission. The majority of resources were used in the operating room (67% of total costs), followed by the ICU (12%). Mean risk-adjusted costs increased with injury severity (geometric mean ratio [GMR] = 4.3 for ISS > 25 v. ISS < 15); decreased with age (GMR = 0.60 for patients aged ≥ 85 years v. 16–54 years); was 16% higher for patients with head injuries than with extremity injuries; and was 20% higher in level 1/2 trauma centres than level 3/4 centres. **Conclusion:** This study provides patient-level estimates of acute care resource use for Canadian injury admissions, information on activity centres that use the most resources, and identifies factors associated with high resource use intensity. This information can be used to evaluate resource use intensity for acute trauma care with the goal of improving efficiency without compromising patient outcomes.

Rates and determinants of unplanned emergency department visits and readmissions within 30 days following discharge from the trauma service — the Ottawa Hospital experience. ***Maher Matar,* Alexandre Tran,* Olivia Margie,* Jean-Denis Yelle,* Giuseppe Pagliarello,* Jacinthe Lampron.**** **From the *the Ottawa Hospital, Ottawa, Ont.**

Background: Unplanned emergency department visits and readmissions are costly in terms of morbidity and mortality. A recent multicentre cohort study in Canada identified readmission rates at 5.9% within 30 days. This proposed study aims to compare the Ottawa Hospital (TOH) experience to that national standard and identify non-admitted emergency department visits as well. Determination of risk factors for the above events may allow for more appropriate patient stratification, discharge planning and prevention of unnecessary visits. **Methods:** Single-centre, retrospective cohort study based on adults >16 years of age admitted to the trauma service at the Civic or General campuses of TOH from 2004 to 2014. Data are collected from the TOH Trauma Registry Database, paper chart review and Oasis database. Proposed data collection points of interest include age, sex, mechanism of injury, ISS, need for operative intervention, disposition upon discharge and services involved. **Results:** Pending. **Conclusion:** Pending

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results, conclusions will be made regarding (a) the comparison to the national standard and (b) the identification of risk factors most predictive for 30-day readmission and ED visits. This will allow us to more appropriately identify and intervene pre-emptively on patients prior to discharge in order minimize costly bouncebacks.

Alcohol — screening, brief intervention and referral to treatment (SBIRT): Is it readily available in Canadian trauma centres? ***Nancy Tze,* Tara Grenier.*** **From the *McGill University Health Centre, Montréal, Que.**

Background: As of 2006 the American College of Surgeons Committee on Trauma (ACS-COT) makes the requirement for SBIRT clear for level 1 and 2 trauma centres, recommending that all trauma centres integrate it into their trauma service repertoire. The Trauma Association of Canada Trauma Systems Accreditation Guidelines state that level 1 trauma centres should be actively engaged in injury prevention programs, emphasizing alcohol screening programs, with access to appropriate evidenced-based interventions. Research demonstrates that SBIRT can cut hospitalization costs by $1000 per person screened and save $4 for every $1 invested in trauma centre and emergency department screening. Counselling resulted in a 40–50% decrease in alcohol consumption, a 42% drop in emergency room visits, a 55% decline in motor vehicle crashes and a 100% reduction in arrests for alcohol or other substance violations. Screened patients will decrease their drinking simply because they were asked about their alcohol use. **Methods:** A 5-question survey was sent to all trauma centres across Canada via SurveyMonkey. Follow-up telephone calls were made to the remaining level 1 trauma centres who did not respond to the initial survey. **Results:** Of the 17 level 1 trauma centres, 8 centres responded via SurveyMonkey; a telephone follow-up was made with the remaining 9 hospitals. Only 4 level 1 centres have a fully implemented SBIRT program, with designated persons to perform the screening and the brief intervention. **Conclusion:** Despite the overwhelming evidence for the benefits of SBIRT, and the recommendations from ACS-COT and TAC, only a small percentage of Canadian Level 1 trauma centres actually have this program in place.

Management of traumatic occult hemothorax: a survey among trauma providers in Canada. ***Rachel Rae,* Jacinthe Lampron.†*** **From the *University of Ottawa, Ottawa, Ont., and †the Ottawa Hospital, Ottawa, Ont.**

Background: Blunt chest trauma is the most frequent cause of thoracic injury, involved in 70% of them. Thoracic injuries are responsible for approximately 25% of all trauma deaths even in modern level 1 trauma centres. Hemothorax contributes to this morbidity. Chest tube remains the first line therapy for traumatic hemothoraces. These days, with increasing access to computed tomography (CT) in trauma, we identify occult hemothorax (hemothorax seen on CT scan but not visible on chest x ray). There is no clear guidance reported in the literature regarding management of occult hemothorax (OH) in adults with blunt trauma. The objective of this study is to survey the current practice among trauma providers in Canada for traumatic occult hemothorax. **Methods:** An electronic survey using SurveyMonkey will be distributed to trauma care providers using the Trauma Association of Canada (TAC) member email list. Participants' demographics, awareness on OH and management of OH will be collected. Participant responses will be compared using χ^2 and t test with significance of $p < 0.05$. **Results:** The answers of the survey will be analyzed to describe the current practice in management of OH in blunt thoracic trauma among trauma providers in Canada. **Conclusion:** Our conclusion will inform on current practices on management of OH and will draw from any uniformity or lack thereof in practice patterns found among trauma providers in Canada.

An audit of venous thromboembolism prophylaxis: a quality assurance project at our level 1 trauma centre. ***Abdulaziz Alali,* Hasham Bakry,* Ali Malla,* Samir Faidi,† Angela Coates,† Paul Engels.*** **From *McMaster University, Hamilton, Ont., and the †Hamilton Health Sciences Trauma Program, Hamilton, Ont.**

Background: Major trauma patients are one of the highest risk groups for venous thromboembolism (VTE). Currently there is no formal protocol for VTE prophylaxis at our hospital although there is a thrombosis service. We hypothesized that significant variation in VTE prophylaxis regimens still exists among clinicians. The purpose of our study was to audit the clinical practice related to the administration of VTE prophylaxis in trauma patients at our centre. **Methods:** We used our trauma registry to identify patients admitted from Jan. 1 to Dec. 31, 2013. All patients over 16 years admitted to hospital for more than 24 hours were included. Demographics, mechanism of injury, ISS and patient outcomes were obtained from the registry. We conducted a retrospective chart review to collect details on the administration of VTE prophylaxis, including type and dose, timing, discrepancies between regimens ordered and administered, recommendations made by the thrombosis service and potential contradindications to administration. We also identified any cases of VTE during the patient's hospital stay. We defined a VTE event as a deep vein thrombosis or pulmonary embolism diagnosed on leg ultrasound, chest CT or V/Q scan. **Results:** Further results are forthcoming. **Conclusion:** We will use our findings to assess the performance of our current VTE prophylaxis practice and identify any opportunities for improvement. This data will inform the process of creating a formal protocol for VTE prophylaxis in our hospital.

Catecholamines as outcome markers in traumatic brain injury. ***Luis Teodoro Da Luz,* Antonio Capone Neto,* Leo Dante DaCosta,* Kenji Inaba,† Shawn Rhind,‡ Barto Nascimento,* Sandro Rizoli.§*** **From *Sunnybrook Health Sciences Centre, Toronto, Ont., the †Division of Trauma and Surgical Critical Care, Los Angeles, Calif., the ‡DRDC, Toronto, Ont., and §St. Michael's Hospital, Toronto, Ont.**

Background: Traumatic brain injury (TBI) has a high impact on long-term disability and mortality. Small and improperly designed studies have suggested that levels of catecholamine in TBI patients are associated with functional neurological status and may be used as predictors of outcome. Our objective was to validate the independent association between circulating catecholamine levels and functional outcome in TBI. **Methods:** Prospective observational cohort study in patients with isolated moderate/severe TBI. Epinephrine (E) and norepinephrine (NE) were measured in 4 time points post admission (0, 6, 12 and 24 h). Patients were enrolled, after meeting the inclusion/exclusion criteria, in 3 level 1 trauma centres. Glasgow Outcome Scale Extended (GOSE) was used for measurement of

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neurological function 6 months post trauma. **Results:** A total of 181 patients were enrolled and 165 levels of E and NE were measured on admission and were compared to basal levels in healthy controls. Median levels of E and NE were 40 and 25 times higher, respectively, than those in the control group. Patients with unfavourable outcome (GOSE 1–4) had median E and NE levels statistically different on admission compared to patients with favourable outcome (GOSE 5–8). NE and E were elevated in patients with diffuse cerebral edema. An increase of 1000 units of NE is associated with in increment 4.8% in the chance of having an unfavourable outcome. **Conclusion:** There is an independent association between high levels of NE and E with unfavourable outcome in patients with moderate to severe isolated TBI. NE and E contribute to the physiopathology of traumatic brain injury.

Are we missing the missed injury? The burden of traumatic missed injuries diagnosed after hospital discharge. ***Kelly Vogt,* Brad Moffat,* William Leeper,† Tanya Charyk-Stewart,* Richard Malthaner,* Daryl Gray,* Neil Parry.**** **From *London Health Sciences Centre, London, Ont., and the †Department of Surgery, Johns Hopkins University School of Medicine, Baltimore, Md.**

Background: Injuries missed during the initial assessment of injured patients are a major cause of morbidity after trauma. The current missed injury literature focuses on injuries identified in hospital. However, we hypothesize that a significant number of injuries are diagnosed after discharge. We undertook this study to identify the rate of missed injuries after major trauma, and to quantify the proportion of injuries diagnosed after hospital discharge. **Methods:** A random number generator was used to select 300 patients from our trauma database who sustained severe trauma (ISS > 16) and survived at least 24 hours. Medical records were reviewed to identify demographics, injury data and missed injuries for up to 1 year after index admission. Missed injuries were defined as those not documented by the time of completion of the tertiary survey, and were considered clinically significant if they resulted in any additional procedure, LOS or follow-up. Regression analysis was used to identify predictors of delayed diagnosis of missed injuries. **Results:** Amongst the 300 randomly selected patients, a total of 55 injuries were identified in 46 patients (missed injury rate 15%). Of these, only 35 injuries (64%) were identified prior to hospital discharge, with 20 (36%) diagnosed after hospital discharge. Overall, 24% of missed injuries were clinically significant. There were no significant demographic or injury predictors of delayed diagnosis of a missed injury. **Conclusion:** A significant number of missed injuries are diagnosed after hospital discharge. This finding has important clinical implication, as well as implications for surveillance programs and future research.

The use of fibrinogen concentrate in trauma: a descriptive systematic review. ***Luis Teodoro Da Luz,* Carlos Eduardo Semprum Pena,* Homer Tien,* Avery Nathens,* Barto Nascimento.**** **From *Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Ont.**

Background: Current literature suggests that a high fibrinogen level exerts a protective effect with regards to the amount of blood loss and that priority must be given to early and effective correction of impaired fibrin polymerization by administering fibrinogen concentrate (FC). We performed a systematic review of the literature in the use of FC in trauma, examining effects on coagulopathy, exposure to allogeneic blood product, mortality and adverse effects. **Methods:** We included observational and experimental studies in humans, animals and in vitro. MEDLINE, EMBASE and Cochrane databases were searched up to November 2014. Data on the effect of FC in coagulopathy, dose of FC, exposure to allogeneic blood products, mortality and adverse effects were extracted. We assessed methodological quality using the Newcastle-Ottawa scale (NOS). **Results:** Eleven clinical studies (n = 2233) met inclusion criteria. Six studies addressed effect of FC in coagulopathy; 5 in exposure to allogeneic blood products; 5 on mortality and 3 on adverse effects. Methodological quality was moderate (NOS score 7.09, SD 1.3). The mean dose of FC used across all studies was 5.68 g. We identified 15 in vitro studies with healthy volunteers (n = 179) and 4 randomized animal studies with anesthetized swine (n = 64) and with male Syrian Golden hamsters (n = 24). In general, the studies demonstrated improvement of coagulopathy measured by routine laboratory and viscoelastic tests, diminished exposure to allogeneic blood products and lower mortality. **Conclusion:** FC may improve coagulopathy and reduce bleeding and transfusion requirements when administered early in bleeding trauma patients with hypofibrinogenemia. It also appears safe; however current clinical evidence about FC is poor and insufficient to change clinical practice. Better designed experimental trials are warranted.

Very early initiation of chemical venous thromboembolism prophylaxis after solid organ injury is safe: a call for a national prospective multicentre study. ***Patrick Murphy,* Neil Parry,* Niroshan Sothilingam,* Kelly Vogt,* Brad Moffat,* Daryl Gray,* Brandon Batey,* Tanya Charyk-Stewart.**** **From *London Health Sciences Centre, London, Ont.**

Background: The need for early initiation of chemical venous thromboembolism (VTE) prophylaxis after trauma is well accepted. The optimal timing of prescribing low-molecular-weight heparins (LMWH) in patients who have undergone non-operative management (NOM) of blunt solid organ injuries (SOIs) remains controversial. We undertook this study to describe the safety of early initiation of chemical VTE prophylaxis among patients undergoing NOM of blunt SOI in planning for a prospective study. **Methods:** This retrospective study was conducted at our Canadian lead trauma hospital, and included severely injured adult patients who sustained blunt SOI (spleen, liver, and/or kidney) without significant intracranial hemorrhage from 2011 to 2014, and who underwent an initial trial of NOM. Safety was assessed based on failure of NOM — defined as the need for therapeutic angiography or operative intervention — in patients who received early LMWH (< 48 hrs) and late LMWH (> 48 hrs). **Results:** There were a total of 189 patients with blunt SOI over the study period, of whom 123 met inclusion criteria. The median injury grade was 2 (IQR 1–3). A total of 57 patients (46%) received early LMWH, and 34 (28%) received late LMWH. The injury grade did not differ between those receiving early and late LMWH (p = 0.66). While 2% of the population failed NOM, there were no failures after the initiation of LMWH. The overall rate of symptomatic VTE was 2%. **Conclusion:** Early initiation of medical thromboembolic prophylaxis appears to be safe in select patients with isolated SOI following blunt trauma. A prospective multicentre study is warranted.

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The 2 student to 1 faculty (2:1) model of teaching the Advanced Trauma Operative Management (ATOM) course. ***Jameel Ali,* Anne Sovari† Sharon Henry.‡*** **From the *University of Toronto, Toronto, Ont., †St. Michael's Hospital, Toronto, Ont., and the ‡R.A. Cowley Shock Trauma Center, Baltimore, Md.**

Background: Traditionally, ATOM courses use a 1:1 student to faculty ratio. We showed in a crossover study effective ATOM course teaching using a 2:1 model. Yet, controversy about adopting this model exists. We compare a 2:1 with a previous 1:1 model and elicited comments directly related to the 2:1 model. **Methods:** A 2:1 model course was completed for 26 senior general surgery residents after the standard pre-course MCQ and self-efficacy form completion. All procedures were conducted twice, each resident being surgeon and assistant for each procedure. Post course MCQE and self-efficacy scores for the 2:1 model were compared with pre-course scores as well as a randomly selected 1:1 previous course by paired and unpaired *t* tests for intragroup and intergroup changes. **Results:** Both groups showed statistically significant but similar improvement in mean% ± SD MCQE and self efficacy (SE) scores post course (2:1 MCQE pre: 62.0 ± 11.9; post: 72.8 ± 13.9; p90%) and residents (> 90%) as a better teaching and learning tool, especially being able to see each procedure twice and improving assistant and operating skills. Faculty with 3 or fewer courses were evaluated at levels equivalent to those who taught more than 3 courses. **Conclusion:** In our hands the 2:1 ATOM course provides a superior learning experience at a significantly lower cost and with lower animal utilization.

Trauma transfusion in the elderly. ***Brett Mador,* Barto Nascimento,† Sandro Rizoli.‡*** **From the *University of Toronto, Toronto, Ont., †Sunnybrook Health Sciences Centre, Toronto, Ont., and ‡St. Michael's Hospital, University of Toronto, Toronto, Ont.**

Background: Trauma resuscitation has undergone a paradigm shift with new emphasis on the early transfusion of blood products and increased use of point-of-care testing such as thromboelastography (TEG). However, it is unclear how these strategies are applied or their impact on clinical outcomes in the elderly population. **Methods:** Data were prospectively collected on consecutive patients who met trauma activation criteria at a level 1 trauma centre. Data fields included injury and resuscitation data, laboratory values, TEG results and outcome measures. Elderly patients were defined as those 55 and older. Patients receiving at least 1 unit of blood product transfusion were matched based on gender, mechanism, ISS and time to hospital. **Results:** We included 628 patients, of whom 142 (23%) were elderly. Overall, the elderly patients had a significantly higher average ISS (25.4 v. 21.6), LOS (17.3 v. 13.1 days), nosocomial infection rate (0.30 v. 0.24) and mortality (0.19 v. 0.07). Elderly patients were more likely to receive transfusion of blood products (0.42 v. 0.30). Among those transfused, the elderly patients had a lower incidence of abnormalities in TEG and fibrinogen, despite similar ISS and INR levels. **Conclusion:** Our results suggest that elderly trauma patients are more likely to receive blood products when admitted to a trauma centre, though this practice may not be justified by laboratory data. It is not clear whether the response of geriatric patients to transfusion mirrors that of the younger population, and further study is therefore warranted.

Cocaine and benzodiazepines are more predictive of an injury severity score greater than 15 compared to alcohol or tetrahydrocannabinol in trauma patients under 18 years old. ***Farid Muakkassa,* Robert Marley,* Ann Salvator,* Zachary Yetmar,† Ileana Horattas,† Daniel Erck.‡*** **From *Akron General Medical Center, Akron, Ohio, †Northeast Ohio Medical University, Rootstown, Ohio, ‡West Virginia School of Osteopathic Medicine, Lewisburg, W.Va.**

Background: Our objective was to study the effects of narcotics in trauma patients < 18 years old with multi-substance abuse on injury severity. **Methods:** Data were retrospectively reviewed from Jan. 1, 2003, to Dec. 31, 2013, at a level 1 trauma centre. There were 2596 patients admitted positive for substances including ETOH, THC, BEN and COC. Patients younger than 18 years who had a positive ETOH and/or positive toxicology screen (n = 221) were used in the analysis. ISS was separated into more severe injury with an ISS ≥ 15 or less severe injury with an ISS < 15. Data were analyzed using χ^2, and logistic regression was performed to assess the relationship between substance abuse and ISS ≥ 15. **Results:** The mean age for the entire group was 17.4 years, where 67% were males. The rate for ISS ≥ 15 was 25%. Narcotics associated with an increased risk of ISS ≥ 15 was COC (odds ratio [OR] 2.7, 95% CI 1.02–7.15, p = 0.04) and BEN (OR 2.7, 95% CI 1.20–6.0, p < 0.02). ETOH and THC revealed a trend toward a lower ISS (ETOH: OR 0.99, 95% CI 0.99–1.00, p = 0.06; THC: OR 0.56, 95% CI 1.0–7.1). **Conclusion:** In patients < 18 years, COC and BEN were more powerful predictors of an ISS ≥ 15 than alcohol or THC.

Are we missing traumatic bowel and mesenteric injuries? **Samir Faidim,* Bret A. Landry,*Angela Coates,* Michael Patlas.* From the *Hamilton Health Sciences Trauma Program, Hamilton, Ont.**

Background: Traumatic bowel and mesenteric injury (TBMI) is an uncommon injury that can be lethal if not detected and treated in a timely manner. The purpose of our study was to evaluate the diagnostic accuracy of 64MDCT for the detection of TBMI in patients at our level 1 trauma centre. **Methods:** We used our trauma registry to identify patients with a diagnosis of TBMI from January 2006 to June 2013. We included only those patients who had a 64MDCT scan at presentation and subsequently underwent laparotomy/laparoscopy. The accuracy of prospective radiology reports was analyzed using the surgical findings as the gold standard. **Results:** Forty-four (0.9%) of 4781 trauma patients had surgically proven TBMI. Twenty-two were excluded as they did not have MDCT before surgery. Of the remaining 22 cases, 17 had blunt and 5 had penetrating injuries. A correct preoperative imaging diagnosis of TBMI was made in 14 (64%) patients. The overall sensitivity of the radiology reports was 63.6% (95% CI 41–82%); specificity was 79.6% (95% CI 67–89%); PPV was 53.9% (95% CI 33–73%); and NPV was 85.5% (95% CI 73–94%). The accuracy was 90.5%. Only 10 of 17 (59%) patients with blunt injuries had a correct preoperative diagnosis. Most patients with missed blunt TBMI (5 of 7) demonstrated only indirect signs of injury. **Conclusion:** The detection of TBMI in

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trauma patients on 64MDCT can be improved, especially in patients presenting with blunt injury. The possibility of TBMI was not considered despite the presence of indirect imaging signs.

The marriage of surgical simulation and telementoring for damage control surgical training of operational first-responders. ***Andrew Kirkpatrick,* Homer Tien,† Anthony LaPorta,‡ Jessica McKee,§ Heather Wright-Beatty,¶ Jocelyn Keillorn,¶ Sue Brien,¶ Derek Roberts** John Wong,¶ Andrew Beckett,†† Brett Mador,‡‡ Chad Ball,§§ Deon Louw.¶¶*** **From the *Departments of Surgery and Critical Care Medicine, Foothills Medical Centre and University of Calgary, Calgary, Alta., †Sunnybrook Health Sciences Centre, Toronto, Ont., ‡Western Surgical Care, Monument, Colo., §Alberta Centre for Injury Control and Research, Edmonton, Alta., the ¶National Research Council Canada, Ottawa, Ont., the **Departments of Surgery and Community Health Sciences, University of Calgary, Calgary, Alta., ††McGill University, Montréal, Que., the ‡‡University of Toronto, Toronto, Ont., the §§Departments of Surgery and Oncology, Foothills Medical Centre and University of Calgary, Calgary, Alta., and ¶¶Caleo Health, Calgary, Alta.**

Background: Hemorrhage is the leading cause of preventable post-traumatic death. Many such deaths are potentially salvageable with damage control surgery (DCS). As recent innovations in informatic technology allow for remote specialist-support to point-of-care providers, advanced interventions, such as DCS, may be possible in remote settings. **Methods:** An anatomically realistic perfused surgical training mannequin with intrinsic fluid loss measurements (the "Cut-suit") was used to study perihepatic packing with massive liver hemorrhage. The primary outcome was loss of simulated-blood (fluid) during 6 stages: incision, retraction, direction, identification, packing and post-packing. Six fully credentialed surgeons performed the same task as 12 military medical technicians (MT) who were randomized to unmentored (n = 5) (UMT) or remotely telementored (n = 7) (RTM) real-time guidance by a trauma surgeon. **Results:** There were no significant differences in fluid loss between the surgeons and the UMT group. However, when comparing surgeons to the RTM group, there was significantly more total fluid loss (p = 0.001) and greater loss during the identification (p = 0.002), retraction (p = 0.035), direction (p = 0.014) and packing (p = 0.022) stages. There were no significant differences in fluid loss after packing between the groups despite differences in the number of sponges used; RTM used more sponges than surgeons and significantly more than UMT (p = 0.048). However, mentoring significantly increased non-surgeon procedural confidence (p = 0.004). **Conclusion:** Perihepatic packing of an exsanguinating liver hemorrhage was performed by military medical technicians after a focused briefing. While real-time RTM did not reduce the surrogate outcome of fluid loss in this model, it significantly increased non-surgeon procedural confidence, which may increase the feasibility of the concept.

Adding remote ultrasound control to remote just-in-time telementored trauma ultrasound: a pilot study. ***Andrew Kirkpatric,* Ian McKee,† Jessica McKee,‡ Nova Panebianco,§ RJ Parfitt,¶ Derek Roberts, Douglas Hamilton,** Bill Sevcik.††*** **From the *Departments of Surgery and Critical Care Medicine, Foothills Medical Centre, University of Calgary, Calgary, Alta., †Edmonton Fire Department, Edmonton, Alta., ‡Alberta Centre for Injury Control and Research, Edmonton, Alta., the §University of Pennsylvania, Philadelphia, Pa., the ¶City of Edmonton, Edmonton, Alta., **University of Calgary, Calgary, Alta., and††Stollery Children's Hospital, Edmonton, Alta.**

Background: Initial experiences suggest that untrained but motivated remote first responders can obtain critical images through remote-telementored ultrasound (RTMUS) when guided by imaging experts using informatics advances to communicate. We piloted the addition of a graphic-user-interface (GUI) technology to allow the remote mentor to guide the distant ultrasound "knobology" as an adjunct to RTMUS. **Methods:** Eleven ultrasound-naive firefighters in Edmonton were mentored from Calgary to image the right upper quadrant (RUQ) of an ultrasound phantom, which was randomized to contain free fluid or not. The remote mentor could visualize the firefighter's hands and generated ultrasound image, and were randomized to remotely control the GUI knobology or not. The primary outcome was remote diagnostic accuracy. **Results:** Conducting RTMUS was feasible in all cases. Six RTMUS exams were randomized to GUI function and 5 to none. There was no significant difference in age, firefighter experience. The overall diagnostic accuracy was 100%. Diagnostic accuracy was thus unrelated to use of the GUI. All participants agreed that the task was realistic for them to perform, but the median response to whether their confidence increased from "neutral" to "agree" associated with the GUI. **Conclusion:** RTMUS by just-in-time responders was highly accurate in triaging the ultrasound signs of intra-abdominal exsanguination. Further, remote control of the distant ultrasound knobology was technically feasible. While the perfect accuracy of the remote exam precluded statistical evidence, subjectively the remote examiner felt the GUI assisted the exam when used and first time responders felt more confident.

Descriptive analysis of morbidity and mortality associated with falls at a level 1trauma centre. ***Matthew Laviolette,* Jacinthe Lampron,* Melissa Waggott.†*** **From the *University of Ottawa, Ottawa, Ont., and †the Ottawa Hospital, Ottawa, Ont.**

Background: Falls account for up to 40% of trauma patient admissions and constitute an important mechanism of injury among this patient population. Morbidity and mortality related to falls vary depending on patient age. For example, elderly patients have worse outcomes than their younger counterparts for the same injury severity. The goal for this study is to describe the epidemiology of falls at a level 1 trauma centre and to identify priority groups to target future prevention strategies. **Methods:** A retrospective review of patient data from the trauma database at a level 1 adult trauma centre between January 2009 and November 2014. Patients admitted as a result of falls and admitted to the trauma service will be identified. Gender, age, ISS, circumstances surrounding fall, hospital LOS, ICU LOS and mortality data will be collected. Data analysis will describe the overall incidence of falls, trends related to age and activity at the time of the fall within our serviced population. **Results:** Descriptive analysis of the at-risk groups within our fall population will be presented including patient characteristics, circumstances surrounding fall, morbidity and mortality according to ISS. A comparison of patients ≤ 65 years old to > 65 years old will also be conducted. **Conclusion:** Identifying at-risk groups within our fall population is foundational for the development of secondary prevention strategies directed at reducing the morbidity and mortality associated with repeat falls.

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Development of an ICU transition questionnaire: evaluating the transfer process from ICU, ward, and patient/family stakeholder perspectives. ***Simon Taylor,**** ***Henry Thomas Stelfox,**** ***Jamie Boyd.†*** **From *University of Calgary, Calgary, Alta., and the †W21C Research and Innovation Centre, Calgary, Alta.**

Background: Transitions of care are potential periods of decreased quality of care. Gaps in care during this transition from ICU to ward can lead to increased ICU readmission and increased morbidity and mortality. Therefore, we developed a standardized discharge template to measure stakeholders' perceptions of the discharge process as a first step in improving the quality of these transitions. **Methods:** One-on-one interviews with ICU staff, ward staff and patient/families were conducted to assess roles, current protocols and perceived shortfalls in the transfer process. This information was used to draft specific surveys for ICU and ward providers and family/patient, and were dispensed following transfer from the ICU to the ward. Surveys were linked to specific transfers to allow for direct comparison between all stakeholders. **Results:** Preliminary results elicited several themes, including: lack of 2-sided communication between ICU, ward and patient/family; incomplete transfer of pertinent health information; lack of sufficient pre-planning in the ICU for transfer to the ward. In general, there was a divergence in perceived quality of communication between ICU and ward personnel (5 point scale), 4.11 (95% CI 3.89–4.33) vs. 3.46 (95% CI 2.81–4.11), respectively. Similarly, overall satisfaction of transfers was 4.11 (95% CI 3.84–4.38) and 3.84 (95% CI 3.40–4.28) from the ICU and ward, respectively. **Conclusion:** We developed a standardized discharge information tool/template to measure stakeholder perceptions of patient discharge from ICU to the hospital ward. Initial pilot testing suggests that the tool is able to capture data related to patient transfer and there may be care-gaps predominantly due to failures in or inconsistent communication.

Use of IO devices in trauma: A survey of trauma practitioners in Canada, Australia and New Zealand. ***Paul Engels,**** ***Mete Erdogan,†*** ***Sandy Widder,‡*** ***Michael Butler,§*** ***Nelofar Kureshi,¶*** ***Kate Martin,**** ***Robert Green.¶*** **From *McMaster University, Hamilton, Ont., †Trauma Nova Scotia, Halifax, N.S., the ‡University of Alberta Hospital, Edmonton, Alta., §Capital Health, Halifax, N.S., ¶Dalhousie University, Halifax, N.S., and **Alfred Hospital, Melbourne, Australia**

Background: Although used primarily in the pediatric population for decades, the use of intraosseous (IO) devices in the resuscitation of severely injured adult trauma patients has become more commonplace over the last few years. We therefore sought to determine the current experience level, beliefs and attitudes about the utility of IO device use for the resuscitation of adult trauma patients among trauma practitioners in Canada, Australia and New Zealand. **Methods:** We administered a web-based survey to members of TAC, the Canadian Association of Emergency Physicians, the American Trauma Society and Australia New Zealand Association for the Surgery of Trauma. Our study was endorsed by the TAC Research Committee and received ethics approval from the University of Alberta. **Results:** Overall, 425 of 1771 members completed the survey. An IO device was available to 97% of respondents, with EZ-IO most common. 98% had previous training with IO device placement, and 72% had used an IO device in adult trauma patients (54% used it ≥ 2 times during past year). Most practitioners indicated IO is an acceptable route for administering crystalloids, blood products, medications and vasopressors. Respondents were most comfortable placing an IO catheter in the proximal tibia, and least comfortable placing an IO catheter in the sternum. 84% responded they would always or often use an IO catheter in a patient with no IV access undergoing CPR for traumatic cardiac arrest. **Conclusion:** IO devices are readily available to trauma practitioners in Canada, Australia and New Zealand, and most physicians are trained in device placement. The majority of respondents felt comfortable using an IO device in resuscitation of adult trauma patients.

Time to reversal of medication-induced coagulopathy in traumatic intracranial hemorrhage. ***Sami Hossri,**** ***Charles Fasanya.**** **From *Staten Island University Hospital, Brooklyn, N.Y.**

Background: Studies have shown that reversing medication-induced coagulopathy in patients who are admitted to the emergency department (ED) due to traumatic brain hemorrhage will prevent the progression of the intracranial bleed and improve patient outcomes. Our study will try to establish if the time to reversal of the coagulopathy has any correlation on morbidity and mortality and if it will decrease the progression of the bleed. **Methods:** This is a retrospective study of patients (>18 years of age) that were on preinjury anticoagulation and/or antiplatelet upon admission to the ED and were found to have an intracranial hemorrhage. Serial computerized tomography (CT) scans of each patient were recorded, as well as the time difference between diagnosis and the transfusion of the reversal therapy. **Results:** A total of 324 patients were identified (229 taking antiplatelets only, 56 taking anticoagulants only, and 39 taking a combination of the two). All of them were given reversal therapy after the initial diagnosis of the intracranial bleed. We will attempt to deduce the time to reversal of coagulopathy after admission that correlated with a better patient outcome. We categorized patients as having deteriorating CT scans versus those that remained stable or improved. **Conclusion:** Our primary goal is to assess the correlation between the time to reversal of anticoagulation and CT scan progression of an intracranial hemorrhage and clinical outcome. This will allow us to determine if time-dependent reversal of medication-induced coagulopathy correlated with patient outcome.

Meta-analysis of randomized control trials of hospital based violence interventions on repeat intentional injury. ***Carolyn Snider,**** ***Nicole Barrett,†*** ***Kaitlin Cyr,†*** ***Paola Camorlinga.†*** **From the *Department of Emergency Medicine, University of Manitoba, Winnipeg, Man., and the †University of Manitoba, Winnipeg, Man.**

Background: Interpersonal injury is a chronic condition with repeat intentional injury (RII) being reported as about 20% within the next year. A meta-analysis of randomized control trials (RCTs) of hospital-based violence interventions (HVIPs) has not been performed. As part of a systematic review examining reports of RII, a meta-analysis of HVIPs evaluating the effectiveness in reducing RII was performed. **Methods:** Search criteria were developed with a librarian. Articles reporting a RII rate for all ages, both sexes were included. Exclusions included studies of child maltreatment, intimate partner violence, sexual violence and elder violence. Ten databases and a hand-search were included. After removing duplicates,

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abstracts and subsequently full text scans were each reviewed by 2 abstractors. Disagreements were resolved with a third investigator. Included articles were double-extracted using an extraction form. RevMan 5.3 was used to complete the meta-analysis. Odds ratios, CIs and I^2 are reported. **Results:** The electronic database search located 814 abstracts and the hand search located 158 abstracts. After deduplication, 626 abstracts were reviewed. Full text scan included 67 articles and the final meta-analysis included 5 RCTs. In all, 418 participants were included in the 5 studies (217 intervention arms, 201 control arms). The odds of a repeat visit for RII is 0.23 (95% CI 0.12–0.43) if participating in the HVIP vs. control (I^2 = 32%). **Conclusion:** While the statistical heterogeneity in results is low there are differences in program eligibility and delivery that must be considered when interpreting these results. Despite this, HVIPs clearly protect participants from RII.

Blunt injury of a horseshoe kidney, case report and review of the literature. ***John Kortbeek,* Stephen Quigley.* From the *University of Calgary, Calgary, Alta.***

Background: Transection of a horseshoe kidney in blunt abdominal trauma is a rare clinical finding. **Methods:** The management of a transected horseshoe kidney and the subsequent complication that developed is described. A summary and discussion of the literature area is presented. **Results:** A 31-year-old male presented following a motor vehicle collision. A diagnosis of transection of a horseshoe kidney with hemorrhage is described. Initial management consisted of angio-embolization. Complications and hospital course are summarized. Injuries to horseshoe kidneys have been identified in 9 previous case reports. The finding, management and outcomes are summarized. **Conclusion:** Injuries to horseshoe kidneys are rare events. Injury patterns and descriptions may be graded according to the American Association for the Surgery of Trauma Organ Injury Scale. Horseshoe kidneys occur in 0.2% of the population. They may be more prone to injury as a result of their midline location. Management principles are consistent with the approach to other solid organ injuries.

Legal consequences for alcohol-impaired drivers involved in motor vehicle collisions: a systematic review. ***Robert Green,* Nelofar Kureschi,* Mete Erdogan.† From *Dalhousie University, Halifax, N.S., and †Trauma Nova Scotia, Halifax, N.S.***

Background: The treatment of alcohol-impaired drivers injured in a motor vehicle collision (MVC) is a complex public health issue. We conducted a systematic review to describe the legal consequences for alcohol-impaired drivers involved in a MVC and taken to a hospital or trauma centre. **Methods:** We searched MEDLINE, EMBASE and CINAHL databases from inception until August 2014. We included studies that reported legal consequences including charges or convictions of drivers taken to a hospital or trauma centre after a MVC with a blood alcohol concentration (BAC) exceeding the legal limit. **Results:** Twenty-six studies met inclusion criteria; 20 studies were conducted in the USA, 5 in Canada, and 1 in Sweden. All were cohort studies (23 retrospective, 3 prospective) and included 11 409 patients overall. A total of 5127 drivers had a BAC exceeding the legal limit, with legal consequences reported in 4937 cases. The median overall DUI/DWI conviction rate was 13% (range 0%–85%). The median percentage of drivers with a previous conviction on their record for driving under the influence (DUI) or driving while intoxicated (DWI) was 15.5% (range 6%–40%). The median percentage of drivers convicted again for DUI/DWI during the study period was 3.5% (range 2%–10%). Heterogeneity between study designs, legal jurisdictions, institutional procedures and policies for obtaining a legally admissible BAC measurement precluded a meta-analysis. **Conclusion:** The majority of intoxicated drivers involved in MVCs and seen in the emergency department are never charged or convicted. A national solution which allows identification and prosecution of intoxicated drivers is required.

A characterization of major adult sport-related trauma in Nova Scotia, 2000–2013. ***Robert Green,*Michael Butler,* Nelofar Kureshi,* Mete Erdogan.† From *Dalhousie University, Halifax, N.S., and †Trauma Nova Scotia, Halifax, N.S.***

Background: The goal of this study was to characterize the overall patterns of major adult sport-related trauma seen in Nova Scotia. **Methods:** The design of this study was a retrospective case series. Data on adult (age > 18 years) major traumatic injuries related to sports was extracted from the Nova Scotia Trauma Program Registry over a 13-year period (2000–2013). We assessed the frequency of injuries, the mechanism and severity of injuries, admission to a special care unit (SCU), hospital LOS and mortality. **Results:** Overall, 138 adults sustained a major sports-related traumatic injury in Nova Scotia during the study period (85.5% male; mean age 40.9 ± 16.7). Most injuries were blunt traumas (99.2%); the mean Glasgow Coma Scale score at the scene was 13 ± 3.86. The largest proportion of sport-related injuries resulted from cycling (71, 51.4%; 30 SCU admissions), followed by downhill skiing (11, 9.0%; 7 SCU admissions) and ice hockey (10, 7.2%; 4 SCU admissions). The longest hospital LOS were from diving injuries (n = 7, mean LOS 51.2 days ± 79.6), swimming (n = 1, LOS 49 days) and rugby (n = 2, mean LOS 15.0 days ± 14.1). There were 10 deaths: 6 from cycling (due to traffic accidents, 4 died at scene), 2 from curling (due to falls), 1 from skateboarding (due to fall), and 1 from ice hockey (due to fall). **Conclusion:** Cycling is the largest contributor to major adult sport-related trauma in Nova Scotia, followed by downhill skiing and ice hockey.

Is hockey the most dangerous pediatric sport? An evaluation of pediatric sport-related injuries treated in Nova Scotia. ***Robert Green,* Michael Butler,* Nelofar Kureshi,* Mete Erdogan.† From *Dalhousie University, Halifax, N.S., and †Trauma Nova Scotia, Halifax, N.S.***

Background: Hockey is widely believed to be the most dangerous sport. However, there are a lack of data on major injuries for all sports. The objective of this study was to describe overall patterns of pediatric sport-related injuries seen in Nova Scotia. **Methods:** This study was a retrospective case series. We hypothesized that hockey is the most common cause of sport-related injury for pediatric patients between 0 and 19 years of age in NS. Injury data were extracted from the Nova Scotia Trauma Program Registry from 2000 to 2013. The primary outcome evaluated was the frequency of injuries from individual and team sports played in NS. **Results:** In total, 107 children aged 3–18 years sustained a major traumatic injury in Nova Scotia. The mean age of injured children was 12.5 years (SD 3.8), with 84.1% being male. The majority of injuries were sustained playing individual sports (85%), with the highest

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proportion of major traumatic injuries resulted from cycling (57, 53.2%), followed by skateboarding (8, 7.4%) and downhill skiing (7, 6.5%). The team sports with the highest proportion of major traumatic injuries were ice hockey (8, 7.4%), followed by baseball (4, 3.7%) and football (2, 1.8%). There were 5 deaths during the study period; all were from individual sports (2 from cycling, 2 from skateboarding, 1 from swimming). **Conclusion:** Cycling is the largest contributor to pediatric traumatic injury in Nova Scotia, followed by hockey. Hockey is the team sport with the highest proportion of pediatric major traumatic injuries in the province.

Interim results of a pilot randomized control trial of an ED-based violence intervention program. ***Carolyn Snider,* S. Longsetty,† Depeng Jian.†*** **From the *Department of Emergency Medicine, University of Manitoba, Winnipeg, Man., and the †University of Manitoba, Winnipeg, Man.**

Background: Winnipeg has the highest homicide rate in Canada. Twenty percent of youth who are treated with injuries due to interpersonal violence return to our ED with a repeat injury within a year. Many U.S. trauma centres have initiated hospital-based violence intervention programs; however, large effectiveness trials have not yet been completed. **Methods:** In November 2013, we began a CIHR-funded randomized control trial to evaluate an Emergency Department Violence Intervention Program in our hospital. Youth injured by violence who are randomized to the intervention receive Wrap Around Care from support workers for approximately 1 year. They aim to address issues that the youth identify as putting them at risk of future violence. **Results:** At 1 year, 120 youth have been randomized into equal arms (with respect to age, gender and severity of injury). After the first year, the intervention has been deemed safe. All youth are safely housed, many are engaged in addictions counselling and many have re-engaged in school. This presentation will present early results from this feasibility stage, including initial recruitment, safety and narrative stories from participants. A larger effectiveness trial is planned to evaluate repeat injury rate and interactions with the justice system amongst participants. **Conclusion:** Secondary violence intervention projects are feasible to implement and evaluate in hospitals in Canadian cities with a high rate of violence prevalence. Early results are extremely promising.

Pre-intubation resuscitation by Canadian physicians: results of a national survey. ***Robert Green,* Dean Fergusson,†Alex Turgeon,‡ Lauralyn McIntyre,§ George Kovacs,¶ Donald Griesdale,** Michael Butler.*** **From *Dalhousie University, Halifax, N.S., the †Ottawa Hospital Research Institute, University of Ottawa, Ottawa, Ont., the ‡CHU de Québec Research Centre, Université Laval, Québec, Que., the §Ottawa Hospital Research Institute, The Ottawa Hospital, University of Ottawa, Ottawa, Ont., ¶Dalhousie University, Queen Elizabeth II Health Sciences Centre, Halifax, N.S., and the **Centre for Clinical Epidemiology and Evaluation, Vancouver Coastal Health Research Institute, University of British Columbia, Vancouver, B.C.**

Background: The objective of this study was to describe the pre-intubation resuscitation practices including vascular access, fluid administration and vasopressor use by emergency medicine and critical care medicine physicians before emergent endotracheal intubation in trauma patients. **Methods:** A clinical scenario-based survey was developed by the investigative team. Respondents were presented a scenario with a major trauma patient involved in a motor vehicle crash and asked to indicate their preferred choices of vascular access, fluid resuscitation and use of vasopressor medications prior to intubation. The survey was distributed in web-based and postal formats to all members of the Canadian Association of Emergency Physicians and the Canadian Critical Care Society. **Results:** Overall, 882 (50.2%) of 1758 physicians completed the survey. The route most physicians selected "always" for establishing vascular access was through use of multiple peripheral IVs. (62%), followed by the use of a single peripheral IV (36%). Most physicians responded they would "never" insert an arterial catheter (58%) or a central line (21%) in the trauma patient. 98% of physicians responded they would administer a fluid prior to intubation. The most common pre-intubation fluid of choice ("always") was a crystalloid bolus (77%). Most respondents indicating they would "always" or "often" administer a fluid volume greater than 1000 mL. The majority of physicians responded they would "never" utilize a vasopressor prior to intubation. **Conclusion:** In this survey, pre-intubation resuscitation with a high volume of crystalloid fluids using multiple peripheral IVs was the most common resuscitation strategy, while few physicians would administer a vasopressor.

First-responder accuracy using SALT during mass-casualty incident simulation. ***Christopher Lee,* Shelley McLeod,† Michelle Klingel,‡ Kristine Van Aarsen,§ Jeffrey Franc,¶ Michael Peddle.***** **From *Western University, London, Ont., †Mount Sinai Hospital, Toronto, Ont., the ‡Peter Gilgan Centre for Research and Learning, The Hospital for Sick Children, Toronto, Ont., the §Division of Emergency Medicine, Faculty of Medicine, Western University, London, Ont., the ¶Division of Emergency Medicine, University Hospital, Edmonton, Alta., and the **SWORBHP, London, Ont.**

Background: During mass-casualty incidents (MCIs), patient volume often overwhelms available emergency medical services (EMS) personnel. If other first responders could accurately triage, pre-hospital medical resources could be focused on patients that require immediate stabilization and transport. The objective of the study is to compare triage accuracy, error patterns, and time to triage completion for primary care paramedic (PCP) and fire students participating in a simulated MCI using the SALT triage algorithm. **Methods:** All students in the second-year PCP program and fire science program at 2 separate community colleges were invited to participate. Following a 30-minute didactic session on SALT, participants were given a standardized briefing and asked to triage an 8-victim mock MCI using SALT. **Results:** Thirty-eight PCP and 29 fire students completed the simulation. Overall triage accuracy was 79.9% for PCP and 72.0% for Fire (Δ 8.0%, 95% CI 1.2–14.7). No significant difference was found between the groups regarding types of triage errors. Over-triage, under-triage and critical errors occurred in 10.2%, 7.6%, and 2.3% of PCP triage assignments. Fire students had a similar pattern, with 15.2% over-triaged, 8.7% under-triaged and 4.3% critical errors. The median times to completion for PCPs and Fire were 147s and 157s, respectively (Δ 10s, 95% CI –10 to 30). **Conclusion:** PCP and fire students were able to quickly and accurately triage a simulated MCI after brief SALT training. These results suggest that fire could be considered for MCI triage depending on the availability of pre-hospital medical resources and appropriate training.

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Emergent endotracheal intubation: medications and device choices by Canadian resuscitation physicians. ***Robert Green,* Dean Fergusson,† Alex Turgeon,‡ Lauralyn McIntyre,† George Kovacs,‡ Donald Griesdale,§ Michael Butler.*** **From *Dalhousie University, Halifax, N.S., the †Ottawa Hospital Research Institute, University of Ottawa, Ottawa, Ont., the ‡CHU de Québec Research Centre, Université Laval, Québec, Que., ‡Dalhousie University, Queen Elizabeth II Health Sciences Centre, Halifax, N.S., and the §Centre for Clinical Epidemiology and Evaluation, Vancouver Coastal Health Research Institute, University of British Columbia, Vancouver, B.C.**

Background: A standard approach to emergent endotracheal intubations (EETIs) in patients with major traumatic injury does not exist. The goal of this study was to determine the medications and devices utilized for intubation by Canadian Emergency Medicine and Critical Care Medicine physicians. **Methods:** As part of clinical scenario-based survey, physicians were asked to indicate medications they would administer to facilitate EETI, their first choice of intubation device and backup procedure should the first choice fail. Physicians were presented a trauma-based scenario and responded using a 5-point scale ranging from "always" to "never." The survey was distributed to all non-trainee physician members of the Canadian Association of Emergency Physicians and the Canadian Critical Care Society. **Results:** A total of 1758 physicians were sent the survey, with a response rate of 50.2% (882/1758). Most physicians indicated direct laryngoscopy with a MacIntosh blade would "always" or "often" be their first choice of intubation device (79%), followed by video laryngoscopy (49%) and bougie-assisted intubation (25%). The backup devices physicians chose to use "always/often" in the event of a "failed airway" were an extraglottic device (56%), followed by percutaneous cricothyrotomy (6%) and open cricothyrotomy (5%). Medications physicians would "always/often" use were fentanyl (51%) and etomidate (50%); most preferred using succinylcholine for paralysis (63%). **Conclusion:** Most emergency and intensive care physicians in Canada utilize direct laryngoscopy with a MacIntosh blade with as a primary device for EETI in trauma patients, with an extraglottic device as a backup. Medications and paralytics used to facilitate EETI were variable.

"Oh the weather outside is frightful": Severe injury secondary to falls while installing residential Christmas lights. ***Michael Driedger,* Arjun Gupta,† Bryan Wells,* Elijah Dixon,‡ Chad Ball.‡*** **From *University of Calgary, Calgary Alta., the †University of Calgary, Cumming School of Medicine, Calgary, Alta., and the ‡Departments of Surgery and Community Health Sciences, Foothills Medical Centre and University of Calgary, Calgary, Alta.**

Background: Falls are an increasing cause of severe traumatic injury. They now account for approximately 40% of both overall trauma volumes and injury-related deaths within Canada. In northern climates the risk of all types of falls appears to increase during the fall/winter months when conditions become increasingly dangerous. The purpose of this study was to define the injury and patient demographics of severe trauma that occurs during falls from installing Christmas lights. **Methods:** All patients who were admitted to the Foothills Medical Centre (2002–2012) with severe injuries (ISS ≥ 12) caused during Christmas light installation were retrospectively evaluated via electronic and paper chart reviews. Standard statistical methodology was utilized. **Results:** A total of 40 patients were severely injured (95% male, mean age 55, mean ISS 27.5 [range: 12–75]) while installing Christmas lights. Injuries included neurologic (68%), thoracic (68%), extremity (45%), spinal (43%) and multiple other sites. Fall mechanisms were ladder (65%), roof (30%), ground (3%) and railing (3%). Interventions included a 20% requirement for intubation/critical care and 30% for operative repairs (orthopedic and neurosurgical). The average LOS was 15.6 days (range: 2–165). The fall-related morbidity (28%) and mortality (5%) was significant. A total of 12.5% patients required transfer to long-term care or rehabilitation facility. **Conclusion:** Falls while installing Christmas lights during the fall/winter seasons can result in severe life-altering injuries with considerable morbidity and significant mortality. Caution should be employed when installing lights at any height.

Can we speak the same language? Understanding Quebec's inclusive trauma system. ***Julien Clement,* Lynne Moore.†*** **From the *CHU de Québec, Québec, Que, †Université Laval, Québec, Que.**

For 2 decades, the province of Quebec has had a fully integrated trauma system based on a network of 59 designated trauma centres (levels 1–4) and transfer agreements between centres. Moreover, a provincial trauma registry tracks every trauma patient admitted to a trauma centre, and the province has an extensive quality control system based on benchmarking of structures, processes and outcomes. The overarching goal of this presentation is to elucidate misunderstandings and misconceptions surrounding the Quebec trauma system. Specific objectives will be to explain and translate the terminology used in Quebec's trauma system, to describe the architecture of the system and patient flow, to describe the trauma registry and performance indicators, and to discuss the system's strengths and shortcomings.

An unusual segmental clavicle fracture treated with titanium elastic nail. ***N. Karthik Divya Charan,* Krubaganesh Rajaram.**** **From the *MNR, Telangana, India**

Background: Fracture of clavicle is a common traumatic injury and comprises 4% of all fractures in adults. Among these, midshaft injuries account for the majority and medial fractures are uncommon. While segmental fractures have been reported in literature, concurrent lateral and medial injuries are very rare. The nature of segmental fractures can pose a difficult management problem for numerous reasons, and initial operative fixation is usually indicated. **Methods:** We present the case of a 16-year-old who had a direct blow in his right shoulder and sustained injury to his right clavicle. He had segmental clavicle fracture, segmental fragment rotated vertical. Titanium elastic nail was done and immediate post-operative mobilization was done. **Results:** Fracture united well and there was no limitation of movement. **Conclusion:** Because of rarity of segmental fracture of clavicle, routine surgical technique has not been described in the text. Although controversy exists regarding titanium elastic nailing of clavicle fracture, our technique for segmental clavicle fracture was very good. Union was achieved, early mobilization was done.

Impact of the age of stored blood on trauma patient mortality: a systematic review. ***Nicholas Sowers,* Patrick Froese,****

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*Mete Erdogan,† Robert Green.** **From *Dalhousie University, Halifax, N.S., †Trauma Nova Scotia, Halifax, N.S.**

Background: The impact of the age of stored red blood cells on mortality in patients sustaining traumatic injuries requiring transfusion of blood products is unknown. The objective of this systematic review is to identify and describe the available literature on the use of older vs. newer blood in trauma patient populations. **Methods:** A systematic search of PubMed, EMBASE, Lilac and the Cochrane Database was conducted. Published studies comparing the transfusion of "newer" v. "older" red blood cells in adult patients sustaining traumatic injuries were eligible. Studies included for review reported on trauma patients receiving transfusions of packed red blood cells, identified the age of stored blood that was transfused, and reported patient mortality as an endpoint. We extracted data using a standardized form and assessed study quality using the Newcastle–Ottawa Scale. **Results:** Seven studies were identified (6780 patients) from 3936 initial search results. Four studies reported that transfusion of older blood was independently associated with increased mortality in trauma patients, while 3 studies did not observe any increase in patient mortality with use of older vs. newer blood. Three studies associated the transfusion of older blood with adverse patient outcomes including longer stay in the intensive care unit, complicated sepsis, pneumonia and renal dysfunction. Studies varied considerably in design, volumes of blood transfused and definitions applied for "old" and "new" blood. **Conclusion:** The impact of the age of stored packed red blood cells on mortality in trauma patients is inconclusive. Future investigations are warranted.

Interhospital transfer of traumatic brain injury: utilization of helicopter transport. *Nina Neuhaus,* Muhammad Younus,* Denise Torres,* Kenneth Widom,* DiAnne Leonard,* Susan Baro,* James Dove,* Joseph Blansfield,* Mohsen Shabahang,* Shelly Timmons,* Jeffrey Wild.** **From *Geisinger Medical Center, Danville, Pa.**

Background: Helicopter transport (HT) is common in interhospital transfer (IHT) of patients with traumatic brain injury (TBI) for expedited transport and perceived improved outcomes. The aim of this study was to assess the appropriateness of HT for IHTs with a diagnosis of TBI in rural trauma. **Methods:** This was a retrospective analysis of IHT patients with TBI admitted to a Level 1 trauma centre from January 2006 to December 2012. The primary outcome was neurosurgical intervention. **Results:** Six hundred seventeen patients arrived by ground transport and 493 by HT. The mean transport time from referring facilities was shorter in the HT group (0:31 v. 1:16, $p < 0.0001$). Fifty patients of the HT group had emergent procedures within 4 hours of admission. Forty patients who had emergent intervention had a severe TBI (GCS < 8) compared to 88 who did not ($p < 0.0001$). Epidural hematoma (EDH) was found in 13 patients requiring emergent intervention versus 43 in the nonintervention group ($p = 0.0012$). Two hundred ninety-two patients in the HT group had mild TBI (GCS 13-15), 4 of which required surgical intervention. **Conclusion:** HT in our rural trauma system may be overutilized for TBI, as 90% of patients did not require emergent neurosurgical intervention. EDH and severe TBI were more likely to need intervention and warrant HT. Mild TBI should not be used as an indication for HT. IHT criteria of TBI patients are needed to maximize patient outcomes, contain costs and minimize HT associated hazards.

Cheerleading injuries: a Canadian perspective. *Isabelle Hardy,* Steven McFaull,† Marianne Beaudin,‡ Dickens Saint-Vil.‡* **From *Université de Montréal, Montréal, Que., †Public Health Agency of Canada, the ‡CHU Ste-Justine, Montréal, Que.**

Background: Cheerleading, now increasingly practised in Canada, has a high propensity to cause traumatic injuries. The objective of this study was to evaluate the importance of injuries in the practice of cheerleading and their occurrence mechanisms, in order to propose preventive measures. **Methods:** Retrospective database review of cheerleading injuries extracted from the Canadian Hospitals Injury Reporting and Prevention Program database between 1990 and 2010. The injuries were evaluated according to their mechanism, nature, location, time and treatment. **Results:** Overall, there were 1496 cases of injuries documented secondary to cheerleading (median age 15.4 [IQR 2–2] years; 1410 women [94%]). The number of injuries reported increased by roughly 200% between 1990 and 2010. The most commonly injured body parts order were the upper limbs, head and neck, and the lower limbs. The most common types of injuries were sprains/strains (28%), soft tissue injuries (22%), fractures (16%) and superficial wounds (12%). Concussions composed 4% of cases. The principal cheerleading mechanisms were basing/spotting a stunt from height and falling from a stunt. **Conclusion:** Although the proportion of serious injury is low, the increasing trend for the practice of cheerleading calls for preventative measures for which unified security guidelines should be created.

Pre-hospital mode of transport in a rural trauma system: air versus ground. *Muhammad Younus,* Denise Torres,* Kenneth Widom,* DiAnne Leonard,* Susan Baro,* James Dove,* Joseph Blansfield,* Mohsen Shabahang,* Jeffrey Wild.** **From *Geisinger Medical Center, Danville, Pa.**

Background: The purpose of this study was to compare the outcomes of trauma patients transported directly from trauma scenes by ground (G) versus helicopter (H) in a rural trauma system. **Methods:** Multivariate regression analysis and Trauma and Injury Severity Score (TRISS) methodology were utilized to determine differences in outcomes over a 7-year period. **Results:** A total of 2414 patients were transferred by ground and 2078 patients were transferred by helicopter. In the helicopter cohort, mean ISS was 18.4 v. 12.3 ($p < 0.0001$), ICU LOS (H: 3.1 v. G: 1.3, $p < 0.0001$) and hospital LOS (H: 6.9 ± 8.9 v. G: 4.6, $p < 0.0001$) were prolonged in the helicopter cohort. Overall, crude mortality was higher for the helicopter group (H: 7.3% v. G: 3.4%, $p < 0.001$). Multivariate analysis found helicopter transport, blunt injury, Glasgow Coma Scale score > 8 and no intubation to be predictive of survival. On TRISS analysis, the helicopter cohort had a Z statistic of 20.16, and a W score of 13.13. This compared with the ground cohort, whose z statistic was 2.96 and W score was 1.41. **Conclusion:** Helicopter transport was associated with improved odds of survival for patients admitted directly from the scene. Both groups had statistically significant improved survival on TRISS analysis (z-statistic), however, helicopter cohort had higher probability of survival as compared to ground.

Analysis of 15 000 patient transfers to level 1 trauma centre: Injury severity does not matter — just drive, drive, drive!

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Irada Ibrahim-Zada, Randall Friese,* Peter Rhee,* Gary Veercruysse,* Bellal Joseph.** **From the *University of Arizona, Tucson, Ariz.**

Background: Improvements in helicopter emergency medical services (HEMS) remain one of the highest priorities for the National Transportation Safety Board. The aim of this study was to identify the optimal mode of transportation from scene to level 1 trauma centre (L1-TC). **Methods:** We performed a retrospective cohort of our state trauma registry (2012) to identify all patients transported from scene to L1-TC. Patients were grouped by mode of transportation (air or ground). Data on demographics, injury severity, location and response times were obtained. Distances were computed using geocodes. Nonparametric generalized additive linear regression model was fitted to predict total response time based on distance to L1-TC. **Results:** Of 15 032 patients, distance was computed in 10 971 patients: 1701 by air and 9270 by ground. Air transfers resulted in longer transport time (6.3 min) when injury occurred within a 30 mile-radius from L1-TC (p = 0.001). Patients transferred by air were more severely injured. **Conclusion:** Helicopter EMS is an expensive resource that needs to be used judiciously. Regardless of injury severity, patients injured within 30 miles of L1-TC should be transferred by ground.

The effects of legislation on morbidity and mortality associated with all-terrain vehicle and motorcycle crashes in Puerto Rico. *Annette Marie Pascual Marrer.** **From the *University of Puerto Rico, San Juan, Puerto Rico**

Background: The prevalence of all-terrain vehicle (ATV)- and motorcycle (MC)-related injuries has increased significantly. Risk factors associated include men aged 16–34 years not wearing protective equipment, alcohol consumption and carrying passengers. The study aims were to describe morbidity and mortality patterns related to ATV and MC crashes and to assess the impact of a law enacted in PR in 2007. **Methods:** An IRB-approved retrospective cohort study (2002–2012) was performed at a single trauma centre using the national registry. **Results:** A total of 249 patients with ATV- and 1444 with MC-related injuries were admitted to PRTC. Most patients of all-terrain vehicle crashes (ATVCS) and motorcycle crashes (MCCS) were men younger than 35 years of age. Head/neck, extremity and chest injuries were the most common areas for ATVCS and MCCS. Patients sustaining MCCS had a higher compliance rate of helmet use (65%) compared to ATVCS (16%). Helmet use significantly reduced mortality, OR 0.34 (95% CI 0.18–0.63). Severe cases were related to ATVCS with ISS > 25 (43.1%) and GCS < 8 (20.9%) (p < 0.005). After adjusting, there was an increase in mortality due to ATVCS once the law was enacted, OR 1.93 (95% CI 0.42–8.50). **Conclusion:** Despite the prevalence of MCCS decreasing, no reduction was reported in morbidity and mortality patterns after the law. Legislation should be reinforced with recurrent education and driver training, and continuous motorcyclists and ATV monitoring to ensure law compliance.

Assessing how pediatric trauma patients are supported nutritionally at McMaster Children's Hospital. *Karen Bailey,* Alice Wang,† Angela Coates,‡ Helena Pelletier,† Diana Calligan.** **From *McMaster Children's Hospital, Hamilton, Ont., the †McMaster University, Hamilton, Ont., and the ‡Hamilton Health Sciences Trauma Program, Hamilton, Ont.**

Background: Nutrition plays a key role in the recovery of pediatric trauma patients. A catabolic state in trauma patients may hinder recovery. Inadequate nutrition may contribute to increased morbidity, mortality and LOS. The goal of this study is to review the current nutrition support practices for pediatric trauma patients at McMaster Children's Hospital and identify areas to improve the quality of patient care. **Methods:** A retrospective chart review was conducted on pediatric trauma patients (age < 18 years) identified through the local trauma registry. Pediatric trauma patients admitted from January 2010 to March 2014 with an ISS ≥ 12 and a hospitalization of ≥ 24 hours were included. **Results:** A total of 131 patients were included in this study, 61.1% male, mean age of 9.21 ± 5.60 years and median ISS of 17 (range 12–50). Blunt trauma accounted for 97.7% of patients admitted, and 73.3% had a trauma team activation. Median LOS was found to be 6 days (range 2–143). Preliminary analysis indicates that on average, patients receive nutrition support 24 ± 10 hours from the time of admission. However, documentation of nutrition support was not consistently being incorporated into patient charts in an easily accessible manner. The corresponding results of our full analysis will be presented. **Conclusion:** The results of this study will be used to guide the development of a process to improve the quality of documentation for nutrition monitoring of pediatric trauma patients locally.

Outcomes of conservative versus operative management of stable penetrating abdominal trauma. *Sean Bennett,* Aysah Amath,* Heather Knight† Jacinthe Lampron.†* **From the *University of Ottawa, Ottawa, Ont., and the†Ottawa Hospital, Ottawa, Ont.**

Background: With improvements in diagnostic imaging and trauma unit monitoring, conservative management (CM) for hemodynamically stable patients with penetrating abdominal injuries has become an increasingly accepted option. Literature comparing CM to operative management (OM) is limited, certainly in the Canadian context. Furthermore, risk factors for failure of CM are not well defined. **Methods:** Using the Ottawa Hospital trauma database, a retrospective analysis will be conducted on all patients presenting with penetrating abdominal trauma. A cohort of patients will be identified as candidates for CM. Criteria for CM include hemodynamically stable patients without imaging suggestive of intra-abdominal injury. Among candidates for CM, a comparative analysis of CM v. OM will be conducted. Important variables will include mortality, morbidity, ICU/trauma unit LOS, hospital LOS and complications. Proportion of CM failure (conversion to OM), reasons for CM failure and negative laparotomy rate will be calculated. Multivariable logistic regression will attempt to identify variables predictive of CM failure. **Results:** Research ethics board application is submitted. The trauma database is well maintained and easily accessible. We hypothesize that CM will have equal rates of mortality, with decreased ICU/trauma unit LOS, hospital LOS, and complications. Multivariable logistic regression analysis may identify predictive factors, such as leukocytosis, hemoglobin level, location of injury or method of injury. **Conclusion:** CM is an increasingly acceptable option for stable penetrating abdominal trauma. This study will compare clinical outcomes of CM vs. OM in the Canadian context, and attempt to identify predictive factors for CM failure.

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S.T.A.R.T.T. — Evolution of a true multidisciplinary trauma crisis resource management simulation course. ***Lawrence Gillman,* Peter Brindley,† Damian Paton-Gay,† Paul Engels,‡ Jason Park,* Sandy Widder.§*** **From the *University of Manitoba, Winnipeg, Man., †Alberta Health Services, Edmonton, Alta., ‡McMaster University, Hamilton, Ont., and §University of Alberta Hospital, Edmonton, Alta.**

Background: Multidisciplinary crisis resource management CRM courses to enhance medical education are common, but the non-physician participants in these courses often serve only ancillary roles to support physician education. True multidisciplinary training remains rare. We previously reported on a pilot multidisciplinary CRM course titled S.T.A.R.T.T. (Standardized Trauma and Resuscitative Team Training). Here we study the course's evolution. **Methods:** In response to participant feedback following each course, major curricular modifications were made, including adoption of a team coach, addition of non-medical CRM activities and more attention to non-physician learners. Satisfaction was evaluated by post-course survey. Trauma teams were evaluated by course instructors using the Ottawa Global Rating Scale (GRS) to assess CRM skills and an Advanced Trauma Life Support (ATLS) primary survey checklist. **Results:** Eleven "trauma teams", consisting of physicians, nurses and respiratory therapists, each completed 4 crisis simulations over 3 courses. Satisfaction remained high among participants (data not shown). As participants progressed through scenarios, improvements in GRS scores were seen between the first and fourth (29.8 v. 36.1 of 42, $p = 0.022$), second and third (28.2 v. 34.6, $p = 0.017$), and second and fourth (28.2 v. 36.1, $p = 0.002$) scenarios. There were no differences in ATLS checklist with mean scores for each scenario ranging from 11.3 to 13.2 of 17. **Conclusion:** Creation of a truly multidisciplinary trauma CRM course requires careful attention to the learning needs of each participating discipline and the team as a whole. The evolved S.T.A.R.T.T. curriculum has maintained high participant satisfaction and is associated with improvement in team CRM skills over the duration of the course.

Development of criteria to identify traumatic brain injury patients NOT requiring intensive care unit monitoring. ***Sami Hossri,* Charles Fasanya.**** **From the *Staten Island University, Staten Island, N.Y.**

Background: Most patients with mild to moderate traumatic brain injury (TBI) are subjectively admitted to the intensive care unit (ICU) for routine monitoring. This study will attempt to derive a clinical predictor tool to identify adult emergency department (ED) patients with mild to moderate TBI who are at low risk for requiring critical care intervention (CCI) during hospitalization; therefore, not requiring ICU monitoring. **Methods:** This is a retrospective study of patients (> 18 years of age) presenting to the ED with mild to moderate TBI. The need for ICU admission was defined as the presence of at least one CCI within the first 48 hours of admission. A list consisting of 1290 patients was extracted from the trauma database and investigated. We performed simple statistical analysis and univariate regression after the completion of data collection and elimination of non-qualifying subjects. The set of pre-defined CCIs included red blood cell transfusion, fresh frozen plasma transfusion, mechanical ventilation, neurosurgery, invasive monitoring, cardiac arrhythmia or arrest, vasopressor use, inotrope use and interventional angiography. **Results:** Three hundred fifty-eight patients met the inclusion criteria and were analyzed. Of these patients, 140 (39.1%) received at least 1 CCI. The variables shown to be associated with a lower risk of requiring 1 or more CCI were age < 65, male gender, absence of pre-injury anticoagulation and the radiological absence of a skull fracture, intraventricular hemorrhage and/or midline cerebral shift. **Conclusion:** This clinical predictor identifies which patients would not benefit from ICU admission, therefore reducing healthcare costs and possible adverse events associated with unnecessary ICU monitoring.

Assigning costs to visits for injuries due to youth violence — the first step in a cost-effectiveness analysis. ***Kaitlin Cyr,* Carolyn Snider,† Nicole Barrett.**** **From the *University of Manitoba, Winnipeg, Man., and the †Department of Emergency Medicine, University of Manitoba, Winnipeg, Man.**

Background: In 2013, a RCT of the Emergency Department Violence Intervention Program was launched in Winnipeg's HSC with the goal of reducing the recidivism rate of violent injuries among youth. The objective of this study is to assign healthcare costs to visits for injury related to violence. This will serve as a template for the planned cost-effectiveness analysis. **Methods:** Youth (aged 14–24) with injuries due to violence were included in the main study. A chart review by 2 extractors of visits for the first 7 months was conducted. Time in the ED, lab, diagnostic imaging and disposition were collected. Cost for ED visits was based on average ED cost per hour. Diagnostic imaging costs were estimated based on the type of test performed. If a patient was admitted, their cost was estimated using CIHI data. For this study we compared index visits to determine if there were any cost differences to baseline visits. **Results:** Eighty-one youth were randomized in the first 7 months. There was no statistical difference between the two groups with respect to index visits; however, there was a trend toward decreased cost of ED visits based on hours in the ED in the intervention group. **Conclusion:** The costing framework is now in place to do a future cost-effectiveness analysis comparing repeat visits for intentional injury. It will help determine whether reducing recidivism through a hospital-based violence intervention program produces a cost savings to the health system.

There's no TRIK to it — development of the Trauma Resuscitation in Kids course. ***Natalie Yanchar,* Adam Cheng,† Angelo Mikrogianakis,† Sonny Dhanani,‡ Farhan Bhanji,§ Amina Lalani,¶ Fayez Al-Harthi,** Sanjay Mehta††.*** **From *IWK Health Centre, Halifax, N.S., †Alberta Children's Hospital, Edmonton, Alta., the ‡Children's Hospital of Eastern Ontario, Ottawa, Ont., the §Department of Pediatrics, McGill University, Montréal, Que., ¶Hospital for Sick Children, Toronto, Ont., **B.C. Children's Hospital, Vancouver, B.C., and the ††Department of Pediatrics, University of Toronto, Toronto, Ont.**

Background: Current training in trauma management focuses primarily on adult patients. Many factors lead to lack of physician and other allied health professional comfort with resuscitation of major trauma in children. **Methods:** A modified Delphi approach was used to determine objectives for a curriculum focusing on pediatric trauma resuscitation and acute management for physicians. Utilizing previously established learning objectives, development of a

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simulation-based pediatric trauma course following Kern's 6-step model for curriculum design was undertaken. A pre–post survey evaluating learner comfort across 10 trauma tasks was undertaken. **Results:** Sixteen knowledge- and 5 skills-based objectives were established. Educational strategies include lectures, team-based high-fidelity simulation, procedural skills, small group discussions and online learning modules. The survey demonstrated improved learner comfort improved across all 10 trauma tasks. **Conclusion:** A focused course in pediatric trauma resuscitation can improve learner comfort and is a feasible option for health care professionals who frequently or infrequently manage this patient population.

Resilient despite childhood trauma experiences. ***Monica Hinton****. **From *Phoenix Counselling Services, Edmonton, Alta.**

Background: In Canada, the number of children who experience trauma is substantial. Research, however, does not seem to reflect the experience of those who do well following traumatic events. As a clinician, I believe that people are resilient despite trauma and I wanted to find out how people do well regardless of distressing life events. The purpose of my qualitative grounded theory research was to uncover what participants believed fostered their resiliency despite trauma. **Methods:** Self-identified resilient volunteers were interviewed and the research data was analyzed using grounded theory. This included open, axial and selective coding. **Results:** The chosen central phenomenon was the perception that the participants' childhood experiences were traumatic. Strategies used by the research participants to address this phenomenon included enlisting important individuals/pets, spirituality and regulating the traumatic experience. Regulation strategies included humour, self-preservation, imagination, intelligence, self-direction and "unhealthy" behaviours (addiction, self-harm, risky behaviours, etc). The results indicate that there are degrees of resiliency. Resiliency is a process, and each participant moved beyond periods of using unhealthy strategies in regulating their experience. **Conclusion:** Implications for practice stem from these findings. If we hope to nurture socially competent people who have a sense of their own identity, and who are able to make decisions, set goals and believe in their future, our primary focus as clinicians must be on meeting patients' basic human needs for respect, caring, connectedness, challenge, power and meaning.

A five-year, single-centre review of toxic epidermal necrolysis management. ***Eileen Bernal**,* **Steven Wolf**,* **Brett Arnoldo**,* **Karen Kowalske**,* **Herb Phelan**.** **From the *UTSW Parkland, Dallas, Texas.**

Background: Toxic epidermal necrolysis (TEN) is a rare, life-threatening mucocutaneous disease. While delay in transfer to a burn centre has been associated with poorer outcomes, many aspects of these patients' care remains controversial. Specifically, the utilization of intravenous immunoglobulin (IVIg), corticosteroids or a combination of both has remained a subject of debate. We examine our institution's recent experience with this disease process and compare our treatment strategies and outcomes with those of the published literature. **Methods:** This was a retrospective review of our ABA-verified burn centre's institutional burn databank from April 2009 to date. Subjects with diagnostic biopsies or classic clinical pictures were included in the analysis. All data are presented as median and interquartile range (IQR). The Mann Whitney *U* test was used for all comparisons. **Results:** Eighteen subjects met inclusion criteria. The mortality for the overall cohort was 28%. All subjects presented to our facility as transfers after a median of 3 days (IQR 2–4.75). Suspected etiologies were antibiotics or antiepileptics (77%), pain medications (17%) and idiopathic (6%). Corticosteroid treatment was seen in five patients, and associated with death in 1 case. IVIg was utilized in 4 patients, and in combination with corticosteroids in 1 case. **Conclusion:** Our point estimates are consistent with previous work suggesting that older age, higher TBSA involvement and higher SCORTEN are associated with worse outcomes. TEN is a rare disease that is best treated at a burn centre with their resources and expertise.

All in the family: creating and implementing an inclusive provincial trauma registry. ***Allison Chisholm**,* **Susan Benjamin**,* **Ann Hogan**,* **Shelley Woodford**,* **Ian Watson**.** **From the *N.B. Trauma Program, Saint John, N.B.**

Background: The New Brunswick Trauma Program recognized the need for creating a single, integrated trauma registry. Historically, there were two standalone trauma registry applications in use at the level 1 and 2 trauma centres. The ability to collect data and produce meaningful reports to assist in the quality of clinical care and contribute to injury prevention strategies was an integral component of the work done, and the need to include the 6 level 3 trauma centres was paramount in getting the provincial picture. **Methods:** A business case and procuring available funding were the first steps. In order to have 1 integrated system, it was necessary to ensure that all facilities were using common inclusion and exclusion criteria and a common data dictionary. Integration of EMS data, coroner's data and all supporting PIPS activities was also included. A web-based solution was chosen and allowed each trauma centre to feed into 1 system. **Results:** As of Apr. 1, 2014, the New Brunswick Trauma Registry went live in all level 1, 2 and 3 trauma centres in New Brunswick. The registry has become more inclusive, with all trauma centres contributing to the single application on a common platform. Patients can be followed from trauma centre to trauma centre without duplication. **Conclusion:** The data procured from the trauma registry will help direct clinical care and injury prevention using longitudinal studies across the continuum of trauma care in New Brunswick.

Lessons learned from a provincial trauma transfer system. ***Ann Hogan**,* **Shelley Woodford**,* **Ian Watson**.** **From the *NB Trauma Program, Saint John, N.B.**

Background: Since June, 2010, the New Brunswick Trauma Program (NBTP) in partnership with Ambulance New Brunswick (ANB) has managed potential and actual trauma transfers through a toll free trauma referral system based on trauma transfer guidelines that were developed by NBTP based on best practice. This system uses a trauma control physician (TCP) and a paramedic-trained critical care transport coordinator communication (CCTC) who together provide support and coordination by telephone to the physicians involved. **Methods:** Between June 2010 and Mar. 31, 2014, digital voice recordings of 383 calls were reviewed by an experienced trauma nurse. Call transactions were scored using 3-point Likert scale and overall narrative comments were noted. This retrospective review evaluated compliance to the established processes for the TCP and CCTC as well as general system-related

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performance. Data were kept in a secure database allowing for detailed analysis. **Results:** Scores improved from an average 1.2 in 2011–2012 to 1.6 in 2013–2014. Thematic analysis of narrative comments identified areas for improvement, which were implemented during the study period. To improve communication, standardized documentation reflecting the expected call management processes was developed for use by CCTCs, TCPs and emergency physicians. Feedback was provided to CCTCs and TCPS to reinforce consistent application of predefined processes to each call to ensure accurate transfer of information. **Conclusion:** Reviewing recorded trauma transfer calls and offering feedback to participants in trauma transfer calls leads to improvements in overall call management and compliance with expected processes.

The NB Trauma Program: 5 years later. ***Ian Watson,* Ann Hogan,* Shelley Woodford,* Allison Chisholm,* Richard Louis,* Erik St. Pierre.*** **From the *NB Trauma Program, Saint John, N.B.**

Background: The NB Trauma Program, established in 2010, has a mission of excellence in trauma care, injury prevention, education and research. The structure of the program created a formalized partnership that represents all acute care facilities, the single provincial EMS provider and the funder/regulator. With structure secure, efforts shifted to key operational processes to provide the means of meeting the program's mission. **Methods:** Early policy priorities were aimed at those that improved access to services. Secondary priorities enhanced clinical safety or introduced capacity for performance improvement and patient safety (PIPS). Process mapping was completed to optimize key operational processes. Following broad consultation of draft documents, completed policies and processes were provincially approved, translated and embedded verbatim into the regional health authorities' policy environments, ensuring provincial consistency. Staff remained engaged at the local, regional and provincial levels to ensure consistency in implementation and evaluation. **Results:** The NB Trauma Program has successfully introduced several provincially consistent and binding policies and processes, including Toll Free Trauma Referral call processing; Field Trauma Triage; Guaranteed Hospital Access for Major Trauma Patients; Massive Transfusion in the Major Trauma Patient; Clinical Case Reviews for Trauma Patients in New Brunswick; Standardized Nursing Documentation for Major Trauma Patients in New Brunswick. **Conclusion:** Marked process improvements in access and quality have been achieved. The program is well positioned to continue employing this methodology for future process enhancements and, more fundamentally, to focus on trauma outcomes at the local, regional and provincial levels.

Provincial coordination of injury prevention: the New Brunswick (NB) experience. ***Ann Hogan,* Richard Louis.**** **From the *NB Trauma Program, Saint John, N.B.**

Background: Unintentional injury is a leading cause of hospitalization, disability and death for New Brunswickers of all ages. Many stakeholders work within NB to provide various injury prevention programs, but prior to 2010 there was no one organization that had a provincial mandate for coordination of injury prevention. The NB government through the formation of the NB Trauma Program (NBTP) recognized the need for provincial oversight of injury prevention in order to ensure a broader scope of implementation. **Methods:** In 2011 NBTP formed an injury prevention committee comprising members representing a wide variety of injury prevention stakeholders from within NB. Based on NB data from the Discharge Abstract Database and the Saint John Regional Hospital trauma registry, 3 priority areas for prevention were identified: child falls, risky behaviour in youth and senior falls. **Results:** The injury prevention committee helped to develop a framework for injury prevention and commissioned a report on senior falls within the community setting. Using these reports NBTP recommended further dissemination of the P.A.R.T.Y. program for youth throughout NB schools as well as pursuing the recommendations within the senior falls report. In October 2013, a new injury prevention coordinator was hired to coordinate injury prevention under the direction of NBTP. **Conclusion:** Through an ongoing commitment to collaboration with stakeholders, coordination of injury prevention efforts through the NBTP will help to ensure a stable foundation for tangible and sustainable reductions of injuries in New Brunswick.

Improving access and uptake of trauma nursing core course (TNCC): a provincial approach. ***Ann Hogan,* Shelley Woodford,* Ian Watson.**** **From the *NB Trauma Program, Saint John, N.B.**

Background: TNCC is an internationally recognized certified trauma nursing course developed by the Emergency Nurses Association (ENA) to provide a comprehensive standardized approach to the care of the trauma patient. Based on 2011 Trauma Association of Canada accreditation standards, the New Brunswick Trauma Program (NBTP) recognized the need for provincial coordination since TNCC was only offered by independent groups in the southern part of New Brunswick (NB), limiting access to nurses in northern areas. **Methods:** In 2011 the NBTP Education Subcommittee began to develop a plan for NBTP to coordinate and deliver TNCC provincially. This included number of courses, course directors, instructors and estimated costs required to meet the need. To determine the number of courses required annually, a survey was sent to each emergency department nurse manager to determine the total number of nurses working in the department and to indicate those who were current in TNCC. Course directors provided information regarding estimated costs per student. Follow-up surveys were collected in 2013–2014. **Results:** In 2011–2012, courses were held in 3 areas in NB with 42% (246/584) of RNs working in emergency department current in TNCC. In 2013–2014 it increased to 5 areas of NB with 59% current. Variable participant costs were standardized across the province, decreasing participant costs in most areas. **Conclusion:** Provincial coordination of TNCC has improved access to TNCC by offering courses closer to participants' community and decreasing cost to participants.

ULTRASIM: ultrasound in trauma simultation. Does the use of ultrasound during simulated trauma scenarios improve diagnostic abilities? ***Leanne Hewitson,* Paul Atkinson,† Jay Mekwan,† Glenn Verheul,† David Lewis.†*** **From *Dalhousie University, Halifax, N.S., the †Department of Emergency Medicine, Saint John Regional Hospital, Saint John, N.B.**

Background: Point of care ultrasound (PoCUS) has become standard of care in many clinical settings. Similarly, simulation is common in medical training and we look to examine the usefulness of

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ultrasound simulation, specifically in trauma simulation and whether diagnostic abilities improve with the addition of ultrasound. **Methods:** Twelve residents were assessed on 6 trauma simulations. For each scenario, the participant would perform a clinical assessment utilizing the SimMan 3G simulator, compiling a differential diagnosis, including confidence scores. They then performed an E-FAST scan using the ultrasound simulator and further adjusted their list of diagnoses accordingly. We examined the effect of addition of simulated ultrasound on diagnostic accuracy, diagnostic confidence and diagnostic precision. Data were analyzed with GraphPad Prism. **Results:** Diagnostic accuracy improved considerably with simulated PoCUS. With the addition of PoCUS, participants had 64 correct primary diagnoses (89% accuracy), as opposed to 32 correct primary diagnoses (44% accuracy) without PoCUS, which when analyzing with a paired t test gives a $p < 0.0001$. Confidence in diagnosis went from a mean of 47.6% (95% CI 39.9%–55.3%) without the ultrasound simulator to a mean of 83.6% (95% CI 78.1%–89.1%) with ultrasound usage, a statistically significant difference ($p < 0.0001$). **Conclusion:** The use of a simulator is a convenient way of supplementing training in both trauma and ultrasound. By incorporating PoCUS into trauma simulations participants are significantly more likely to arrive at the correct diagnosis, have more confidence in their conclusions and also have a narrowed differential diagnosis.

Traumatic tale of 2 cities, part 1: Does being treated by different EMS affect outcomes in trauma patients destined for transport to level 1 trauma centres in Halifax and Saint John? ***Colin Rouse,* Jefferson Hayre,* James French,† Ian Watson,‡ Susan Benjamin,‡ Jacqueline Fraser,† Allison Chisholm,‡ Beth Sealy,§ Mete Erdogan,§ Robert Green,¶ Paul Atkinson.†*** **From *Dalhousie Medicine New Brunswick, Saint John, N.B., †Emergency Medicine, Saint John Regional Hospital, Saint John, N.B., the ‡NB Trauma Program, Saint John, N.B., and the §NS Trauma Program, Halifax, N.S.**

Background: Emergency medical services (EMS) are a major contributor to trauma care in the prehospital setting. The transport and treatment provided to patients before arriving at hospital has been a topic of major study and discussion, and has led to the adoption of various systems in different regions. Nova Scotia (NS) has adopted an advanced EMS program which includes advanced care paramedics and helicopter services. In contrast, during the study period New Brunswick (NB) used primary care paramedics in a ground transport network of multi-level trauma centres. **Methods:** This observational cohort study examined trauma patients (age > 15 years) who suffered a kinetic injury ISS > 12) for whom an ambulance was called and who were destined for transport to a level 1 trauma centre in NB or NS. Eligible patients were identified from the NS and NB trauma registries between Apr. 1, 2011, and Mar. 31, 2013. Survival to hospital and survival to discharge or 30 days were the primary endpoints. A total of 101 cases met criteria in NB and will be compared to 251 cases in NS. Hypothesis testing will be conducted comparing the results data extracted from the two registries. **Results:** Analysis is underway. Measures and outcomes being compared include crude mortality stratified by ISS banding, prehospital time intervals, the level of prehospital providers, as well as the interventions that are administered in each province. **Conclusion:** Results may aid in evaluating current EMS systems in NB and NS.

Traumatic tale of 2 cities, part 2: Does being treated by different hospitals affect outcome in trauma patients destined for transport to Level 1trauma centres in Halifax and Saint John? ***Colin Rouse,* Jefferson Hayre,* James French,† Ian Watson,‡ Susan Benjamin,‡ Jacqueline Fraser,† Allison Chisholm‡ Beth Sealy,§ Mete Erdogan,§ Robert Green,¶ Paul Atkinson.†*** **From *Dalhousie Medicine New Brunswick, Saint John, N.B., †Emergency Medicine, Saint John Regional Hospital, Saint John, N.B., the ‡NB Trauma Program, Saint John, N.B., and the §NS Trauma Program, Halifax, N.S.**

Background: Emergency department trauma care organization can have profound effects on patient outcomes. By design, there are differences between trauma systems in New Brunswick (N.B.) and Nova Scotia (N.S.). The Queen Elizabeth II Health Sciences Centre (QEII) in Halifax, N.S., is a teaching hospital and trauma care is led by an organized trauma team with formalized activation criteria. The Saint John Regional Hospital (SJRH) in Saint John, N.B., is a hybrid community/teaching hospital in which trauma care is led by the emergency department physician; additional services are called as needed. These pre-existing differences in system design between the 2 provinces provide the opportunity for a natural comparison. **Methods:** This observational cohort study compares trauma patients who suffered a kinetic injury, had an ISS > 12 and who presented at a level 1 trauma centre in N.S. or N.B. Eligible patients were identified from the N.S. and N.B. trauma registries over a 2-year period. A total of 112 cases met criteria in N.B. and will be compared to 266 cases in N.S. Hypothesis testing will be conducted, comparing the results data extracted from the N.B. Trauma Registry to the similar data extracted from the N.S. Trauma Registry. **Results:** Analysis of the outcomes is underway. The primary outcome examined is survival to discharge or 30 days. Secondary outcomes include the proportion of patients who receive transfusions, time to CT, length of ICU stay and more. **Conclusion:** Results may aid in evaluating current emergency department systems in N.B. and N.S.

Protective devices use in road traffic injuries in a developing country. ***Hassan Al-Thani,* Ayman El-Menyar,† R. Consunji,‡ Ahmad Zarour,* H. Abdulrahman,* A. Parchani,* Ruben Peralta.**** **From *Hamad General Hospital, Doha, Qatar, †Hamad General Hospital Weill Cornell Medical College, Doha, Qatar, and ‡Hamad General Hospital Trauma Surgery Department, Doha, Qatar**

Background: Road traffic injuries (RTI) are the leading cause of morbidity and mortality across the globe. The seat belt is an important protective device that improves vehicle occupants' safety during motor vehicle crashes (MVC). We aimed to evaluate the frequency and impact of protective devices used on the injury pattern and outcome of vehicle occupants involved in RTI in Qatar. **Methods:** A retrospective study for all patients who sustained MVC-related injuries that required admission at the trauma centre in Qatar between 2011 and 2014. Demographics, mechanism of injury, use of protective devices, position in the vehicle, injured body regions, ISS, Abbreviated Injury Scale (AIS), Glasgow Coma Score (GCS), duration of hospital stay and mortality. **Results:** Of the total 2730 RTI, 1830 (67%) cases sustained MVC-related injuries; 88% were young males and

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two-thirds were expatriates. Fifty-five percent were drivers. Seat belt and airbag were documented in only 26% and 2.5% of cases respectively. Unbelted passengers were mainly nationals, young, and had higher rates of head, chest and upper extremities injuries than belted passengers ($p = 0.001$). Also, unbelted passengers sustained greater ISS, GCS and chest AIS, longer hospital stay had higher rate of pneumonia and mortality compared to belted patients ($p = 0.001$ for all). Compliance of seat belt ($p = 0.001$) and airbag ($p = 0.008$) was significantly lower in the ejected group. Also, ejected patients had prolonged hospital stay, pneumonia and sepsis ($p = 0.001$ for all). The overall mortality was 8.3%. The mortality rate was threefold higher in the ejected group as compared to non-ejected group (18% vs. 6.3%; $p = 0.001$). **Conclusion:** Lack of protective devices use is associated with worse outcomes during MVCs. Our study highlighted a lower rate of seat belt compliance among young population that results in severe injuries, greater need of hospital resources and mortality. Therefore, community education, strict rules and more attention for legislative implementation are needed.

Functional and anatomical connectivity and communication impairments in moderate to severe traumatic brain injury. ***Michele Masson-Trottier,* Catherine-Edith Cyr,† Caroline Arbour,‡ Nadia Gosselin,† Karine Marcotte.*** **From *Université de Montreal, Montréal, Que., †Hôpital Sacre Coeur, Montréal, Que., and ‡McGill University, Montréal, Que.**

Background: Although communication impairments recovery following traumatic brain injury (TBI) have received relatively less attention, they may have important implications in psychosocial functioning. Functional and anatomical connectivity allows us to analyze more subtle damage. Thus, the aim of the present study is to characterize changes in functional and anatomical connectivity following moderate to severe TBI and to determine whether communication skills in chronic phase can be predicted by neuroanatomical damages following TBI. **Methods:** Eleven participants with moderate-to-severe TBI and matching controls took part in this study. Communication skills were evaluated using the Montreal Évaluation de la Commmunication. Functional MRI (fMRI) and DWI were acquired on a 3T Siemens Trio scanner. Probabilistic tractography was used to identify the ILF, SLF and uncinate bilaterally. A spatial independent component analysis approach was used for the resting-state fMRI and functional integration measures were calculated. **Results:** TBI patients showed impairments in all communicative measures, but most importantly in conversational skills. Significant white matter changes were found in tracts with an established role in language processing, in both the dorsal and ventral streams. Conversely, functional integration in the DMN and its subnetworks were not significantly different than controls. None of the regressions between the significant DWI metrics and conversational skills were found significant. **Conclusion:** These findings suggest that white matter bundle characteristics in the chronic phase might be a better predictor of communication impairments in the chronic phase. Probabilistic tractography provides evidence that structural compromise to bilateral tracts is associated with cognitive communication impairments in TBI patients.

Caring and communicating in critical cases: Westlock trauma form, a resource for rural physicians. ***M. Firdaus Mydeen,* Antonia Johnson.†*** **From *Westlock, Alta., the †University of Alberta School of Medicine, Edmonton, Alta.**

Background: Trauma protocols are key to optimal evaluation and management of trauma patients, and a designated trauma team leader improves protocol compliance and outcome. Practitioners' knowledge of trauma protocols decline after completion of trauma courses. This challenges physicians, especially in rural settings where critical cases are encountered less frequently than those in urban centres and with less resources. We designed a 1-page form and an accompanying wall poster that outline ABCDE assessment protocols sequentially and concisely. This focuses on team communication and uses pictures to document findings, besides utilizing a checklist approach to facilitate progression through the ABCDEs. Our objective was to determine the ability of the trauma form and poster to improve communication, organization and documentation of critical cases in rural settings. **Methods:** A survey of 51 administrators, paramedics, nurses, students, residents and physicians with experience in rural medicine. Outcome measures included a rating scale ranging from "not at all likely" (1 point) to "very likely" (5 points) to improve each of communication, organization and documentation of critical cases in rural settings. **Results:** Most participants thought the form would be useful in improving communication (4.3 average points), organization (4.7 average points) and documentation (4.5 average points). **Conclusion:** This form is very likely to be useful in the assessment and management of critical cases in rural emergency rooms. We intend to further our research by performing a randomized simulation-based research to assess the outcome benefit.

Monitoring of ocular nerve sheath in traumatic raised intracranial pressure (Moonstrip Study): a prospective blinded observational trial. ***Niv Sne,* Timothy Rice,* Jeffrey Rice,† Edward Passos,* Jerome Fan,* Frank Baillie,‡ Draga Jichici,* Andew Healey.**** **From *McMaster University, Hamilton, Ont., †Queen's University, Kingston, Ont., and ‡McMaster University and Hamilton General Hospital, Hamilton, Ont.**

Background: Elevated intracranial pressure (EICP) after traumatic brain injury (TBI) is an independent predictor of poor outcome. Optic nerve sheath diameter (ONSD) using ultrasonography was reported as a non-invasive tool for identifying EICP. Studies to date have been limited by their heterogeneity and small sample size, leaving the role of ONSD in predicting EICP inconclusive. The purpose of our study was to determine the sensitivity and specificity of a focused bedside ultrasonography of the ONSD in predicting EICP. **Methods:** We conducted a prospective, blinded, observational study at a Canadian level 1 trauma centre over a 2-year period. Patients ≥ 16 years of age with blunt TBI were enrolled. Patients underwent a head computed tomography (CT) scan (gold standard) and an ultrasound of the ONSD within 1 hour of each other. An ONSD measurement of > 5.00 mm in either eye was considered positive. CT scans with predefined EICP findings as reported by a blinded neuroradiologist were considered positive as per current practice. **Results:** One hundred eighty-six patients were enrolled. Mean age was 44.7 ± 19.6. Mean GCS was 11.8 ± 4.5. Mean binocular ONSD was 4.2 ± 0.7 mm. EICP was diagnosed on 16% ($n = 30$) of head CTs and 24.2% ($n = 45$) of ONSD measurements. The ONSD measurement was 33% sensitive (95% CI 19–51%) and 78% specific (95% CI 75–81%) for EICP. The positive and negative

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predictive values were 22.2% and 85.8%, respectively. **Conclusion:** Our study suggests that focused bedside ultrasonography of the ONSD has a poor sensitivity for predicting EICP in TBI.

Establishing an alcohol screening and brief intervention for trauma patients in a multicultural setting in the Middle East: challenges and opportunities. ***Ruben Peralta,* R.Consunji,† Ayman El Menyar,† H.Shaltout,‡ H.Abdi,‡ H. Tarakieh,‡ H Abdulrahman,* A. Parchani,‡ A. Zarour,‡ Hassan Al Thani.*** **From the *Hamad Medical Corporation, Doha, Qatar, † Hamad General Hospital Trauma Surgery, Doha, Qatar, and ‡Hamad General Hospital, Doha, Qatar**

Background: Alcohol screening and brief intervention and referral for treatment [ASBIRT] for trauma patient is a standard component of level 1 trauma centres but there have been no reports on this type of intervention in the Middle East. This study will describe the process of starting an ASBIRT program in a trauma centre serving a culturally diverse population. **Methods:** A process evaluation of the initial establishment of the ASBI program was conducted using a modified Delphi technique. The experiences and feedback from the multidisciplinary ASBI team during the first 12 months of the program were elicited and documented monthly. **Results:** Challenges identified were grouped into 2 categories: system- and patient-related. System-related issues: standard screening protocols and tools are culturally sensitive to the local environment and designated staff were trained on the use of the tools. Patient-related issues: language barriers, cultural and religious factors, and the fear of potential consequences and stigma of alcohol use. Opportunities were the availability of online training resources for alcohol screening and evaluation, and the identification of qualified personnel trained in substance abuse treatment. **Conclusion:** The process of initiating an ASBI program for trauma patients in a multi-cultural setting like Doha, Qatar, comes with a unique set of challenges and opportunities. However, a multidisciplinary approach can identify and overcome the challenges of ASBI establishment. There is a need for long-term outcome data, to allow for the robustness in the analysis of the benefit of this intervention.

The poor compliance to seat belt use in Montréal: an 18 461 road user iPhone-based study. ***David Bracco,* Dan Deckelbaum,* Tara Grenier,‡ Tarek Razek.*** **From *McGill University, Montréal, Que., and ‡MUHC, Montréal, Que.**

Background: Seat belt use halves the rate of death and severe injury after road accident and is considered standard in Canada and Quebec. Seat belt use is mandatory in Montréal, with some exemption for taxi drivers. The objectives of this study are to validate an iPhone-based roadside observation/geomapping system and to observe seat belt compliance in Quebec before a worldwide observation. **Methods:** During the development and test phase of iBuckle up, we observed 18 461 road users on the island of Montréal. Date, time and GPS position were recorded from the iPhone system. The observers had to log the type of vehicle, the sex of the occupants, their position in the car and seat belt compliance. The system has a 1-click acquisition for cars. Latitude/longitude was geomapped through Google Maps API. **Results:** A total of 18 461 road users were observed. Overall seat belt use is 85.7%. Compliance ranges from 94.4% (in cars), 61.3% (bus drivers), 54.4% (in truck) to 7.4% (in taxi). In most categories, seat belt use was higher in women than men. **Conclusion:** Seat belt use is abnormally low in Montréal. Despite the fact that taxi passengers are mandated to wear a seat belt, most of them do not. Seat belt usage is still below the 95% target set by road safety authorities across the country. Professional drivers (bus, taxi, trucks) have very poor compliance to seat belt use.

An iPad-based data acquisition for core trauma registry data in 6 Tanzanian hospitals: 1 year and 13 462 patients later. ***David Bracco,* Respicious Boniface,† Lawrence Museru,† Annie Lalande,‡ Dan Deckelbaum,* Tarek Razek.*** **From *McGill University, Montréal, Que., †Muhimbili Orthopaedic Institute, Dar es Salaam, Tanzania, and ‡Montreal General Hospital, McGill University, Montréal, Que.**

Background: Trauma registries are an essential component of trauma systems. However, due to resources required they are poorly adapted for low- and middle-income countries (LMIC). Simpler data registries designed for LMIC are needed. **Methods:** An iPad-based trauma database is deployed in 6 hospitals in Tanzania. Data on all trauma presenting at these hospital were collected over 11 months and is ongoing. **Results:** A total of 13 462 trauma patient records were collected: 68.3% were males and median age was 28.0. In Dar es Salaam, 88% of the trauma arrives by ambulance but this ranges between 1 and 20.3% in rural hospitals. The most common cause of injury was MVC (51%), followed by falls (22%), animal/snake bite (6%), stab injuries (4%), burns (2%) and sexual assaults (1%). The cause of MVC was evenly distributed between car (41%) and motorbike (58%), but the proportion of motorbike ranges from 25% to 69% depending on the area. Between 1 and 34% of the injuries were nonintentional, with an average of 14%. The Kampala trauma score has a bimodal distribution with a median of 12. Overall mortality was 1.52%, ranging from 0.6% to 4.8% depending on the hospitals. 58% of deaths occur in the ED, 42% in the first 2 weeks after admission. **Conclusion:** An iPad-based trauma registry provides real-time vital data on trauma, which are essential for policymakers and health care resources support. Simplified core trauma registries are feasible and sustainable in LMIC.

"The Triple-Q Algorithm": a practical approach to the identification of liver topography. ***Omar Bekdache.*** **From *Tawam Hospital, Abu Dhabi, United Arab Emirates.**

Background: The descriptive identification of liver pathology on imaging modalities and intraoperatively continues to raise some confusion especially for the trainees and junior physicians who don't deal frequently with such pathology. The wide diversity in the description of the modern liver segmentation with sometimes contradictory terminology between the French and the American literature added to this confusion. Several attempts were made to create a unified nomenclature that simplifies the problem; yet, the interpretation is still difficult for the new medical graduates. **Methods:** We propose a novel, simple approach to describe the location of liver pathology in different settings, like tumours when dealing with neoplastic process, or when describing and comparing liver injuries in trauma setting, by referring to an algorithm based on three questions. **Results:** Explanations to answer these questions and correctly describe the location of liver pathology are described. **Conclusion:** We think that the adoption of such an algorithm — arbitrarily called "The Triple Q Algorithm" — will facilitate the understanding of liver topography

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for the young physicians, as well as it will allow for the accurate description and localization of the pathological lesions of the liver.

A pan-Canadian bicycle helmet use observational study. ***David Bracco,* Dan Deckelbaum,* Tara Grenier,† Tarek Razek.*** **From *McGill University, Montréal, Que., and †MUHC, Montreal, Que.**

Background: The objective of the present study is to assess the regional disparities in helmet use among cyclists across Canada. **Methods:** Using an iPhone GPS based observational software, bicycle helmet use was observed at the roadside during summer 2014, and deployed through TAC members. Date, time and GPS position was gathered from the iPhone and location was mapped through GoogleMap API. Standard statistical methods were used. **Results:** Thirty-one observers reported on 27 520 bicycles in 3351 different locations in 4 provinces and 66 localities. Helmet use was variable from one province to another (figure). Helmet use was lowest in adults (55%) v. kids (59%) or seniors (67%). Helmet use was lower in males (52%) v. females (62%). Helmet use was lowest in bike-sharing programs (18%), followed by skates (21%), regular bikes (57%) or racing bikes (97%). Rural area cyclists use helmets more (64% in area with 4000 hab/km^2). **Conclusion:** Helmet use is variable from one are to another in Canada. Lowest helmet rate was observed in suburban areas, followed by urban centres. These data help to target prevention.

Door to decompression: the new benchmark in trauma craniotomies. ***David Bracco,* Judith Marcoux,* Mohammed Maleki,* Dan Deckelbaum,* Tarek Razek.*** **From *McGill University, Montréal, Que.**

Background: One quality indicator for level 1 trauma centres is the time from arrival in emergency room to operating room (OR) for patients with an epidural hematoma. However, the timing for the real brain decompression is overlooked in this classical benchmark. Based on the STEMI door-to-balloon concept, the objectives of this study are to evaluate the real door-to-decompression time for patients requiring emergency craniotomies and to identify factors that could improve the performance. **Methods:** Prospective collections of 11 time points, from admission to local hospital until effective decompression for emergency craniotomies, from Jan. 1, 2014, to November 2014. Non-parametric tests were used and median presented. **Results:** A total of 32 priority 0 and 1 craniotomies from ED were included. The median GCS was 5. Forty-one percent of patients had unilateral blown pupil, and 19% bilateral blown pupils. In patients first admitted to local hospitals, the door to CT time was 99 min and CT to local ED out was 78 min. In primary MGH patients the door to CT time was 40 min and CT to OR 33 min. Median ED door to OR time was 61 min. Once in the OR, anesthesia time was 2 min, surgical preparation time 25 min and skin incision to decompression 15 min, leading to an OR door-to-decompression of 44 min. Median effective ED door-to-decompression was 121 min. In secondary transfer patient, prealerting the neurosurgical team shortened the door-to-decision time by 29 min (4 min v. 33 min), and having the CT scan on PACS (v. CD/DVD) shortened the decision time by 15 min (3 min v. 18 min). Burr decompression prior to standard craniotomy shortened the skin-cut-to-decompression time by 19 min (8 min v. 27 min). **Conclusion:** Emergency trauma craniotomy is a complex process involving trauma surgery, imaging, neurosurgery, anesthesia and OR. Hospital door-to-decompression should be the standard benchmark for trauma craniotomies.

Are missed doses of pharmacological thromboprophylaxis a risk factor for thromboembolic complications? ***Pedro Padim,* Sergio Canestrini† Mazin Tuma,* Amanda McFarlan,* Joao Rezende Neto,* Precilla Veigas,‡ Sandro Rizoli,‡ Caio Cesar Gabrielli Belmont.§*** **From *St. Michael's Hospital, Toronto, Ont., †St. George's Hospital, London, U.K., ‡Sunnybrook Health Sciences Centre, Toronto, Ont., §St. Michael's Hospital, Toronto, Ont., and Juiz de Fora, Brazil**

Background: Pharmacological thromboprophylaxis (PTP) is recommended by trauma clinical guidelines to prevent and reduce thromboembolic complications (TEC). Interruption in PTP may occur due to bleeding complications, perioperative interruption, patient refusal and nursing errors. It is unknown whether missed doses are a risk factor for TEC. **Methods:** Retrospective analysis of consecutive adult trauma patients admitted to a Level 1 trauma centre (2010–2013). Demographics, injury type/severity and medication data were collected. Outcomes (TEC) were compared between patients with missed doses versus those receiving standard uninterrupted therapy. Student t test, bivariate and stepwise multivariate logistic regression analyses were performed. **Results:** Out of 2103 trauma patients, 859 were excluded from the analysis for having no PTP indication; in this group only 2 patients (0.2%) developed TEC. A total of 1244 patients received PTP, 1032(83%) were on standard uninterrupted therapy while 212 (17%) had 1 or more missed doses. The missed-dose group had higher ISS (mean 25 v. 19, $p < 0.0005$), LOS (31 v. 12, $p < 0.0005$), more pelvic injuries ($p = 0.013$) and higher incidence of TEC (8.5% [18] v. 3.3% [34], $p = 0.001$). Bivariate logistic regression reported ISS, LOS and missed dose as significant predictors of TEC (OR 1.05, 95%CI 1.03–1.08; OR 1.02, 95%ci 1.01–1.03; OR 0.37, 95% CI 0.2–0.66, respectively; $p < 0.005$). Stepwise multiple logistic regression analysis reported only LOS and ISS as independent predictors of TEC. **Conclusion:** Patients without PTP indication have low TEC rates. ISS and LOS are independently associated with TEC, whereas missed doses appear not to be a risk factor.

Complications following admission for traumatic brain injury. ***Madiba Omar,* Lynne Moore,† Pier-Alexandre Tardif,* Philippe Dufresne,† Paule Lessard Bonaventure.*** **From *Québec, Que., †Université Laval, Québec, Que.**

Background: The objective of this study was to obtain information on the incidence, determinants and impact on mortality and resource utilization of hospital complications potentially related to quality of care for patients with traumatic brain injury (TBI). **Methods:** We conducted a multicentre cohort study to assess the incidence of intracranial and extracranial complications and their determinants in adults with TBI between 2007 and 2012, in the integrated trauma system of Quebec. Risk ratios were calculated for the influence of determinants on the occurrence of complications. Then we studied the impact of these complications on LOS and mortality adjusting for risk factors. **Results:** The study population comprised 13 446 patients. Globally 2.8% of patients had at least one intracranial complication and 22.1% had at least one extracranial complication. The most important determinants of intracranial

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complications were intensive care with ventilation, maximum AIS of TBI, blood transfusion and neurosurgery. The most important determinants of extracranial complications were intensive care with ventilation, blood transfusion, the body region of concomitant injuries and the Glasgow Coma Scale. For intracranial complications, stroke was associated with significant mortality (odds ratio [OR] 5.3) and LOS (geometric mean ratio [GMR] 1.4). For extracranial complications, cardiac arrest was associated with high mortality (OR 23.1) and LOS (GMR 1.5). **Conclusion:** More than 20% of patients with TBI have a complication related to quality of care, but only 1 in 10 are intracranial complications. Results indicate that efforts to reduce hospital complications in TBI patients could improve resource use and outcome in these patients.

Excessive crystalloid infusion in the first 24 hours is not associated with increased complications or mortality. ***Shahram Yazdani,* Amanda McFarlan,* Precilla Veigas,† Joao Rezende Neto,* Sandro Rizoli.*** **From *St. Michael's Hospital, Toronto, Ont., and †Sunnybrook Health Sciences Centre, Toronto, Ont.**

Background: There is growing concern over potential deleterious effects of excessive crystalloid (defined as > 5 L over first 24h) infusion in trauma. We explored the association of excessive crystalloids with complications (sepsis, pneumonia, VTE, ARDS) and mortality. **Methods:** Retrospective chart review of all trauma patients admitted to St. Michael's Hospital between December 2011 and February 2012. Patients were classified in 5 L of crystalloids/first 24h (including pre-hospital). Student *t* test and multivariate logistic regression analysis were used. Data analyzed: age, gender, mechanism of injury, ISS, coagulopathy (INR, PTT, fibrinogen, platelets), acidosis (pH, lactate), transfusions/first 24h (RBC, plasma, platelet, cryoprecipitate), hospital/ICU LOS, adult respiratory distress syndrome (ARDS), pneumonia, sepsis, thromboembolic events (VTE), mortality. **Results:** Of 199 patients, 61 (31%) received > 5 L of crystalloids in the first 24h. Compared to patients receiving < 5 L, they had significantly lower admission pH, received more transfusions (RBC, plasma, platelet, cryo) and had more septic events ($p < 0.05$). When differences were adjusted using multiple logistic regression analysis, administration of > 5 L crystalloid was not an independent predictor of complications or mortality (OR 1.018, 95% CI 0.977–1.061). **Conclusion:** In this cohort of severely injured patients, we did not find a significant association between infusion of > 5 L of crystalloid in the first 24 hours with complications or mortality.

SBIRT: plant, tend, grow. ***Zahra Hussein,* Nasira Lakha,* Richard Simons.*** **From *Vancouver General Hospital Trauma Services, Vancouver, B.C.**

Background: VGH Trauma Services implemented a screening, brief intervention and referral to treatment (SBIRT) protocol with the purpose of reducing the number of injuries seen related to hazardous alcohol consumption. Hospital EDs and trauma centres provide opportunities for early intervention with at-risk substance users before more severe consequences occur. **Methods:** Two processes were designed for SBIRT: 1 for the ED and 1 for trauma units. Both were necessary for continuity and to ensure follow-up with non-admitted patients. In both processes, nurses screen patients using the AUDIT-C and social workers conduct a brief intervention using the FLO framework on patients who screen positive. **Results:** Patients are receptive to SBIRT; however, missing data indicate that opportunities to refine the SBIRT protocol exist. Inconsistent implementation cannot be attributed to 1 stakeholder and adjustments to the process must occur with nursing, social work and trauma. Patient care coordinators were not initially engaged but have since been identified as crucial in the consistency and sustainability of SBIRT. **Conclusion:** The importance of frontline medical professionals assisting with early screening and intervention for hazardous alcohol consumption, as well as educating patients about low-risk drinking is well documented. Ongoing stakeholder communication, collaboration, role clarity and problem-solving will ensure that VGH staff continue to follow the new SBIRT protocol and feel supported in their efforts, thus supporting our goal of decreasing alcohol-related injuries, death, ED visits and readmissions.

Real time electronic injury surveillance in an African trauma centre. ***Eiman Zargaran,* Damon Ramsey,* Morad Hameed,† Andrew Nicol,‡ Richard Spence,‡ Pradeep Navsaria.§*** **From *Vancouver, B.C, †Trauma Services, Vancouver General Hospital, Vancouver, B.C., the ‡Health Sciences Campus, Cape Town, South Africa, and the §University of Cape Town, Cape Town, South Africa**

Background: Advances in trauma systems on a global scale are critically dependent on the creation of innovative injury surveillance strategies in low-resource settings. We hypothesized that the newly created electronic Trauma Health Record (eTHR) when used by frontline trauma doctors can replace existing means of paper-based injury surveillance with minimal workflow hindrance while simultaneously creating a more complete, real-time trauma registry. **Methods:** The eTHR was implemented on Mar. 1, 2014, at a level 1 trauma centre in Cape Town, South Africa. A pre- and post-implementation study was designed to compare usability and field completion rates of paper and eTHR records. The electronic trauma registry created after 9 months of real-time clinical use of eTHR was evaluated for the quality of actionable data, with special emphasis on data relevant for both clinical performance improvement and the formulation of public health policy. **Results:** Fields relevant to injury surveillance had 100% completion rates, compared to 20–80% completion rates with paper charting. Electronic patient charting was found to be more efficient and enjoyable for doctors compared to its paper predecessor. eTHR successfully captured key data fields on over 8500 consecutive patients, allowing for comprehensive and immediate analysis and reporting of the predictors and mechanisms of injury in Cape Town. The eTHR's database was able to accurately describe the structure, process and outcomes of trauma care in Cape Town. **Conclusion:** The electronic Trauma Health Record is a potentially sustainable solution to the challenge of injury surveillance in low-resource settings. Its successful implementation has shown that mobile electronic tools can create unprecedented opportunities for evidence-based advances in emerging trauma systems.

SBIRT in concert: establishing a new initiative. ***Deanna Fong,* Nasira Lakha,† Zahra Hussein,† Heather Wong,† Rociio Martinez† Erin Shangguan.†*** **From the *B.C. Trauma Registry, Vancouver, B.C., and †Vancouver General Hospital, Trauma Services, Vancouver, B.C.**

Background: Screening, brief intervention and referral to treatment (SBIRT) is a protocol with the intent to reduce the number of injuries seen related to alcohol misuse. The VGH

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Trauma Registry in conjunction with VGH Trauma Services supported this injury prevention initiative by developing a concurrent data collection system to measure the effectiveness of this new process. **Methods:** Registry analysts were involved in meetings with multidisciplinary teams to outline stakeholder needs. Custom elements and definitions were developed and built in our database in order to collect SBIRT data. Data are collected concurrently on admitted patients and entered directly into the pre-registry database. Reports are generated as requested. **Results:** Early findings showed 40% of our screened patients were referred for treatment, and 25% of the referred patients received a brief intervention. Some challenges included data inconsistencies, availability of data as well as incomplete documentation. **Conclusion:** To ensure accurate concurrent data collection, processes are being established with the injury prevention lead and trauma coordinator to address these challenges. Planned strategies include sending screening forms directly from the unit to the VGH Trauma Registry, and registry analysts attending trauma rounds. The VGH Trauma Registry will continue to support this initiative by collecting and reporting on results. This will assist VGH Trauma Services in further expansion of this screening tool to benefit a broader patient population.

Review of the current knowledge of the pathophysiology of acute traumatic coagulopathy: implications for current trauma resuscitation practices. ***Alghalya Almaawali.*** *** From *Vancouver General Hospital, Vancouver, B.C.**

Background: Current massive transfusion protocols embrace empiric resuscitation with packed red blood cells, plasma and platelets in a set ratio. With the evolving knowledge about acute traumatic coagulopathy (ATC) as a major contributor to exsanguination-related deaths, it is apparent that current resuscitation protocols may fail to address the early coagulation deficits in trauma. We aim to provide a review of the current literature related to the pathophysiology of ATC. **Methods:** Online search from the MEDLINE database of all published articles from 2003 to March 2014. **Results:** Activated protein C is strongly linked to ATC pathophysiology and related to shock and tissue injury. FV is commonly depleted, but thrombin generation is preserved, potentially minimizing the role of FV in ATC. Hypofibrinogenaemia occurs very early in trauma and is strongly associated with higher mortality. Hyperfibrinolysis incidence is low but is associated with increased transfusion requirements and higher mortality. Fibrinolytic activation is evident in almost half of trauma patients, and is associated with higher ISS and higher mortality compared to patients with no fibrinolytic activation. Platelet dysfunction plays a more important role in ATC pathophysiology compared to platelet counts. Endothelial damage and sympathoadrenal activation are associated with glycocalyx degradation, higher adrenaline levels and autoheparinization, all contributing to the bleeding diathesis in trauma. **Conclusion:** Early fibrinogen depletion and fibrinolysis appears to play a central role in ATC; modification of current empiric resuscitation protocols to address these hemostatic deficits is needed.

Factors associated with primary fascial closure rates in patients undergoing damage control laparotomy. ***Homer Tien,* Jenn Asselstine,* Barto Nascimento,* Fred Brenneman.**** **From *Sunnybrook Health Sciences Centre, Toronto, Ont.**

Background: The open abdomen has become a common procedure in the management of critically injured patients. We did a retrospective cohort study to examine factors associated with successful primary fascial closure in trauma patients. **Methods:** We used trauma registry data to study all patients who had a damage control laparotomy performed at our institution during a 14-year period. Our primary outcome was primary fascial closure. Our analysis focused on examining how different patient and technical factors were associated with the primary fascial closure rate. **Results:** During the study period, 158 patients met inclusion criteria; 74% were male, 31% suffered penetrating injuries, their average age was 39 years, and their average ISS was 40. They received an average of 12 units of PRBCs/24 hours. Mortality was 17%. Of the 131 patients who survived to discharge, primary fascial closure was obtained in 91%. If we only studied those patients who had 3 or more laparotomies before their abdomen was closed, their primary fascial closure rate was 86% (48/55). Surgeons were more likely to achieve primary fascial closure if graduated traction was applied during washout procedures (28/29 vs. 20/26, p = 0.03). **Conclusion:** At our institution, our primary fascial closure rate was very high (91%). Even if only examining those patients who had at least 3 laparotomies, our primary fascial closure rate was 86%. Utilizing a graduated traction technique on the fascia was associated with a higher primary fascial closure rate.

Free intraperitoneal fluid on CT abdomen in blunt trauma: Is hospital admission necessary? ***Saeed Alshlwi,* Badar Alhadhrami,† David Bracco,† Tarek Razek,† Jeremy Grush.†*** **From *McGill University Health Centre, Montréal, Que. †McGill University, Montréal, Que.**

Background: Abdominal CT scan is accepted as the primary diagnostic modality in hemodynamically normal patients with blunt abdominal trauma (BAT). The isolated finding of intraperitoneal free fluid (IPFF) on CT in patients with BAT and no solid organ injury does not warrant laparotomy. Our aim is to identify potential radiologic predictors that may safely expedite patient discharge from hospital. **Methods:** Retrospective analysis (2008–2012) of all BAT patients arriving at the Montreal General Hospital was performed. Patients who underwent initial abdominal CT were screened for the presence, quantity and location of IPFF in the absence of solid organ injury. Quantity of IPFF was defined as trace, minimal, moderate or severe. Location of IPFF was divided into four abdominal quadrants and the pelvis. Clinical outcomes were analyzed. **Results:** A total of 2869 patients with suspected blunt abdominal trauma were identified. In all, 1863 patients met study eligibility criteria and were retrospectively reviewed. Of these patients, 259 (14%) were found to have IPFF with no solid organ injury. Two patients (0.7%) clinically deteriorated and required exploratory laparotomy. Two hundred forty-nine patients (96%) were found to have trace to minimal IPFF, 227 patients (87.6%) had IPFF in a single intra-abdominal region, and 219 patients (84.5%) had evidence of both trace and minimal IPFF in 1 intra-abdominal region. **Conclusion:** The isolated finding of IPFF on CT scan in patients with BAT and no solid organ injury does not warrant laparotomy. Furthermore, trace to minimal IPFF in a single

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intra-abdominal region is associated with a favourable clinical outcome, and these patients may not benefit from hospital admission and prolonged observation.

The need for speed — the time cost of off-site helipads. ***Brad Moffat,* Kelly Vogt,† Mahvareh Ahghari,‡ Neil Parry,* Russell MacDonald,‡ Daryl Gray.†*** **From *Western University, London, Ont., †London Health Sciences Centre, London, Ont., and ‡Ornge, Mississauga, Ont.**

Background: The timely transfer of critically ill and injured patients to tertiary care centres is crucial to survival. Some referring hospitals do not have on-site helipads and need to transfer patients by land ambulance between the hospital and the nearest landing site. We undertook this study to determine the time delay associated with off-site helipads at referring hospitals. **Methods:** The database for Ornge, Ontario's air medical transport agency, was queried for all emergent interfacility transports by helicopter to a tertiary care centre in London, Ont., over a 5-year period. Sending sites were identified as having either an on-site or off-site helipad. Time delays related to transport to and from landing sites were calculated for each transfer, and were compared between sites with and without on-site helipads. Regression was used to identify factors associated with increased delay. **Results:** A total of 1405 helicopter transfers occurred during the study period. The median transport time was significantly longer for sites with off-site helipads (0.7 min/km, IQR 0.5–0.7 v. 0.6 min/km, IQR 0.5–0.6, $p < 0.01$). Each kilometer of driving distance from the sending facility to an off-site helipad conferred an additional 9 minutes of transfer time. Off-site helipads were associated with double the mean hospital to helipad delay time ($p \leq 0.01$). This difference remains significant after controlling for the urgency of transport and primary diagnosis ($p < 0.01$ and $p = 0.01$, respectively). **Conclusion:** Off-site helipads impart significant transport delays among patients in whom time to definitive care is paramount. Hospitals with off-site helipads should invest in building on-site helipads to minimize transport delays.

Endovascular management of penetrating Zone III retroperitoneal injuries in selective patients: a case report. ***Saptarshi Biswas.**** **From * Forbes Allegheny Hospital, Monroeville, Pa.**

Background: Traumatic arteriovenous fistulas (AVF) are rare. Traditional teaching mandates that zone III pelvic retroperitoneal hematomas secondary to penetrating trauma be explored. We present a unique case illustrating management of a gunshot wound to the flank with a retroperitoneal hematoma and traumatic iliac arteriovenous fistula with endovascular stenting of the iliac artery. **Methods:** A 19-year-old male presented with a gunshot wound to the left flank. Pelvic x-ray revealed the bullet in the left hemipelvis. The patient was hemodynamically stable. A CT scan of the abdomen and pelvis showed a large left-side retroperitoneal hematoma displacing the small bowel, sigmoid colon and left kidney. A traumatic AVF at the level of the common iliac was evident, which was successfully treated with an endovascular stent placement. Postoperatively, the patient was admitted to the surgical ICU for close monitoring. The patient's subsequent recovery was uneventful. **Results:** In a trauma patient, a patient presenting with a penetrating wound to the abdomen with hemodynamic instability and/or peritonitis, operative intervention is mandated. However, select patients can be managed nonoperatively with serial clinical exams in a surgical ICU after appropriate radiological workup, thus avoiding unnecessary laparotomy and decreasing hospital stay. Repair of AVF is recommended to prevent serious complications later. Direct open surgical repair of a fistula through the artery may incur substantial intraoperative blood loss. Surgical bypass grafting with exclusion of the iliac system has been advocated. **Conclusion:** We report a case where AVF was treated successfully with endovascular technique.

Measured resting energy expenditure in patients with open abdomens: preliminary data of a prospective pilot study. ***Muhamad Elhusseini Hassan,* Sameena Iqbal,† Nancy Fong,* Jeremy Grushka,* Dan Deckelbaum,* Lyne St-Laurent,* Eleanor Eckert,* Tarek Razek,* Kosar Khwaja.**** **From *McGill University, Montreal, Que., and †Montréal General Hospital, Montréal, Que.**

Background: Resting energy expenditure (REE) can be affected by various factors in acute illness. However, the relationship between an open abdomen (OA) and the measured REE remains unclear. Our objective is to explore the impact of the OA on REE and determine other potential factors that may influence the REE in OA patients. **Methods:** A prospective study was conducted on seven mechanically ventilated non-septic OA patients admitted to the ICU at a level 1trauma centre between August and November 2014. The indirect calorimetry was used to measure REE before and after abdominal closure. Body temperature, sedation medications and route of feeding were evaluated at the time of each measurement. Patients' demographic, predicative equations and standard clinical outcomes were recorded. **Results:** A total of 31 REE measurements were performed (16 before v. 15 after closure) in 7 OA patients. The before abdominal closure measurements of REE were lower than after closure (1770 v. 2179kcal/day, respectively, $p = 0.012$). Furthermore, before the abdominal closure, propofol, fentanyl and levophed use was significantly higher than after closure ($p = 0.033$, $p \leq 0.0001$, $p = 0.043$, respectively). However, body temperature, proportion of enteral feeding and pneumonia were higher after abdominal closure ($p = 0.027$, $p = 0.053$, $p = 0.043$, respectively). There is a significant unadjusted correlation between REE and temperature ($p = 0.001$, $r^2 = 0.29$). No significant correlation was identified between REE and abdominal status in the multivariate generalized estimating equation using repeated measures. **Conclusion:** This pilot study identifies several factors that are associated with an increased measured REE after abdominal closure. Careful monitoring of REE may better guide nutritional targets in OA patients.

Traumatic inferior gluteal artery pseudoaneurysm: case report and review of literature. ***Saptarshi Biswas*.*** **From *Forbes Allegheny Hospital, Monroeville, Pa.**

Background: Gluteal artery aneurysms are rare, and the majority of them are pseudoaneurysms secondary to blunt or penetrating trauma. Inferior gluteal artery pseudoaneurysms are uncommon, with only 10 cases in the last 30 years. **Methods:** An 18-year-old man presented with a stab wound to the left upper quadrant and left flank. He underwent exploratory laparotomy, which revealed 2 bleeding mesenteric vessels that were ligated. The patient was discharged on post-operative day 4. He returned to the ED 3 days later with slow ooze from the left iliac wound, which was packed. He came back to the ED again 3 days later with active bleeding from the same site, associated with generalized weakness, fatigue

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and dizziness. Selective angiography of the internal iliac artery revealed a large inferior gluteal artery pseudoaneurysm, which was successfully treated with coil embolization and thrombin injection. **Results:** The mainstay of diagnosis is angiography, but these aneurysms may not be visible on an aortic flush angiogram, and super selective angiography may be required to delineate the anatomy. Treatment is either by surgical therapy or minimally invasive techniques, such as embolization, during angiography. We report a case of pseudoaneurysms of the inferior gluteal artery following stab injury. A review of the relevant literature is also presented. **Conclusion:** Inferior gluteal artery pseudoaneurysms are rare, with few cases reported in the recent literature. Such cases often present with a variable time course, mode of injury and associated symptoms, leading to their misdiagnoses and improper treatment.

Pancreatico duodenectomy, SMA, SMV repair and delayed reconstruction following blunt abdominal trauma. A case report with discussion of trauma whipple and complex pancreatico duodenal injuries. ***Saptarshi Biswas.*** *** From *Forbes Allegheny Hospital, Monroeville, Pa.**

Background: Pancreaticoduodenectomy (PD) is a lifesaving procedure for complex pancreatico-duodenal trauma that is rarely performed and has a reported mortality as high as 31–36%. **Methods:** We report the case of a 61-year-old man who sustained a significant pancreatico-duodenal injury with laceration of the superior mesenteric artery, superior mesenteric vein along with blowout of the common bile duct following a blunt trauma. He was treated with PD, along with repair of the vascular injuries followed by delayed reconstruction. **Results:** PD is a complex procedure that requires advanced surgical skills and an experienced critical care team. In a trauma situation this operation carries high mortality and complication rates, mostly because of associated vascular injuries. The fatality rate among patients with such wounds who reach the hospital alive has been between 39% and 71%. Our case is uncommon, as 90% of such complex injuries are caused by penetrating trauma. We discuss the management schemes for complex pancreatico-duodenal and associated vascular injuries. **Conclusion:** Hemodynamically unstable patients are best served by damage control followed by delayed reconstruction. The timing of the planned reoperation is controversial as longer delays increase the risk of intra-abdominal infections. We propose the reoperation be undertaken within 24–96 hours, as soon as the patient is normothermic and acidosis and coagulopathy has been restored.

A retrospective evaluation of the effect of the Trauma Team Training program in Tanzania. ***Annie LaLande,* Respicious Boniface,† Victoria Munthali,† David Bracco‡ Dan Deckelbaum,‡ Lawrence Museru,† Tarek Razek.‡*** **From *Montreal General Hospital, Montréal, Que., the †Muhimbili Orthopaedic Institute, Dar es Salaam, Tanzania, and ‡McGill University, Montréal, Que.**

Background: Injuries are an important cause of morbidity and mortality, responsible for about 1 in 10 deaths per year. Low- and middle-income countries are most severely affected by injuries, bearing near 95% of the worldwide mortality burden. An important step in addressing injuries is providing optimal care to patients as they arrive to the hospital. The Trauma Team Training program (TTT) is a low-cost course run in Tanzania that teaches a multidisciplinary team an approach to management of trauma patients. **Methods:** This is a retrospective study of all the TTT courses administered in the last few years in Tanzania. Each course was conducted over 3 days and taught by local staff. The improvement in knowledge was assessed by administering a pre-course and a post-course questionnaire. The participants also filled in a satisfaction questionnaire. **Results:** Overall, 388 hospital-based workers (doctors, nurses and other staff) participated in the course, conducted in 14 different sites. After the TTT, the participants improved their pre-course scores by a median of 13% ($n = 259$). In all, 98% of the participants were satisfied with what they learned in the course, 99% felt comfortable taking care of injured patients and 98% would recommend this course to others. Over 70% of them would be strongly interested in teaching the course in the future. One of the most common suggestions was to run the course more often. **Conclusion:** The TTT is a much-appreciated course that is well adapted to a low-resource setting like Tanzania and holds a crucial place in trauma management.

Does procalcitonin measurement predict clinical outcomes in critically ill/injured adults managed with the open abdomen technique? ***Aziza Al Rawahi,*Andrew Kirkpatrick,† Derek Roberts,‡ Christopher Doig,§ Fatma Alhinai,¶ Jimmy Xiao, John Kortbeek.***** **From the *University of Calgary, Calgary, Alta., the †Departments of Surgery and Critical Care Medicine, Foothills Medical Centre and University of Calgary, the ‡Departments of Surgery, Community Health Sciences and Critical Care Medicine, Calgary, Alta., the §Department of Critical Care Medicine, University of Calgary, Calgary, Alta., ¶Calgary, Alberta, and the **Department of Surgery, University of Calgary, Calgary, Alta.**

Background: Temporary abdominal closure (TAC) techniques are necessitated through use of the open abdomen (OA) after abbreviated laparotomy. TAC with active negative pressure wound therapy (ANPWT) has been associated with improved outcomes. It has been suggested that ANPWT may more effectively remove cytokine-rich peritoneal fluid from the abdomen and hence reduce the systematic inflammatory response. This study assessed procalcitonin (PCT) levels after severe illness/injury necessitating OA and TAC. **Methods:** We measured PCT levels among 45 patients randomized to either ANPWT or a more passive TAC (Barkers Vac Pac; VPC) for OA management after abdominal injury or intra-abdominal sepsis. The primary end point was PCT concentration differences at 24 and 48 hours after TAC application. The secondary end point was correlation of PCT with mortality outcome. **Results:** Out of 45 patients enrolled (23 ANPWT; 22 VPC), 40 completed at least 24 hours of the allocated TAC therapy. There was no difference in the peritoneal levels of PCT between the 2 groups at 24 hours ($p = 0.07$) and at 48 hours ($p = 0.08$). There was also no difference in serum levels of PCT at 24 ($p = 0.38$) and 48 hours ($p = 0.12$) between the 2 groups. While the 30-day mortality was 13% for patients allocated to the ANPWT and 45% for those fitted with the VPC ($p = 0.02$), there was no significant difference in the serum level of PCT between survivors and non-survivors ($p = 0.61$) for all patients enrolled. **Conclusion:** While OA management with ANPWT associated with increased survival compared to VPC, manipulation of procalcitonin levels was not apparent.

In trauma, conventional ROTEM and TEG results are not interchangeable but are similar in clinical applicability. ***Arimie***

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Min, Sandro Rizoli,* Adic Perez,† Pang Shek,‡ Richard Grodecki,‡ Precilla Veigas,† Henry Peng.‡* **From *St. Michael's Hospital, Toronto, Ont., †Sunnybrook Health Sciences Centre, Toronto, Ont., and ‡Defence Research and Development Canada, Toronto Research Centre, Toronto, Ont.**

Background: There is growing interest in viscoelastic assays rotational thromboelastometry (ROTEM) and thromboelastography (TEG) for trauma. Despite their similarities, it is not known whether their results are interchangeable or whether one is superior to the other in predicting mortality, blood transfusion and diagnosing early coagulopathy. **Methods:** A prospective observational study comparing equivalent ROTEM and TEG parameters was conducted. Severely injured patients expected to receive massive transfusion were included. Assays were performed simultaneously on admission and repeated over subsequent 12h. INR ≥ 1.2 or fibrinogen. **Results:** Thirty-three patients (74 ROTEM, 74 TEG) were included. In all, 79% were male, mean ISS 23.5 ± 14, admission INR 1.33 ± 0.4 and 63.4% received blood transfusions. Overall, parameter agreement fell outside acceptable limits. No significant associations between ROTEM CT and TEG R, and weak correlations between ROTEM α angle and TEG α angle; clot formation time (CFT) and K; maximum clot firmness (MCF) and maximum amplitude (MA); LI30 and CL30 were observed. Both tests had similar clinical performance. ROTEM MCF and TEG MA showed reasonable predictive accuracy for mortality, strong accuracy for any or massive blood transfusion and reasonable accuracy for plasma transfusion and similar poor predictive accuracy for diagnosing coagulopathy defined by INR or fibrinogen. **Conclusion:** Conventional ROTEM and TEG results are not interchangeable, arguably due to different coagulation triggers. Both assays had similar clinical performance when predicting mortality, blood transfusion and diagnosing coagulopathy.

Severe trauma in the province of New Brunswick: a descriptive epidemiological study. *Benoit Phelan,* Jacqueline Fraser,† Tushar Pishe, † Joanna Middeton, † Allison Chisholm,‡ Susan Benjamin, ‡ Ian Watson, ‡ Paul Atkinson.†* **From *Dalhousie Medicine, Saint John, N.B., †Department of Emergency Medicine, Saint John Regional Hospital, Saint John, N.B., †Emergency Medicine, Saint John Regional Hospital, Saint John, N.B., and the ‡NB Trauma Program, Saint John, N.B.**

Background: The New Brunswick Trauma Program (NBTP) is an all-inclusive provincial trauma system that was implemented in February 2010 to service the province's urban and largely rural population. This geographical reality presents many unique challenges for the organization and optimization of a trauma system — yet may have a significant impact on trauma outcomes. This study aims to describe trauma in the province of New Brunswick in patients with an ISS > 15. **Methods:** A retrospective observational study design will be used to better understand severe trauma in patients discharged from either the level 1 or level 2 provincial trauma centres between April 2011 and March 2013. Patients will be identified from the NBTP database utilizing an inclusion and exclusion criteria. The inclusion criteria are having been transported to hospital by EMS, having an ISS > 15, and having arrived to the initial hospital within 24 hrs of injury. Exclusion criteria are having been discharged from hospital alive within 3 days of injury and arriving from out of province/country. The information gathered on cases includes event details, including geolocation; prehospital time data; in-hospital course; and vital statistics. These will be analyzed in attempt to identify spatial and temporal clustering and regional differences. **Results:** Standard statistical methodology will be utilized for analysis of categorical and continuous data. **Conclusion:** This study aims to provide guidance for provincial policy development and implementation, as well as to establish a framework for future longitudinal studies.

Partnering for success — a road safety strategy for London and region. *Jane Harrington,* Tanya Charyk Stewart,* Alyssa Penney.†* **From *London Health Sciences Centre, London, Ont., and the †Middlesex London Health Unit, London, Ont.**

Background: Motor vehicle collisions (MVCs) are a significant health concern. In 2011, there were 2006 MVC fatalities in Canada. A need to address road issues is accomplished through partnership. The London Middlesex Road Safety Committee (LMRSC), with representatives from the trauma centre, public health, police, city/county and the Ministry of Transportation, leads initiatives focusing on reducing road injuries. The LMRSC will utilize a London Road Safety Strategy (LRSS) with a mandate of reducing injury collisions by 10% over 5 years. **Methods:** The LMRSC initiates campaigns using a multifaceted approach to road safety and incorporates "Es" of prevention: education, enforcement, engineering, epidemiology, environment, empathy, evaluation. Recognizing a need for collaboration and engagement, LMRSC expanded its role to create a comprehensive strategy for the region, LRSS. **Results:** Half of severe traumas at London Health Sciences Centre over the last 5 years (n = 837) were MVC-related. Building on partnerships, LMRSC is a force for the creation of LRSS. This strategy focuses the actions of LMRSC and establishes countermeasure areas: intersections, distracted driving, young drivers, cyclists, pedestrians, red light running. Using traffic collision data and qualitative surveys for input, countermeasures for road issues were determined. **Conclusion:** MVCs contribute significantly to injury and must be addressed through comprehensively utilizing a collaboration of stakeholders to facilitate implementation and evaluation of countermeasures. Campaigns including the LRSS are made possible through the partnerships of the LMRSC. Expanding the scope of existing structures, a multidisciplinary team enhances the ability to address road issues in a more comprehensive manner.

Evaluation of a patient safety initiative of rapid removal of backboards in the emergency department. *Meagan Mucciaccio,* Shelley McLeod,† Michelle Klingel,* Kristine Van Aarsen,* Cathie Hedges,‡ Adam Dukelow,§ Paul Bradford,¶ Donald Levy.¶* **From the *Division of Emergency Medicine, Faculty of Medicine, Western University, London, Ont., the †Mount Sinai Hospital, Toronto, Ont., the ‡EWEMS, Corporation of the County of Essex, Essex, Ont., the §Local Medical Director, SWOR.BHP, London, Ont., and the ¶Trauma Program, Hotel Dieu Grace Hospital, Windsor, Ont.**

Background: Prolonged time on a rigid spinal board leads to higher levels of patient discomfort, claustrophobia and pressure point tissue breakdown. Removal from a backboard in the emergency department (ED) is resource intensive, as multiple staff members must coordinate to safely remove the patient.

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Prolonged time on a transfer board may lead to unnecessary spinal imaging and longer ED stays. Our objective was to determine if length of time patients were immobilized on a rigid backboard prior to being transferred to an ED bed decreased following implementation of a policy that changed ED culture and allowed paramedics to assist in board removal. We sought to determine whether there is a decrease in the amount of spinal imaging and ED LOS after implementation of this directive. **Methods:** A retrospective chart review was conducted on all charts of patients 18 years or older presenting to a large community trauma centre (annual volume 60 000) via EMS on a rigid transfer board 3 months pre- and 3 months post-implementation of a policy that enabled paramedics to assist in patient removal from the backboard. **Results:** Preliminary data of 88 patients (44 pre- and 44 post-implementation) shows that following policy implementation, total time on backboards was reduced from an average 72 minutes to 51 minutes ($p < 0.001$). **Conclusion:** Although we found no significant change in ED LOS or spinal imaging, this study aims to review over 400 charts. Final analyses will provide more complete results.

Active negative pressure peritoneal therapy and C-reactive protein levels after abbreviated laparotomy for abdominal trauma or intra-abdominal sepsis. ***Fatma Alhinai,* Andrew Kirkpatrick,† Chip Doig,‡ Derek Roberts,§ Jimmy Xiao,¶ Aziza Al Rawahi.‡*** **From *Calgary, Alberta, the †Departments of Surgery and Critical Care Medicine, Foothills Medical Centre and University of Calgary, Calgary, Alta., the ‡University of Calgary, Calgary, Alta., the §Departments of Surgery and Community Health Sciences, University of Calgary, Calgary, Alta., and ¶Alberta Health Services, Trauma Services, Calgary, Alta.**

Background: Open abdomen negative pressure therapy (OANPT) is increasingly common in the management of complicated abdominal trauma. A recent randomized controlled trial suggested that survival was higher in patients treated with this technique, postulated as due to reducing the systematic inflammatory response from inflammatory mediators. However, the specific mechanism or mediator was not identified. The aim of this study was to evaluate the role of C-reactive protein (CRP) in patients with OANPT. **Methods:** We conducted a randomized controlled trial. A total of 45 patients were randomized to either the ABThera or Barker's vacuum pack after abbreviated laparotomy for abdominal trauma or intra-abdominal sepsis. Peritoneal and plasma CRP levels were compared between the 2 groups. **Results:** Among those allocated to the ABthera, levels of plasma CRP was significantly lower at 24 hours compared to baseline ($p = 0.0002$), whereas in Barker's vaccum pack there was no significant reduction in plasma level ($p = 0.207$). However, no major differences presented between the 2 groups. Both showed no significant reduction at 48 hours and the plasma CRP remained higher compared to the peritoneal level in the 24 and 48 hours. **Conclusion:** Plasma CRP reduction is a significant result found in patients with temporary abdominal closure. Further examination of the CRP role as a potential mechanism of marker of inflammation and outcome is warranted.

A comparison of outcomes: Direct admissions vs. interhospital transfers April 2009–March 2014. ***Heather Knight,* Alanna Keenan,* Melissa Waggott.*** **From *the Ottawa Hospital, Ottawa, Ont.**

Background: The Ottawa Hospital is a level 1 trauma centre, receiving patients from 15 hospitals in eastern Ontario, in addition to transfers from out of province (primarily western Quebec). This study compared the outcomes of direct admissions (DA) v. interhospital transfers (IHT). **Methods:** A retrospective review of trauma data was undertaken between April 2009 and March 2014. Data elements included ISS, abbreviated injury score (AIS), ICU LOS, hospital LOS, mortality, complication rate, number of operative reports, type of injury. Patients with ISS ≥ 12 and/or trauma codes were included while patients who died in the ED were excluded. **Results:** A total of 2583 patients were included in the study. Sixty percent were DA and 40% were IHT. Results were markedly similar between the 2 groups. Statistically significant differences ($p < 0.05$) included average ISS (21.1 for IHT v. 20 for DA, $p = 0.0035$), discharged alive (91.8% for IHT v. 88.2% for DA, $p < 0.003$) and penetrating injury (2% for IHT v. 9% for DA, $p < 0.001$). **Conclusion:** Significantly higher percentages of patients with penetrating injuries were admitted directly to the trauma centre. Mortality was higher for patients admitted directly, despite having slightly lower ISS. The exclusion of deaths in the ED may partially explain the higher DA mortality rates; further research is required to determine contributing factors. In addition, these results support the benefits of a regional trauma system, which improves outcomes for trauma patients from rural areas.

YEE HA or YEE OUCH! A 5-year review of large animal-related incidents. ***Desiree Young,* Sukhi Lally,* Jimmy Xiao,* Alma Rados,* Anita Williams,* Christine Vis.*** **From *Alberta Health Services, Trauma Services, Calgary, Alta.**

Background: Alberta has large rural communities, and Calgary is the home to the greatest rodeo show. Horseback riding, chuckwagon races and animal-drawn vehicle activities are popular. Unfortunately, these activities contribute to both severe and minor injuries. We aim to raise awareness of these incidents and provide recommendations for protection from large animal-related injuries. **Methods:** A retrospective review of trauma registry at a level 1 trauma centre (2009–2014) in conjunction with data integration measurement reporting (DIMR) was performed. Elements included animal-related injury data and outcomes. **Results:** DIMR recorded 921 minor injured outpatients, including 562 patients injured by animal riding and 359 patients injured by crushing. Among 5496 major trauma patients (ISS ≥ 12), 168 patients had large animal-related injuries. Two of them were related to Stampede activities, 124 patients (74%) were injured from falls when horseback riding, 18 patients (11%) by crushing/kicking (horses), 16 patients (9%) by falls from animal-drawn vehicles and 10 patients (6%) by crushing (bulls/cows). Injuries involved the chest (60%), head/neck (35%) and other parts (5%) of the body. Approximately 80% of these patients were discharged home, 2% to rehabilitation, 15% to other care facilities, and 3% died. Head injury was the major cause of death. **Conclusion:** Horseback riding accounted for the majority of animal-related injuries. Helmet usage may play an integral role in protection

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from head injuries in severe trauma incidents. Chest orthotics should be recommended for preventing chest injuries, and spinal protective-gear needs to be further studied.

Early goal-directed therapy for prevention of hypothermia-related transfusion, morbidity and mortality in severely injured trauma patients. ***Asim Alam,* Ryan Perlman,* Jeannie Callum,* Barto Nascimento,* Homer Tien.*** **From *Sunnybrook Health Sciences Centre, Toronto, Ont.**

Background: Hypothermia is present in a majority of patients with severe injury although it is often disregarded during the initial resuscitation. Studies have revealed that hypothermia is associated with mortality in 21-100% of trauma cases when the patient's temperature is below 32°C. Risk factors include the severity of injury, wet clothing, low transport unit temperature, use of anesthesia and prolonged surgery. With persistent heat loss below 34°C, there is a decrease in platelet function and clotting factor activity of 10% per degree Celsius. Fortunately, these coagulation disorders have been shown to completely resolve with aggressive warming. Both passive and active warming techniques such as warm blankets, forced-air coverings, intravenous fluids and peritoneal lavage have each independently been validated in trauma to prevent heat loss. These methods can be applied in damage control resuscitation, which focuses on the medical management of hypothermia, acidosis and coagulopathy instead of the definitive surgical repair of injuries. While treatment guidelines exist for acidosis and bleeding, there is no evidence-based systematic approach to managing hypothermia in trauma patients. **Methods:** We reviewed the literature from 1987 to 2014 on hypothermia management in trauma to synthesize a goal-directed algorithm for warming the severely injured patient that can be directly incorporated into current ATLS treatment guidelines. **Results:** This involves the early use of warming blankets and removal of wet clothing in the pre-hospital phase followed by aggressive rewarming on arrival at hospital. **Conclusion:** This series of interventions may help decrease transfusion and improve morbidity and mortality in this population of patients.

Improving care of adolescent trauma patients admitted to adult trauma centres by fostering collaboration between adult and pediatric partners. ***Melissa Waggott,* Alanna Keenan,* Heather Knight.*** **From *the Ottawa Hospital, Ottawa, Ont.**

Background: Patients under 18 are typically triaged to pediatric lead trauma hospitals (LTH); however, at times adolescents are admitted to adult LTHs. The staff are experts in adult care but many lack experience or education in caring for adolescents, specifically their psychosocial needs. Based on concerns identified by staff, a project was conducted to determine the scope and resources needed to respond to this issue. **Methods:** Patients < 18 years of age were identified and data from the trauma database at an adult LTH between Sept. 1, 2009, and Aug. 31, 2014, was extracted. Data extracted related to gender, age, ISS, hospital and ICU LOS, injuries, diagnosis and discharge disposition. An analysis of current programs to foster collaboration between the adult and pediatric centre was also conducted. **Results:** Forty-two adolescents were admitted to the adult LTH, average ISS 25, average age 16.5 (range 13-17). Twenty (48%) were transferred from scene, 17 (40%) were transferred from referring adult hospital and 5 (12%) were transferred from the pediatric LTH (primarily complex orthopedic injuries). Upon review, no formal processes to involve the pediatric LTH in the care of adolescent trauma patients were available. Consultation with the pediatric LTH was conducted and potential resources related to child life specialists, resources for staff and suggestions on how to involve parents in care were identified. **Conclusion:** Support and collaboration between pediatric and adult LTHs are needed to provide comprehensive care to adolescent trauma patients. Our 2 LTSs have initiated a program to respond to these needs and have identified potential areas of support.

Expediting operational damage control laparotomy closure: iTClam v. suturing during damage control surgical simulation training. ***Jessica McKee,* Homer Tien,† Heather Wright-Beatty,‡ Jocelyn Keillor,‡ Anthony LaPorta,§ Sue Brien,¶ Derek Roberts** Chad Ball†† Deon Louw‡‡ Andrew Kirkpatrick§§.*** **From the *University of Alberta, Edmonton, Alta., the †Sunnybrook Health Sciences Centre, Toronto, Ont., the ‡National Research Council of Canada, Ottawa, Ont., §Monument, Colorado, the ¶Royal College of Physicians and Surgeons of Canada, Ottawa, Ont., the **Departments of Surgery, Community Health Sciences and Critical Care Medicine, Calgary, Alta., the ††Departments of Surgery and Oncology, Foothills Medical Centre and University of Calgary, Calgary, Alta., Caleo Health, Calgary, Alta., the ‡‡Departments of Surgery and Critical Care Medicine, Foothills Medical Centre, Calgary, Alta., and §§University of Calgary, Calgary, Alta.**

Background: As recent innovations in informatic technology allow for specialist support to point-of-care (POC) providers, advanced interventions, such as damage control surgery (DCS), may be possible on the front lines. However, for non-surgeons suturing is a very complex procedural skill, and thus other operational laparotomy closure techniques are needed. **Methods:** The study was a head-to-head comparison of laparotomy closure in an anatomically realistic surgical training mannequin (the "Cut-suit") following a perihepatic DCS packing exercise. After skin-only closure with either the iTClamp or suture, the primary outcomes were completeness of closure and time to close. Six board-certified surgeons performed the same task as 12 military medical technicians (MT) who were randomized to unsupported (n = 5; UMT) or remotely telementored (n = 7; RTM) with real-time guidance by a trauma surgeon. **Results:** No study participants were able to close the incision with sutures and 0.55 achieved closure with the iTClamp. iTClamp application was superior to suturing when examining length of incision closed ($p < 0.001$), percent of incision closed ($p < 0.001$) and time to close incision ($p = 0.008$). Surgeons outperformed the RMT and UMTs on percent closed ($p = 0.001$, $p = 0.004$) and length closed ($p = 0.001$, $p = 0.004$) when suturing. However, MTs performed as well as the surgeons when using the iTClamp. All participants preferred the iTClamp to suturing, thought it was easy to use and learn to use and was applicable to DCS. **Conclusion:** Laparotomy closure following DCS in an anatomically realistic surgical mannequin was readily performed by military medical technicians and trained surgeons. The iTClamp proved to be a faster and easier modality to achieve incision closure compared to suturing.

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Are conventional coagulation tests inadequate in the assessment of acute traumatic coagulopathy? *Safiya Al-Masrouri,* Naisan Garraway,† Tyler Smith,‡ Richard Simons.†* From the *University of British Columbia, Vancouver, B.C., †Trauma Services, Vancouver General Hospital, Vancouver, B.C., and ‡Vancouver General Hospital, Vancouver, B.C.

Background: Hemorrhage is one of the leading causes of mortality in major trauma, and is often exacerbated by a complex coagulation derangement called acute traumatic coagulopathy (ATC). Early and accurate assessment of hemostasis in trauma patients is required before targeted therapy for ATC can be instigated and hemorrhage arrested. Current conventional coagulation tests (CCTs) are time-consuming and do not provide a comprehensive description of all potential coagulation disturbances in ATC. To overcome these limitations, 2 point-of-care viscoelastic assays — thromboelastography (TEG) and rotational thromboelastometry (ROTEM) — have been increasingly used to diagnose ATC. The aim of this paper is to review the current literature regarding the role of ROTEM in diagnosing and managing ATC. **Methods:** A systematic review of the published literature from 2003 to November 2014 was conducted in MEDLINE, EMBASE and Cochrane Library. **Results:** A total of 17 clinical studies were reviewed. Key findings were that ROTEM parameters detected ATC accurately, correlated well with the standard coagulation tests and provided extra information regarding the dynamics of clot formation, stability and lysis in a shorter span of time (typically 10 min); were independent predictors of mortality, injury severity and the need for massive transfusion; were used successfully in goal-directed therapy of ATC with allogeneic blood products, fibrinogen and recombinant factors. **Conclusion:** ROTEM assay provides rapid and reliable means to assess the complex coagulation disturbances in trauma patients. This advantage allows for early targeted utilization of blood products and minimizes the complications of empiric transfusion of allogeneic blood products.

Predictors of long-term outcomes in patients admitted to emergency general surgery services: a systematic review of literature. *Alreem Al Hinai,* Morad Hameed†.* From *Vancouver, B.C., and †Trauma Services, Vancouver General Hospital, Vancouver, B.C.

Background: Emergency general surgery (EGS) patients have unique physiologic characteristics and are at a high risk of mortality/morbidity compared to EGS patients. To date, there is scarce literature examining factors predicting unfavourable outcomes, especially in the long term (30 days and beyond). We aimed to perform a systematic review of the available literature that examines long-term outcomes of EGS patients. **Methods:** A systematic review of published literature from 2004 to date was conducted in MEDLINE, EMBASE and Cochrane Library. Keywords were chosen based on the 3 most common diagnoses in EGS: acute appendicitis, cholecystitis and small bowel obstruction in addition to EGS, acute care surgery, outcomes and post-operative complications. Outcome measures were divided into patient, disease, technical and system factors. **Results:** A total of 407 articles were identified during the primary search; of those 60 were found to be relevant to the research question. There is scarcity of literature beyond 30 days post-operatively. Respiratory and surgical site complications were the most common occurrences. Many complications had predictable pre-operative risk factors. **Conclusion:** As the EGS patient population is increasing, more studies and predictive models are warranted to control pre-operative risks and reduce complications.

Use of the iTClamp versus standard suturing techniques for securing chest tubes: A randomized cadaver study. *Jessica McKee,* Chad Ball,† Derek Roberts, Dennis Filips,‡ Andrew Kirkpatrick,§ Ian Mckee,‡ Melanie Bouclin,‡ Ian Atkinson.‡* From the *University of Alberta, Edmonton, Alta., the †Departments of Surgery and Oncology, Foothills Medical Centre and University of Calgary, Calgary, Alta., ‡Innovative Trauma Care, Edmonton, Alta., and the §Departments of Surgery and Critical Care Medicine, Foothills Medical Centre and University of Calgary, Calgary, Alta.

Background: Placement of a tube thoracostomy (TT) is a common trauma procedure. As suturing a TT in place is a skill set that requires practice, the TT may become dislodged during transport of patients from hospitals with less TT experience to level 1 trauma centres. The purpose of this study was to examine if the iTClamp was substantially equitant to suturing TT. **Methods:** Using a cadaver model, a 1.5 inch incision was made along the upper border of the rib below the 5th intercostal space anterior to the axillary line. TTs (sizes 28Fr, 32Fr, 36Fr and 40Fr) were inserted and secured with both suturing and iTClamp according to the preset randomization. TT were then functionally tested for positive and negative pressure as well as the force required to remove the TT (pull test — up to 5 lbs). Time to secure the TT was also recorded. **Results:** When sutured in place by a trained surgeon the sutures and iTClamp were functionally equivalent for holding a positive and negative pressure. Median pull force for both sutures and iTClamp exceeded the 5 lb threshold, there was no significant difference between the groups. Securing the TT with the iTClamp was significantly faster ($p = 0.002$) for 32Fr but was not significantly different for the other sizes. **Conclusion:** The iTClamp worked well to secure TTs. The main benefit to the iTClamp being used in place of sutures is that very little skill is required to properly secure a TT to ensure that it does not become dislodged during transport to a trauma centre.

iTClamp application for control of simulated massive upper extremity arterial hemorrhage by tactical police. *Jessica Mckee,* Derek Roberts,† Ian McKee,‡ Andrew Kirkpatrick.§* From the *University of Alberta, Edmonton, Alta., the †Departments of Surgery, Community Health Sciences and Critical Care Medicine, Calgary, Alta., the ‡Edmonton Fire Department, Edmonton, Alta., and the §Departments of Surgery and Critical Care Medicine, Foothills Medical Centre and University of Calgary, Alta.

Background: Hemorrhage is the leading cause of preventable post-traumatic death worldwide. In many cases, first responders attending to a bleeding victim may have minimal medical training. The iTClamp is a novel hemorrhage control device that may be useful for first responders. **Methods:** We studied police tactical members ability to control hemorrhage with the iTClamp using an anatomically realistic model of massive upper extremity arterial hemorrhage. Study participants were asked to apply the iTClamp with both dry and wet gloves to simulate application in the presence and

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absence of blood. The primary outcomes were ability to achieve hemostasis and time to achieving hemostasis during both wet and dry applications. **Results:** All participants were able to achieve hemostasis in both dry and wet applications. There was no significant difference in time to application between the first and second application of the clamp (median 6.3 v. 5.4 s; $p = 0.158$) or between wet and dry applications (median 5.5 v. 6.2 s, $p = 0.654$). During 46 applications and 46 removals, there were no needlestick injuries. All participants rated the iTClamp 10/10 for ease of use, confidence in ability to apply the device and satisfaction with its use. **Conclusion:** As many bleeding patients with massive external hemorrhage may die before reaching hospital, simple modalities of hemorrhage control such as the iTClamp may be useful for first responders with minimal medical training.

Assessing performance in the trauma room. ***Carlos Semprun,* Homer Tien,* Asim Alam,* Avery Nathens,* Barto Nascimento.**** **From *Sunnybrook Health Sciences Centre, Toronto, Ont.**

Background: During acute trauma resuscitation, compliance with trauma care guidelines is challenged by the fast-paced and demanding environment of the trauma room. As part of our trauma performance improvement program key performance indicators were established for our trauma team activations (TTAs). We conducted a prospective audit to assess performance in the trauma room. **Methods:** A prospective audit was conducted at our level 1 trauma centre for all consecutive TTAs in November 2014. Compliance with key performance improvement items, such as LOS in the trauma room, the presence of a trauma team leader (TTL) at patients' arrival, use of personal protective equipment (PPE), collection of group and screen samples for blood bank, recording of temperature, administration of tranexamic acid (TXA) for eligible patients, starting of trauma clock, were assessed by direct observation by trained 24/7 research assistants. Descriptive statistics were utilized. **Results:** Fifty-one TTAs were observed and included in this analysis. Severe trauma patients (systolic blood pressure < 90 mm Hg) stayed < 1h in the trauma room; the TTL was present in 49 TTAs (96%); PPE was used in 48 (94%); group & screen samples were collected for 41 (80.4%); temperature was recorded for 30 (59%); TXA was administered in 45% of eligible cases; the trauma clock was started in 10 (19.6%). **Conclusion:** At our trauma centre, compliance with some key performance indicators is challenged by short resuscitation times in the trauma room. A trauma room checklist will be implemented in the hope of improving trauma team performance during acute resuscitation.

The deadly need for methadone/opiate education. ***Donna Collins.**** **From *Crystal Clear Transitional Care Inc., Upper Loch Lomond, N.B.**

Background: The proliferation of methadone/opiate treatment in communities across Canada has resulted in intentional/unintentional and/or accidental opiate overdose. Education on preventative measures to reduce premature death associated with methadone/opiate overdose has not kept pace with the needs of clinicians, and more specifically has not kept pace with the needs of the overdose victim either in the community, hospital or correctional setting. **Methods:** Through retrospective chart audits, review of clinical practice guidelines, examination of clinical practice tools and peer reviewed articles. This process occurred over a 2-year period to determine what, if any, problems existed in the treatment of methadone/opiate overdose. **Results:** There are significant knowledge gaps in identifying the signs and symptoms of methadone/opiate overdose. Further, there is evidence to suggest that naloxone is not being prescribed to treat methadone/opiate overdose at the right dosage, at the right frequency, or duration — if at all. Other data suggest that there are gaps in methadone treatment guidelines, including insufficient patient education on drug–drug interactions that occur with methadone/opiates and other medications, including over-the-counter medications, antibiotics and antipsychotics. Clinical tools (i.e. Opiate Manager, ACLS algorithm) are outdated and contain significant gaps leaving clinicians vulnerable and patients exposed to deadly knowledge deficits. **Conclusion:** Prompt and extensive education strategies need to be developed to ensure safe clinical practice by all health care providers when prescribing methadone/opiates. Prevention strategies, including designing new tools and changing current practice guidelines (i.e. ACLS algorithm, reversible causes checklist, methadone guidelines and resuscitation strategies) and the development of comprehensive overdose treatment protocols are needed. It is anticipated that this national strategy will positively impact other national programs currently under review, such as organ donation and retrieval.

Trends in the management of major abdominal vascular injuries: 2000-2014. ***Dennis Kim,* Gloria Kim,* Brant Putnam,* Chris de Virgilio,* James Maciel,* Angela Neville,* Fred Bongard,* Scott Bricker,* David Plurad.**** **From the *Harbor-UCLA Medical Center, Torrance, Calif.**

Background: Abdominal vascular injuries are highly lethal. The objectives of this study were to examine our experience with abdominal vascular injuries, to identify risk factors for mortality and to characterize the evolution of management over time. **Methods:** We performed a 15-year retrospective analysis of our level 1 trauma centre database to identify patients with major abdominal vascular injuries. The primary outcome measure was mortality. Multivariate and trend analyses were performed to identify predictors of mortality and changes in the use of damage control surgery (DCS) (shunting/ligation) and resuscitative practices over time. **Results:** A total of 566 abdominal vascular injuries were identified in 364 patients. Overall mortality was 49%. Patients who died were more likely to present with hypotension (78% v. 22%, $p < 0.0001$), undergo ED thoracotomy (30% v. 3%, $p < 0.001$), and had a higher incidence of combined arterial and venous injuries (22 v. 9%, $p = 0.02$). Increasing AAST injury grade was associated with increased mortality (OR 2.21, 95% CI 1.03–4.76, $p = 0.04$). Predictors of mortality included an increased base deficit and estimated blood loss ($p < 0.005$). During the study period, there was a decreased trend in mean crystalloid administration (3% per annum, $p = 0.07$); increased use of DCS (mean 20% per annum, $p = 0.09$); and a decrease in the mean PRBC:FFP ratio (7% per annum, $p < 0.0001$). **Conclusion:** Despite increased use of DCS and modern resuscitative practices, mortality from abdominal vascular injuries continues to be high. Prospective, multi-centre studies may provide further insight into the optimal surgical and resuscitative practices associated with survival in patients with these lethal injuries.

Addressing high school seniors' risky behaviours through a hospital-based and peer teaching outreach program. ***Tara***

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Grenier,* *Nancy Tze*.* From *McGill University Health Centre, Montréal, Que.*

Background: Unintentional injuries are the number 1 cause of death in Canada for people aged 1–34 years old. The Montreal General Hospital's trauma program, in collaboration with the SAAQ and the Longueil police service, implemented a community outreach program to address risky behaviour in young people. The program consists of an educational trauma centre visit, followed by a series of safety and injury prevention peer teaching sessions in their schools. **Methods:** Police officers were responsible for recruiting high school students interested in participating in a road safety and injury prevention ambassador program. Visits were scheduled between November 2014 and March 2015 for groups no larger than 16 students. Students were given pre-trauma centre visit questionnaires: AUDIT and a series of questions regarding risk-taking behaviour. After the visit they completed a post-visit evaluation. A post-program survey will also be conducted. **Results:** Thirteen visits including 14 schools were scheduled. The results include the first 3 visits. Forty-two students visited the trauma centre: 29 responded to the pre-visit questionnaires and 39 to the post-visit evaluation. The average AUDIT score was 2.72. Most students claimed to wear their seat belts all the time (25/29), while neglecting to wear their bike helmets (23/29). The students appreciated the testimonial shared by a trauma survivor and participating in a trauma scenario in the trauma bay. The key message they retained was "pay attention, be careful and think ahead!" **Conclusion:** Risk-taking behaviour is an ongoing issue in young people; outreach programs instill a valuable message.

Screening for risk of post-traumatic stress disorder after injury in acutely injured children: a systematic review. *Sarah Curtis*,* *Jeffrey Odenbach*,* *Rebecca Grokiert*,† *Cathy Falconer*,‡ *Craig Courchesne*,* *Sandra Campbell*,§ *Amanda Newton.*¶ **From the *University of Alberta, Edmonton, Alta., the †Faculty Extension, University of Alberta, Edmonton, Alta., ‡Stollery Children's Hospital, Edmonton, Alta., the §John W. Scott Health Sciences Library, Edmonton, Alta., and the ¶Department of Pediatrics, University of Alberta, Edmonton, Alta.**

Background: Although physical traumas are treated systematically in the emergency department, significant emotional traumas are often overlooked which can lead to the development of post-traumatic stress disorder (PTSD). Currently, screening for risk of significant psychological sequelae after injury in the acute care setting is not common practice. This systematic review aimed to identify, describe and appraise the performance characteristics and outline the clinical utility of PTSD screening tools suitable for children and families in the acute care setting. **Methods:** Electronic databases were searched for derivatives of [post-traumatic stress or acute stress], [pediatric or children] and diagnosis. Articles were screened and reviewed by 2 independent reviewers. Screening tools were assessed using the QUADAS-2 tool for assessment of diagnostic accuracy. **Results:** A total of 10 415 articles were screened by title/abstract and 337 potentially relevant articles were retrieved in full text. Inter-rater reliability (κ) score of 0.833 was calculated for article screening. Screening tool characteristics including quantitative diagnostic accuracy data (specificity, sensitivity, positive and negative likelihood/odds ratios) were compiled for 92 screening tools. Of these, we identified 2 immediate use risk assessment tools suitable for ED use. **Conclusion:** We identified 2 unique tools suitable for use in the pediatric acute care setting: the Screening Tool for Early Predictor of PTSD (STEPP) and the STEPP-AUS. Children at risk for development of PTSD after injury could be identified immediately for early psychological referral. Further research is warranted to evaluate the utility of these tools in risk stratifying injured children to direct appropriate follow-up care.

The impact of trauma centre designation levels on surgical delay, mortality and complications: a multicentre cohort study. *Philippe Dufrsne*,* *Lynne Moore*,* *Julien Clement.*† **From *Université Laval, Québec, Que., and the †CHU de Québec, Québec, Que.**

Background: Hemorrhagic shock is an important cause of mortality. Integrated trauma systems are designed to rapidly transport these patients to a hospital with surgical capacity. We aimed to describe the trajectories of patients in hemorrhagic shock and to evaluate the effect of trauma centre designation level on surgical delays, mortality and complications. **Methods:** We performed a retrospective cohort study with data from the provincial trauma registry (1999–2012). We included adults with SBP < 90 mm Hg who required urgent surgical care (< 6 h). Logistic regression was used to compare surgical delays (ED arrival to surgery), mortality and complications according to designation level. **Results:** Of 658 patients in the study population, 206 (31.3%) were transported directly to a level 4/3 centre, 256 (38.9%) directly to a level 2/1 centre, and 177 (26.9%) were transferred to a level 2/1 centre. One-hundred seventy-one patients (26%) had a surgical delays of < 1 h. Level 1/2 centres tended to operate more frequently within 1h (OR 1.4, 95% CI 0.96–2.0), had similar mortality (OR 1.1, 95% CI 0.7–1.6), but a higher incidence of complications (OR 1.7, 95% CI 1.2–2.3) than level 3/4 centres. **Conclusion:** One in 4 patients were transferred from level 4 centres without surgical hemorrhage control, and only a quarter of patients requiring urgent surgery had an operation in the first hour. Results suggest that level 2/1 centres may be beneficial in terms of surgical delays but do not have a positive impact on mortality or complication rates.

How many acutely injured children report subsequent stress symptoms? *Sarah Curtis*,* *Cathy Falconer*,† *Bill Sevcik*,† *Lindy VanRiper*,‡ *Heidi Wilkes*,‡ *Abbeir Hussein*,§ *Amanda Newton.*§ **From the *Division of Emergency Medicine, University of Alberta, Edmonton, Alta., †Stollery Children's Hospital, Edmonton, Alta., the ‡Department of Psychiatry, University of Alberta, Edmonton, Alta., and the §Department of Pediatrics, University of Alberta, Edmonton, Alta.**

Background: Currently, it is unknown how often Canadian children and parents are affected by unhealthy stress after injury. Our primary objective is to determine the proportion of children who report persistent post-traumatic stress disorder (PTSD) symptoms on the ASC-KIDS checklist and parents who report persistent PTSD symptoms on the PCL checklist 1 month after injury. Secondary objectives are to identify the proportion of children who screen positive for high risk of PTSD on the STEPP screening tool and characteristics of at-risk children and parents. **Methods:** Consecutive children, aged 8–16, presenting

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to the Stollery ED with acute injury, will be eligible from February 2015 to August 2015. The STEPP screening tool and a risk variable questionnaire will be administered in the ED to children. Parents and children will be contacted electronically 1 month after the injury to fill checklists evaluating persistent PTSD symptoms. **Results:** Based on review of the published literature, we hypothesize that in the community, 10–30% of children will display persistent symptoms of PTSD 1 month after acute injury; iIn the ED, 5–40% of children will screen at risk for PTSD, and 20% mothers and < 5% fathers will screen positive for subsequent PTSD; and several predictor variables of PTSD are identifiable at the acute care stage. **Conclusion:** Through this project we will learn the proportion, prognostic factors and degree to which children experiencing acute trauma (and their parents) will have psychological sequelae. Preliminary data may be available for TAC 2015.

The frequency of coagulopathy and its significance in an emergency neurotrauma facility. ***Salman Khan.*** *** From the *Aga Khan University, Karachi, Pakistan**

Background: Most data on coagulopathy are from the West. We sought to determine frequency of coagulopathy in our population and determine the relationship of coagulation parameters and other clinical variables with unfavourable outcomes of patients with traumatic brain injury (TBI). **Methods:** This was an observational cohort study conducted in a tertiary care facility from Jan. 1, 2010, to Dec. 31, 2012. All patients with isolated TBI presenting within 24 hours of injury were included in the study. Coagulation parameters at presentation were recorded and Glasgow Outcome Scale (GOS) calculated on the last follow-up. Outcomes were dichotomized into favourable and unfavourable outcomes. Relationship of coagulopathy with Glasgow Coma Scale (GCS), GOS, revised trauma score (RTS) and unfavorable outcomes was calculated using Pearson correlation and receiver operator curve analysis. **Results:** A total of 121 patients were included in the study. Mean age was 38.86 (± 16.71) years. Overall frequency of coagulopathy was found to be 6%. In severe head injury group it was 14%. Area under curve (AUC) for activated partial thromboplastin time (APTT) was found to be 0.702 (95% CI 0.602–0.802, $p < 0.001$) indicating its strong predictive value. Predictive value of platelets and INR was not found to be significant. APTT, INR, age, GCS and RTS were found to be significantly correlated with GOS. **Conclusion:** Overall incidence of coagulopathy in our population was 6%. APTT, INR, RCTS, age, GCS and RTS in emergency are correlated with outcomes of patients with TBI.

Psychosocial care for injured children: The views of 2500 emergency department physicians and nurses from around the world. ***Sarah Curtis,*Eva Alisc,† Claire Hoysted,† Markus Landolt,‡ Niccolo Parri,§ Mark Lytle,¶ Rachel Stanley,** Anupam Kharbanda,†† Franz Babl,‡‡ Nancy Kassam-Adams.§§*** **From the *Division of Emergency Medicine, University of Alberta, Edmonton, Alta., the †Monash University, Melbourne, Australia, the ‡Zurich Kinderspital, Zurich, Switzerland, the §Meyer Children's Hospital, Florence, Italy, the ¶Bristol Royal Hospital for Children, Bristol, U.K., the **University of Michigan, Detroit, Mich., the ††University of Minnesota, Minneapolis, Minn., the ‡‡Royal Children's Hospital, Melbourne, Australia, and the §§University of Pennsylvania, Philadelphia, Penn.**

Background: Up to 20% of injured children develop persistent post-traumatic stress symptoms that impair functioning and development. ED staff are key providers of psychosocial care for children and families. Our goals were to examine the knowledge and confidence of ED staff in providing psychosocial care, differences according to demographic and professional characteristics, and training preferences. **Methods:** Based on the Psychological First Aid framework (PFA; The National Child Traumatic Stress Network and the National Center for PTSD, 2006) and international literature, we developed an online survey in 12 languages (35 questions). ED staff were primarily targeted via the Pediatric Emergency Research Network but staff from any hospital worldwide were eligible. **Results:** Over 2500 professionals from over 60 countries participated. While participants' knowledge of traumatic stress was moderate to good, we identified several areas for improvement (e.g. stress reactions in young children). There was variation in confidence scores across the eight elements of PFA and participants differed according to their demographic and professional characteristics. The respondents identified a number of barriers, including time constraints and cultural issues. Over 85% of the respondents had not received formal training in psychosocial care and would like to participate in future training. **Conclusion:** Psychosocial care is seen as an important domain of ED care. The findings indicate a range of focal areas for ED staff education.

Development of the Trauma Electronic Document (TED). ***Jamie Appel,* Kim Fichter,* Jagadish Rao,* Yvonne Harris,* Desiree Nahachewsky.**** **From the *RQHR Trauma Program, Regina, Sask.**

Background: Hospitals have developed electronic medical records (EMRs) for inpatient documentation, with a goal to improving efficiency and patient safety, and to increase accessibility by care providers. Trauma resuscitations can often result in incomplete data for the trauma registry and have traditionally relied upon paper documentation. To bridge this gap, an electronic document for trauma was created for an urban trauma centre. **Methods:** Collaboration between front-end users, developers and trauma registry data collectors was achieved through a process that recognized the limitations of software programming and development. It also involved revisions to both paper and electronic documents. In addition, data points for trauma registry, quality assurance, injury prevention and research were identified and adapted to the electronic document. Information sharing across the continuum of care from pre-hospital to rehabilitation was then adjusted to COWs, tablets and, eventually, to iPads/tablets. Medicolegal implications were considered and incorporated, including time/date stamps, user stamps and documentation of corrections. **Results:** Standardized documentation across multiple platforms has resulted in an electronic document that replaces paper charting. Diagrams of injuries and estimation of burns with automatic calculations for resuscitation and integration of laboratory values have been incorporated. Compliance with ATLS protocols have improved due to mandatory completion of sections for resuscitation. **Conclusion:** The TED has resulted in efficient documentation of trauma patients and with data collection in a more efficient manner. The potential exists for

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this electronic health record to improve patient safety and care, without compromise of documentation.

Development of trauma team activation criteria for an urban trauma centre. ***Jamie Appel,* Jagadish Rao.*** **From the RQHR Trauma Program, Regina, Sask.**

Background: Prior to the development of the RQHR trauma team activation (TTA) criteria, all trauma levels resulted in activation of all trauma team members. Resources were often diverted to the ED and resulted in potential delays in care to other patients. The aim of the new activation criteria was to develop field triage guidelines based upon the CDC criteria for trauma, and to ensure the continuity of care among various care providers. **Methods:** The Centre for Disease Control Field Triage guidelines were reviewed to determine applicability to a Canadian urban trauma centre, with referrals from the southern half of the province of Saskatchewan. Stakeholders, such as STARS air transport, EMS, air ambulance, BedLINE, along with urban trauma care providers, helped to develop a model of care from pre-hospital transport to admission to an urban trauma centre. Criteria were developed for the Regina General Hospital. Urban providers first piloted the criteria for 6 months, with revisions occurring including specific rural guidelines, followed by implementation by rural care providers. **Results:** The initial compliance of the TTA criteria was low. However, within 3 months the compliance reached 83% and after 6 months, reached 86%. The accuracy of the activation remains over 94% (2013 87.71% accuracy and in 2014, 94.27%). Revisions to the activation criteria were made based upon input from both user input and trauma registry data collectors. **Conclusion:** The compliance of the TTA has resulted in more efficient, timely care of trauma patients, with better utilization of resources. Allied health has been better utilized for care in other patient areas. It has resulted in recognition of mortality and morbidity of trauma and not just mechanism. Review of short term results is encouraging and may result in provincewide adoption of the criteria for standardized mobilization of resources.

Brains and brawn: evaluation of a sports skills and concussion awareness camp. ***Tanya Charyk Stewart,* Neil Parry,* Brandon Batey,* Tim Fleiszer,† Douglas D. Fraser.‡*** **From *London Health Sciences Centre, London, Ont., the †Sports Legacy Institute Canada; Western University's Schulich School of Medicine & Dentistry, London, Ont., and the ‡Children's Hospital, London Health Sciences Centre, London, Ont.**

Background: Concussions are a major public health concern, particularly for youth athletes. The objective of this study was to evaluate a youth football skills camp in terms of effect on participants' concussion knowledge, attitudes and perceptions, as well as camp satisfaction. **Methods:** A pre–post evaluation was performed on the Sports Legacy Institute Canada's Brains & Brawn Youth Football Skills Camp composed of skills training with professional athletes and concussion education. A validated questionnaire was utilized. Participant satisfaction survey was undertaken, utilizing 5-point Likert scales. Descriptive statistics and non-parametric repeated-measures tests were generated. **Results:** Twenty boys with a median age of 11 years participated in this camp. Seventy-eight percent of athletes reported learning new skills. Having professional football players leading the camp was reported as very important to its success (median 5/5), stating they were able to learn more from professional athletes (77%), and it was more motivating (77%). Something new was learned about concussion for 72% of participants. The median level of satisfaction was 5 (very satisfied). There were significantly increased concussion knowledge scores post-camp (median 11 v. 13, $p = 0.002$), as well as perception scores on the likelihood that concussions will affect their daily activities (median 30 v. 40; $p < 0.001$). **Conclusion:** A sports camp led by professional athletes that teaches skills and concussion awareness can be an effective method to increase concussion knowledge and alter perceptions of the potential effects on lives. These are important precursors to ultimately changing behaviours to help reduce the incidence of sports-related concussions.

Regional trauma networks: a tale of 2 pilots. ***Alanna Keenan,* Barbara Klassen,† Melissa Waggott,‡ Yvonne Briereley.**** **From *the Ottawa Hospital, Ottawa, Ont., the †Hamilton Health Sciences, Hamilton, Ont., and ‡National Defence, Ottawa, Ont.**

Background: In 2013, the Ontario Trauma Advisory Committee (OTAC) identified the need for regional trauma networks (RTN). The goal of RTNs is to develop an inclusive framework for system integration, stakeholder engagement and shared responsibility between the lead trauma hospital (LTH) "hub" and the regional hospitals "spokes" to provide comprehensive trauma care. The LTHs in Ottawa and Hamilton were selected as pilot sites. **Methods:** Critical Care Services Ontario (CCSO) provided structure and administrative support. Terms of reference, membership, objectives and priority projects were adapted to meet the needs of each pilot site. Ottawa serves a single Local Health Integration Network (LHIN) with 15 referral hospitals, providing rural trauma courses and site visits. Hamilton serves 3 LHINs with 22 referral hospitals, providing sporadic outreach, and is situated within a multilayered trauma system along the Canada–U.S. border. **Results:** Ottawa utilized a grassroots approach, inviting all stakeholders to participate in determining its membership. Priority issues were identified through consensus. Working groups were developed to move projects forward and sustain momentum. Hamilton utilized a high-level approach to identify key stakeholders in establishing its membership. Initial work focused on understanding transfers and communication data across its complex geographic region. Feedback was utilized to identify priorities in developing a comprehensive work plan. **Conclusion:** A standardized provincial framework is vital in establishing a well-defined RTN. It is essential that RTNs be tailored to meet the unique characteristics of the communities they serve in order to enhance regional trauma systems.

Continuous data quality improvement in a provincial trauma registry. ***Jaimini Thakore,* Jennifer McMillan,* Scott Robinson,* Dori Williams.**** **From the *Provincial Health Services Authority, Vancouver, B.C.**

Background: In British Columbia we have created a system of continuous data quality improvement (CDQI) that can measure data quality, review areas of concern/improvement and then follow through with those improvements via education or process improvement over all 11 sites. The purpose of this study is to show that our CDQI method results in sustainable, high data quality. **Methods:** Data validation checks: the BC Trauma Registry was used to validate data every 6 months. Since the start of CDQI, this

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has been reduced to 2 weeks. Chart auditing: we have developed a scoring system for inter-rater reliability for both abstracted elements and coded elements. **Results:** Chart auditing was conducted over 2 months from late September to late November 2014 to assess inter-rater reliability. Over that period 11 charts have been audited with an inter-rater reliability of 98.3% (based on 299 abstracted fields in the BCTR). Over the same period, we implemented 235 data validation checks (on 2045 records) and frequent communication has improved our compliance rates from 47% error-free records in the first month to 81% error-free records in the second month. **Conclusion:** Although the CDQI program is early in its implementation, the results are promising. Increasing the frequency of data validation checks and feedback to analysts has resulted in increased compliance rates. Adding targeted education based on the most common errors, we aim to see both the compliance rates and the inter-rater reliability scores increasing over time.

Does the Rural Trauma Team Development Course shorten transfer time? ***Anam Younus,* Jeffrey Wild.*** **From the *Geisinger Medical Center, Danville, Pa.**

Background: The Rural Trauma Team Development Course (RTTDC) was developed with the aim to improve the quality of care in rural communities through a timely and organized approach to trauma patients. The aim of this study was to evaluate if the RTTDC shortens transfer time from referring non-trauma hospitals in a rural trauma system. **Methods:** This was a retrospective study of 3 non-trauma referring facilities to a level 1 trauma centre that participated in the RTTDC. Overall transfer time and pre-transfer imaging were compared prior to and following the RTTDC. **Results:** A total of 276 patients met the study inclusion criteria. Ninety-seven patients were transferred prior to the RTTDC course, compared to 179 following it. There was no difference in mechanism of injury between the 2 cohorts with falls and MVCs being the most common. Overall, there was a significant decrease in transfer time following the course, 219 minutes v. 257 minutes. **Conclusion:** The RTTDC has made a positive impact on shortening transfer time in our rural trauma system. Overall, the RTTDC did not impact pre-transfer imaging, and this imaging increased transfer time by 60 minutes. Improved education on essential imaging prior to transfer and expansion of the RTTDC can further improve transfer time to definitive care and trauma outcomes.

Epidemiology of trauma in Puerto Rico. ***Annette Marie Pascual Marrero.*** **From the *University of Puerto Rico, San Juan, Puerto Rico**

Background: Injuries represent a leading cause of overall worldwide mortality, being responsible for 9% of death cases and 16% of disability. In Puerto Rico (PR), there is no information on trauma epidemiology. Thus, the objective of this study was to describe the distribution of injury mechanisms and its impact on morbidity and mortality patterns of trauma in PR. **Methods:** A cross-sectional study was performed at a single trauma centre secondary to stab wounds (SWs;), gunshot wounds (GSWs), falls, road traffic collisions (RTCs) and pedestrians during 2002–2011, using the registry database. A logistic regression model was done to identify trauma mechanisms that led to worse health outcomes ($p < 0.05$). **Results:** From 14 874 patients, 36.11%; 19.81%; 15.59%; 11.11% and 7.21% were admitted for RTCs, GSWs, falls, pedestrians and SWs, respectively. Most patients were males. Patients with GSWs, SWs and RTCs were younger than those with falls and pedestrian injuries. Patients with GSWs were 1.19 (CI 95% 1.07–1.33) times more likely to have an ISS ≥ 25 compared to those with RTCs. Pedestrians were 1.76 (CI 95% 1.49–2.09) times more likely to have a GCS ≤ 8 than RTC patients. GSW victims (2.64; CI 95% 2.20–3.16) and pedestrian (1.51; CI 95% 1.23–1.86) had a higher risk to die than RTC victims. **Conclusion:** Consistent with literature, RTCs had the highest prevalence of all trauma mechanisms. Conversely, mortality patterns observed in this study are contrary to the existent evidence.

CT scans facilitate early discharge of trauma patients. ***Deng Mapiour,* Sandy Widder.*** **From the *University of Alberta, Edmonton, Alta.**

Background: Multislice CT has revolutionized management of patients, but patients are still admitted based on mechanism. Studies show that assessable individuals without injuries or with minimal injuries, despite mechanism, can safely be discharged. Unnecessary admission is costly and inconvenient to the patient. We propose that patients can be discharged safely if no clinical or minimal radiological injury is present regardless of mechanism and minimize health care cost. **Methods:** Using the Alberta Trauma Registry (ATR), we reviewed patients with ISS > 12 admitted for mechanism with no evidence of clinical injuries, Jul. 1, 2013, to June 30, 2014, to our acute care emergency surgery (ACES) service in Edmonton, Alta. Primary outcome was missed injuries. Secondary outcomes were length of stay, direct costs and readmission rates. **Results:** A total of 880 patients admitted with ISS > 12, 287 patients were admitted to ACES; 84% of the patients were male, and 98% were blunt trauma. A total of 61% had positive alcohol. All underwent ATLS assessment and radiological assessment with CT scan. Forty-nine patients (17%) were discharged within 48 hours. There was no additional injuries picked up on tertiary survey. There were no readmissions within 30 days. **Conclusion:** A total of 17% of patients without injuries were discharged within 2 days: Unnecessary admission incurred a direct cost $47 304/year. Short-stay observation unit or a trauma clinic could facilitate safe discharge, and follow up at minimal cost. Additional cost savings with the inclusion of all trauma patients (ISS < 12). Admissions for mechanism without injury could be safely discharged without incurring additional costs.

Feasibility of data collection in a conflict zone to assess the impact on emergency health care delivery. ***Fadi Hamadani,* Haytham Qosa,† Kosar Khwaja,‡ Tarek Razek.‡*** **From *McGill University Health Centre, Montréal, Que., the †Al-Shifa Hospital (Gaza) and Western University Schulich School of Medicine and Dentistry, London, Ont., and ‡McGill University, Montréal, Que.**

Background: Disasters in low-resource settings cause additional disruption to an already strained emergency health services sector, creating a gap between the increase in surgical pathology and a decrease in the ability to meet this need. We used the 2014 Israel–Gaza conflict to understand the decrease in the infrastructure plus the training and staffing needs required to cope. **Methods:** A retrospective analysis utilized data from 4 civilian hospitals and the Palestine Red Crescent Society's Emergency Medical Services

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sub-branch in Gaza, measuring both human and material resources during the conflict. An assessment of the hospital management structure and patient flow through the pre-hospital and hospital systems was performed. A qualitative component utilized interviews with 9 local and international health personnel in Gaza to describe their experiences in a disaster with limited resources. **Results:** Our assessment revealed a widening gap between the increased need in emergency surgical care provisions and a decrease in the capacity to provide this care. There is an increase in the distribution of surgical injuries requiring specialized care but a decrease in the availability of specialized personnel and medical resources. **Conclusion:** We demonstrate that data collection in a disaster setting is feasible and can be utilized to not only define the gap that occurs in emergency surgical care provision but to also appropriately plan for the management of disasters by identifying the specific needs that emerge.

Consent for Emergency Research (CONfER): a national survey of Canadian research ethics board practices. ***Barto Nascimento,* Adic Perez,* Sandro Rizoli,† Sandy Trpcic,† Neill Adhikari,* Francois Lamontagne,‡ Annabelle Cumyn,‡ Karen Burns,† Damon Scales,* Mark Duffett,§ Blair Henry.*** **From *Sunnybrook Health Sciences Centre, Toronto, Ont., †St. Michael's Hospital, Toronto, Ont., the ‡Université de Sherbrooke, Sherbrooke, Que., and the §Hamilton Health Sciences Centre, Hamilton, Ont.**

Background: In Canada, guidelines on pragmatic issues, such as data management and operational details, on alternate consent models for emergency research are lacking. We conducted a national survey to ascertain self-reported practices of research ethics boards (REBs) regarding permissibility of alternate consent models and data management practices; and to measure support for a consensus conference to harmonize practices. **Methods:** English and French web-based survey using sequential steps of item generation and reduction involving pre-testing, pilot testing and clinical sensibility analysis. The National Council on Ethics in Human Research (NCEHR) database was used to identify Canadian REBs with experience in reviewing emergency research protocols. The survey was available as a Web link or a Word document. Response rates were reported using descriptive statistics. **Results:** Ninety-two REBs were identified and included in the analysis. Sixty (65.2%) REBs responded to our survey, but 34 REBs reviewed non-FDA Canadian research protocols. For minimal risk studies, 14 (50%) of REBs would approve a deferred consent process for the study without restrictions. The use of an independent physician authorization model for enrolment into an emergency research protocol was a requirement of 6 (21.43%) and 7 (24.14%) REBs for minimal risk and less than minimal risk studies, respectively. A total of 85.3% of REBs indicated a willingness to participate in a national consensus conference. **Conclusion:** Our survey of Canadian REBs demonstrated considerable variation in practice with respect to the logistics and requirements for the conduct of emergency research. Canadian REBs favours harmonization of emergency research practices at a consensus conference.

Making handover safer for our trauma patients through the lens of trauma team leaders. ***Melissa McGowan,* Amanda McFarlan,* Tanya Zakrison,† Aynsley Young,* David MacKinnon,* Katie Dainty.*** **From *St. Michael's Hospital, Toronto, Ont., and the †Ryder Trauma Center, University of Miami, Miami, Fla.**

Background: Trauma care is fraught with potential for error, particularly failure in communication among providers in the trauma bay and beyond, for those patients requiring admission. Transport and interventions outside the trauma bay increase the chance of information degradation, with serious implications for care. **Methods:** Eight trauma team leaders (TTLs) from a single level 1 trauma centre were invited to participate in semi-structured qualitative interviews. Participants were purposively selected to provide insight into clinical handover practice and patient safety from a leadership perspective. Interview narratives were recorded, transcribed verbatim and subsequently analyzed using constant comparison, including searches for disconfirming evidence. **Results:** While TTLs reported good interpersonal relationships with the diverse providers and services, the current culture for clinical handover was informal, brief, ad hoc and siloed within profession. Absence of the TTL at patient arrival to the ICU compromised quality trauma care, with resultant parallel reports and disjunctive management plans. A TTL's sense of identity, role and where responsibility ended in the trauma journey strongly influenced handover practice. Additional issues hampering high-quality handover and patient safety were level of residents involved in handover, interventions required, timeliness of access to bedspace, undifferentiated injuries and outstanding follow-up plan. **Conclusion:** The importance of the TTL perspective on understanding organizational leadership in handover of the most critically injured patients cannot be undervalued. While checklists and standardized handover have been shown to facilitate communication, instituting an interprofessional handover policy with training and education to support implementation may provide a starting position for safer handovers.

Challenges and opportunities to improve trauma transitions of care from emergency to intensive care nursing. ***Candis Kokoski,* Jodi Denbok,* Melissa Mcgowan,* Alexander Blight,* Alicia Bakker,* Lee Barratt,† Elizabeth Butorac,* Karen Gaunt.†*** **From *St. Michael's Hospital, Toronto, Ont., and †Toronto, Ont.**

Background: The transfer of the trauma patient from the ED to the ICU occurs during a time when not all information regarding injuries and next steps are known. The perceived vulnerability of these patients, questions regarding care plan and changes in level of care can contribute to poorly coordinated transitions, stress, anxiety and interdisciplinary conflict. **Methods:** In an academic, level 1 trauma centre, a team of nurses (RN) from the ED and ICU designed a 5-question open-ended survey to elicit emergency RNs' concerns, stressors and current gaps in the ED to ICU transition process as part of a quality initiative. Thematic analysis was done to identify emerging categories and themes. **Results:** Sixty-three surveys (62%) were returned, with the majority citing interpersonal conflict and tension as the greatest concern from unsatisfactory handover and potential compromise to patient safety. Contributing factors were patient not in the electronic system leading to delayed ordering and flow of tests; limited/missing provider documentation from the trauma bay and discrepancy upon arrival at ICU; nature and complexity of injuries with undifferentiated priorities and plan; and absence of the trauma team leader at handover. **Conclusion:** Preliminary

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themes highlight the importance of communication and collaboration at a time of uncertainty, including sharing injuries and care plans among disciplines and professions, to enhance patient safety, reduce health care provider stress, while supporting smooth transitions. These findings will be used to develop an ED-ICU transfer of care tool to support and guide sharing of information critical to the care of the trauma patient.

Physical disorder following major injury: a population-based study. ***S. Logsetty,* J. Gawaziuk,* Stephanie Lim,* D. Chateau,* Sazzadul Khan,† M. Doupe,* J. Sareen.*** **From the *University of Manitoba, Winnipeg, Man., and the †Manitoba Centre for Health Policy, Winnipeg, Man.**

Background: Traumatic injury causes metabolic stress but how this stress affects future physical disorders (PD) is unknown. Our previous research showed increased mortality following major trauma and this mortality is not directly related to the trauma. There is limited research evaluating the long-term prevalence of PD after trauma. Our objective is to examine the prevalence of PD in adults post-injury, compared to matched non-trauma controls. We hypothesize the rate of change in the prevalence of each PD compared post-injury will be significantly higher in the major trauma cohort compared to controls. **Methods:** Following ethics approval, a population-based epidemiological study including patients with ISS > 12 during 2001–2010 was undertaken. Patients were identified from the regional trauma registry and matched 1:5 to control non-trauma individuals from the general population on age and sex. PD diagnoses were determined from physician and hospital billing using ICD codes for arthritis, cancer, coronary artery disease, diabetes, hypertension and total respiratory morbidity. PD prevalence was analyzed for 2 years post-injury and compared to the rate in the control group. **Results:** A total of 2249 patients were identified in the trauma group and 11 245 in the control group. We found that trauma patients had significantly increased odds of having arthritis 2.359 (95% CI 2.150–2.588, $p < 0.001$) or diabetes 1.2345 (95% CI 1.058–1.441, $p = 0.007$) post-injury versus matched controls. There was no significant increase for other PDs. **Conclusion:** The possible impact of trauma on subsequent physical health is important for health evaluation and screening in patients with the aim of reducing further morbidity.

Toward an inclusive trauma system: regional trauma system development in Ontario. ***Bernard Lawless.*** **From *St. Michael's Hospital, Toronto, Ont.**

Background: Inclusive trauma systems improve outcomes for injured patients. Critical Care Services Ontario (CCSO) plays a central coordinating role, with advice from the Ontario Trauma Advisory Committee (OTAC), to identify system components required for an integrated trauma system. The goal of this project was to develop and implement a framework for regional trauma systems as part of an inclusive trauma system. **Methods:** CCSO conducted a literature review to identify described inclusive trauma systems. A regional system development (RSD) advisory committee was formed to identify key elements, frameworks and governance structure required for a successful regional trauma system. Two geographically separate Local Health Integration Networks (LHIN), each with a lead trauma hospital (LTH), were identified as pilot sites for implementation of the regional system framework. LHIN 1 identified as already having established system components to support access for injured patients; LHIN 2 identified having minimal established system structure. CCSO supported the implementation of the regional trauma system framework in both areas. **Results:** LHIN 1 has an LTH and 15 referral hospitals. Most referrals come from within the LHIN. LHIN 2 supports trauma referrals from 3 other LHINs and 23 hospitals. In each LHIN, the trauma program at the LTH played a central role in coordinating meetings, identifying regional committee memberships and implementing the framework. Each identified key priorities/gaps to improve access to care at the regional level. **Conclusion:** Regional trauma systems are a key component of an inclusive trauma system and are necessary to address local needs for injured patients.

Traumatic brain injury in British Columbia: current incidence, injury patterns and risk factors. ***Paul McBeth,* Mypinder Sekhon,† Morad Hameed,‡ Nadine Schuurman,§ Peter Dodek¶ Najib Ayas,¶ Erik Vu,** Donald Griesdale.¶*** **From *the University of Tennessee, Memphis, Tenn., the †University of British Columbia, Vancouver, B.C., ‡Trauma Services, Vancouver General Hospital, §Simon Fraser University, Burnaby, B.C., ¶Vancouver Coastal Health, Vancouver, B.C., and **British Columbia Ambulance Service AirEvac & Critical Care Operations, Vancouver, B.C.**

Background: Despite advances in the prevention and treatment of trauma, preventable injuries continue to impact the lives of millions of people. Mortality due to traumatic brain injury (TBI) accounts for 20% of all trauma fatalities. The purpose of this study was to describe the patterns of injury in patients who had TBI since 2000. **Methods:** From the British Columbia Trauma Registry, we retrospectively reviewed all patients who had TBI between Jan.1, 2000, and Jan. 1, 2014. Severe TBI was defined as Abbreviated Injury Scale (AIS; head) ≥ 3 or Glasgow Coma Scale (GCS) score ≤ 8. We tabulated age, sex, date, mechanism of injury, location of incident, vital signs, GCS scores, diagnoses, procedures, hospital LOS, ICU LOS and events surrounding the injury. **Results:** A total of 15 142 patients were identified. The mean age was 48 ± 25 years and most (70%) were male. The mean presenting GCS was 13 ± 3 and mean ISS score was 26 ± 12. A total of 2839 (21%) patients were admitted to an ICU, and 1652 (12%) were admitted to a neurosurgical high-acuity unit. Most injuries were related to blunt trauma (98%) from motor vehicle crashes (43%) and falls (46%). Assault related TBI was identified in 11% of patients; 2% of patients had self-inflicted injuries. The most common neurologic injuries were basal skull fractures (50%) followed by small to moderate (22%) and large (12%) subdural hematomas. Four percent of patients required a neurosurgical intervention. The mean ICU LOS was 8 ± 10 days and mean hospital stay was 17 ± 28 days. In-hospital mortality was 17%. **Conclusion:** The incidence of TBI in BC is common. Safety initiatives should be developed to target this population.

Acute cytokine and chemokine profiles in brain-injured patients: relationship to sympathetic activation and outcome. ***Alex Di Battista,* Shawn Rhind,† Sayed Hassan,† Adi Perez,‡ Jane Topolovec-Vranic,§ Luis Teodoro Da Luz,‡ Kenjilnaba,¶ Antonio Capone Neto,‡ Sandy Trpcic, ¶ Leo Dante Da Costa,‡ Andrew Baker,¶ Sandro Rizoli.¶*** **From the *University of Toronto, Toronto, Ont., the †DRDC, Toronto, Ont., ‡Sunnybrook Health Sciences Centre, Toronto, Ont., §St.**

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Michael's Hospital, Toronto, Ont., and the ¶Division of Trauma and Surgical Critical Care, Los Angeles, Calif.

Background: Cytokines and chemokines play a pivotal role in neuroinflammation, which contributes to secondary brain injury. Systemic cytokine/chemokine release is mediated by activation of the sympathetic nervous system (SNS). The aim of this study was to investigate how changes in circulating cytokine/chemokine profiles and catcholamines relate to neurological outcome in moderate-to-severe traumatic brain injury (TBI) patients. **Methods:** In all, 181 TBI patients (aged 37 ± 18 y; 66% male), stratified as moderate (n = 38) or severe (n = 143) using the Glasgow Coma Scale (GCS) were enrolled. Blood was sampled on admission, 6, 12, and 24 h post-injury; healthy controls (n = 21) were age/sex-matched. Plasma concentrations of cytokines (interleukin [IL]-1β, 2, 4, 5, 8, 10; tumor necrosis factor [TNF]-α; interferon [IFN]-γ)], and chemokines [Eotaxin, IFN-γ-induced protein (IP)-10, monocyte chemoattractant protein (MCP)-1, 4, macrophage-derived chemokine (MDC), macrophage inflammatory protein (MIP)-1, thymus activation regulated chemokine (TARC)] were analyzed using a MULTI-ARRAY system. Plasma Epi/NE was measured by commercial immunoassay. Six-month neurological outcome was assessed using the extended Glasgow Outcome Scale (GOS), and dichotomized into good (GOS 5–8) and poor (GOS 1–4) outcomes. **Results:** Compared to controls, TBI patients showed elevated levels of Epi, NE, cytokines (IL-1β, IL-8, IL-10, TNF-α) and chemokines (MIP-1, MDC, MCP-1,4, TARC, Eotaxin-3). Marked differences in these markers were evident between moderate and severe cohorts. We also found high levels of IL-8, -10, MCP-1, MIP-1, Eotaxin and Epi/NE related to poor outcome. **Conclusion:** These results confirm an association between SNS activation and dysregulated inflammation after TBI.

Multidisciplinary trauma simulation training in a tertiary care centre. ***Jagadish Rao,* Jamie Appel,† Kish Lyster.*** **From the *RQHR, Regina, Sask., and the †RQHR Trauma Program, Regina, Sask.**

Background: While trauma literature has demonstrated that simulation has been successful in team building, it has been studied primarily in individual groups. The aim for our trauma simulation program was to identify barriers to multidisciplinary training and to develop a model that addressed funding, staffing and silo issues, and to improve communication, care and efficiency of care. **Methods:** Barriers, such as funding, were addressed by including education in budgets, simulation trained personnel and physicians. Experts who were involved in preparation of the education days were brought in through networking. Individual silos were removed and replaced with integration of role-swapping, and included nurses, paramedics, physicians and students. Feedback was used to improve future sessions. **Results:** Core principles of ATLS were achieved by diversifying the sessions to students. Success of the simulation sessions was enhanced using mixed method debriefing, which included using elements from the PEARLS framework. These included direct feedback and plus Δ techniques and, more importantly, advocacy inquiry. **Conclusion:** Multidisciplinary trauma team training can be achieved by addressing barriers to funding, staffing and educational requirements. Using appropriate debriefing techniques can enhance the experience of the learner and lead to positive communication, collaboration and integration of the team member.

Non-operative management of blunt splenic injuries: routine radiologic follow-up may reduce the time of activity restriction. ***Mostafa Alhabboubi,* Jeremy Grushka,* Muhamad Elhusseini Hassan,* AbdulMohsin Baabsail,* Kosar Khwaja,* Dan Deckelbaum,* Tarek Razek,* Paola Fata.**** **From *McGill University, Montréal, Que.**

Background: Both the need for and the utility of follow-up imaging in selective non-operative management (SNOM) of blunt splenic trauma remain unclear. Although most failures of SNOM occur within the first 72 hours following admission, delayed splenic rupture has also been observed in patients up to months following injury. As a result, the optimal time to return to full activity is not clear. We hypothesize that follow-up CT scans post-SNOM can identify full splenic healing with and may serve as an objective tool to guide return to full regular activities. **Methods:** A retrospective review (2005–2014) of all SNOM patients with blunt splenic injury admitted to a level 1 trauma centre was performed. Follow-up CT scans were identified and patients with abnormal findings on follow-up CT scans were compared to those with normal follow-up CT scans. Abnormal scans were defined by the persistence of splenic hematoma. A Cox regression model was developed to identify predictors of abnormal scans. **Results:** Two hundred and sixty-nine patients with BSI underwent SNOM from 2005 to 2014. Seventy-eight (29%) underwent follow-up CT scan more than 10 days after the initial date of injury. The median time to follow-up CT scan was 42.5 days (IQR 20.25 – 89.75). In this period, 54 (69.2%) patients had normal scans. Time to normal scans for low-grade injuries (grades 1–3) and high-grade injuries (grade 4–5) was 45 days (IQR 7–80) and 100 days (79.5–133) respectively. The minimum time to detect healing was 42 days in the high-grade injury group. Cox regression model identified both high-grade injury and angioembolization as predictors of delayed splenic healing within the follow-up period. **Conclusion:** Follow-up imaging in SNOM of patients with BSI is an underutilized clinical tool. High-grade injury and angioembolization are potential risk factors for delayed splenic healing post-injury. Routine use of follow-up imaging in this group of patients may offer clinicians objective evidence of healing which can assist in specific patients to guide return to certain activities.

Modified triple layer peritoneal-aponeurotic transposition: a new strategy to close the open abdomen. ***Joao Rezende Neto,* Najma Ahmed,* Ori Rotstein,* Sandro Rizoli.**** **From *St. Michael's Hospital, Toronto, Ont.**

Background: Primary abdominal closure in the open abdomen technique is challenging, with only a brief period for success. The peritoneal-aponeurotic transposition, described by Lázaro da Silva for repair of incisional ventral hernias, uses the hernia sac as part of the reinforcement. However, that structure is undeveloped in the open abdomen after damage control surgery. The new method uses a double mesh as a surrogate for the hernia sac. **Methods:** The method was used in 12 patients after damage control laparotomy for trauma/acute care. The posterior rectus sheath is opened longitudinally on 1 side and the anterior sheath is opened on the opposite side, creating 4 free edges. An absorbable mesh is sutured to the laparotomy edge where the anterior sheath is opened, and a non-absorbable mesh sutured to the opposite side creating a total of 6 free edges that are overlapped in 3 reinforcement layers. **Results:**

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Primary abdominal closure was obtained in all patients. Follow-up of 36 months showed no incisional hernias. Most common complications were seroma (n = 4) and wound infection (n = 2); all managed with percutaneous drainage. There were no cases of abdominal compartment syndrome or fistulas. **Conclusion:** This new method enables medialization of the rectus abdominis with 3 reinforcement layers, despite the lack of an autologous hernia sac. Therefore, appropriate for primary closure of the abdominal wall when an open abdomen strategy is used.

Mesenchymal stem cells locate and differentiate to the trauma site in a blunt rat liver trauma model: preliminary results. ***Mostafa Alhabboubi,* Zu-Hua Gao,* Minh Duong,* Dan Deckelbaum,* Tarek Razek,* Dominique Shum-Tim,* Kosar Khwaja.*** **From *McGill University, Montréal, Que.**

Background: The liver is commonly injured in abdominal trauma. Healing from liver injuries requires a long time. Stem cells have shown promising results in treating non-traumatic pathologies. However, using stem cells in blunt liver trauma may be a novel approach. We hypothesize that stem cells can locate and differentiate to liver-like cells in a blunt rat liver trauma model. **Methods:** Mesenchymal stem cells (MSCs) were injected into 6 rats subjected to blunt liver trauma. The MSCs were transfected with LacZ retrovirus to express B-galactosidase enzyme, which gives their nuclei a blue colour on microscopy. Trauma was induced to the left lobe using Kelly clamp. MSCs were injected through the tail vein (TV) in 4 rats, portal vein (PV) in 2. In the TV group, 3 rats were euthanized 48 hours post-trauma while the third was euthanized 2 weeks post-trauma. In the PV group, the two rats were sacrificed 48 hours post-trauma. Liver and lung were examined under microscopy. **Results:** MSCs were found in the lungs of the TV group that were euthanized after 48 hours. However, no MSCs were found in their livers. No MSCs were found in the rat euthanized 2 weeks post-trauma. Examining the PV group reveals successful localization of the MSCs to the liver. MSCs began migrating from liver blood sinusoids to traumatic area. Labelled MSCs localized to traumatic area, showing evidence of differentiation to liver-like cells. **Conclusion:** MSCs can locate and differentiate to the livers subjected to blunt trauma. Further investigation is required to identify the outcome benefit of using this novel technique.

Three indications for the "open abdomen", anatomical, logistical and physiological: How are they different? ***Joao Rezende Neto,* Sandro Rizoli,* Emanuelle Abreu,† Ori Rotstein.**** **From *St. Michael's Hospital, Toronto, Ont., and † Hospital Risoleta Tolentino Neves Trauma Center, Belo Horizonte, MG, Brazil**

Background: The open abdomen (OA) strategy is frequently utilized in trauma/acute care (TAC). However, the fundamental indications for its use have not been specified. In this study we define 3 basic reasons for the use of the OA and describe their clinical features. **Methods:** Patients who required an OA approach in TAC where prospectively studied for 30 days in a single centre. Basic indications for an OA were defined as anatomical (unbridgeable abdominal wall, risk of intra-abdominal hypertension); logistical (need for sequential revision); physiological (severe physiologic derangement prompting surgical interruption, "bailout"), or any combination of reasons. **Results:** Forty-five consecutive patients (70% male) had an OA from (Jan. 1 to Dec. 31, 2012); mean age 38.8 years. Acute care (AC) patients were significantly older (mean age 67 years, p = 0.001). The most common reason for OA was physiological (84%); 67% had 2 or 3 reasons; no difference in trauma v. AC. Primary closure rate was 42%, a physiological indication resulted in lower rates (34%, p = 0.001), the odds of closure in logistic reasons were 4.9 times higher (OR 4.875, 95% CI 1.360–17.472). Primary closure occurred within 72 h in 58% of the patients. This was less likely (15%) for physiological reasons (p = 0.004); lactate > 5 occurred in 63% of patients with physiological reasons for OA v. 14% for other reasons. **Conclusion:** This is the first study to collectively categorize OA into 3 indications, enabling better application of this strategy in future investigations.

Development of an urban trauma centre using lean methodology. ***Jagadish Rao,* Jamie Appel,† Kim Fichter.**** **From the *RQHR, Regina, Sask., and the †RQHR Trauma Program, Regina, Sask.**

Background: Prior to 2014, the province of Saskatchewan did not have a well-defined trauma program. The Ministry of Health invited stakeholders to develop a trauma model that could be replicated around the province. The trauma program in Regina is a pilot program developed using lean methodology, including a visioning session, rapid process improvement workshop (RPIW) and 3P tools, in an effort to achieve better teams, better care, better value and better health. **Methods:** PQA (patient quantity analysis) data was reviewed in the current state and compared to future state attributes in the visioning session, and using other Lean 3P tools, such as simulation/modelling and layouts. This resulted in key qualities of the selected future state, followed by an implementation plan. Metrics of success such as quality, cost, delivery, safety and morale are key attributes that will be examined. **Results:** The Regina Qu'Appelle Health Region has developed, in the last 2 years, the following: TTA guidelines, data collection and review, massive transfusion protocols, trauma rounds and education, electronic trauma document. Fishbone charts for flow, simulation, design planning and time maps have validated information seen in PQA data and allowed for improvement. **Conclusion:** Using lean methodology, a trauma pilot program in an urban centre has evolved into a model that could be replicated elsewhere in the province. It allowed collaboration from the Ministry of Health with key stakeholders in trauma and community members in order to achieve better trauma care for patients.

The impact of standardized care in 191 patients with chest tube thoracostomy. ***Joao Rezende Neto,* Emanuelle Abreu,† Carla Machado,† Mario Pastore Neto,† Joao Godinho,† Athos Bernardes,† Sandro Rizoli.**** **From *St. Michael's Hospital, Toronto, Ont., †Hospital Risoleta Tolentino Neves Trauma Center, Belo Horizonte, MG, Brazil**

Background: Chest tube thoracostomy (CTT) is the most common surgical intervention in thoracic trauma patients. Although a minor procedure, it can result in severe complications. The high incidence of empyema after CTT prompted the authors to implement standardized care (SC) for patients who underwent CTT. **Methods:** Retrospective review before and after the implementation of SC, defined as antibiotic prophylaxis, CTT performed in the operating room (OR), respiratory therapy TID. Only patients < 60 years old, hemodynamically stable, ISS < 25, with isolated trauma to the chest

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wall, lung and pleura were included in the study. The study period went from January 2011 to December 2013. **Results:** Ninety-nine patients, before implementation of SC, were compared to 92 patients after SC. The groups had similar demographics: mean age 30.4 ± 11.8 years, 93.7% male, mean ISS 12. Penetrating mechanism occurred in 79.6% (47% gunshot wound). Rib fractures were present in 30% of the patients, 38% had pulmonary contusion and 77% had hemothoraces. Implementation of SC resulted in 10% increase in CTT placement in the OR, 24% increase in antibiotic prophylaxis and a 97% increase in respiratory therapy TID. The incidence of retained hemothorax decreased drastically with SC from 32% to 6.5% (p = 0.001), as well as the mean hospital LOS (12–7 days). The incidence of empyema also decreased, from 22% to 2% (p = 0.03). **Conclusion:** Significant reduction in complications after CTT was achieved with a simple standardized approach.

Complex abdominal wall reconstruction: recommendations from the Canadian Abdominal Wall Reconstruction Group. ***Amber Menezes,* Nicholas Fry, †Michael Liang,‡ Kosar Khwaja,§ Fred Brenneman,¶ Michael Bleszynski,† Andrzej Buczkowski,† Neil Parry,** Robert Martindale,†† David Evans,‡‡ Shannon Fraser,§§ Mary Stephens,¶¶ Jagadish Rao,*** Andrew Kirkpatrick,††† Lisa Knowlton,‡‡‡ Morad Hameed.‡‡***
From the *University of British Columbia, Vancouver, B.C., †the Vancouver General Hospital, Vancouver, B.C., ‡University of Texas Health Sciences Center, Houston, Texas, §McGill University, Montreal, Que., the ¶University of Toronto, Toronto, Ont., **Western University, London, Ont., the ††Oregon Health and Science University, Portland, Ore., ‡‡Trauma Services, Vancouver General Hospital, Vancouver, B.C., §§Jewish General Hospital, Montreal, Que., the ¶¶University of Alberta, Edmonton, Alta., the ***RQHR, Regina, Sask., †††Regional Trauma Services, Foothills Medical Centre, Alberta Health Services and University of Calgary, Calgary, Alta., and ‡‡‡Trauma Services Centre, Vancouver, B.C.

Background: The field of abdominal wall reconstruction (AWR) has emerged in response to increases in the frequency and complexity of abdominal wall defects. Novel materials and techniques have been developed and described. However, there remains a lack of guidance for the surgeon as to how to appropriately apply these tools in clinical practice. **Methods:** Following a comprehensive literature review of Complex AWR, experts and leaders in the field from Canada and internationally were invited to the University of British Columbia in November 2012 and September 2014. Through a series of expert presentations and panel sessions, knowledge and technical expertise was shared. Discussions on topics ranged from the definition of abdominal wall failure to the development of a comprehensive care map encompassing preoperative considerations through to follow-up. The individual components of the care map were evaluated according to the best available therapeutic level of evidence. **Results:** One hundred and ninety-eight studies were included in this analysis, after applying exclusion criteria. Risk stratification is the only area of Complex AWR that contains level 1 therapeutic evidence. The remainder of the components of the care map, from pre-hospital care through in-hospital care and systems of care, consist of levels 2–4 therapeutic evidence. **Conclusion:** The Canadian AWR 2014 consensus guidelines provide an assessment of Complex AWR as it stands today. The majority of the therapeutic evidence available ranges from levels 2–4. We propose evidence-based standard of care recommendations, and an approach to implementing technologies and techniques of AWR into clinical practice.

Compensatory behaviours and cognitions in persons with history of trauma. ***Kaitlyn Gillard.* From the *University of Windsor, Windsor, Ont.***

Background: The presented study integrated threat and defense theories in regards to posttraumatic growth (PTG) — namely Anxiety Buffer Disruption Theory (ABDT) and the Meaning Maintenance Model (MMM). A limitation of ABDT is that findings have been based on individuals with a history of trauma — i.e., by comparing high- to low-trauma individuals. Additionally, ABDT has only accounted for the effect of mortality salience on cultural affirmations, and has wholly ignored the effect of other meaning threats espoused by the MMM. Moreover, ABDT has further neglected the effect of threat on other compensatory behaviour, such as abstraction. **Methods:** Participants were undergraduate students with histories of trauma. Participants were assigned to read 1 of 3 passages describing dental pain (control), death (mortality salience) or an absurd doctor's visit (non-mortality salience). All participants then completed measures of cultural affirmation and abstraction. **Results:** The current study investigated whether participants low in PTG reported significantly more cultural affirmation and abstraction than participants high in PTG when both groups were exposed to various meaning threats (mortality salience and non-mortality salience) and whether participants high in PTG reported more cultural affirmation and abstraction when not exposed to a meaning threat (control) than when they were exposed to a meaning threat (mortality salience and non-mortality salience). **Conclusion:** Expanding our efforts to better understand how people with a history of trauma adjust their world views to meaning violations is of critical value in developing well-functioning societies and appropriate interventions.

Development of the Kenyatta National Hospital — University of Alberta Orthopedic Trauma Assessment Tool: phase 1 results. ***Khaled Almansoori,* Dena Almansorri,† Vincent Mutiso,‡ Abdullah Saleh,† Harvey Hawes,† Jessica Hogan,† Julie Kromm,† Matthew Menon.* From the *University of Alberta, Edmonton, Alta., the †Innovative Canadians for Change, Brampton, Ont., and ‡Kenyatta National Hospital, Nairobi, Kenya***

Background: The University of Alberta's (UA) Office of International Surgery and the non-profit organization Innovative Canadians for Change (ICChange), have been collaborating with local stakeholders to develop a national trauma system in Kenya. A comprehensive trauma systems assessment demonstrated opportunities for improvement in orthopedic trauma services (OTS) at Kenya's largest trauma hospital, the Kenyatta National Hospital (KNH). A review of the medical literature revealed that apart from outcome indicators, no evidence-based tools specific to orthopedic trauma care were available. Therefore, a novel tool named KUOTA was developed to provide a criteria-referenced method for evaluating OTS and identifying deficiencies. **Methods:** Retrospective collection of 35 clinical indicators to evaluate the 11 most common orthopedic injuries over a 1-year period (e.g. femoral shaft fractures). **Results:** Application of the tool to the University of Alberta Hospital has demonstrated a KUOTA score of 25/30 (10 structural,

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9 process, 6 outcome). Preliminary results from KNH suggest significantly lower structural and outcome scores compared to those expected of a level 1 OTS based upon the KUOTA tool. **Conclusion:** The University of Alberta achieves a KUOTA tool score of 25/30 and is prepared to provide Level 1OTS. The tool appears to adequately assess OTS care based upon Canadian standards and, pending results from KNH, will validate its application in the developing world.

Risk-taking behaviour negatively affects outcome in burn patients. ***Nick Nash*,* *Matt Benns*.* From the *University of Louisville, Louisville, Ky.**

Background: The prevalence of prescription drug use, alcohol, and smoking among burn patients is unknown. We hypothesized that outpatient use of these substances is under-reported and negatively affects outcomes. **Methods:** A retrospective review of patients admitted to a level 1 trauma centre with a diagnosis of burn injury from Jan. 1, 2010, to Dec. 31, 2013 was performed. Data review included prescription controlled substance (PCS), gender, age, %TBSA burn, LOS, mortality, complications and smoking or daily alcohol use. Toxicology screens and PCS reports from the statewide database were also reviewed when present. **Results:** A total of 558 patients met inclusion criteria. The prevalence of PCS use, alcohol use and smoking was 21.7%, 9.1% and 51.3% respectively. On univariate analysis, PCS use and daily alcohol use were associated with increased mortality (7.4% v. 3.2%, $p = 0.038$; 11.8% v. 3.4%, $p = 0.004$). Smoking and daily alcohol use were associated with increased mean LOS (13.06 v. 9.84 days, $p = 0.022$; 19.39 v. 10.69 days, $p < 0.001$). Daily alcohol use was associated with increased complications (45% v. 19.7%, $p < 0.001$). On multivariate analysis, daily alcohol use remained significant for an increased risk of mortality and complications. Mortality, LOS and complications all increase with an increasing number of substances used. Thirty-five percent of tox screens and 30% of positive controlled substance screens were from subjects who reported no substance use. **Conclusion:** There is a high prevalence of PCS, smoking and alcohol use among burn patients, and the use of these substances is associated with poorer outcomes. Self-reported data likely underreports true usage.

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