

and could be modified and implemented locally to improve patient flow in the ED (and the rest of the health system).

**Keywords:** quality improvement and patient safety, positive deviance, complex adaptive systems

### P113

#### **A systematic review and meta-analysis of tourniquet devices for speed of application, successful hemostasis and patient tolerance**

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**Introduction:** Tourniquets are a mainstay of hemorrhage management. However, there is insufficient evidence to guide device selection. This review analyses the literature on tourniquets, for the following outcomes: lower-extremity arterial hemostasis, application speed, and pain. **Methods:** Studies were limited to English. Non-human studies, case series, and intra-operative applications were excluded. A systematic review of MEDLINE, PubMed, Google Scholar, and the Cochrane Database from 1992 to Dec 2017 was performed. Article citations were also assessed. **Results:** Twenty-one studies met criteria, testing 28 tourniquet devices. The most popular devices for arterial hemostasis were the Combat Application Tourniquet (C-A-T) (662 applications), Special Operations Forces Tactical Tourniquet (SOFTT) (307 applications), blood pressure cuff (80 applications), rubber tubing (58 applications) and the Emergency Medical Tourniquet (EMT) (52 applications). The blood pressure cuff achieved the highest (weighted averages) rate of 99% (95% CI 93 to 100) based on four studies of 80 applications. Followed by the EMT which achieved 83% (95% CI 72 to 93), based on three studies of 52 applications ( $p < 0.01$ ). The fastest device to apply, taking 17 seconds (95% CI 11 to 23), was surgical tubing, based on two studies totalling 30 applications. The next fastest was the blood pressure cuff, requiring 20 seconds (95% CI 18 to 22), based on two studies totaling 58 applications (though there was no statistical difference in application time,  $p = 0.08$ ). Tolerance could not be analyzed, due to heterogeneity of outcome measures. **Conclusion:** This is the first meta-analysis of tourniquet outcomes. The literature lacks a standard approach to device application. The quality of evidence is of very low due to the small sample sizes, lack of blinding, selective outcome reporting and result inconsistency. Common medical equipment appear to outperform commercial tourniquets for arterial hemostasis and speed of application; however, they are some of the least studied devices.

**Keywords:** trauma, tourniquet, hemorrhage control

### P114

#### **Blood on board: the development of a prehospital blood transfusion program in a Canadian helicopter emergency medical service**

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**Introduction:** Prehospital blood transfusion has been adopted by many civilian helicopter emergency medical service (HEMS) agencies and early outcomes are positive. Shock Trauma Air Rescue Service (STARS) operates six bases in Western Canada and in 2013 implemented a prehospital transfusion program. We describe the processes and standard work ensuring safe storage, administration, and stewardship of this precious resource. Our aim was to produce a sustainable and

safe blood storage system that could be carried on each mission flown. **Methods:** Close collaboration with transfusion services and adherence to Canadian Transfusion Standards was key at each step of development. An inexpensive, reusable, temperature controlled thermal packing device was obtained along with an electronic temperature logger. Conditioning of the device and temperature maintenance (1 6C) was tested to ensure safe storage conditions. Online training programs were developed for air medical crew (AMC) as well as transport physicians (TPs) regarding administration indications, safety, and stewardship processes. Blood traceability and usage was monitored on an ongoing basis for quality assurance. **Results:** Two units of O negative packed red blood cells (pRBCs) are now carried on each flight. The blood box is conditioned and prepared by transfusion services for routine exchange every 72 hours. If pRBCs are administered the blood bank is immediately notified for preparation of another cooler. Unused blood is returned to blood bank circulation. **Conclusion:** The introduction of the STARS blood on board program supports the provision of emergent transfusion to selected patients in the pre-hospital environment. Our standard work and stewardship processes minimize wastage of blood products while keeping it readily available for critically ill and injured patients. Subsequent work will aim to describe characteristics and patient centred outcomes.

**Keywords:** quality improvement and patient safety, prehospital blood transfusion, helicopter emergency medical service

### P115

#### **Bounceback reports-improving patient care**

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**Introduction:** Seeking patient outcome feedback (POF), defined as obtaining information on a patients clinical course beyond ones care, is crucial to the learning process. However, the lack of POF is a major pitfall of emergency medicine. Emergency department (ED) bouncebacks, which are characterized as patients with unplanned returns to the ED after being discharged, are an important type of POF to study because they represent a potential misdiagnosis or mismanagement and can highlight areas for physician self-improvement. Currently, most hospitals do not relay details about ED bouncebacks back to the treating physician, unless a grave error occurred. This studys purpose is to provide weekly reports to all physicians in the ED on patients who have unplanned returns within 7 days of discharge from the ED, and evaluate the impact this has on the physicians practice on seeking POF. **Methods:** A new weekly report was distributed to physicians working at an academic hospital outlining the patients who have returned within 7 days of discharge from the ED, their new presenting complaint and final disposition. An online survey was also administered to all ED staff evaluating the amount of POF they sought pre and post report, and their attitude towards the new reports. **Results:** 22 responses were received, for a response rate of 85%. The majority of respondents follow the reports (73%) and actively seek POF by looking up patients charts and results(70%). Additionally, 58% state that they seek POF more often since receiving these reports, for both the bouncebacks and their other patients. Furthermore, 37% claimed that the reports helped improve the appropriateness of their referrals and 32% stated it helped increase their confidence in their clinical practice. The majority of physicians (87%) found the reports to be helpful and would like to continue receiving it. **Conclusion:** Weekly bounceback reports are a high-yield tool for increasing POF sought in the ED and have benefits for both the physician and the department as a whole. They can be used to not only identify patients who may have had an error in their management, but

also help to improve physicians' clinical skills by encouraging and enabling follow-up of patients they managed. Thus, bounceback reports are a valuable tool to provide to physicians and should be considered by ED Departments.

**Keywords:** quality improvement and patient safety, bouncebacks, patient outcome feedback

#### P116

##### **A randomized cross-over trial of conventional bimanual versus single elbow (Koch) chest compression quality in a height-restricted aeromedical helicopter**

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**Introduction:** Aeromedical helicopters and fixed wing aircraft are used across Canada to transfer patients to definitive care. Given height limitation in aeromedical transport, CPR performance can be affected. An adapted manual compression technique has been proposed by H. Koch (pron. Cook) that uses the elbow to compress the sternum rather than the conventional hand. This preliminary study evaluated the quality of Koch compressions versus conventional bimanual compressions. **Methods:** Paramedics (5), registered nurses (3) and a physician (1) were recruited. Each participant performed a 2 minute cycle of each technique, were randomized to determine which technique was performed first, and rested 5 minutes between compression cycles. A Resusci Anne SkillReporter manikin atop a stretcher in a BK117 helicopter was used. The compressors performed without feedback or prompting. Outcomes include compression rate, depth, recoil, and fatigue. **Results:** The mean conventional compression rate was (bpm) 118 +/- 13 versus 111 +/- 10 in the Koch scenario ( $p=0.02$ ) (target 100 to 120). Mean conventional compression depth (mm) was 44 +/- 9 versus 49 +/- 7 in the Koch scenario ( $p=0.01$ ) (target 50 to 60). The mean percentage of compressions with complete release in the conventional scenario was 86 +/- 20 versus 84 +/- 22 in the Koch scenario ( $p=0.9$ ) (target 100%). Using a Modified Borg Scale of 1 to 10, mean provider fatigue after conventional CPR was 7 (+/- 1.6) versus 3 (+/- 1.2) using Koch technique ( $p<0.001$ ). On average, Koch technique improved the percentage of compressions at target rate by 26%, the percentage at correct depth by 9%, overall compression quality score by 13% and were more less fatiguing. **Conclusion:** Using an elbow in a height-restricted environment improved compression depth and reduced provider fatigue. From our limited data, Koch compressions appear to improve compression quality. Further study and external validation are required.

**Keywords:** resuscitation, cardiopulmonary resuscitation, aeromedical transport

#### P117

##### **A pilot program of physician at triage conducted at a tertiary care hospital improved measures of emergency department throughput and provides a potential solution for emergency department overcrowding**

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**Introduction:** Emergency Department Overcrowding (EDOC) is a multifactorial issue that leads to Access Block for patients needing

emergency care. Identified as a national problem, patients presenting to a Canadian Emergency Department (ED) at a time of overcrowding have higher rates of admission to hospital and increased seven-day mortality. Using the well accepted input-throughput-output model to study EDOC, current research has focused on throughput as a measure of patient flow, reported as ED length of stay (LOS). In fact, ED LOS and ED beds occupied by inpatients are two "extremely important indicators of EDOC identified by a 2005 survey of Canadian ED directors. One proposed solution to improve ED throughput is to utilize a physician at triage (PAT) to rapidly assess newly arriving patients. In 2017, a pilot PAT program was trialed at Kelowna General Hospital (KGH), a tertiary care hospital, as part of a PDSA cycle. The aim was to mitigate EDOC by improving ED throughput by the end of 2018, to meet the national targets for ED LOS suggested in the 2013 CAEP position statement. **Methods:** During the fiscal periods 1-6 (April 1 to September 7, 2017) a PAT shift occurred daily from 1000-2200, over four long weekends. ED LOS, time to inpatient bed, time to physician initial assessment (PIA), number of British Columbia Ambulance Service (BCAS) offload delays, and number of patients who left without being seen (LWBS) were extracted from an administrative database. Results were retrospectively analyzed and compared to data from 1000-2200 of non-PAT trial days during the trial periods. **Results:** Median ED LOS decreased from 3.8 to 3.4 hours for high-acuity patients (CTAS 1-3), from 2.1 to 1.8 hours for low-acuity patients (CTAS 4-5), and from 9.3 to 8.0 hours for all admitted patients. During PAT trial weekends, there was a decrease in the average time to PIA by 65% (from 73 to 26 minutes for CTAS 2-5), average number of daily BCAS offload delays by 39% (from 2.3 to 1.4 delays per day), and number of patients who LWBS from 2.4% to 1.7%. **Conclusion:** The implementation of PAT was associated with improvements in all five measures of ED throughput, providing a potential solution for EDOC at KGH. ED LOS was reduced compared to non-PAT control days, successfully meeting the suggested national targets. PAT could improve efficiency, resulting in the ability to see more patients in the ED, and increase the quality and safety of ED practice. Next, we hope to prospectively evaluate PAT, continuing to analyze these process measures, perform a cost-benefit analysis, and formally assess ED staff and patient perceptions of the program.

**Keywords:** quality improvement and patient safety, physician at triage, emergency department overcrowding

#### P118

##### **Pulmonary Embolism Severity Index (PESI) score as a predictor for readmission in acute pulmonary embolism in emergency department?**

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**Introduction:** Pulmonary Embolism (PE) management in Emergency Department (ED) confers a substantial cost burden representing opportunities for improvements in decision-making. The Pulmonary Embolism Severity Index (PESI) is a validated tool to prognosticate patients with PE supporting admit versus (vs.) discharge decisions from the ED. Despite existing evidence, PESI is under-used in patients with PE. We sought to evaluate PESI scores and patient disposition from 4 EDs within Calgary to determine discordance between them and the effect of the discordance on readmission and mortality. **Methods:** Retrospective review of adult patients 18 years, diagnosed with PE between January-June 2016 at 4 EDs in Calgary Health Region. Patients were divided into high-risk PESI (score > 85) and low-risk PESI (score 0-85). Chi-Square (2) test was used for comparison between the groups. Primary outcome measure was rate of discordance between PESI risk