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Paul Atkinson, Chair, CAEP/AMCU Research Committee

Oral presentations

Top Four Abstracts 2012

First Place, Winner of the Grant Innes Research Paper and Presentation Award; Plenary Presentation
5480
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RANDOMIZED controlled trial of volume-based staffing in an urban emergency department
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Keywords: administration, crowding, emergency medicine
Introduction: Emergency department (ED) overcrowding is a growing problem. Among throughput interventions, volume-based staffing has been described infrequently. This study evaluated the impact of adding an additional shift in a moderate case-complexity area of a typical crowded urban, high-volume, and academic centre with severe ED overcrowding. **Methods:** This unblinded, parallel-group, controlled trial took place between 24/06 and 24/08/2011 at a Canadian hospital experiencing long-standing ED overcrowding. Four computerized, block-randomized, 2-week sequences were generated. Staff satisfaction was evaluated through pre/post shift and study surveys; administrative data (physician initial assessment [PIA], length of stay [LOS], patients leaving without being seen [LWBS], and against medical advice [LAMA]) were collected from an electronic ED information system. Data are presented as proportions and medians with interquartile ranges (IQRs); bivariable analyses were performed. **Results:** ED physicians and nurses expected the intervention to reduce the LOS of discharged patients only. PIA decreased during the intervention period (68 v. 74 minutes; $p < 0.001$). No statistically/clinically significant differences were observed in the LOS; however, there was a significant reduction in the LWBS (4.7% to 3.5%; $p = 0.003$) and LAMA (0.7% to 0.4%; $p = 0.028$) events. Although there was a reduction of approximately 5 patients seen per physician in the affected ED area, the total number of patients seen on that unit increased by approximately 10 patients/day. Overall, compared to days when there was no extra shift, 61% of emergency physicians stated that their workload decreased and 73% felt that their stress level at work decreased. **Conclusions:** Although this study did not demonstrate a reduction in the overall LOS, it did reduce PIA times and the proportion of LWBS/LAMA patients. Although physicians saw fewer patients during the intervention shifts, the overall patient volume increased and satisfaction among ED physicians was rated higher.

Second Place; Plenary Presentation
5605
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SERUM levels of spectrin breakdown product 150 (SBDP150) distinguish mild traumatic brain injury from trauma and uninjured controls and predict intracranial injuries on CT and neurosurgical intervention
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Keywords: biochemical markers, emergency medicine, injury/trauma
Introduction: This study examined whether early serum levels of cytoskeletal protein SBDP150 could distinguish mild TBI from controls and whether levels were associated with traumatic intracranial lesions on CT (+CT) and neurosurgical intervention (+NSG). **Methods:** This prospective cohort study enrolled adult patients presenting to two level 1 trauma centres following blunt head trauma with loss of consciousness, amnesia, or disorientation and a GCS of 9 to 15. Control groups included uninjured controls and trauma controls presenting to the ED with orthopedic injuries or an MVC without TBI. Mild TBI was defined as a GCS of 15 and moderate TBI as a GCS < 15. Blood samples were obtained in all patients within 4 hours of injury and measured by ELISA for SBDP150 (ng/mL). Data were expressed as means with 95% CI, and performance was tested by ROC curves (AUC and 95% CI). **Results:** There were 275 patients enrolled: 54 TBI patients (42 GCS 15, 12 GCS 9–14), 23 trauma controls (16 MVC controls and 7 orthopedic controls), and 198 uninjured controls. The mean age of TBIs was 39 years (range 19–70), with 63% males. Fourteen (14%) had a +CT and

9% had +NSG. Mean serum SBDP150 levels were 0.764 (95% CI 0.561–0.968) in normal controls, 1.035 (0.091–2.291) in orthopedic controls, 1.209 (0.236–2.181) in MVC controls, 2.764 (1.700–3.827) in mild TBI with GCS 15, and 5.227 (0.837–9.617) in TBI with GCS 9 to 14 ($p < 0.001$). The AUC for distinguishing mild TBI from both controls was 0.83 (95% CI 0.68–0.99). Mean SBDP150 levels in patients with –CT versus +CT were 2.170 (1.340–3.000) and 6.797 (2.227–11.368), respectively ($p < 0.001$), with AUC = 0.78 (95% CI 0.61–0.95). Mean SBDP150 levels in patients with –NSG versus +NSG were 2.492 (1.391–3.593) and 6.867 (3.891–9.843), respectively ($p < 0.001$), with AUC = 0.88 (95% CI 0.77–0.98). **Conclusions:** Serum SBDP150 levels were detectable in serum acutely after injury and were associated with CT lesions and neurosurgical intervention. Further study is required to validate these findings before clinical application.

Third Place; Plenary Presentation

5452

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CLINICAL decision rules to improve the detection of adverse drug events in emergency department patients

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Keywords: adverse drug events, clinical decision rules, clinical practice, emergency medicine

Introduction: Adverse drug events (ADEs), unintended and harmful effects of medications, account for 1.7 million emergency department (ED) visits in Canada annually and are associated with high health resource and cost but are often not detected. **Objective:** To derive clinical decision rules that could identify patients at high risk for ADEs to improve ADE identification while limiting the number of patients requiring medication review. **Methods:** This prospective study was conducted from July 2008 to January 2009 in two Canadian tertiary care EDs. We used a systematic sampling algorithm to enrol a representative sample. Physicians and nurses evaluated patients for candidate predictor variables. Interobserver assessments were conduced on a subset. Pharmacists, blinded to the predictor variables and physician assessments, evaluated all patients for ADEs. When pharmacists and physicians independently agreed on the presence or absence of an ADE, the diagnosis was considered final. Discordant cases and cases where either the pharmacist or physician were uncertain were adjudicated by an independent committee. Predictor variables with good between-rater agreement and univariate associations with the outcome were used to derive clinical decision rules using recursive partitioning. **Results:** Among 1,591 patients, 131 (8.2%, 95% CI 7.0–9.7) were diagnosed with a moderate or severe ADE. The following variables were used to derive two decision rules: 1) presence of comorbid conditions, 2) antibiotic use within 7 days, 3) medication changes within 28 days, 4) age, 5) arrival by ambulance, 6) triage acuity, 7) recent hospital admission, 8) renal failure, and 9) use of more than three prescription medications. The most sensitive rule was 96.7% (95% CI 91.8–98.6) sensitive and 40.3% (95% CI 37.7–42.9) specific. No fatal events were missed. **Conclusions:** We derived two clinical decision rules that identified patients at high risk for ADEs. If validated, these rules may improve patient care by identifying patients who require medication review.

Fourth Place, Top Resident Abstract; Plenary Presentation

5491

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UNDERSTANDING communication between emergency and consulting physicians: manifestations of conflict, conflict prevention, and conflict resolution

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Keywords: communication, education/teaching, emergency medicine

Introduction: Conflict can arise in the referral process between emergency and consulting physicians and can have a negative impact on both patient care and the ongoing relationship between physicians. This study examines physician insight into conflict during the referral process and aims to aid us in understanding it. **Methods:** From Mar. to Sept. 2010, 61 physicians (21 emergency medicine [EM], 20 general surgery [GS], 20 internal medicine [IM]) underwent semistructured interviews. Two investigators independently reviewed the transcripts using inductive methods associated with grounded theory to generate themes until saturation was reached. Disagreements about themes were resolved by consensus, yielding an inventory of themes, subthemes, and qualifiers. Measures for ensuring trustworthiness of the analysis included external audits of the material by investigators not involved with the initial analysis. **Results:** Our analysis suggests that physicians are able to retrospectively describe both sources and prevention of conflict in the emergency department (ED) referral-consultation process. They are less able to describe steps they use to resolve conflict once it has already arisen during the referral-consultation process. We present a classification of conflict, its prevention and resolution, based on the building and breaching of trust. We compared our findings to previously established models for understanding conflict as a breach of trust to create a framework for analyzing problems that arise during the referral-consultation process. **Conclusions:** Both emergency and consulting physicians and residents encounter conflict during the ED referral-consultation process. Our model may help physicians conceptualize conflict as breaching and building of trust. Our findings suggest that rebuilding of trust may require a skill set currently not well optimized in both resident and attending physicians. More research is required to determine how to optimize physicians' ability to handle conflict around the referral-consultation process.

5457

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COMPARISON of bystander fatigue and CPR quality when older bystanders use continuous chest compressions versus 30:2 compressions to ventilations: a randomized crossover trial

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Keywords: emergency medical services, emergency medicine, resuscitation

Introduction: Resuscitation guidelines for layperson CPR changed from 30:2 compressions to ventilations (2005) to continuous chest compressions (CCC) in 2010. This was done to minimize chest compression interruptions and reduce the reluctance to perform CPR due to its mouth-to-mouth component. We sought to measure bystander fatigue and CPR quality after 5 minutes of CCC versus 30:2 CPR in older laypersons, a population most likely to perform CPR. **Methods:** This randomized crossover study took place at three tertiary care hospitals and a seniors' centre. Participants were aged ≥ 55 with no significant physical limitations (frailty score ≤ 3/7). All participants completed two 5-minute CPR sessions (using 30:2 and CCC) on a manikin, separated by a rest period. We used concealed block randomization to determine order of first CPR method. Metronome feedback maintained a compression rate of 100/min. We measured heart rate (HR), mean arterial pressure (MAP), and Borg Exertion Scale (range 6–20). CPR quality measures (Zoll R-Series monitor) included total number of compressions and number of good compressions (depth ≥ 38 mm).

Analyses included descriptive statistics, paired *t*-test, and random coefficient modeling with 95% CIs (required sample size = 60). **Results:** We enrolled 63 participants: mean age 70.8, female 66.7%, past CPR training 60.3%. Bystander fatigue was similar between CPR methods: mean difference in HR 0.6 (95% CI –3.5 to 2.3), MAP 3.0 (95% CI –0.6 to 6.7), Borg 0.5 (95% CI 0.1 to 0.9). Compared to 30:2, participants using CCC performed more chest compressions (480.0 v. 376.3, mean difference 103.7; $p < .0001$) and more good chest compressions (381.5 v. 324.9, mean difference 56.5; $p < .0001$), although the number of good compressions/min declined significantly faster over time with the CCC method ($p = .0002$). **Conclusions:** CPR quality decreased significantly faster when performing CCC compared to 30:2. However, performing CCC produced more adequate compressions overall than the 30:2 method with a similar level of fatigue.

5461

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THE USEFULLNESS of the 3-minute walk test in predicting adverse outcomes in ED patients with heart failure and COPD

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Keywords: adverse events, clinical prediction rule, emergency medicine, respiratory

Introduction: We sought to evaluate the usefulness of a unique, structured 3-minute walk test in predicting the risk for serious adverse events (SAEs) among ED patients with acute exacerbations of heart failure (HF) and COPD. **Methods:** We conducted a prospective cohort study in six academic EDs and enrolled 1,504 adult patients who presented with exacerbations of HF or COPD. After treatment, each patient underwent a 3-minute walk test, with RNs or RRTs monitoring heart rate, oxygen saturation, and the Borg score. Patients walked at their own pace in the ED on room air or home oxygen level. We evaluated patients for multiple clinical and routine laboratory findings. Patients were followed for SAEs, defined as death, intubation, admission to a monitored unit, myocardial infarction, or relapse back to the ED requiring admission within 14 days. We evaluated both univariate and multivariate associations of the walk test components with SAE. **Results:** The characteristics, respectively, of the 559 HF and 945 COPD patients were mean age 76.0, 72.6; male 56.4%, 51.6%; too ill to start walk test 13.2%, 15.3%; and unable to complete walk test 15.4%, 21.5%. Outcomes for HF and COPD were SAE 11.6%, 7.8%, and death 2.3%, 1.0%. Univariate associations with SAE for walk test components were too ill to walk (both HF, COPD $p < 0.0001$); highest heart rate > = 110 (HF $p = 0.02$, COPD $p = 0.10$); lowest SaO_2 < 88% (HF $p = 0.42$, COPD $p = 0.63$); Borg score > = 5 (HF $p = 0.47$, COPD $p = 0.52$); and walk test duration ≤ 1 minute (HF $p = 0.07$, COPD $p = 0.22$). With logistic regression analyses, we found these odds ratios for SAE: 1.9 for "walk test heart rate > = 110" in HF patients and 3.5 for "too ill to start the walk test" in COPD. **Conclusions:** The 3-minute walk test was easy to administer, and maximum heart rate and inability to start the test were highly associated with adverse events in patients with exacerbations of HF and COPD, respectively. ED physicians might consider using the walk test prior to making disposition decisions for these patients.

5463

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CLINICAL characteristics of emergency patients presenting with transient ischemic attack (TIA) in the setting of atrial fibrillation

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Keywords: atrial fibrillation, cardiovascular, emergency medicine, transient iischemic attack

Introduction: Emergency department (ED) patients with transient ischemic attack (TIA) have a 4 to 10% risk of stroke within 90 days. Atrial fibrillation (AF) requires specific therapy for stroke prevention. Little is known about the characteristics of TIA patients in the setting of AF. For patients where AF caused the TIA, early recognition of AF will allow clinicians to optimize therapies. **Methods:** We studied a prospective cohort of TIA patients in eight tertiary care EDs over 5 years as part of a larger decision rule study. Patients were classified as having AF based on their presenting 12-lead ECG, subsequent Holter monitor, echocardiogram, or history of previous AF. Patients were followed for 90 days, and our primary outcome, subsequent stroke, was assessed by a blinded adjudication committee. Standardized clinical variables were recorded by physicians on a data collection form prior to disposition. We conducted univariate analysis for clinical findings in TIA patients with and without AF. **Results:** A total of 3,298 (77.6% of eligible) patients were enrolled; 379 (11.5%) had AF. Patients with AF were older (76.5 years v. 66.9, $p = < 0.001$) and had more comorbidities: history of stroke/TIA (21.5% v. 12.4%, $p = < 0.001$), dyslipidemia (39.0% v. 32.6%, $p = 0.015$), ischemic heart disease (31.3% v. 17.1%, $p = < 0.001$), heart failure (13.0% v. 1.6%, $p = < 0.001$), or valvular heart disease (9.8% v. 2.7%, $p = < 0.001$). TIA patients with AF were more likely to have speech symptoms (53.0% v. 38.8%, $p = < 0.001$). TIA patients with AF had an increased risk for subsequent stroke (6.2% v. 3.1%, $p = 0.004$) and death ≤ 90 days (5.0% v. 1.2%, p = < 0.001). **Conclusions:** TIA patients with AF are at higher risk of subsequent stroke and death. AF was found more frequently in TIA patients who were older and had a history of ischemic or valvular heart disease. Efforts to identify AF may allow for earlier targeted antithrombotic therapy and better stroke prevention.

5464

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INTRODUCING bedside limited compression ultrasound by emergency physicians into the diagnostic algorithm for patients with suspected DVT: a prospective cohort trial

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Keywords: deep venous thrombosis, diagnostic technologies/imaging, emergency medicine, ultrasound

Introduction: Diagnosing deep venous thrombosis (DVT) relies on clinical characteristics (modified Wells score), serum D-dimer, and formal imaging but can be inefficient. Our objective was to evaluate whether a novel diagnostic approach that incorporates bedside limited compression ultrasound (LCU) could be used to improve diagnostic efficiency for DVT. **Methods:** We performed a prospective cohort study of ED patients with suspected DVT. We excluded patients on anticoagulants, with a chronic DVT, leg cast, or amputation, or when the results of formal imaging were already known. All patients were treated in the usual fashion based on the protocol in use at our centre: treating physicians classified patients as "DVT unlikely" or "DVT likely" using the modified Wells score and then obtaining serum D-dimer and/or formal ultrasound imaging per protocol. Seventeen physicians were trained and performed LCU in all subjects. DVT was considered ruled out in "DVT unlikely" patients if the LCU was negative and in "DVT likely" patients if both the LCU and D-dimer were negative. **Results:** We enrolled 227 patients (47% "DVT likely"), of whom

24 had DVT. The sensitivity and specificity of the novel approach were 0.96 (95% CI 0.77, 1.00) and 0.66 (0.59, 0.72), respectively, compared with the current protocol, 1.00 (0.83, 1.00) and 0.35 (0.28, 0.42). Overall, the stand-alone sensitivity and specificity of LCU were 0.91 (0.70, 0.98) and 0.97 (0.92, 0.99). Incorporating LCU into the diagnostic approach would have reduced the rate of formal imaging from 81% (actual) to 40% and the mean time to diagnostic certainty by 5.0 hours and eliminated 24 (11%) return visits, of which 10 were empirically anticoagulated. **Conclusions:** LCU holds promise as one component of the diagnostic approach to DVT but should not be used as a stand-alone test due to imperfect sensitivity. Tradeoffs in diagnostic efficiency for the sake of perfect sensitivity remain a difficult issue collectively in emergency medicine but need to be scrutinized carefully in light of the cost of overinvestigation.

5465

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VALIDATION and refinement of a clinical decision rule for subarachnoid hemorrhage in emergency department patients with headache

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Keywords: cardiovascular, clinical decision rule, emergency medicine, headache, subarachnoid hemorrhage

Introduction: The decision to investigate patients with acute headache for subarachnoid hemorrhage (SAH) is a common dilemma in emergency medicine. By assembling a new cohort of patients, we sought to validate and refine a previously derived clinical decision rule for acute headache. **Methods:** We conducted a prospective cohort study in 11 university-affiliated Canadian emergency departments. We enrolled neurologically intact adults presenting with an acute headache (peaking within 1 hour) in the absence of trauma or prior similar headaches. Physicians completed data forms and explicitly scored three previously derived versions of a decision rule prior to investigations. We conducted telephone and medical record follow-up at 1 and 6 months. SAH was defined as 1) SAH on CT; 2) visual xanthochromia in the cerebrospinal fluid (CSF); or 3) red blood cells in the final tube of CSF with positive angiography. We used recursive partitioning to optimize the best performing rule. **Results:** We enrolled 2,120 (80.7% of eligible patients) over 4 years, including 132 (6.2%) with SAH. Subjects were of mean age 44.1 years, female 60.4%, and mean headache severity of 8.7 of 10, and 83.1% underwent CT. The optimal a priori rule was any of age ≥ 40 years, history of neck pain/stiffness, witnessed loss of consciousness, or onset with exertion. This rule had a sensitivity of 0.985 (95% CI 0.946 to 0.996) and a specificity of 0.275 (95% CI 0.256 to 0.295) for SAH. Including the variables "thunderclap headache" and "neck stiffness with flexion/extension" improved the rule sensitivity to 1.00 (95% CI 0.972 to 1.00) with specificity of 0.139 (95% CI 0.125 to 0.155). **Conclusions:** The refined rule is highly sensitive for identifying SAH among neurologically intact patients presenting to the emergency department with a headache. Standardizing which patients require investigations may improve patient care in cases that might otherwise be missed.

5468

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UPSTREAM relief: benefits on EMS offload delay of a provincial ED overcapacity protocol aimed at reducing ED boarding

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Keywords: crowding, emergency medical services, emergency medicine, overcapacity

Introduction: EMS offload delays resulting from ED crowding contribute to EMS system costs, operational inefficiencies, and compromised patient safety. Overcapacity protocols (OCPs) that enhance ED outflow to inpatient units may improve EMS offload delays. This study examined the impact of a provincial, system-wide OCP policy implemented in December 2010 on ambulance offload delays at three urban EDs. **Methods:** Data were collected on all ED EMS arrivals from the metro Calgary area to its three urban adult hospitals. The study phases consisted of February to October 2010 (pre-OCP) compared against the same months in 2011 (post-OCP). Data from the EMS operational database and the Regional Emergency Department Information System (REDIS) database were linked. The primary analysis examined the change in EMS offload delay defined as the time from EMS triage arrival until patient transfer to an ED bed. A secondary analysis evaluated variability in EMS offload delay between receiving EDs. **Results:** A total of 11,431 patients had linked data in both the EMS and REDIS databases. The mean EMS offload delay time was reduced following OCP implementation by 18.2 minutes (95% CI 16.4–19.9) from 33.5 minutes to 15.8 minutes. At site 1, which has the highest acuity, offload delay improved by 7.5 minutes, from 14.4 minutes (95% CI 13.1–15.7) to 6.9 minutes (95% CI 6.1–7.7). At site 2, which has the next-highest acuity, offload delay improved by 22.0 minutes from 36.8 minutes (95% CI 33.7–39.9) to 14.8 minutes (95% CI 13.8–16.0). At site 3, which has the lowest acuity, offload delay improved by 29.6 minutes from 59.2 minutes (95% CI 54.9–63.7) to 29.6 minutes (95% CI 27.4–31.8). **Conclusions:** Implementation of a regional OCP to reduce ED crowding was associated with an important reduction in EMS offload delay, suggesting that policies that target hospital processes have a bearing on EMS operations. Offload delay improvements are varied by receiving site, and the gains in efficiency correlate inversely with acuity.

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A TIME flow study to establish determinants of the EMS offload interval: implications for evaluation of EMS operational efficiency

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Keywords: emergency medical services, emergency medicine, operational efficiency

Introduction: To maintain response time standards to high-priority events, the EMS system must offload patients to the hospital efficiently. The EMS offload interval includes triage, waiting for bed availability, patient transfer to an ED bed, and return of ambulance to operational readiness. Evaluation of each step may identify opportunities for improvement in EMS system operational efficiency. We sought to evaluate the relative contribution to EMS offload interval of the time from triage to patient transfer to ED bed and the time from patient transfer to EMS unit operational readiness. **Methods:** Data were collected on all ED EMS arrivals from the metro Calgary area to its three urban adult hospitals, April to October 2010 and April to October 2011. Data from the EMS operational database and the Regional Emergency Department Information System database were linked. Measures included time from EMS arrival at the ED until EMS unit readiness (offload interval), time from EMS arrival to triage (arrival:triage), time from triage until patient transfer to ED bed (triage:bed), and time from

patient transfer to ED bed until EMS unit readiness (bed:ready). **Results:** A total of 8,422 patients had complete data in both the EMS and REDIS databases during the study period. The mean offload interval was 73.4 minutes (95% CI 72.5–74.3). When divided into components, this consisted of a mean arrival:triage time of 5.2 minutes (95% CI 5.1–5.3), a mean triage:bed time of 14.4 minutes (95% CI 13.8–15.0), (95% CI 11.9–18.9), and a mean bed:ready interval of 52.8 minutes (95% CI 52.0–53.6-4). Offload interval, triage:bed, and bed:ready times varied between receiving EDs. **Conclusions:** The time from patient transfer to an ED bed until readiness to receive another call accounts for the majority of the total EMS offload interval. Efforts to reduce the bed:ready interval will improve EMS system operational efficiency, likely at a lower cost, and with greater benefit, than improvements in triage:bed times.

5470

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OUTCOMES and length of stay of low-risk abdominal pain patients returning to the ED for scheduled next-day abdominal ultrasonography

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Keywords: abdominal pain, administration, emergency medicine, ultrasound

Introduction: Many EDs do not have 24-hour access to formal ultrasonography (US). This has led to the practice of discharging low-risk patients with abdominal symptoms for scheduled next-day US through the ED. We sought to 1) evaluate outcomes of low-risk patients with abdominal complaints who were discharged from the ED to return for scheduled next-day abdominal US and 2) compare average length of stay (LOS) for same-day US patients to the combined LOS (visit 1 + visit 2) for next-day US patients. **Methods:** Administrative databases were queried to identify all patients undergoing abdominal and pelvic US (excluding obstetrical ultrasounds) between September 1, 2010, and August 31, 2011, in two urban EDs in Calgary, Alberta. Next-day US patients were those who had an ED discharge in the preceding 24 hours. Same-day US patients had no ED discharge in the preceding 24 hours. The primary analysis evaluated admission and surgery rates for next-day US patients. A secondary analysis focused on patients who were ultimately discharged from the ED following their US examination, comparing the mean ED LOS for same-day US patients to the mean total ED LOS for next-day US patients (visit 2 does not include US time). **Results:** A total of 2,488 patients underwent abdominal/pelvic US during the study period, including 1,498 (60.2%) same-day patients and 993 (39.8%) next-day patients. Among patients undergoing next-day US, 12.8% (95% CI 11.1–14.9) were admitted and 1.6% (95% CI 1.0–2.5) underwent surgery. Among patients discharged following their US, those undergoing same-day US had a mean ED LOS of 9.6 hours (95% CI 9.4–9.8), whereas next-day US patients had a combined ED LOS of 8.2 hours (95% CI 8.0–8.4). **Conclusions:** Physicians can safely select a low-risk population for next-day US with a low probability of admission or surgery. A scheduled next-day US practice for low-risk abdominal pain can divert a significant proportion of the ultrasound demand from evening to daytime hours without an increase in LOS, leading to potential cost savings.

5488

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DEVELOPING a Canadian EMS research agenda: a baseline study of stakeholder opinions

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Keywords: emergency medical services, emergency medicine, research

Introduction: In Canada, like other countries, the amount and quality of EMS research are on the rise. However, research endeavours often occur in silos, and there has not been a common roadmap to guide future initiatives. The purpose of this baseline study was to explore the opinions of key EMS stakeholders on EMS research in Canada as a first step to building a national EMS research agenda. Specifically, we sought to learn about their perceptions of the barriers and opportunities in EMS research, what recommendations they have for moving forward, and what areas of EMS research they believe should be high priority in Canada. **Methods:** Over the course of the spring of 2011, a qualitative study was conducted, using one-on-one semistructured interviews. Purposeful sampling was used to recruit a variety of EMS research stakeholders, including paramedics, medical directors, researchers, and administrators from across the country. Interviews were conducted by telephone, audiorecorded, and transcribed verbatim. A constant comparative analysis approach was used to track emerging themes, and a basic coding framework was developed. **Results:** A total of 13 interviews were completed. Participants included EMS physician researchers, paramedics, EMS medical directors, and EMS educators. Key themes identified included (a) the lack of education and training related to research for EMS staff and management, including mentorship opportunities; (b) the importance of creating a physical infrastructure to support pan-Canadian research collaboration; (c) the need to address the complexities of involving front-line paramedics in research despite their desire to be involved; and (d) the need for a Canadian research agenda to consider the geographic and political diversity of EMS in Canada. **Conclusions:** This baseline study reveals key themes regarding the state of EMS research in Canada, which are hypothesis generating. These data are a crucial first step to establishing a comprehensive and representative national research agenda.

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EFFECTIVENESS and safety of emergency department short-stay units: a rapid review

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Keywords: administration, emergency medicine, observational medicine, short-stay unit

Introduction: Short-stay units (SSUs) have emerged as a potentially useful strategy for managing crowding in emergency departments; however, evidence on their safety and effectiveness is heterogeneous and limited. Administrators work in a unique environment of strict confining time restraints, making traditional systematic reviews of the literature impractical. We present a streamlined approach to synthesizing evidence on SSUs in a Canadian context through a rapid review, scanning published literature in a timely manner. **Methods:** We used an eight-step approach to rapid review developed by our knowledge translation team: 1) needs assessment of the end-user (senior hospital management), 2) refinement of the research question, 3) rapid review proposal agreement with the stakeholder, 4) detailed systematic literature search, 5) screening and selection of studies by two independent reviewers, 6) quality assessment using AMSTAR and extraction, 7) synthesis into a user-friendly final report, and 8) submission of the report to end-users for feedback and approval. We included synthesized studies published in/after 2000. Final results were presented

according to PRISMA format. **Results:** A total of 1,648 records were identified and screened, and 196 went through full-article assessment. Four studies were ultimately included in qualitative synthesis. One systematic review specifically assessing evidence of SSUs included only one Canadian study and suggests that SSUs may offer an effective and safe ED crowding management option. Other reviews looking at combinations of interventions aimed at reducing ED crowding suggest that SSUs result in generally positive process outcomes. There is limited evidence from one systematic review indicating that SSUs may lead to improved patient satisfaction in specific clinical contexts. **Conclusions:** There is some but limited evidence on the effectiveness of SSUs due to the large heterogeneity of evaluative study designs. We present a rapid review approach that provided timely (< 1 month) literature synthesis for evidence-based administrative decision making.

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THE DEVELOPMENT and validation of simulation-based OSCE stations for the assessment of emergency medicine residents

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Keywords: assessment, education/teaching, emergency medicine, simulation

Introduction: High-fidelity simulation is emerging as a useful tool for competency-based assessment in medical education. We set out to develop and validate six simulation-based Objective Structure Clinical Examination (OSCE) scenarios using anchored global assessment scores to assess emergency medicine resident competency in resuscitation. **Methods:** An expert panel of emergency physicians developed six high-fidelity simulation-based resuscitation scenarios to be used as OSCE stations, each with a corresponding assessment tool. The tool consisted of four domain-specific anchored scores and one overall global score. Emergency medicine residents were videotaped completing two separate three-station OSCEs separated by 6 months. Three clinician experts blinded to training level independently evaluated all taped performances using the assessment tools. Correlational analyses and analysis of variance were applied to the assessment scores to measure the discriminatory capabilities and interrater reliability of each scenario. **Results:** Eight residents in the Canadian College of Family Physicians Emergency Medicine program (CCFP-EM) and 18 residents from the Fellow of the Royal College of Physicians Emergency Medicine program (FRCP-EM) completed the OSCE. Interrater reliability was good for each scenario (Spearman rho = [1] 0.74, [2] 0.83, [3] 0.79, [4] 0.73, [5] 0.72, [6] 0.76), and strong for each of the two combined three-station OSCEs (rho = [1] 0.87, [2] 0.88). The discriminatory validity was strong, with senior FRCP-EM residents outperforming junior FRCP-EM and CCFP-EM residents (p = < 0.001–0.027). **Conclusions:** This study demonstrates the development and analysis of six OSCE stations using high-fidelity mannequins for the evaluation of resuscitation skills in emergency medicine trainees. The assessment tools have strong interrater reliability and discriminatory capabilities, supporting their validity and utility as measurements of trainee competence. These stations and similar stations may be used in the future for high-stakes or summative examinations.

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NONINVASIVE positive pressure ventilation to treat acute exacerbations of chronic obstructive pulmonary disease: a study of utilization and adherence to evidence-based standards and proposed quality improvement metrics

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Keywords: chronic obstructive pulmonary disease, emergency medicine, noninvasive ventilation, respiratory

Introduction: Noninvasive positive pressure ventilation (NPPV) improves survival and decreases length of stay in patients with respiratory failure secondary to acute exacerbation of chronic obstructive pulmonary disease (AECOPD). NPPV application is common in emergency departments (EDs); however, it is unclear whether patients are being screened appropriately for respiratory failure and if those meeting the criteria for NPPV receive this intervention. We measured the adherence to eligibility screening using blood gas (BG) values and NPPV treatment for eligible AECOPD patients. **Methods:** In this retrospective study involving three 400+-bed tertiary care hospitals in Calgary, Alberta, data from the Regional Emergency Department Informatics System (i.e., tracking and admissions data) and Sunrise Clinical Manager (i.e., laboratory data and physician order entry) were linked for descriptive analysis. All patients with an AECOPD diagnosis requiring hospitalization between May 1, 2010, and March 31, 2011, receiving systemic corticosteroids (both markers for severity) were included. Outcomes were the proportions of eligible patients who had either arterial or venous BG measurements; those patients with hypercapnic respiratory failure meeting eligibility criteria for NPPV (pCO_2 > 45 and pH < 7.30); and NPPV-eligible patients receiving a trial treatment. **Results:** A total of 912 AECOPD patients were included; 67.4% (95% CI 64.3–70.5) underwent BG determination, with 19.2% (95% CI 16.2–22.6) meeting eligibility criteria for NPPV. Only 59.3% (95% CI 49.9–68.2) of these patients with respiratory failure had NPPV ordered, whereas 4.4% (95% CI 2.9–6.7) of all patients whose BG analysis did not demonstrate respiratory failure criteria had NPPV administered. **Conclusions:** We found a significant practice gap related to screening for NPPV and NPPV use in AECOPD. To our knowledge, no administrative metric has been proposed to assess the quality of AECOPD care in the ED. Further prospective validation of this quality improvement metric is warranted.

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MULTICENTRE prospective validation of the Canadian Assessment of Tomography for Childhood Head Injury (CATCH) Rule

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Keywords: clinical decision rule, emergency medicine, head injury, pediatrics

Introduction: It is important to minimize the overuse of CT in children. We assessed the accuracy, reliability, and acceptability of the previously derived CATCH rule in a new cohort of children with minor head injury. **Methods:** This is a prospective cohort study in the EDs of nine Canadian pediatric teaching hospitals and included consecutive children (0–16 years) who presented with a Glasgow Coma Scale (GCS) score of 13 to 15 and documented loss of consciousness, amnesia, disorientation, persistent vomiting, or irritability. Physicians completed a 20-item assessment form prior to CT scan, and in some cases a second physician performed an interobserver assessment. The outcome standards were "need for neurologic intervention" and "brain injury." Analyses included the kappa coefficient, sensitivity and specificity with 95% CIs. **Results:** We enrolled 4,060 children with the following characteristics: mean age 9.8 years; male 64.5%; and GCS scores of 13 (2.2%), 14 (6.5%), and 15 (91.3%); mechanisms: falls 45.2%, sports 26.9%, bicycle 6.6%, MVC 2.2%. CT scans were obtained on 1,417 (34.9%); acute brain injury occurred in 197 (4.8%), and 23 (0.57%) required neurosurgical intervention. The four high-risk factors (GCS < 15 after 2 hours; suspected open or depressed skull

fracture; history of worsening headache; irritability on examination) were 87% sensitive (95% CI 68–98) for predicting neurologic intervention and would require 14% of patients to undergo CT. The seven CATCH Rule high- and medium-risk factors (sign of basal skull fracture; large, boggy hematoma of the scalp; dangerous mechanism of injury) were 98% sensitive (95% CI 95–99) for predicting acute brain injury and would require 38% of patients to undergo CT. The kappa value for MD interpretation of the CATCH Rule was 0.67 (0.60–0.74). MDs were uncomfortable applying the rule in 9.8%. **Conclusions:** The seven-criteria CATCH Rule was highly sensitive for predicting acute brain injury, but the four high-risk factors alone were less sensitive for predicting neurologic intervention.

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LIMITED access to services in Canadian rural emergency departments: a pilot study

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Keywords: emergency medicine, rural, service delivery

Introduction: Emergency departments (EDs) are important safety nets for the 30% of Canadians who live rurally. Information on the services provided in rural EDs is scarce. Recent efforts at cost containment through regionalization may have impacted access to comprehensive emergency care. Our objective was to examine access to services in rural EDs. **Methods:** This descriptive study was based on mixed methods (interviews and database analysis). A random sample of EDs located in Canadian rural small towns (defined by Statistics Canada) from each province/territory was selected to participate. We focused on hospitals with 24/7 ED physician coverage that have hospitalization beds. Data were collected from several sources: ministries of health, local health authorities, and facility ED statistics. A semistructured interview was conducted by telephone with ED managers to collect additional data and confirm the status of services. **Results:** Among the 336 rural EDs identified, 122 (36%) were contacted and 95 (28%) participated in the study. Hospitals had on average 24 acute care beds and 7 ED stretchers and averaged 15,000 annual ED visits. The proportion of rural hospitals having local access to the following services 24/7 was as follows: intensive care unit = 17%, general surgeon = 26%, internal medicine = 11%, obstetrician = 10%, pediatrician = 5%, psychiatrist = 10%, CT scanner = 20%, ultrasound = 28%, basic x-ray and laboratory services = 97%. The average distance to the nearest referral hospital and tertiary trauma center was more than 200 km. **Conclusions:** This is the first study to describe the services offered in Canadian rural EDs. Other than basic laboratory and x-ray services, the majority of rural EDs have limited access to professional and ancillary services. A detailed study is required to evaluate the impact of these limited services on interfacility transport demands, costs, and patient outcomes.

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ENHANCING teamwork skills among health care providers in the emergency department: development and assessment of the effectiveness of a team training educational program

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Keywords: communication, education/teaching, emergency medicine, teamworking

Introduction: Team training is at the forefront of a movement to improve patient safety, placing emphasis on team behaviours rather than technical knowledge and skills. This study assesses the impact of interdisciplinary team training and peer coaching on observed teamwork behaviours and attitudes in an academic ED. **Methods:** A pre/post study design assessed results over a 1.5-year study period. A behaviour rating scale (TeamSTEPPS Performance Observation Tool) was calibrated and used by the same two human factors experts pre/post-training to measure teamwork behaviours. A third external observer contributed to the final assessment. A pre/post-survey of teamwork attitudes and patient safety practices was developed from publicly available, validated measures. Based on needs assessment, an interdisciplinary 4-hour training program was designed and conducted for all ED staff over a 2-month period. All ED staff were invited to attend training sessions on coaching techniques. Shifts with no clinical responsibilities were scheduled to facilitate peer coaching for these skills. **Results:** Initial mean survey scores ranged from 2.90 to 4.37, whereas initial observation scores ranged from 1.52 to 2.48 (scale 1 = poor to 5 = exceptional). All 31 observed teamwork behaviours improved significantly postintervention, with a mean improvement of 0.94, $p <= 0.05$. Specific behaviours showing the greatest improvement were "effectively advocating for the patient" and "ensuring a team-shared mental model," with mean differences of 1.45 ($p < 0.01$) and 1.28 ($p < 0.01$), respectively. Staff survey perceptions of teamwork improved less dramatically with statistically significant improvement on only 6 of 16 scales measured. **Conclusions:** Explicit teamwork training with active coaching effectively increased observable teamwork behaviours. Present self-assessment survey tools for teamwork were unable to detect the degree of change in teamwork behaviours detectable with observation tools. Staff perceptions of teamwork may not reflect the true state of teamwork behaviour.

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EMERGENCY department utilization by adult cancer patients: a prospective cohort study

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Keywords: cancer, clinical practice, emergency medicine, oncology

Introduction: Cancer patients are receiving a greater proportion of their care on an outpatient basis. The impact of this change on emergency department (ED) use is poorly understood. The aim of this study is to examine the characteristics of ED visits by adult cancer patients. **Methods:** We performed a prospective cohort study of cancer patients using linked administrative data. Between July 2007 and March 2009, all new adult cancer patients referred to a tertiary care cancer centre were recruited into a study examining psychological distress. Patients were followed prospectively until September 2011. The collected data were linked to administrative data from three tertiary care EDs. The primary outcome was ED visit rates. Trends in ED visit numbers were evaluated using the Spearman correlation coefficient. **Results:** Of the 6,772 cancer patients approached, 4,329 (64%) agreed to participate in the study. Between July 2007 and September 2011, 1,881 patients (44%) made 4,623 ED visits. Of those seeking ED care, 45% made one visit, 47% made two to five visits, and the remaining 8% made six or more visits. Patients with gastrointestinal (25%), breast (20%), lung (13%), and prostate cancers (10%) accounted for the majority of ED visits. The distribution of Canadian Triage Acuity Scores 1 to 5 was 1%, 41%, 50%, 7%, and 1%, respectively. Forty-two percent of ED presentations required a consultation, and 40% resulted in admission.

The most common diagnoses were intestinal obstruction (3.1%), chest pain (2.3%), fever (2.3%), abdominal pain (2.2%), and pneumonia (2.2%). Emergency department visits were most frequent within 6 months of initiating cancer care and then decreased gradually over time (1,410 visits at < 6 months v. 517 visits at 18 to 24 months, $p < 0.01$ for trend). **Conclusions:** Collectively, these results indicate that adult cancer patients are high users of ED resources. The elevated ED presentation rates in the first 6 months of cancer care suggest a need for enhanced follow-up and the development of alternative routes to inpatient admission.

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A PROSPECTIVE evaluation of the utility of the prehospital 12-lead electrocardiogram to change the management of patients in the emergency department

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Keywords: electrocardiogram, emergency medical services, emergency medicine

Introduction: Prehospital 12-lead electrocardiograms (pECGs) can provide valuable information prior to any medical treatment. Retrospective research has shown that 19% of pECGs had clinically significant abnormalities that were not captured on the initial ED ECG and had the potential to change medical management. The purpose of this study was to prospectively determine how many pECGs had clinically significant abnormalities not present on the initial ED ECG and determine how many pECGs changed physician management. **Methods:** This was a prospective cohort study of patients ≥ 18 years who had a pECG completed by EMS prior to arriving at one of two tertiary care EDs. STEMI bypass patients were excluded. Physicians reviewed the pECG to determine if any clinically significant abnormalities were present that were not captured by the initial ED ECG. Physicians completed a questionnaire and recorded if and how the pECG changed their ED management. **Results:** A total of 281 patients were enrolled over the 3-month study period. Thirty-five (12.5 %) pECGs showed changes that were not captured on the initial ED ECG (11 ST depression [STD], 5 T wave inversion [TWI], 2 STD and TWI, 2 STD and arrhythmia, 12 arrhythmia, 2 ST elevation, 1 unknown). There were 51 (18.1%) pECGs that influenced management. Thirty-three (11.7%) resulted in consultation to an admitting service, 10 (3.6%) resulted in immediate treatment prior to a formal ED ECG, 8 (2.8%) led to laboratory investigations, 5 (1.8%) resulted in consultation to an outpatient service, 3 (1.1%) did not require a formal ED ECG, 2 (0.7%) led to outpatient testing, 2 (0.7%) were unknown, and 1 (0.4%) resulted in the initiation of code STEMI. **Conclusions:** pECGs show clinically significant abnormalities that are not always captured on the initial ED ECG. pECGs have the potential to change the management of patients in the ED.

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MRI abnormalities in ED patients with a diagnosis of TIA: a pilot study

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Keywords: cerebrovascular accident, emergency medicine, magnetic resonance imaging, neurosciences, transient ischemic attack

Introduction: The diagnosis of a transient ischemic attack (TIA) carries with it a substantial risk of subsequent cerebrovascular accident (CVA). Recent studies have suggested that combining the ABCD2 TIA score with early diffusion-weighted magnetic resonance imaging (DWMRI) enhances the prediction of risk for ischemic stroke at 90 days. The primary objective of this pilot study was to determine the percentage of emergency department (ED) patients diagnosed with a TIA who had positive findings on DWMRI consistent with an acute CVA. **Methods:** This prospective, observational cohort study enrolled adult (≥ 18) patients presenting to a tertiary care ED (annual census 120,000) with a diagnosis of a TIA. Exclusion criteria included pregnancy, contraindications to MRI, and terminal illness. Patients with an ABCD2 score ≥ 3 were eligible for early DWMRI within 72 hours of ED discharge. Outcomes were determined at 7 and 90 days from ED discharge. **Results:** A total of 124 patients were enrolled; 8 were excluded. A total of 108 (93.1%) met the criteria for early MRI. Of those, 106 had an MRI ordered, 1 refused the MRI, and 1 had an MRI arranged through the TIA clinic. Ninety-six underwent MRI as an outpatient, one re-presented prior to MRI and required admission, one died prior to MRI, one cancelled, and seven were not completed for unknown reasons. After neurology assessment, 38 (39.2%) had a diagnosis of TIA and 28 (28.9%) had a diagnosis of CVA. Of those with a CVA, 18 had MRI changes consistent with acute CVA, 8 had chronic ischemic changes, and 2 were normal. Of the 66 patients with a TIA or CVA, 14 had new or ongoing neurologic symptoms at 7 days, with 5 having an unplanned return visit to the ED. Five patients had new or ongoing neurologic symptoms at 90 days, with two having an unplanned return visit. **Conclusions:** A number of patients diagnosed with a TIA in the ED had MRI findings consistent with CVA. Early DWMRI may help emergency physicians make the diagnosis of CVA and expedite follow-up care.

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PREDICTORS of failure of empiric outpatient antibiotic therapy in emergency department patients with uncomplicated cellulitis

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Keywords: ambulatory care, cellulitis, emergency medicine, infectious disease

Introduction: Despite several expert panel recommendations and cellulitis treatment guidelines, there are currently no clinical decision rules to assist clinicians in deciding which emergency department (ED) patients should be treated with oral antibiotics and which patients require intravenous therapy at first presentation of uncomplicated cellulitis. The objective of this study was to determine risk factors associated with adult patients presenting to the ED with cellulitis who fail initial antibiotic therapy and require a change of antibiotics or admission to hospital. **Methods:** This was a prospective cohort study of patients ≥ 18 years presenting with cellulitis to one of two tertiary care EDs (combined annual census 120,000). Patients were excluded if they had been treated with antibiotics for the cellulitis prior to presenting to the ED, if they were admitted to hospital, or had an abscess only. Trained research personnel administered a questionnaire at the initial ED visit with telephone follow-up 2 weeks later. Backwards stepwise multivariable logistic regression models determined predictor variables independently associated with treatment failure. **Results:** A total of 598 patients were enrolled; 47 were excluded, and 53 were lost to follow-up. A total of 497 (99.8%) patients were given antibiotics in the ED; 185 (37.2%) were given oral, 231 (46.5%) were given IV, and 81 (16.3%) patients received both oral and IV antibiotics. A total of 102 (20.5%) patients had a treatment failure. Fever (temp > C) at triage (OR 4.1, 95% CI 1.5, 10.7), leg ulcers (OR 3.1, 95% CI 1.4, 6.6), edema or lymphedema (OR 2.5, 95% CI 1.4, 4.5), and prior cellulitis in the same area (OR 1.8, 95% CI 1.1, 2.9) were independently associated with treatment failure ˚38. **Conclusions:** This analysis found four

risk factors associated with treatment failure in patients presenting to the ED with cellulitis. These risk factors should be considered when initiating empiric outpatient antibiotic therapy for patients with uncomplicated cellulitis.

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NORMAL renal ultrasound identifies renal colic patients at low risk for urologic intervention: a prospective study

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Keywords: diagnostic technologies/imaging, emergency medicine, renal colic

Introduction: Computed tomography (CT) is an imaging modality used to detect renal stones. However, ultrasound (US) has been recognized as an alternative imaging tool for patients in whom radiation exposure should be avoided. The objective was to determine if a normal renal US can identify renal colic patients who do not require urologic intervention within 90 days of their initial emergency department (ED) visit. **Methods:** This was a prospective cohort study involving adult (≥ 18 years) patients presenting to the EDs of a tertiary care centre (combined census 150,000) with suspected renal colic over a 1-year period. Results of renal US were categorized by trained research personnel into four mutually exclusive groups: "normal," "suggestive of ureterolithiasis," "visualized ureteric stone," or "disease unrelated to urolithiasis." The suggestive category included US results where hydronephrosis, perinephric fluid, or abnormal ureteric jets were seen or where a nonobstructing intrarenal stone was identified. Electronic charts were reviewed 90 days after the initial visit to determine if urologic intervention (lithotripsy, stents, etc.) was required. **Results:** A total of 514 patients were screened for eligibility. Of 397 patients enrolled, 222 (55.9%) had a renal US for suspected urolithiasis. Of those, 64 (28.8%) were classified as normal; none of these patients required urologic intervention within 90 days of the initial ED visit. Sixty-four (28.8%) results were classified as suggestive, and six (9.4%) patients required urologic intervention. Eighty-eight (39.6%) results were classified as visualized ureteric stone; 25 (28.4%) patients required urologic intervention. Six (2.7%) results were classified as disease unrelated to urolithiasis; none required urologic intervention. The rate of urologic intervention was significantly lower in those with normal results on US ($p < 0.001$) than in those with abnormal results on US. **Conclusions:** A normal renal US predicts a low likelihood for urologic intervention within 90 days for adult ED patients with suspected urolithiasis.

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RISK factors associated with the need for urologic intervention in emergency department patients with suspected renal colic

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Keywords: clinical practice, emergency medicine, renal colic

Introduction: Although the majority of patients who present to the emergency department (ED) with urolithiasis will pass their stones spontaneously, some will ultimately require urologic intervention (e.g., lithotripsy, stenting, etc.). The objective was to determine risk factors associated with the need for urologic intervention within 90 days for patients who present to the ED with suspected renal colic. **Methods:** This was a prospective cohort study of patients ≥ 18 years presenting to one of two tertiary care EDs (combined census 150,000) with suspected renal colic over a 1-year period. Trained research personnel collected data from patients' medical records, including demographics, clinical history, and results of laboratory and imaging investigations. Electronic charts were reviewed 90 days after the initial ED visit to determine if urologic intervention was required for management of urolithiasis. Backwards stepwise multivariable logistic regression models determined predictor variables independently associated with the need for urologic intervention. **Results:** A total of 514 patients were screened for eligibility. Of 397 patients enrolled, 38 (9.6%) were excluded for definite alternate diagnoses. Of 359 remaining patients, 161 (44.8%) patients had a stone visualized on imaging investigation. Fifty-seven (15.9%) patients ultimately required urologic intervention within 90 days of their initial visit. Mean (SD) age was 47.1 (14.4) years, and 224 (62.4%) were male. Stone size ≥ 5 mm (OR 3.8, 95% CI 1.9, 7.5), presence of leukocytes on urinalysis (OR 3.0, 95% CI 1.5, 6.3), proximal ureteric stone (OR 2.9, 95% CI 1.3, 6.6), and a previous history of renal colic (OR 1.9, 95% CI 1.0, 3.6) were independently associated with urologic intervention within 90 days. **Conclusions:** This analysis found four risk factors associated with urologic intervention within 90 days in patients presenting to the ED with renal colic. Physicians should consider these risk factors when making management and disposition decisions for patients with suspected urolithiasis.

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POLICY-DRIVEN improvements in crowding: system-level changes introduced by a provincial health authority and its impact on emergency department operations in 15 centres

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Keywords: administration, crowding, emergency medicine, overcapacity protocol

Introduction: System-level changes that target both ED throughput and output show the most promise in alleviating crowding. In December 2010, Alberta Health Services (AHS) implemented a province-wide overcapacity protocol (OCP) structured on the Viccellio model. We sought to determine if the OCP policy resulted in improvements in ED throughput and output metrics. **Methods:** A prospective pre-post study was conducted using administrative data from 15 centres. The study phases consisted of the 8 months from February to September 2010 compared against the same months in 2011. Data for all centres were collected through the EDIS tracking systems. The OCP included three main triggers: ED bed occupancy > 110%, at least 35% of ED stretchers blocked by patients awaiting inpatient bed or disposition decision, and no stretcher available for high-acuity patients. When all criteria were met, selected boarded patients were moved to an inpatient unit (nontraditional care space if no bed available). The primary outcome was ED length of stay (LOS) for admitted patients. The ED load of boarded patients from 10 to 11 am was reported in patient-hours (pt-hrs). Throughput is reported as time from ED arrival to MD assessment and percentage left without being seen (LWBS). Continuous variables were compared with the Student *t*-test. **Results:** The volume of patients increased by 6.3% from the pre to the post phase (579,071 v. 615,787; $p < 0.001$), whereas admission rates remained constant (12.9% v. 13.1%; p = NS). ED LOS for admitted patients went from 17.2 hours to 11.6 hours ($p < 0.001$); the load of admitted patients at 10 am declined from 11.3 pt-hrs to 6.1 ($p < 0.001$). Average time from ED arrival to MD assessment decreased (113.2 v. 99.3 min; $p < 0.001$), as did % LWBS (4.0% v. 3.8%; $p < 0.001$). All OCP effects remained constant over time; however, there were regional disparities in its impact. **Conclusions:** Policy-driven changes in ED and hospital opera-

tions were associated with significant improvements in both throughput and output despite increased input.

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DO IMPROVEMENTS in emergency department operations influence the patient experience? Impacts of large-scale implementation of overcapacity protocols on perceptions of crowding and overall ratings of care

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Keywords: administration, crowding, emergency medicine, overcapacity protocol

Introduction: In December 2010, the overcapacity protocols (OCPs) were launched to address crowding in Alberta EDs. We sought to determine if OCP and its resulting effect on ED crowding influenced how patients perceived their care. **Methods:** Design/Setting: An independent agency mandated by government collected and analyzed ED patient experience data using a comprehensive, validated, multidimensional instrument with a random periodic sampling methodology for all ED patients. A prospective pre-post experimental study design was employed in the eight community and tertiary care hospitals most impacted by crowding. Two 5.5-month study periods were evaluated (pre: 28/06–12/12/2010; post: 13/12/2010–29/05/2011). Outcomes: The primary outcome was patient perception of wait times and crowding reported as a composite mean score (0–100) from six survey items, with higher scores representing better ratings. The overall rating of care by ED patients (composite score) and other dimensions of care were collected as secondary outcomes. All outcomes were compared using two-tailed Student *t*-tests and a Bonferroni correction ($p < 0.001$ significant). **Results:** A total of 3,774 surveys were completed in both the pre-OCP and post-OCP study periods, representing a response rate of 45%. The composite for perceived wait times and crowding improved from 61.7 to 65.3 in Calgary and from 59.8 to 64.4 in Edmonton ($p < 0.001$), with some variation among specific sites. The overall composite score for care was 75.6 of Calgary patients and 74.1 of Edmonton patients, respectively, in the pre-OCP phase and did not change in the post period (77.3 and 76.1 for both cities in the post-OCP phase comparison; p = NS). The global rating also remained unchanged following the intervention for both Calgary and Edmonton zones. Other dimensions of care remained unchanged. **Conclusions:** Improving ED crowding results in significant, albeit modest, improvements in patients' perception of crowding in busy urban hospital EDs.

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VALIDATION of the ED RAFF scale over time in patients with recent-onset atrial fibrillation or flutter

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Keywords: atrial fibrillation/flutter, cardiovascular, clinical prediction score, emergency medicine

Introduction: Recent-onset atrial fibrillation/flutter (RAFF) causes significant morbidity and is the most common cardiac arrhythmia managed by emergency department (ED) physicians. We previously developed and validated the ED RAFF Scale for symptom severity in the ED. The purpose of this study was to assess the ED RAFF Scale's sensitivity to change over time. **Methods:** We conducted a multicentre cohort study in the EDs of six tertiary care hospitals and enrolled adult patients diagnosed with RAFF. In the ED on day 0, consenting patients rated the severity of seven different RAFF symptoms on the ED RAFF Scale from 0 to 10, with 0 being none and 10 being worst possible. They also completed the SF-8 Health Survey. They were contacted by telephone or mail on days 7 and 45 and completed the ED RAFF Scale and the SF-36 Health Survey at those times. We compared results with Student *t*-test. **Results:** We enrolled 147 patients: male 69.4%, mean age 63.4 years, mean duration symptoms 7.2 hours. Individual items on the ED RAFF Scale on days 0, 7, and 45 had these means (SD): palpitations 4.7 (3.4), 0.6 (1.4), 0.6 (1.6); lightheadedness 2.9 (3.1), 0.8 (1.8), 0.5 (1.3); chest pain 2.2 (2.8), 0.4 (1.0), 0.4 (1.3); shortness of breath (SOB) 1.9 (2.6), 0.6 (1.6), 0.4 (1.3); SOB with exertion 4.1 (3.3), 2.3 (2.7), 2.0 (2.7); fatigue 2.8 (3.1), 1.2 (2.2), 0.7 (1.8); fatigue with exertion 4.4 (3.3), 2.2 (3.0), 1.9 (2.7). High values (7–10) for ED RAFF Scale questions showed fair discrimination for both the physical and mental component summary scores of the SF-8 and SF-36 on days 0, 7, and 45 with statistical significance ($p < 0.05$) on a minimum of three of seven questions. **Conclusions:** The ED RAFF Scale was sensitive to symptom change at days 0, 7, and 45 and showed fair correlation to the SF-8 and SF-36 Health Surveys. This scale will be a valuable clinical and research tool for ED patients presenting with RAFF.

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STANDARDIZED reporting guidelines for emergency department syncope risk stratification research

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Keywords: cardiovascular, emergency medicine, risk score, syncope

Introduction: There is increasing research interest in the risk stratification of emergency department (ED) syncope patients. A major barrier to comparing and synthesizing existing research is wide variation in the conduct and reporting of studies. Our aim was to create standardized reporting guidelines for ED syncope risk stratification research using an expert consensus process. **Methods:** We convened a panel of syncope researchers and performed a literature review to identify candidate reporting guideline elements. Candidate elements were grouped into four sections: eligibility criteria, outcomes, electrocardiogram findings, and predictors. We then conducted a two-round, modified Delphi consensus study using an Internet-based survey application. In the first round, candidate elements were rated on a 5-point Likert scale. In the second round, panelists rerated items after receiving information about group ratings from the first round. Items that were rated by > 80% of the panelists at the two highest levels of the Likert scale were included in the final guidelines. **Results:** There were 24 panelists from eight countries who represented five clinical specialties. The panel identified an initial set of 183 candidate elements. After two survey rounds, the final reporting guidelines included 92 items that achieved > 80% consensus. These included 10 items for study eligibility, 23 items for outcomes, 9 items for electrocardiogram abnormalities, and 50 items for candidate predictors. **Conclusions:** Using an expert panel process, we developed standardized reporting guidelines for ED-based syncope risk stratification studies. Adherence to these guidelines should facilitate comparison of future research in this area.

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EVIDENCE-based analgesia in the ED: a GRADE evaluation of medical literature and recommendations for practice

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Keywords: analgesia, clinical practice, emergency medicine, pain
Introduction: Acute pain is the most common complaint encountered by emergency physicians. Our objective was to synthesize and evaluate the medical literature concerning analgesia delivery using the Grading Assessment, Development and Evaluation (GRADE) framework and thereby provide substrate for the development of clinical practice guidelines of analgesic use based on graded recommendations. **Methods:** We developed seven clinically based PICO questions (patient, intervention, comparison, outcome) comparing analgesics (morphine, fentanyl, hydromorphone, NSAIDs, codeine, oxycodone) used in the management of adult acute pain. We conducted librarian-supported literature searches for each of the questions using *PubMed*, *OVID Medline*, *EMBASE*, *Cochrane*, and the *Trip* database. We screened article titles and abstracts and retrieved full-text articles that met the inclusion criteria. We used the GRADE system and its quality of evidence criteria as well as *GRADE-Pro* software to create summary of findings (SoF) tables. Each SoF table outlined the level of evidence for each question and served as the basis for making recommendations on each clinical question. **Results:** We screened 153 abstracts for eligibility, and 27 articles met eligibility criteria. The grading process supported the use of intravenous hydromorphone and fentanyl as superior to intravenous morphine for rapid and effective pain relief (weak recommendation, moderate-quality evidence). Oral NSAIDs, oxycodone, and hydromorphone are generally superior to codeine-acetaminophen combinations (weak recommendations, very low-quality evidence). **Conclusions:** Despite frequency of pain, there are limited ED-based syntheses and guidelines that compare analgesics commonly used in the ED. We have developed the first GRADE-based recommendations for improving analgesia in the ED. Going forward, these findings can be used by ED clinicians and guideline panels to evaluate and develop analgesic order sets based on specific clinical presentations and drive the research agenda in ED analgesia.

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NURSE practitioners in the emergency department: a solution to long wait times and high walkout rates?

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Keywords: clinical practice, emergency medicine, left without being seen, nurse practitioners, wait time
Introduction: Canadian emergency departments (EDs) are plagued by protracted wait times for patients stemming from heavy case loads for physicians and nurses, too often leading to patients leaving the ED without being seen. In recent years, nurse practitioners (NPs) have been incorporated into EDs in an effort to alleviate these problems and improve patient care. This project evaluated the effectiveness of incorporating NPs into an ED in New Brunswick on two key parameters: wait times and walkout rates. **Methods:** Data consisted of administrative data that were collected by the hospital. A Cox proportional hazard model was used to determine if there was any change in wait times when an NP is on duty. A binary logistic regression was performed to detect any differences in walkout rates. **Results:** Mean wait times drop from 103 minutes ($\sigma = 97.8$) to 80 minutes ($\sigma = 68.5$) when an NP is on duty. Preliminary regression analysis indicates that patients are 26.1% ($p < 0.001$) more likely to be seen in a given time period when an NP is on duty. This difference is not significant for patients with a Canadian Triage and Acuity Score (CTAS) of 1 or 2 but is substantial for patients with a CTAS score of 3 (35.3%, $p < 0.001$) or 4 and 5 (53.4%, $p < 0.001$). Mean walkout rates drop from 8.1% to 4.7% when an NP is on duty. Analysis indicates a 28% reduction in the likelihood of a patient walking out during an NP shift, although this result was only marginally significant ($p < 0.1$). **Conclusions:** NPs have increased the likelihood of CTAS level 3, 4, and 5 patients being seen in a shorter period of time. It remains unclear to what extent NPs have influenced walkout rates, and further analysis is required. Overall, NPs appear to have a positive impact on studied parameters in this ED.

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IMPACT of a new emergency department and process changes on quality indicators

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Keywords: administration, emergency medicine, left without being seen, wait times
Introduction: Emergency department (ED) wait times and left without being seen (LWBS) rates are commonly used as quality indicators for global performance. Both have been shown to have an association with increased morbidity and mortality. We examined the effect of the opening of new emergency department in an urban tertiary referral centre with new streaming processes on wait time and LWBS rate. **Methods:** The new ED has 40 separate patient rooms, compared to 27 previously, including dedicated trauma, acute, and rapid assessment zones (RAZs). Process changes included dedicated emergency physician (EP) time to RAZ, 1.4 FTE nurse practitioner (NP) coverage, and a flow nurse. Data were retrieved from the hospital patient administration system for all of 2011. Analysis was performed using ANOVA and Student *t*-tests (MS *Excel* and GraphPad *Prism*) for the 3 months before and after the opening of the new ED in 2011, excluding the 2 months during the transition, and from the same months during 2010. **Results:** There was a trend to reduction in wait times from 2010 to 2011, but with no significant change for any triage group. There was a significant reduction in monthly LWBS rates from spring 2010 (11.99%; 95% CI 7.59–16.39) to summer/fall 2011 (7.32%; 6.47–8.17%; $p = 0.0036$) and a reduction in mean daily LWBS totals before (11.98; 10.61–13.36 patients) and after (8.87; 8.06–9.67 patients; $p < 0.0001$) the intervention. **Conclusions:** Process changes including extra NP hours, a new larger ED, patient streaming, and reorganization of EP hours led to a sustained reduction in LWBS rates, despite no significant change in wait times. This cannot be wholly attributed to the opening of the new ED as there is a progressive trend beginning before the intervention.

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ARE METAL detectors reliable for the detection and localization of ingested metallic foreign bodies in children? A systematic review and meta-analysis

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Keywords: diagnosis, emergency medicine, foreign body, pediatrics, technology
Introduction: Foreign body ingestion in children is a common occurrence.[1] Most foreign bodies are radiopaque and metallic (MFB).[2] Current clinical practice for the detection of MFBs can lead to unnecessary radiation exposure, especially if serial radiographs are performed. Our objective was to determine in children suspected of having ingested a metallic foreign body (MFB), if localization using hand-held metal detectors (HHMDs) is as reliable as plain radiography. **Methods:** We performed a literature search using the National Library for Health advanced search interface. Multiple databases

(*AMED*, *BNI*, *CINAHL*, *Health Business Elite*, *HMIC*, *Medline*, *Psychinfo Cochrane*, *DARE*, *NICE*) were searched individually using MeSH terms and the term "metal detector." A hand search of references was undertaken, adding one further publication. Finally, we contacted an expert in the field. After independent screening of abstracts, papers were reviewed and scored by both authors. **Results:** Of 27 papers returned by the initial search, 11 papers had direct relevance to the question, had appropriate methodology, scored over 10 on a QUADAS scale, and were included by consensus in our meta-analysis (Meta-DiSc version 1.4). The pooled sensitivity was 95% (95% CI 92–97%), and specificity was 93% (87–97). Pooled likelihood ratios (LRs) showed an LR+ 9.8 (95% CI 5.6–17.2) and an LR– 0.08 (0.03–0.18). **Conclusions:** The current evidence indicates that the use of HHMDs is a safe, quick, and cost-effective method to locate ingested MFBs in children but may not be as accurate as plain radiography to independently rule out a swallowed MFB. We recommend that a combined approach between HHMDs and plain radiography be used. 1. Bronstein AC, et al. *2009 annual report of the American Association of Poison Control Centers' National Poison Data System*. 2009. 2. Connors GP. *Medscape website*. http//:emedicine.medscape.com/article/801821-overview.

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ACCURACY of nurse practitioner–performed ultrasound for the detection of soft tissue foreign bodies

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Keywords: diagnostic technologies/imaging, emergency medicine, foreign bodies, nurse practitioners

Introduction: Undetected soft tissue foreign bodies (FBs) can cause delayed wound healing. Initial wound care is often performed by nurse practitioners (NPs). This study aimed to evaluate the accuracy of emergency NP-performed point of care ultrasound (POCUS) for the detection of soft tissue FBs. **Methods:** Following a 2-hour training session, 10 NPs were assessed on their ability to detect various FBs in an experimental model. FBs (wood, metal, and plastic) were inserted randomly into eight experimental models (uncooked chicken thighs) by an independent observer. Control experimental models had no FB inserted, but all had a 1 cm incision made on their surface. NPs, blinded to the type of model, were then assessed on their ability to detect the FBs by ultrasound examination using high-frequency linear transducers (Toshiba Nemio). Models were also scanned by two experienced emergency physicians (EPs) as a further control. **Results:** Overall, NP-performed POCUS detected 47 of the 60 FBs with a sensitivity, a specificity, and positive and negative predictive values of 78.3%, 50%, 82%, and 43%, respectively, compared with 83.3%, 75%, 90.9%, and 60% for EPs. Sensitivity for detecting specific types of FBs was 95%, 85%, and 50% for wood, metal, and plastic, respectively, for NP-performed POCUS, compared with 100%, 100%, and 50% in the EP group. **Conclusions:** With relatively short focused training, NPs with no previous ultrasound experience can detect soft tissue FBs with accuracy comparable to that of EPs in an experimental model. Test sensitivity was high for wood and metal FBs. Specificity was generally low. NP-performed POCUS for detection of FBs needs to be evaluated further in a clinical setting before recommending this as an extension of practice.

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IMPACT of an asthma pathway on time to corticosteroid administration

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Keywords: asthma, corticosteroids, emergency medicine, pediatrics

Introduction: The objective is to compare the time between arrival and corticosteroid administration in patients treated with an asthma pathway (AP) or with standard management (SM) in a pediatric emergency department (ED). **Methods:** Chart review of children aged 1 to 17 years diagnosed with asthma, bronchospasm, or reactive airways disease seen in the ED of a tertiary care pediatric hospital. For a 1-year period, 20% of all visits were randomly selected. We reviewed patients eligible to be treated with the AP (18 months with previous history of asthma and no other pulmonary condition) and who received at least one inhaled bronchodilator treatment. Charts were evaluated by a data abstractor blinded to the study hypothesis using a standardized data sheet. The primary outcome was the time from arrival to corticosteroid administration. The secondary outcome was length of stay. A Mann-Whitney test was used to compare the two groups. Interrater agreement was measured in 10% of the eligible charts by intraclass correlation (ICC). Evaluation of 20% of all ED visits was estimated necessary to yield at least 200 patients eligible. **Results:** Among the 2,952 visits, 591 were randomly selected. From these, 216 visits were eligible: 41 (19%) treated with AP and 175 (81%) with SM. Median time between arrival and corticosteroid administration in AP was 66 (IQR 47, 97) minutes compared to 90 (IQR 58, 123) for SM ($p = 0.02$). Median LOS for patients in AP was 263 (IQR 219, 420) minutes compared to 283 (IQR 206, 384) for SM ($p = 0.99$). The patients of the AP were older, were more often seen by a medical student or resident first, had a lower saturation at triage, were more often treated with ipratropium in the ED, and were discharged more often with antibiotics. ICC for the primary outcome was 0.99. **Conclusions:** Corticosteroids were administered more rapidly if the AP was used, but this had no effect on LOS. Biases inherent in the uncontrolled study design may have limited the impact of the AP, probably because patients were sicker in that group.

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ULTRASOUND-GUIDED peripheral intravenous catheter placement: a systematic review and meta-analysis of trials

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Keywords: diagnostic technologies/imaging, emergency medicine, peripheral intravenous cannulation, ultrasound

Introduction: Peripheral intravenous cannulation (PIVC) is one of the most frequently performed in-hospital medical procedures. It can be a technically difficult procedure for health care workers and is painful for patients. First-attempt success rates for PIVC using the traditional method leave much room for improvement. Our objective was to evaluate ultrasound (US) guidance as an aid to PIVC with a systematic review and meta-analysis. **Methods:** We searched for published and unpublished trials using *Medline*, *Cochrane Central Register of Controlled Trials*, *EMBASE*, *CINAHL*, *Web of Science*, ClinicalTrials.gov, and Google.ca. We included trials for meta-analysis if they had a randomized or quasirandomized design, evaluated US-guided PIVC, and reported on one of four primary outcome measures. Primary outcome measures were success or failure of PIVC, number of attempts to successful PIVC, time from study enrolment or IV order to successful PIVC, and procedure time. Two blinded reviewers assessed trials for eligibility and extracted data from the included studies. Study quality was assessed using the Jadad scale and the Cochrane Risk of Bias Tool. Data were combined with mean differences or relative risk ratios using a random-effects

model. **Results:** Eight studies were included for meta-analysis. Three studies had a high risk of bias, three had a low risk of bias, and two had an uncertain risk of bias. Meta-analysis of six trials found that US guidance significantly decreased the number of attempts required for adult PIVC by 0.96 (95% CI –1.74, –0.18, I2 = 83%). US did not significantly improve other adult PIVC outcomes. Evidence from two pediatric trials suggests that US-guided PIVC may decrease attempts and procedure times in this population. **Conclusions:** US-guided PIVC of adults takes fewer attempts than the traditional method. Early evidence suggests that US guidance may decrease attempts and procedure times in the pediatric population. More trials with proper randomization methods and allocation concealment are needed.

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DECREASE in medevacs and overall transportation to a regional emergency department with implementation of territorial picture archiving and communication system

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Keywords: communication, emergency medical services, emergency medicine, patient transportation

Introduction: Patient transportation from remote locations to regional centres is a costly reality in providing emergency medical care in northern Canada. A retrospective analysis of 2008–2009 urgent patient transport to Stanton Territorial Hospital's Emergency Department (STH ED) revealed 450 medevacs in a 1-year period costing $2.7 million. Subsequently, a territory-wide picture archiving and communication system (PACS) was implemented. It was hypothesized that access to PACS from remote health centres would decrease transfer rates to the emergency department in Yellowknife. **Methods:** Using data from the Northwest Territories Department of Health and Social Services, all medevacs (average cost $5,000), scheduled and chartered flights, and ambulance or taxi road transfers (average cost $350) to the STH ED were reviewed. Transfer rates were compared using the chi-squared statistic. Subsequent subgroup analyses of transfers for orthopedic/trauma patients were conducted. Other subgroup proportions were recorded and reported. **Results:** There were 382 medevacs to STH ED from April 2010 to April 2011, and an additional 72 patients were sent either by scheduled or chartered flight or by road. The total number of medevacs declined by 15% 2 years after PACS implementation. This represents a significant decrease in the proportion of medevacs versus scheduled flights, charters, or by road ($p = 0.005$). Orthopedic/trauma and plastic surgery transfers declined from 136 to 83. There was no statistical significance between mode of travel pre- and post-PACS for these patients ($p = 0.22$). **Conclusions:** Implementation of PACS was associated with a decrease in emergency patient transfers. Furthermore, an increase in the proportion of less expensive scheduled flights and charters versus medevacs was observed. Remote to regional PACS can significantly reduce urgent transfers, potentially resulting in substantial cost savings for health care organizations.

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TRANSPORT outcomes and dispatch determinants in a novel expanded scope paramedic–long-term care program

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Keywords: emergency medical services, emergency medicine, long-term care patients, triage

Introduction: Long-term care (LTC) patients with acute illnesses or injuries are usually sent to emergency departments (EDs) by ambulance. In a recently implemented extended care paramedic (ECP) program, specially trained paramedics manage LTC patients on site. The study objective was to describe dispatch determinants and transport dispositions used for LTC patients managed by ECP versus emergency crews. **Methods:** This observational study was conducted in an urban centre with a single EMS system. EMS data were collected for all calls to 15 LTC facilities (03/15/2011–06/15/2011). Dispatch determinants and transport rates were identified for both ECP and emergency crews, and absolute risk reduction (ARR) of transport with ECP was calculated. Unexpected relapse emergency calls for patients not transported for a related reason ("bounce-back") were determined. **Results:** A total of 238 calls were received, 140 attended to by ECP (58.6%) and 98 by emergency paramedics (41.2%). The three most frequent dispatch determinants were the same for ECP and emergency paramedics: sick person: $n = 80$, 51 ECP managed (63.7%); falls: $n = 47$, 29 ECP managed (69.0%); and breathing problems: $n = 30$, 18 ECP managed (60%). The overall distribution of dispatch determinants and acuity levels differed between ECP and emergency crews (Pearson chi-squared, both $p = 0.03$). Transport outcomes for ECP calls were 98 treat and release (70.0%), 9 urgent ambulance transport (6.4%), and 33 ECP-arranged transfer (23.6%). Transport outcomes for emergency paramedic calls were 21 no transport (21.4%) and 77 transport to ED (78.6%). The ARR of transport with ECP is 48.7% (95% CI 34.9–58.7%). Six bounce-backs occurred after ECP treat and release (4.3%) and none after emergency paramedics nontransport. **Conclusions:** In this novel paramedic-LTC collaborative program, ECP involvement in LTC calls was found to reduce transports to emergency with low overall bounce-back.

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IMPLEMENTATION and operation of a novel paramedic–long-term care program

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Keywords: emergency medical services, emergency medicine, long-term care patients, program implementation

Introduction: An extended care paramedic (ECP) program has been recently implemented to provide emergency care on site to urban long-term care (LTC) patients suffering acute illnesses or injuries. In this unique program, a single paramedic responds and develops a tailored care plan with physicians, LTC staff, and the patient, and the patient is often not transported to hospital. The study objective was to identify insights gained and lessons learned during implementation and operation of such a program and to explore the experiences of the ECPs in this novel role. **Methods:** In this qualitative study, the perceptions and experiences of various stakeholders were explored. A semistructured interview guide was used, and focus groups were recorded and transcribed verbatim. Two investigators conducted thematic analysis to identify emerging themes and related codes. **Results:** Twenty-one participants took part in four homogeneous focus groups: paramedics and dispatchers: $n = 7$; ECPs: $n = 6$; physicians: $n = 3$; managers: $n = 5$. Mean age was 41 years, with a mean of 14 years of emergency medical services experience. The key themes and related codes were 1) program implementation: why paramedics in this role, ECP characteristics, ECP training, and breaking traditional practice; 2) ECP process of care: differences between ECP and traditional roles, the ECP approach, alternative delivery of care, ECP decision making, time on calls, and expectations of ECPs; 3) communications: ECPs liaise communications, ECP communication with patient and family, ECP and LTC staff

communications, paramedic and LTC staff communications; and 4) end-of-life care: right decision for the patient, ECP preparation for end-of-life cases, end-of-life discussions, influence of advanced directives. **Conclusions:** In this qualitative study, it was discovered that this ECP program has implications for paramedic education and EMS system operations, and ECPs have a role to play in end-of-life care, which is novel for paramedic practice.

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CLINICAL characteristics associated with significant carotid imaging in transient ischemic attack patients presenting to the emergency department

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Keywords: carotid imaging, emergency medicine, neurosciences, transient ischemic attack

Introduction: Better outcomes with early surgery for symptomatic carotid stenosis highlight a need to prioritize imaging of transient ischemic attack (TIA) patients. This study compared features of TIA patients with and without significant abnormalities on carotid imaging. **Methods:** We prospectively enrolled adult TIA patients in eight EDs over 5 years. We followed patients by telephone and medical records for 90 days. Significant carotid abnormalities were defined as stenosis > 50% or dissection by catheter angiography, CTA, MRA, or Doppler. We conducted logistic regression for adjusted odds ratios (ORs) and 95% confidence intervals (CIs). **Results:** We enrolled 3,704 patients, of whom 3,069 (82.9%) underwent carotid imaging. Overall, 2,580 (69.7%) had no significant carotid abnormalities and 489 (13.2%) had significant carotid abnormalities. Aphasia, confusion, dysarthria, vertigo, and SBP ≥ 160 mm Hg were present in 22.7%, 10.2%, 9.8%, 8.7%, and 44.8% of patients with significant carotid abnormalities, respectively, versus 17.6%, 14.8%, 8.4%, 12.7%, and 39.1% of patients without significant abnormalities; the corresponding adjusted ORs (95% CI) were 1.1 (0.8–1.5), 0.5 (0.4–0.8), 0.8 (0.5–1.2), 0.7 (0.5–1.0), and 1.2 (1.0–1.5). Hypertension, coronary artery disease (CAD), diabetes, previous carotid stenosis, and dyslipidemia were present in 73.5%, 32.5%, 26.9%, 15.3%, and 46.0% of patients with significant carotid abnormalities, respectively, versus 57.3%, 15.5%, 18.0%, 2.0%, and 32.0% of patients without significant abnormalities; the corresponding ORs (95% CI) were 1.6 (1.2–2.0), 1.6 (1.2–2.1), 1.1 (0.9–1.5), 6.5 (4.3–10.0), and 1.3 (1.0–1.7). **Conclusions:** TIA patients with aphasia, SBP ≥ 160 mm Hg, hypertension, CAD, dyslipidemia, or previous carotid stenosis were more likely to have significant carotid artery abnormalities. Patients with confusion or vertigo were at lower risk. Given the magnitude of these abnormalities, we suggest maintaining the current recommendation for urgent carotid imaging for all TIA patients as part of their risk stratification.

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RAPID ultrasound diagnosis of heart failure in patients with acute dyspnea

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Keywords: diagnostic technologies/imaging, dyspnea, emergency medicine, heart failure, ultrasound

Introduction: Lung ultrasound (US) is used increasingly in the diagnosis of a number of pulmonary diseases. One application is the assessment of interstitial lung fluid in heart failure (HF). The presence of bilateral B-lines ("comet tails") on lung US has been reported to be consistent with HF. If these findings are reproducible by emergency department (ED) clinicians, ultrasound would become an important diagnostic tool in caring for patients with acute dyspnea. **Methods:** Within an ongoing research program to develop a clinical decision rule for assessing ED patients with dyspnea related to HF or COPD, lung US was performed. Research assistants captured images from eight zones on the chest using a 3.5 MHz curvilinear probe. These images were read in a blinded format by two ED physicians trained in US. The interpretation was coded as diagnostic for HF (≥ 3 B-lines in at least one zone each lung) or not diagnostic for HF (< 3 B-lines or indeterminate scan). The final clinical diagnosis was adjudicated by a different ED clinician based on the chest x-ray report and/or the discharge diagnosis. **Results:** We recruited 37 participants. Their mean age was 76 years (range 50–90), of whom 22 (59%) were female and 24 (65%) were admitted. HF was the final clinical diagnosis in 20. COPDE was the diagnosis in 15 of the remaining 17. The sensitivity of US for HF was 80% (95% CI 56, 93), and the specificity was 88% (95% CI 66, 98), with strong interobserver agreement (kappa 0.78; 95% CI 0.58, 0.98). The two false positives had final diagnoses of bilateral pneumonia and cor pulmonale. Associated likelihood ratios (and 95% CIs) were positive LR 6.80 (1.81, 25.46) and negative LR 0.23 (0.09, 0.55). **Conclusions:** These findings suggest that lung US may provide an accurate bedside assessment tool in differentiating the etiology of acute dyspnea in the ED. Our ongoing research will assess the precision and reproducibility of these estimates in larger populations of patients and clinicians.

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A PROSPECTIVE cohort study to derive the Canadian TIA score for identification of subsequent stroke risk within 7 days

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Keywords: clinical decision rule, emergency medicine, neurosciences, transient ischemic attack

Background: The occurrence of a transient ischemic attack (TIA) increases an individual's risk for stroke. The goal of this study was to derive a clinical score for TIA patients to identify those at high risk for stroke ≤ 7 days. **Methods:** We conducted a prospective cohort study in eight academic Canadian EDs. We enrolled consecutive adult ED patients diagnosed with a TIA. Standardized clinical variables were recorded by physicians on data forms prior to discharge/admission. Our primary outcome was stroke ≤ 7 days of TIA diagnosis. We derived a clinical score using logistic regression analysis. **Results:** We prospectively enrolled 3,331 patients including 73 patients with a subsequent stroke ≤ 7 days. From this cohort, we derived the Canadian TIA Score. The Canadian TIA Score identifies patients at minimal risk of subsequent stroke ≤ 7 days (probability < 0.5%), low risk (0.5–2.5%), high risk (2.6–10.0%), and critical risk (> 10.0%). This score contains 10 variables, 5 from history: 1) initial TIA (in lifetime) lasting ≥ 30 minutes, 2) already on ASA, 3) gait disturbance, 4) unilateral leg weakness, and 5) vertigo; two on examination: 1) initial diastolic blood pressure ≥ 100 mm Hg, 2) dysarthria and three from investigations: 1) atrial fibrillation on electrocardiogram, 2) infarction on CT head, 3) platelets ≥ 500 × 1,000,000,000/L. Variables were assigned point values ranging from 4 to –3 and added, obtaining a score from –3 to 19. This model has very good discrimination with a c-statistic of 0.79 (95% CI 0.74–0.84). **Conclusions:** The Canadian TIA Score identifies the subsequent stroke risk at 7 days following a TIA. Following validation, the Canadian TIA

Score will allow physicians to selectively expedite investigations/specialist assessment and allow for safe, less urgent follow-up of patients at low risk. Patients currently classified as high or critical risk should be strongly considered to get advanced care during their ED visit (ie, carotid imaging and/or immediate specialist consultation).

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PUBLIC online posting of emergency department and urgent care centre wait times: an evaluation of accuracy and impact on visit volumes

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Keywords: emergency medicine, informatics, public, wait times

Introduction: In July 2011, Calgary began posting public online wait time (OWT) estimates for emergency departments (EDs) and urgent care centres (UCCs). The goal was to help patients decide where to seek care and increase awareness of non-ED options. Wait estimates, updated every 2 minutes, are derived from real-time data (recent wait times, new registrations, MD staffing, and EMS arrivals expected). Our objective was to compare estimated waits to actual waits and assess the impact of online wait times on ED and UCC use. **Methods:** This administrative database study was performed at four Calgary EDs and two UCCs. Online wait time estimates and actual wait times were captured from all six sites and stratified by period of day (12 am–8 am, 8 am–noon, noon–4 pm, 4 pm–8 pm, 8 pm–12 am). Data were collated for three 15-week intervals: before, after, and 1 year prior to OWT implementation. **Results:** Average online ED wait estimates ranged from 85 minutes (during the 8 am–noon period) to 132 minutes (8 pm–12 am). Actual ED waits were, on average, 36% lower than posted estimates, ranging from 64 minutes (12 am–noon) to 101 minutes (8 pm–12 am). Posted UCC wait estimates ranged from 84 minutes (8 am–noon) to 131 minutes (8 pm–12 am). Actual UCC waits were 9% higher than posted estimates, ranging from 82 minutes (8 am–noon) to 129 minutes (noon–4 pm). During all time intervals, online estimates and actual waits were shorter for EDs than UCCs. After OWT activation, ED volumes rose by 2.6%, whereas UCC volumes fell by 5.9%. Compared to the period 1-year before, ED volumes increased by 13.2% and UCC volumes rose by 0.2%. No changes were seen in EMS arrival rates, ED or UCC acuity mix, low-acuity patient distribution, or hospital admission rates. **Conclusions:** Public access to ED and UCC wait time estimates were associated with an increase in ED use and a decrease in UCC visits. This may be the result of patients seeking shorter waits.

5595

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IMPACT of airline travel on outcome in NHL and NFL players immediately postconcussion: increased recovery times

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Keywords: emergency medicine, head injury, neurosciences, sport, travel

Introduction: Air travel may be associated with unmeasured neurophysiologic changes in an injured brain that may impact postconcussion recovery. No study has compared impact of commercial air travel on acute concussion injuries despite rather obvious decreased oxygen tension and increased dehydration impact on acute mTBI. **Objectives:** To determine if air travel within 4 to 6 hours of concussion is associated with increased recovery time in professional hockey (NHL) and football (NFL) players. **Methods:** Prospective cohort study of all active-roster NHL and NFL players during the 2010–2011 seasons. Internet website review of league sites for injury identification of concussive injury and when player returned to play solely for mTBI. Team schedules and flight times included only players who flew immediately following a game (within 4–6 hours). Players with multiple injuries were excluded. **Results:** In the 2010–2011 seasons, 223 players experienced a concussion: NFL, 122 (7.2%), and NHL, 101 (13.0%) (percentage of total players). Of these, 68 NFL (57%) and 39 NHL (39%) concussed players flew within 6 hours of the incident injury. Mean distance flown was shorter for NFL, 850 miles (SD 576), versus NHL, 1,060 miles (SD 579). Mean games missed for NFL and NHL players who traveled by air immediately after concussion were increased by 29% and 24% (respectively) than those who did not travel by air: NFL, fly 3.8 games missed (SD 2.2) versus no fly 2.6 (SD 1.8), and NHL, fly 16.2 games missed (SD 22.0) versus no fly 12.4 (SD 18.6); $p < 0.03$. **Conclusions:** This is an initial report of an increased rate of recovery in terms of more games missed for professional athletes flying commercial airlines post-mTBI. The obvious changes of decreased oxygen tension with altitude equivalent of 7,500 feet, decreased humidity with increased dehydration, and duress of travel accompanying pressurized airline cabins all likely increase the concussion penumbra in acute mTBI. Early air travel postconcussion should be further evaluated and likely postponed 48 to 72 hours until initial symptoms subside.

5596

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IMPLEMENTATION of an overcapacity protocol improves emergency care access and patient flow in the Calgary Health Region

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Keywords: administration, crowding, emergency medicine, overcapacity protocol

Introduction: In December 2010, Alberta Health Services (AHS) implemented a province-wide hospital overcapacity protocol (OCP) structured on the Viccellio model. OCP is triggered if ED occupancy is > 110%, 35% of ED stretchers are blocked by patients awaiting inpatient bed or disposition decision, and no stretcher is available for arriving CTAS 2 to 3 patients. When these criteria are met, boarded patients are moved rapidly on a no-refusal basis to an inpatient unit (nontraditional space if no bed available). Our objectives were to determine OCP impact on ED length of stay (LOS) for admitted patients, ED wait times, EMS offload success, and left without being seen (LWBS) rates. **Methods:** A before-after experimental study was conducted using prospectively gathered administrative data from Calgary's three adult emergency departments. We compared an 8-month period (Feb 1–Sept 30) in 2010 to the corresponding period in 2011. Data were captured in real time and collated from the Regional Emergency Department Information System (REDIS). **Results:** Patient age, acuity distribution, EMS arrival rates, and admission rates remained constant during the before and after phases, but ED volumes increased by 8.6% from 583 to 633 patients/day at the three sites. After OCP implementation, mean ED LOS for admitted patients decreased by 38% from 16.9 hours to 10.5 hours (Δ = 6.4 hours; 95% CI 5.0–8.1) and mean number of admitted patients boarding at 10 am declined by 58% from 17.5 to 7.4 (Δ = 10.1; 95% CI 7.5–13.3). Average time from CTAS 3 arrival to MD assessment decreased by 20% from 147 minutes to 118 minutes (Δ = 29 minutes; 95% CI 23.6–42.1), whereas LWBS rates for CTAS 1 to 3 patients fell by 45% from 4.7% to 2.6% (Δ = 2.1%; 95% CI 1.6–2.8). EMS offload success within 30 minutes increased from 58.3 to 80.7%

(Δ = 22.4%; 95% CI 16.9–27.8). Effects differed slightly between sites, but improvements were sustained over time. **Conclusions:** Despite substantial increases in ED inflow, OCP implementation was associated with significant improvements in ED wait times, boarding numbers, and ED LOS.

5602

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THE CANADIAN National Emergency Medical Services (EMS) research agenda: a mixed methods consensus study

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Keywords: emergency medical services, emergency medicine, research

Introduction: Research is essential for the development of evidence-based Canadian EMS systems. When resources are scarce and the gaps large, a national agenda may guide growth. This mixed methods consensus study explores current barriers to and existing strengths of Canadian EMS research, provides recommendations, and identifies research topics of priority interest. **Methods:** Purposeful sampling was employed to invite EMS research stakeholders from across various institution types across the country. Study phases consisted of 1) baseline interviews of a subsample, 2) roundtable discussion, and 3) Delphi survey. Data from the roundtable were developed into a three-round online Delphi consensus survey, in which participants scored each item for importance. Consensus was defined a priori as 80% scored a statement "important" or "very important." **Results:** Fifty-three participants consented: 36 paramedics, 16 physicians, and 1 nurse, which represented researchers (37.7%), EMS administrators/regulators (22.6%), front-line clinicians (20.7%), educators (17.0%), and an emergency management administrator (0.02%). Participation rates across study phases were 1) interviews, 13 of 13 (100%); roundtable, 47 of 53 (89%); survey round 1, 50 of 53 (94%); round 2, 47 of 53 (89%); round 3, 40 of 53 (75%). There were 141 statements identified as important: 20 barriers; 54 strengths/opportunities; 31 recommendations; and 36 priorities. Recommendations were amalgamated where appropriate and categorized as time, opportunities, and funding (n = 5); training, education, and mentorship (n = 5); culture of research and collaboration (n = 6); and structure, process, and outcome of research (n = 4). Research priorities were amalgamated and categorized as clinical (n = 7); health systems (n = 8); education (n = 4); safety (n = 3); and professional development (n = 3). **Conclusions:** This study established consensus-based key messages that may inform the strategic direction to be used on a local, regional, and national level to further advance the Canadian EMS research enterprise.

5607

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INTUBATION success before and after intensive airway education

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Keywords: airway, education, emergency medical services, emergency medicine, intubation

Introduction: Advanced airway management by paramedics may be lifesaving but carries risk. Previous studies on this education intervention demonstrated improvement in paramedic performance on written and scenario examinations and increased confidence. This study sought to determine the impact of an intensive paramedic airway management education intervention on real-world intubation success. **Methods:** The 10-hour course was taken by all ALS paramedics in our provincial system (2009/04–08, n = 395). The electronic charting database was queried for attempts and successful intubations during 12 months prior to the intervention, the months of teaching, and 12 months post. The primary outcome is difference in success pre- and postintervention. The secondary outcome is number of attempts per patient. Monthly rates were used to set up an x-matrix such that the model could be fit using linear regression, testing the rate of change before the intervention, because of the intervention, and after. A sample size of 476 in each of pre and post was required to detect a 10% improvement. **Results:** A total of 858 intubation events occurred preintervention, 818 post, and 174 during teaching; 153 events were excluded as success was unknown. Intubation success in the pre- and postintervention periods was shown to be static. Intubation success improved during the intervention, from 0.67 (95% CI 0.64, 0.71) to 0.75 (95% CI 0.72, 0.78)—a difference of 0.076 (95% CI 0.03, 0.12) (p = 0.001). The number of attempts decreased from 1.40 to 1.27 (p = 0.005). Limitations include missing success data, self-reporting, and lack of clear definition of an attempt. **Conclusions:** This education intervention has made a significant improvement to patient outcomes. Sustained improvement is seen in intubation success, along with a decrease in attempts suggesting improved judgment. Along with previous work, this supports the value of continuing education to improve quality and safety of airway management by paramedics.

5608

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EARLY serum levels of glial fibrillary acidic protein (GFAP) are associated with global outcome at 1 month postinjury in mild and moderate traumatic brain injury

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Keywords: biochemical markers, emergency medicine, head injury, injury/trauma

Introduction: Glial fibrillary acidic protein (GFAP) is found in glial cells and is specific to the central nervous system. This study compared levels of GFAP from patients with mild and moderate TBI (MMTBI) with good and poor outcome at 1 month postinjury. **Methods:** This prospective cohort study enrolled adult patients presenting to the emergency department (ED) of a tertiary care Level 1 trauma centre following blunt head trauma with a GCS of 9 to 15. Blood samples were obtained in all patients within 4 hours of injury and measured by ELISA for GFAP (ng/mL ± SEM). Patients were assessed in person at 1 month postinjury. The main outcome was measured using the traditional dichotomization of GOS at 1 month postinjury. Poor outcome was defined as death, vegetative state, or severe disability, and good outcome was moderate disability or good recovery. **Results:** There were 35 MMTBI patients included in the analysis: 33 with a GCS of 13 to 15 and 2 with a GCS of 9 to 12. The mean age of TBI patients was 39 years (range 19–68), with 63% males. Ten patients (29%) had poor outcome at 1 month postinjury. Mean serum GFAP-BDP levels obtained within 4 hours of injury were 0.071 (0.260) in those with good outcome and 2.162 (0.777) in those with poor outcome (p = 0.039). The AUC for distinguishing good versus poor outcome was 0.76. **Conclusions:** Early levels of GFAP measured in the emergency department within 4 hours of injury were able to distinguish good versus poor outcome at 1 month postinjury. These results need further study in a larger cohort.

5610

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BREAKING down silos: building better advance directives

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Keywords: advance directives, emergency medical services, emergency medicine

Introduction: Silos separate those who write advance directives (ADs), those who use them, and those who can make them accessible, particularly out of hospital. This project sought to achieve consensus on content and access among these stakeholders. **Methods:** The content of local ADs was catalogued. A systematic literature review explored practice in other jurisdictions. From this, a candidate list was devised for an online three-round Delphi survey, in which participants scored each item on utility when providing care in an emergency. Physicians, nurses, and paramedics across the province were invited to form a panel. Consensus was defined as items scored "important" or "very important" by 80% or more of participants. Snowball method brought together stakeholders and technical experts to discuss access, exploring opportunities, challenges, and a locally viable solution. **Results:** Forty-four participants took part: 28 paramedics, 7 physicians, and 9 nurses. Participation in round 1 was 89%; in round 2, 87%; and in round 3, 82%. The participants achieved consensus for importance on 46 content items, focused on demographics, care team, airway/breathing/circulation, other specific treatments, and structure/language. Review ensured that the unbalanced panel did not skew results. A focus group of end-users and technical experts highlighted challenges in the out-of-hospital setting, including grey areas when health professionals will be unknown to the individual, challenges at schools, variability in long-term care facilities, and communication out of hospital or between agencies. Standardization, communication, and education of providers and public were opportunities. An electronic database such as the in-house "special patient program" was recommended to address many of these issues. **Conclusions:** This study achieved consensus among end-users on actionable recommendations regarding content and accessibility of AD. These results provide an implementable strategy to address challenges in providing care respectful of AD in diverse settings.

5611

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PREVALENCE of bicycle helmet use by users of public bicycle sharing programs

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Keywords: bicycle helmets, emergency medicine, injury/trauma, prevention, public health

Objective: Public bicycle sharing programs are becoming increasingly common in the United States and around the world. These programs make bicycles accessible for hourly rental to the general public. We sought to describe the prevalence of helmet use among adult users of bikeshare programs and users of personal bicycles in two cities with recently introduced bicycle sharing programs (Boston, Massachusetts, and Washington, DC). **Methods:** We performed a prospective observational study of adult bicyclists in Boston, MA, and Washington, DC. Trained observers collected data during various times of the day and days of the week. Observers recorded the gender of the bicycle operator, type of bicycle, and helmet use. All bicycles that passed a single stationary location in any direction for a period of between 30 and 90 minutes were recorded. **Results:** There were 43 observation periods in two cities at 36 locations. A total of 3,073 bicyclists were observed. There were 562 (18.2%) bicylists riding bikeshare bicycles. Overall helmet use was 45.5%, although helmet use varied significantly with gender, day of use, and type of bicycle. Bikeshare users were helmeted at a lower rate compared to users of personal bicycles (19.2% v. 51.4%). Logistic regression, controlling for type of bicycle, gender, day of week, and city, demonstrated that bikeshare users had higher odds of riding unhelmeted (OR 4.34, 95% CI 3.47–5.50). Women had lower odds of riding unhelmeted (OR 0.62, 0.52–0.73), whereas weekend riders were more likely to ride unhelmeted (OR 1.32, 1.12–1.55). **Conclusions:** Use of bicycle helmets by users of public bikeshare programs is low. As these programs become more popular and prevalent, efforts to increase helmet use among users should increase.

5618

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CONSTRUCT and outcome validity of CTAS chest pain

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Keywords: administration, chest pain, emergency medicine, triage

Introduction: The Canadian Triage and Acuity Scale (CTAS) includes a standardized presenting complaint list with selected modifiers and acuity levels for each complaint. Chest pain, cardiac (CPC) features restricts the acuity range to level 1 or 2 to limit delays in identifying and managing patients with acute coronary syndrome (ACS). Chest pain, noncardiac (CPNC) permits the assignment of any acuity levels (from 1 to 5). This study addresses the construct and outcome validity of these designations as they relate to ACS patients. **Methods:** Demographics; date and time in minutes of triage, MD, ECG; and troponin levels were extracted for all adult chest pain visits to ED in Edmonton, AB, during 2010. Medians and interquartile ranges (IQRs) are presented and compared using Mann-Whitney *U* tests. **Results:** Time from triage to ECG for CPC was 15 (IQR 8, 92) minutes for CTAS 1 and 24 (IQR 15, 43) minutes for CTAS 2 ($p = 0.137$). Time from triage to MD was 77 (IQR 40, 159), 81 (IQR 40, 171) and 130 (IQR 67, 218) minutes ($p < 0.0001$), and time from triage to first troponin was 73 (IQR 39, 120), 75 (IQR 39, 119), and 121 (IQR 62, 201) minutes ($p < 0.0001$) for CPC level 2, CPNC level 2, and CPNC level 3 patients, respectively. CPC designation resulted in twice as many AMI-positive troponin values (> 0.3 ng/dL) (712 v. 346) and admissions for ACS (11.0% v. 1.0%) than CPNC designation. **Conclusions:** Patients identified as CPC had routine ECGs performed, faster MD assessment, and troponin sampling and more troponin-positive ACS patients identified. This study appears to support the validity of complaint-based design of CTAS as it relates to chest pain symptoms. Future research on the construct and outcomes validity of other common CTAS complaints appears warranted.

Moderated Poster

5424

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REFERRAL to a community program for youth injured by violence: a feasibility study

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Keywords: emergency medicine, injury/trauma, youth violence

Introduction: Youth violence is an immense burden in Canada. Violence is a recurring condition; approximately 40% of youth injured by violence will be reinjured within the next year. The objective of this

study was to assess the feasibility of referring youth injured by violence to community-based intervention programs. **Methods:** Youth presenting to St. Michael's Hospital Emergency Department and Trauma Service were approached to participate in the study. Information about the study was conveyed using a computer tablet. Youth completed an online baseline survey. If a youth consented to participation, a research coordinator linked the youth with their chosen community partner. **Results:** Sixty youth (27% of eligible patients) were approached and 20 (33%) chose to participate. Ninety-two percent were male, and the average age was 19.3. In the prior 6 months, 76% of participants had been in a physical fight, with 57% of all participants having visited a doctor for a fight-related injury. Fourteen youth (70% of enrolled) chose a community program; however, five were unable to be contacted the following day to facilitate the referral. **Conclusions:** This feasibility study demonstrates the complexity of recruiting and referring a high-risk population to community resources. The results from this study will be used to develop a larger study to determine the effectiveness of these referrals in reducing future intentional injury. This process evaluation will inform future interventions that are planned.

5430

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TEACHING emergency medicine skills: is a self-directed, independent, online curriculum the way of the future?

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Keywords: curriculum, education/teaching, e-learning, emergency medicine

Introduction: Procedural competence is critical to emergency medicine, but the ideal method to acquire these skills is unclear. Online tutorials may be as effective as didactic sessions at teaching specific procedural skills. We studied whether a novel online curriculum teaching pediatric intraosseus (IO) line insertion to novice learners is as effective as a traditional classroom curriculum in imparting procedural competence. **Methods:** We conducted a randomized, controlled educational trial of two methods of teaching IO skills. Preclinical medical students with no past IO experience completed a written test and were randomized to either an online or classroom curriculum. The online group (OG) were given access to a website and instructed to spend 30 minutes with the material, whereas the didactic group (DG) attended a lecture of similar duration. On a separate day, participants attended a self-directed manikin practice session without any further instruction. A videotaped objective structured clinical examination (OSCE) and written test were completed immediately following this session. Finally, participants were crossed over into the alternate curriculum and given a satisfaction survey that compared the two curricula. Results were compared with a paired *t*-test for written scores and an independent *t*-test for OSCE scores. **Results:** Sixteen students completed the study. Precourse test scores of the two groups were not significantly different prior to curricular assignment (mean scores of 32% for OG and 34% for DG, respectively; $p > 0.05$). Postcourse written scores were also not significantly different (both with a mean of 76%; $p > 0.05$); however, for the postcourse OSCE scores, the OG group scored significantly higher than the DG group (mean scores of 92.6% and 88.1%; $t(14) = 1.76$, $p < 0.05$). **Conclusions:** This novel online curriculum was superior to a traditional didactic approach to teaching pediatric IO line insertion. EM educators should consider adopting online teaching of procedural skills.

5433

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WHAT electrocardiogram (ECG) diagnoses and/or findings do residents in emergency medicine need to know?

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Keywords: education/teaching, electrocardiogram, emergency medicine

Introduction: Although emergency physicians must often make rapid decisions that incorporate their interpretation of an ECG, there is no evidence-based description of ECG interpretation competencies for emergency medicine (EM) trainees. The first step in defining these competencies is to develop a prioritized list of ECG findings relevant to EM contexts. The purpose of this study was to categorize the importance of various ECG diagnoses and/or findings for the EM trainee. **Methods:** We developed an extensive list of potentially important ECG diagnoses identified through a detailed review of the cardiology and EM literature. We then conducted a three-round Delphi expert opinion-soliciting process where participants used a 5-point Likert scale to rate the importance of each diagnosis for EM trainees. Consensus was defined as a minimum of 75% agreement on any particular diagnosis at the second round or later. In the absence of consensus, stability was defined as a shift of 20% or less after successive rounds. **Results:** Twenty-two EM experts participated in the Delphi process, 16 (72%) of whom completed the process. Of those, 15 were experts from 11 different EM training programs across Canada and 1 was a recognized expert in EM electrocardiography. Overall, 77 diagnoses reached consensus, 42 achieved stability, and 1 diagnosis achieved neither consensus nor stability. Of 120 potentially important ECG diagnoses, 53 (43%) were considered "must know" diagnoses, 62 (51%) "should know" diagnoses, and 7 (0.06%) "nice to know" diagnoses. **Conclusions:** We have categorized ECG diagnoses within an EM training context, knowledge of which may allow clinical EM teachers to establish educational priorities. This categorization will also facilitate the development of an educational framework to establish EM trainee competency in ECG interpretation.

5445

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KETAMINE-PROPOFOL combination (ketofol) versus propofol alone for emergency department procedural sedation and analgesia: a randomized, double-blind trial

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Keywords: clinical practice, emergency medicine, ketamine, propofol, sedation

Introduction: Procedural sedation is used to efficiently and humanely perform necessary painful procedures. The opposing physiologic effects of ketamine and propofol suggest the potential for synergy, and this has led to interest in their combined use (ketofol) to facilitate procedural sedation. We sought to determine if a 1:1 mixture of ketamine and propofol (ketofol) for procedural sedation results in a 13% or more absolute reduction in adverse respiratory events compared to propofol alone. **Methods:** Participants were randomized to receive either ketofol or propofol in a double-blind fashion. Inclusion criteria were age 14 years or greater and ASA class 1 to 3 status. The primary outcome was the number and proportion of patients experiencing an adverse respiratory event as defined by the "Quebec Criteria." Secondary outcomes were sedation consistency, sedation efficacy, induction time, sedation time, and adverse events. **Results:** A total of 284 patients were enrolled, 142 per group. Forty-four (31%) patients experienced an adverse respiratory event in the ketofol group compared to 46 (32%) in

the propofol group (difference 1%; 95% CI –9 to 12; $p = 0.899$). Thirty-eight ketofol patients and 36 propofol patients developed hypoxia, of whom 3 ketofol patients and 1 propofol patient received bag-valve-mask ventilation. Sixty-five (46%) patients receiving ketofol and 93 (65%) patients receiving propofol required repeat dosing or lightened to a Ramsay Sedation Score of 4 or less during their procedure (difference 19%; 95% CI 8 to 31; $p = 0.001$). Recovery agitation occurred in six ketofol patients (4%, 95% CI 2.0 to 8.9). Other secondary outcomes were similar between the groups. Patients and staff were highly satisfied with both agents. **Conclusions:** Ketofol for ED procedural sedation does not result in a reduced incidence of adverse respiratory events compared to propofol alone. Induction time, efficacy, and sedation time were similar; however, sedation depth appeared to be more consistent with ketofol.

5446

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A SIMULATION-based trauma education program: does it improve trauma management?

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Keywords: education/teaching, emergency medicine, simulation, trauma

Introduction: The purpose of this study was to evaluate the impact of an 11-month simulation-based education program on the trauma management and leadership skills of senior medical residents in the simulation laboratory and the real trauma room. **Methods:** The educational intervention was an 11-month simulation-based trauma education program consisting of monthly sessions that emphasized a "hands-on" experience. The first cohort was evaluated over a 3-month period using evaluation forms following the management of trauma cases presenting to the emergency department, as well as a video-recorded simulated trauma scenario. The second cohort was then offered the educational intervention, after which they participated in the same evaluation process. The primary outcome of this study was performance on the simulated trauma scenario. Secondary outcomes were trauma team captains' self-evaluation, trauma team staff evaluation, and student satisfaction with the intervention. **Results:** The course evaluation survey averaged 3.8 of a maximum of 5. Self-evaluation scores were not significantly different between the two cohorts ($p = 0.719$). Also, there was no significant difference in the overall trauma management scores provided by the staff trauma physicians between the two cohorts ($p = 0.672$). The video-recorded, standardized, simulated trauma scenarios are currently being evaluated. **Conclusions:** All residents rated the program as highly effective and a worthwhile educational experience; however, an 11-month simulation-based trauma education program for senior medical residents did not result in either improved self-evaluation or improved evaluation by staff trauma physicians. This may have been due to poor attendance, small sample size, or a small benefit from the intervention relative to the other learning opportunities experienced by the learners. The assessment of the residents' performances on the video-recorded standardized simulated trauma scenarios may help clarify the effectiveness of this program.

5453

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ADVERSE drug event reports in administrative records of emergency department patients

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Keywords: administration, adverse drug events, emergency medicine

Introduction: Health data collected for administrative purposes are routinely used for drug safety research. Yet their sensitivity in identifying adverse drug events (ADEs), the unintended and harmful consequences of medication use, has not been described. **Objective:** To determine the proportion of ADEs to outpatient medications that was identified at the point of care in patients presenting to two EDs that were documented in administrative health data. **Methods:** We linked data from a cohort of ED patients who presented between July 2008 and January 2009, for whom we prospectively collected data on ADEs to outpatient medications to existing administrative health records. We enrolled adults who were > 19 years of age, reported having ingested at least one prescription or over-the-counter medication within 2 weeks, and spoke English using a systematic patient selection algorithm. At the point of care, pharmacists evaluated all patients for ADEs in a manner that was blinded to the emergency physicians' assessment. When pharmacists and physicians independently agreed on the presence or absence of an ADE, the diagnosis was considered final. Discordant cases and cases where either the pharmacist or the physician was uncertain were adjudicated by an independent committee. ADEs were identified in administrative health data using International Disease Classification (ICD)-10 diagnostic codes for ADEs. **Results:** Among 1,574 patients, 221 (221 of 1,574; 14.0%; 95% CI 12.4–15.8) were diagnosed with an ADE at the point of care. Of these, 15 (15 of 221; 6.8%; 95% CI 4.0–11.2) were found to have an ICD-10 diagnostic code that indicated a causal relationship between the presentation and a medication, and 47 (47 of 221; 21.3%; 95% CI 16.2–27.4) indicated that an ADE had "very likely," "likely," or "possibly" been identified. **Conclusions:** Only a small proportion of ADEs to outpatient medications that presented to two EDs were identifiable in administrative data by querying the database for ICD-10 codes indicating an ADE.

5454

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WHICH competencies belong in an emergency medicine point-of-care ultrasonography fellowship? A national needs assessment study

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Keywords: curriculum, education/teaching, emergency medicine, fellowship, ultrasound

Introduction: Point-of-care ultrasonography (PoCUS) for emergency medicine (EM) is a core competency for EM residents. There are few EM PoCUS fellowship programs in Canada, none of which have a published, comprehensive curriculum. We sought to identify the essential elements of Canadian EM PoCUS fellowships versus general EM practice. **Methods:** We conducted a systematic needs assessment with a national survey of EM program directors (PDs), residents, and experts in EM PoCUS using a modified Dillman technique. The survey was pilot tested and reviewed by three experts for validity and reliability. The paper and Web survey consisted of general demographic questions and categorization of 81 PoCUS competencies to one of essential for EM PoCUS fellowship, advanced EM practice, general EM practice, or not essential to EM practice. Descriptive statistics were used. **Results:** The response rate was 80.6% (351 of 435). The response rates for PDs, residents, and experts were 53.5%, 86.4%, and 78.4%. Median ages were 46.0, 30.6, and 42.0, respectively; 36.7% were female. Responses were obtained from across Canada, with 48.1% of respondents from Ontario. All primary indications (trauma, abdominal aortic aneurysm, pericardial effusion, first-trimester pregnancy, and central line insertion) were included in general EM practice. Compe-

tencies identified for the fellowship included advanced skills in addition to administration and research skills. Gap scores were calculated, which demonstrated similar categorization for residents and experts, whereas PDs disagreed in 27.2% of the categories; 86.6% of respondents believe that there was a need for an EM PoCUS fellowship with an ideal length of 6 months (46.7%). The perceived need was widespread, including rural, urban, academic, and international practice settings. **Conclusions:** This is the first national comprehensive needs assessment to identify the competencies for an EM PoCUS fellowship curriculum versus general EM practice. There is a need and demand for EM PoCUS fellowships in Canada.

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NEEDS assessment for telephone consultation guidelines for emergency physicians

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Keywords: clinical practice, emergency medicine, telemedicine

Introduction: Emergency physicians (EPs) at academic tertiary care centres receive many telephone consultations from peripheral hospitals. EPs must understand their role in telephone consultations and the impact it may have on the department. The purpose of this needs assessment is to identify current practices and to determine the need for guidelines in the management of telephone consultations. **Methods:** We conducted a Web-based survey of all EP attendings and residents at an academic tertiary care hospital using a modified Dillman technique. Two EPs reviewed the validity and reliability of the survey tool. The Web-based survey consisted of six common telephone consultation scenarios (to rule out low-risk subarachnoid hemorrhage, inpatient for possible stroke code, to rule out low-risk pulmonary embolism [PE], to rule out appendicitis, single system trauma, hip fracture). Participants were given the option of multiple management decision choices and asked to explain the reasons for their choice. Descriptive statistics were used. **Results:** The survey response rate was 58.9% (56 of 95), of which 67.3% (37 of 55) were EP attendings; 89.5% of residents and 59.5% of attendings reported a need for guidelines. There was considerable variation in management. For the low-risk PE case, 16.1% would accept the transfer, 57.2% would ask the EP to call radiology or thrombosis, 14.3% would ask the EP to call another hospital first prior to accepting, and 12.5% would refuse the transfer. Reasons for management decisions in all cases included that all transfers should be accepted on principle; the originator should contact a specialty consultant directly; divert transferring patients to other community hospitals with imaging capacity; and complete refusal of the telephone consultations. **Conclusions:** Telephone consultations to the EP are an important competency and service to the community. Current management of telephone consultations by EPs is variable. There is a need to develop guidelines for telephone consultations.

5456

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FACTORS associated with the use of intraosseous access in adult patients requiring fluid resuscitation when peripheral intravenous access is not available

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Keywords: clinical practice, emergency medicine, intraosseous access, resuscitation

Introduction: The literature suggests that intraosseous (IO) access is underused or delayed despite being recommended by the advanced trauma and cardiac life support guidelines. We sought to identify barriers and facilitators to IO use by physicians during adult resuscitation when peripheral intravenous (IV) access is not readily achievable. **Methods:** We conducted semistructured qualitative interviews with a purposeful sample of residents and physicians from the departments of Emergency Medicine, Critical Care, Anesthesia, Surgery, and Internal Medicine. We developed an interview guide based on the constructs of the Theory of Planned Behavior, which elicits salient attitudes, social influences, and behavioural controls that potentially influence the use of IO when IV access is not achievable. We recorded and analyzed interviews until data saturation was reached. Two independent reviewers performed inductive analyses to identify emerging themes and ranked them by way of consensus. **Results:** Demographics of the 20 interviewees are mean age 30, female 40%, prior IO training 85%, median resuscitations attempted 45, and median IO inserted 0.5. Leading attitudes were 1) IO provides rapid vascular access; 2) IO is easy to insert; and 3) perception that IO is a painful procedure. Leading social influences came from 1) nursing staff; 2) physician colleagues; and 3) hospital culture. Behavioural control was the construct most associated with the ability to use an IO, including 1) accessibility of IO equipment; 2) training and familiarity with IO; and 3) need for protocols to guide IO use. **Conclusions:** This is the first qualitative study using the Theory of Planned Behavior to identify key facilitators and barriers for the use of IO in adult resuscitation when IV access is not achievable. These findings will inform the design of a hospital-based survey and guide future knowledge translation interventions targeted at increasing the awareness and use of IO access in adult resuscitation.

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TEST characteristics of thoracic point-of-care ultrasonography for the diagnosis of acute congestive heart failure in the emergency department

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Keywords: clinical practice, emergency medicine, heart failure, ultrasound

Introduction: The test characteristics of thoracic point-of-care ultrasonography (PoCUS) for the diagnosis of acute congestive heart failure (CHF) are not well known, and no prior study evaluated the diagnostic impact of pleural effusions. We sought to determine the test characteristics of thoracic PoCUS when performed within 2 hours of initial emergency physician (EP) assessment by combining sonographic B-lines and pleural effusion to diagnose acute CHF. **Methods:** This prospective cohort study used a convenience sample of adult patients presenting to the ED with suspected acute CHF. An EP not involved in the patient's care performed an eight-zone thoracic PoCUS (positive when B-lines seen in ≥ 2 zones on each side). Two EPs blinded to thoracic PoCUS results performed a health record review that served as the criterion standard for CHF. We calculated the test characteristics of two- (inferior lateral zones only) and eight-zone thoracic PoCUS with and without sonographic pleural effusion using stratified analysis with 95% confidence intervals (CIs). **Results:** Of the 40 patients enrolled, 3 did not meet all inclusion criteria and were excluded. The mean age was 81, males 51%, 84% diagnosed with CHF, 54% arrived via EMS, 65% admitted, and 3% intubated. Positive and negative likelihood ratios, sensitivity, and specificity for the 37 patients analyzed are 1) eight-zone PoCUS: infinity; 0.35 (95% CI 0.22–0.57); 64.5% (95% CI 45–80); 100% (95% CI 51–100); 2) eight-zone PoCUS with pleural effusion: infinity; 0.26 (95% CI 0.14–0.47); 74% (95% CI 55–87); 100% (95% CI 51–100); 3) two-zone PoCUS: 4.43 (95% CI 0.7–27.7); 0.43 (95% CI 0.26–0.71); 63% (95% CI 44–79); 86% (95% CI 42–99);

4) two-zone PoCUS with pleural effusion: 5.4 (95% CI 0.9–32.5); 0.11 (95% CI 0.03–0.36); 90% (95% CI 73–97); 83% (95% CI 36–99). **Conclusions:** The test characteristics of thoracic PoCUS are improved with the inclusion of sonographic pleural effusion. There is a role for thoracic PoCUS in the diagnosis of acute CHF.

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COMMUNITY emergency medicine outreach (CEMO): evaluation of a CME program for physicians in rural practice

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Keywords: continuing medical education, education/teaching, emergency medicine

Introduction: Rural physicians identify higher needs for EM continuing medical education (CME) than urban doctors. We designed an outreach program with aims to 1) update adult EM knowledge and skills, 2) unify clinical care, 3) strengthen academic and community ED ties, and 4) encourage retention. **Methods:** We offered a written needs assessment survey to EM doctors at 12 rural hospitals in our health region. EM chiefs completed another second survey designed to uncover physicians' unperceived needs. A list of potential CME topics was given, generated from Tintinalli's text, a preliminary chiefs' survey, and the CanMEDS Roles applied to EM. Fourteen faculty gave 10 half-day sessions of 19 different lectures and workshops, with subjects chosen by each site. Physicians evaluated CEMO immediately and 2 or more months later. **Results:** Twelve single-coverage EDs have 21,000 to 29,000 annual visits and 10 to 18 EM doctors. Physicians had graduated from medical school a mean of 16.4 years (1971–2006). Certifications included 41 of 72 (56.9%) CCFP, 10 of 72 (13.9%) CCFP(EM), 3 of 72 (4.2%) FRCP(EM), and 6 of 72 (8.3%) GP-Anaesthesia; 74.7% work full time EM and 25.3% part time. Needs assessment response rates were chiefs 7 of 12 (58.3%) and physicians 72 of 165 (43.6%). There was marked site-to-site variability as to subjects chosen; ocular, poisonings, diabetic emergencies, and cerebral resuscitation were top-ranked overall. Response rates were session evaluations 89 of 94 (94.7%) and postsession evaluations 60 of 94 (63.8%). A total of 250 of 277 (90.2%) agreed or strongly agreed initially and 105 of 136 (77.2%) later that CEMO is practice changing; 243 of 256 (93.8%) initially and 132 of 136 (97.1%) later that CEMO is an effective way to learn; 237 of 250 (94.8%) initially and 127 of 136 (93.4%) later that CEMO effectively maintains competence; and 228 of 241 (94.6%) initially and 113 of 136 (83.1%) later that CEMO enhances practice satisfaction. **Conclusions:** Academic EM departments can play an important role in the design and implementation of regional CME programs.

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QUANTITATIVE B-type natriuretic peptide values for stratifying risk of poor outcomes in ED patients with heart failure

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Keywords: biochemical markers, cardiovascular, emergency medicine, heart failure

Introduction: Although measurement of B-type natriuretic peptide (BNP) is often used to confirm the diagnosis of heart failure (HF) in ED patients, there is no clear evidence that quantitative BNP values help improve patient outcomes. Our objective was to evaluate the usefulness of quantitative BNP values in identifying the risk of serious adverse events (SAEs) in ED HF patients. **Methods:** We prospectively measured BNP values (NT-ProBNP with Roche Elecsys 2010 system) in ng/L for adult patients who presented with acute decompensated HF. This prospective cohort study was conducted in six large, academic EDs, and we followed patients for 30 days. The primary outcome was SAE, defined as death, intubation, admission to a monitored unit, myocardial infarction, or relapse back to the ED within 14 days and requiring admission. We conducted univariate and multivariate data analyses to test the association of NT-proBNP values with SAE. **Results:** We enrolled 305 patients who had mean age 76.2 years, male sex 58.7%, arrived by EMS 32.5%, initial heart rate > = 110 9.8%, initial SaO_2 < 90% 8.7%, elevated troponin 23.3%. The NT-proBNP values were median 4,000.3 ng/L; range 11.0 to 52,852.0 ng/L; > = 5,000 ng/L 44.3%. Outcomes were SAE 9.5%, admission to a monitored unit 5.3%, intubation 0.3%, myocardial infarction 1.0%, and mortality 1.0%. Comparing the 29 SAE cases to the 276 without SAE, we found that mean NT-proBNP values were 11,245 versus 6,782 ng/L (p < 0.05), and the proportions with values > = 5,000 were 75.9% versus 40.9% (p < 0.001). After adjustment for relevant clinical and laboratory covariates, logistic regression found that NT-proBNP > = 5,000 had an odds ratio for SAE of 4.39 (95% CI 1.36–14.16), Hosmer-Lemeshow goodness-of-fit p = 0.97. **Conclusions:** We found that elevated NT-proBNP values were strongly associated with poor outcomes in ED patients with HF. Quantitative NT-proBNP can play an important role in risk stratification and management planning, thus leading to better and safer care for ED HF patients.

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COMPARISON of management and outcomes of ED patients with acute decompensated heart failure between the United States and Canada

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Keywords: emergency medicine, heart failure, respiratory

Introduction: Acute decompensated heart failure (ADHF) is a common clinical problem presenting to the ED. We believe that there are significant differences in ED management of ADHF between the United States and Canada. The objective of the study was to compare the ED management and rate of admission of patients presenting with ADHF between two academic hospitals in the United States and Canada and to compare the morbidity and mortality of these patients. **Methods:** This was a health records review of adults presenting with ADHF to two EDs in Canada and the United States between January 1, 2010, and April 30, 2010. Data elements and outcome measures were defined and collected with a common data tool from hospital records. Specific outcome measures were admission to hospital, myocardial infarction (MI), death, and relapse rates to the ED within 30 days. These data were analyzed using descriptive and univariate analyses. **Results:** In total, 416 cases were reviewed and 82 were excluded. Comparing 173 US patients to 161 Canadian (CDN) patients, respectively, the mean age was 75.7 and 76.3 years; male sex was 52.0% and 54.0%. Vitals on arrival were mean initial HR 84.1 and 87.6; RR 21.2 and 22.1; and O_2 sat 95.1% and 94.8%. US and CDN ED treatments were noninvasive ventilation 13.4% versus 7.4% (p = 0.08); IV diuretics 36.1% versus 76.4% (p < 0.0001); and IV nitrates 7.0% versus 4.4% (p = 0.30). There was a significant difference between sites for admission to hospital (95.4% v. 48.5%, p < 0.0001). The proportion of US and CDN patients who died within 30 days of the ED visit was 10.4% versus 5.0% (p = 0.06); relapsed to the ED within 30 days was

17.9% versus 20.8% (p = 0.51); and had MI within 30 days was 1.8% versus 1.9% (p = 0.95). **Conclusions:** The US and CDN centres saw ADHF patients with similar characteristics but differed in use of treatments. Although the US centre had almost double the hospital admission rate of the CDN site, the outcomes of patients were similar. This study questions the necessity of routine hospital admission for ED patients with ADHF.

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WHAT is the impact of a rapid assessment zone on wait times to care for the acute care unit of the emergency department?

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Keywords: administration, emergency medicine, streaming, wait times

Background: Timely access to ED care remains a persistent problem that challenges managers to identify new strategies to optimize patient flow. **Objective:** To evaluate the impact of the implementation of a rapid assessment zone (RAZ) on wait times to cubicle access and nurse (RN) and physician (MD) assessment for patients directed to the acute care unit (ACU) of the ED. **Methods:** Pre-post study conducted in an adult teaching hospital ED (visits = 69,000/yr). The RAZ unit (intervention), created to offload the ACU of the main ED, started operating in January 2011. Using a split flow management strategy, at triage, patients with acuity level (CTAS code 3 and certain code 2), likely to be discharged within 12 hours and not requiring an ED bed for continued care, were directed to RAZ. Pre-RAZ data were collected for 4 months (Sept–Dec 2008) and post-RAZ for 1.5 months (Feb–March 2011), on weekdays (9:00 to 21:00). Data were collected via observation (cubicle access, RN and MD assessment times) and administrative database. Multiple linear regression analysis compared the wait times (from triage-end) between pre and post periods with adjustment of confounders: age, triage code, and ED % occupancy. **Results:** During the pre and post periods, the ACU received 1,692 and 876 visits, respectively; mean age (± SD): 68 (± 18) versus 70 (± 17); triage codes 1 to 2: 30% versus 35%; ambulances 36% versus 46%; and % occupancy 115% versus 159%. Medical staff were redistributed but not increased during post, and hospital admission policy remained unchanged. Compared to pre, the post period wait times to cubicle access and RN and MD assessments decreased on average by 50 (95% CI 41–60), 46 (95% CI 38–55), and 22 (95% CI 13–31) minutes, respectively. Other factors associated with wait times were % occupancy, age, and triage code. **Conclusions:** Following the implementation of the RAZ unit, a significant reduction in wait time to cubicle and RN and MD assessment for patients directed to the ACU of the main ED was detected.

5472

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USE of bedside ultrasound in distal radius fractures: a review of the literature

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Keywords: diagnostic technologies/imaging, emergency medicine, fractures, ultrasound

Introduction: Distal radius fractures (DRFs) are one of the most common types of fractures presenting to emergency departments (EDs). Bedside ultrasound (BUS) has been shown to be useful in the assessment of fractures, as well as in their reduction and immobilization (R&I), the mainstay of treatment. **Methods:** *Medline* and *EMBASE* databases were searched using the following PICO format. The population was ED patients with suspected DRF. The intervention was the use of BUS, and the comparator was plain radiography. The outcome was the diagnostic performance of BUS in detecting the presence of fracture, aiding in R&I, or assessing the success of R&I. Data analyses were composed of test performance of BUS. **Results:** Eight studies were selected for inclusion, ranging from 17 to 163 patients. Six of the studies, all with pediatric patients, assessed specifically the diagnostic accuracy of BUS to detect DRFs; five of these also assessed distal ulna fractures. These studies comprised 357 patients and 401 fractures. Sensitivity for the detection of fracture with BUS ranged from 71 to 100% and specificity from 69.2 to 100%. Three studies demonstrated a success rate of BUS-guided R&I of 83 to 98.4%. This was better than the success rate obtained with the blind reduction technique when both modalities were compared. In one study, BUS had a sensitivity of 94% and a specificity of 56% for the identification of successful reduction of displaced fracture. **Conclusions:** Our literature review identified eight studies that assessed the diagnostic performance of BUS in the setting of distal radius fractures. Detection of fractures with BUS compared to plain radiography has a sensitivity of 71 to 100% and a specificity of 69 to 100%. At the current time, the accuracy of BUS is too low to allow the foregoing of plain radiography. However, the use of BUS in confirming the adequate R&I of a displaced fracture is promising. Future studies should focus on the performance characteristics of BUS in the setting of R&I, as well as on the health economics of its use.

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HANDOVER in the emergency department: an observational analysis of quality and elements

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Keywords: communication, education/teaching, emergency medicine, handover

Introduction: Patient handover during shift change in the emergency department (ED) is a potentially high-risk period for medical error, and handover procedures have not been well described. This study examined current handover procedures and effectiveness in the ED. **Methods:** This prospective cohort study involved 50 staff emergency physicians at shift change in the high-acuity areas of two academic EDs. From March to July 2011, two trained nurses used a piloted checklist to measure the type of information discussed at handover and handover duration. The principal investigator observed 10% of handovers to ensure accurate data collection. An immediate posthandover survey was distributed to oncoming emergency physicians to determine perceived quality of handover. **Results:** We observed 323 staff physician handovers (1,880 patients). Twenty-four categories of variables were discussed at handover, of which the five most frequent were patient sex (84.8%), name (82.4%), presenting complaint (74.5%), provisional diagnosis (85.2%), and likely disposition (home v. admit) (50.4%). The three least frequently discussed were amount of time spent by the patient in the department (1.0%), allergies (0.8%), and informing the patient of the handover (0.2%). The management plan was explained to the oncoming physician 63.7% of the time. Surveyed physicians rated their perceived quality of the handover to be excellent 31.6%, good 57.9%, average 9%, and fair or poor 1.6% of the time. Mean handover duration was 8.54 minutes. Mean handover duration per patient was 1.8 minutes. **Conclusions:** We found great variability in the elements and perceived quality of patient handovers in the ED. Management plans and patient communication factors were not automatically discussed, leaving room for potential concerns regarding patient safety and quality care. In addition, the perception that a handover is excellent only 31.6% suggests that there is substantial room for improvement. Guidelines for effective handover in the ED are needed.

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KNOCKED up? Parental knowledge of concussion symptoms in a minor football organization

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Keywords: emergency medicine, head injury, prevention, sport

Introduction: Patients presenting with concerns regarding sports-related concussions are increasingly attending emergency departments for care. The consensus statement from the Zurich 3rd International Conference on concussion in sport and the accompanying Sport Concussion Assessment Tool 2 (SCAT2) provided an opportunity to assess levels of knowledge about concussion symptoms in the public. Since football is a sport where the risk of concussion is a concern, especially for young players, this study examined parents' knowledge of concussion symptoms in a minor football league in Canada. **Methods:** Using the SCAT2, 34 true/false concussion symptom statements were created as part of a larger survey. Participant total scores could reach 34 when all statements are interpreted correctly (true or false). A total of 93 parents of football players (mean age 42.9 ± 5.2) completed a paper (n = 77) or online (n = 16) survey. Total scores were analyzed for different categories of participant characteristics. **Results:** Mean total scores were 25.0 ± 2.7. Results showed no significant differences in total scores ($p > .05$) between participants who had suffered a concussion before or not, between participants who indicated that they were able to recognize a concussion or not, and between participants who had children playing organized coached sports for differing numbers of years (sorted in four categories). A significant difference was found between categories of participants' education levels, $F(2,56) = 3.45$, $p > .05$, $\omega = .28$, with lower completed levels of education corresponding with lower total scores. **Conclusions:** Knowledge about concussion symptoms is of growing importance to parents as evidence about the long-term effects of concussions continues to increase. This study illustrates that the current level of knowledge across minor football players' parents is adequate but suggests that parent education could play a role in improving concussion symptom knowledge and, consequently, timing of return to play.

5479

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TAILORING the intervention of a future trial in acute asthma: engaging patients and key knowledge users

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Keywords: asthma, emergency medicine, research, respiratory

Introduction: Acute asthma is a common emergency department (ED) presentation. Most (90%) patients are discharged after ED management; however, reassessments with primary care providers (PCPs) following acute asthma are often delayed. This study aimed to refine future interventions for patient self-management and opinion leader (OL) recommendations. **Methods:** Between 07 and 09/2011, 64 asthmatics completed a survey including questions about their history, PCP support, and the ideal delivery of ED-directed educational interventions. Edmonton PCPs (n = 150) were faxed surveys to determine their preferred asthma OL and the ideal delivery of an OL educational intervention involving asthma. **Results:** Overall, 61% of patients reported that a PCP frequently managed their asthma; 41% preferred to receive guidance regarding their asthma attack from a lung specialist, 45% during their ED visit, and 60% through one-on-one discussions. In addition, 57% expressed interest in having PCP follow-up within a week of being discharged from the ED; however, the difficulty obtaining a follow-up visit was assessed as moderate (median = 4; IQR 3, 6). The response rate for the PCPs' survey was 11%. A pulmonologist or a PCP/ED physician with special interest in asthma was identified as an OL in ambulatory asthma by 53% of respondents. All expressed interest in receiving notification of their patients' ED acute asthma presentation; 59% preferred next-day notification, including details on treatment (100%), diagnosis (94%), and severity/investigations (88%). Most (66%) would be interested in receiving OL guidance after patient presentation with acute asthma; 60% considered personalized, guideline-based recommendations to be the ideal content of an educational intervention. **Conclusions:** Messages and recommendations arising from patients and knowledge users at the planning stages of a trial helped adapt the study educational intervention to meet the local needs. Moreover, respondents facilitated the identification of potential barriers to knowledge uptake.

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RETURNS on investment from a hospital foundation research grants competition: implications for young researchers

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Keywords: emergency medicine, funding, methodology, research

Introduction: Many hospital foundation research grants are designed to support health researchers with small grants ($25–35,000) with pilot studies that generate preliminary results to advance a program of research. This study examines scholarly outcomes of projects funded by one Canadian hospital foundation over a 10-year period. **Methods:** Online, e-mail, and faxed surveys were sent to researchers who received funding between 1999 and 2008. Data collection focused on grant deliverables and opinions (1–7 Likert scale) regarding the value of the grant. **Results:** From 215 awards, 10 awardees were retired, deceased, or otherwise unavailable to comment. From the remaining 205, responses were received from 187 (91.2%) recipients. Grants were commonly awarded to junior (34.2%) and senior (33.1%) researchers; emergency medicine was involved in 14 (7.5%) grants. Local (26.1%), national (37.2%), and international (50.9%) abstract presentations for the completed projects were documented. Overall, 153 (82%) projects were completed at the time of contact, and 119 (77.7%) manuscripts were published or in press, and the median journal impact factor was 4.2 (IQR 2.8, 7.7). Ten editorials and 16 secondary publications (eg, *ACP Journal Club*) were derived from the primary manuscripts. Additional funding was received for 96 (51.3%) projects; most arose from governments (59%) or charitable organizations (31%). The median funding per grant was $21,553 (IQR 19,072, 24,500); the median additional funding per grant was $123,875; (IQR 49,590, 315,000). Respondents felt that funding contributed to the completion of their projects and felt strongly that designated research funds are required to stimulate clinical research in Canada. **Conclusions:** Overall, this grants competition has produced impressive results; however, only 8% of the grants involved emergency physicians' departments. Despite the relatively small funding available, they helped various investigators complete studies, secure additional funding, and conduct widespread knowledge dissemination.

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EMERGENCY department waits: a time-in-motion study

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Keywords: administration, emergency medicine, wait times
Introduction: Delays in registration, triage, and access to support staff have the potential to add considerable time to emergency department (ED) length of stay (LOS). This study measured the time patients spend waiting at the front end of their ED visit before being placed in an active treatment space in a typical urban, academic ED seeing patients of all ages. **Methods:** Prospective observational study on randomized dates/times between June 21 and July 8, 2011, at the University of Alberta Hospital ED. Up to five trained observers per 4-hour observation period collected patients' ED times using standardized forms and synchronized digital watches. Information on sociodemographics, presentation, consultations, and disposition was collected from the electronic ED information system. Data are presented as proportions and medians with interquartile ranges (IQRs); bivariable analyses were performed. **Results:** From a total of 409 patients observed during the study period, 51% were male and the median age was 32 years (IQR 9, 56). Pediatric patients represented 33% of the sample. The most common ED complaint was unspecific symptoms/signs (48%), and 77% scored 3 in the Canadian Triage Acuity Scale. The time between when the patient's chart was received at the triage desk and bed placement was the longest step within the waiting room time (median 36 minutes; IQR 11, 60). The median time from triage to bedside ED nurse assessment was 63 minutes (IQR 28, 113) and from triage to first consultation request 2.2 hours (IQR 1.1, 4.4). Most patients were discharged (77%); the median ED LOS for admitted and discharged patients was 8.0 (IQR 4.8, 12.5) and 3.7 (IQR 2.0, 5.8) hours ($p < 0.0001$), respectively. **Conclusions:** These results support the role of promising interventions designed to expedite the care of less urgent patients and confirm the need to address the considerable delays at the back end of ED operations.

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FACTORS affecting the success of prehospital intubation in an air and land critical care transport service: results of a multivariate analysis

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Keywords: airway, emergency medical services, emergency medicine, intubation
Introduction: Paramedics perform tracheal intubation in the prehospital environment, and the morbidity associated with failed attempts causes some to question the appropriateness of intubation in this setting. To inform this discussion, we should understand the factors that predict the success of prehospital intubation. This study aims to determine the factors that affect success on first attempt of paramedic intubations in a rapid sequence intubation (RSI)-capable critical care transport service. **Methods:** We conducted a multivariate logistic analysis on a prospectively collected database from a critical care transport service that provides scene responses and interfacility transport in Ontario. The study population includes all intubations by flight paramedics from January 2006 to July 2009. The primary outcome is success on first attempt. A list of potential factors predicting success was obtained from a review of the literature and includes age, sex, Glasgow Coma Scale, location of intubation attempt, paralytics and sedation given, a difficult airway prediction score, and type of call (trauma, medical or cardiac arrest). **Results:** Data from 549 intubations were analyzed. The success rate on first attempt at intubation was 57.7%, and the overall success rate was 87.4%. A total of 498 had complete data for all predictive variables and were included in the multivariate analysis. The factors found to be statistically significant were age per decade (OR 1.1, CI 1.04–1.2), female gender (OR 1.5, CI 1.03–2.32), paralytics given (OR 2.7, CI 1.5–4.7), and sedation given (OR 0.6, CI 0.41–0.91). This model demonstrated a good fit (Hosmer-Lemeshow = 8.906), with an AUC of 0.632. **Conclusions:** Use of a paralytic agent, age, and gender were associated with increased success of intubation. The association of sedative use alone with decreased success was unexpected and may be due to confounding related to the indications for sedation, such as patient agitation. Our findings may have implications for RSI-capable paramedics and require further study.

5486

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EMERGENCY department physician comfort with central venous catheter insertion

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Keywords: central venous cannulation, education/teaching, emergency medicine
Introduction: Central venous pressure (CVP) assessment is an important component of the management of a variety of acute presentations in the emergency department. This study assessed emergency department physician comfort levels with central venous cannulation (CVC). **Methods:** A self-administered online questionnaire was distributed to 1,350 members of the Canadian Association of Emergency Physicians. The study group included practicing emergency physicians. The questionnaire contained 12 multiple-choice, multiple-answer multiple-choice, and open-ended response questions. Data were collected and stored online via Surveymonkey.com. **Results:** The survey response rate was 30.4% (410 of 1,350). Twenty-five percent of respondents reported being uncomfortable with CVC; 86.1% of respondents who reported being uncomfortable stated "lack of repetition" as the reason, whereas 13.9% reported "lack of adequate training," And 48.6% of physicians with CCFP training were uncomfortable with CVC, which was significantly ($p < 0.001$) higher than both the FRCPC (19.5%) and CCFP-EM (23.1%) certified physicians. Eighty-five percent of physicians in their first 5 years of practice were comfortable with CVC, compared to 70% of physicians who had been out of their residency program for more than 5 years ($p < 0.001$). Physicians who were responsible for less than two central line insertions in the last 6 months had an uncomfortable response rate of 49.4%, compared to 7.6% of physicians who were responsible for more than two lines ($p < 0.001$). Physicians working in community hospitals showed a trend to more discomfort (30.0%) than those working in academic hospitals (22%) (p 0.10). Reports of extra training with central line insertion did not affect physician comfort scores significantly. **Discussions:** Technical skills such as CVC may require increased opportunity to practice in addition to training to maintain comfort with the procedure. Educational courses in isolation may not have a significant impact on comfort or abilities.

5487

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MOST paramedics are victims of violence in the prehospital workplace

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Keywords: emergency medical services, emergency medicine, violence, workplace safety
Introduction: Emergency medical service (EMS) providers can experience violence in the workplace as they perform their jobs in unpredictable environments and near people in crisis. Anecdotal reports have highlighted cases of verbal, physical, and sexual abuse. **Methods:**

Paramedics were invited to participate in a quantitative paper survey. Paramedics were asked to identify if they had directly been the victims of violence within the past 12 months and to identify the type(s) of perpetrator(s). Quantitative data were analyzed using descriptive statistics. **Results:** Of 1,541 paramedics who received a survey, 1,381 completed the survey (89.6%). Respondents were male (70.0%), median age 34 (range 21–66), and mean 10.2 (SD 8.7) years of experience. Two-thirds of paramedics reported being victims of at least one form of violence while at work during the past 12 months. Verbal abuse was reported by 67.4%, perpetrated by patients (62.9%), patient family or friends (36.4%), colleagues (20.8%), and bystanders (5.8%). Intimidation was reported by 41.5%, perpetrated by patients (37.8%), patient family or friends (27.0%), colleagues (45.3%), and bystanders (3.4%). Physical abuse was reported by 26.1%, perpetrated by patients (92.3%), patient family or friends (11.1%), colleagues (3.8%), and bystanders (2.3%). Sexual harassment was reported by 13.6%, perpetrated by patients (64.7%), patient family or friends (18.4%), colleagues (41.2%), and bystanders (8.8%). Sexual assault was reported by 2.7%, perpetrated by patients (88.9%), patient family or friends (7.4%), colleagues (14.8%), and bystanders (2.7%). **Conclusions:** Most paramedics are victims of violence in the workplace. Further research is needed to understand the impact of this on the health of paramedics. Reducing violence and mitigating the effects of violent events should be a priority.

5492

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UNDERSTANDING communication between emergency and consulting physicians: interpersonal relationships and the emergency department referral-consultation process

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Keywords: communication, education/teaching, emergency medicine, referral

Introduction: The major accrediting bodies of North America have identified communication with colleagues as a key competency for resident physicians. To date, however, few studies have sought to uncover the complex nature of relationships between the referring and the consulting physicians. As with all interpersonal encounters, the referral-consultation process may be affected by the relationships between participants. Our study determined themes that emerged from discussions about relationships during the referral-consultation process. **Methods:** From Mar. to Sept. 2010, we interviewed 31 resident-physicians (11 emergency medicine [EM], 10 general surgery [GS], 10 internal medicine [IM]) through semistructured interviews. Two investigators independently reviewed transcripts using inductive methods associated with grounded theory to generate themes until saturation was reached. We resolved disagreements by consensus, yielding an inventory of themes, subthemes, and qualifiers. Measures for ensuring the trustworthiness of the analysis included generating an audit trail and with external audits of the material by investigators not involved with the initial analysis. **Results:** We determined that there were two main relationship-related themes that affected the referral-consultation process: 1) familiarity and 2) trust. Various subthemes within these two themes were further delineated and studied in the context of pertinent literature. **Conclusions:** We present confirmatory evidence that relationships between consulting and referring physicians affect the emergency department (ED) referral-consultation dynamic. The ED referral-consultation may be significantly altered by the familiarity and perceived trustworthiness of both referring and consulting physicians. We provide a framework for conceptualizing the complexities of communications between referring and consulting physicians in the ED. Our proposed framework may further inform instructional methods for improving the referral process between emergency and consulting physicians.

5493

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THE USE of furosemide in the prehospital setting for the treatment of heart failure

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Keywords: diuretics, emergency medical services, emergency medicine, heart failure

Introduction: The diagnosis and management of heart failure (HF) in the prehospital setting can be both difficult and variable. Recently, there has been renewed debate on the use of prehospital diuretics. The objectives of this study are to evaluate the appropriateness of furosemide use by EMS and its association with adverse outcomes. **Methods:** This study was a multicentre health records review of patients who received prehospital furosemide or had an ED diagnosis of HF. We included all acutely ill patients > 50 years of age with shortness of breath who were transported by land EMS (mixed BLS/ALS model) to any of the four EDs within the City of Ottawa. Univariate and logistic regression analyses were performed to determine associations between furosemide use and serious adverse outcomes (acute renal failure, intubation, vasopressors, or death). **Results:** The study population consisted of 330 patients (n = 58, furosemide given by EMS but no HF diagnosed in ED; n = 110, furosemide given, HF diagnosed; n = 162, no furosemide given, HF diagnosed). The mean age was 80 years, 43.3% male gender, and the median dose of IV furosemide was 80 mg (range 20 to 80 mg). Serious adverse outcomes occurred in 61 patients (19.0%, 23.6%, and 14.8% of the three groups, respectively; p = 0.18). The adjusted odds ratio for adverse events with furosemide use was 0.62 (95% CI 0.33 to 1.43) in patients with a diagnosis of HF and 1.14 (95% CI 0.58 to 2.23) in those without. **Conclusions:** The prehospital diagnosis of HF can be challenging; more than a third of patients who received furosemide did not have an HF diagnosis. Serious adverse outcomes were identified in all patient groups; however, there were no statistically significant associations between furosemide use and adverse events. Educational initiatives should focus on helping paramedics better identify suitable patients for use of prehospital diuretics.

5500

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PREDICTORS of admission/readmission and regional variations in practice patterns: a 4-year population-based analysis of emergency department syncope in Alberta

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Keywords: cardiovascular, clinical prediction, emergency medicine, syncope

Introduction: Syncope is a common and potentially high-risk ED presentation. Given the lack of population-based studies of ED syncope, the goals of this study were to 1) identify factors associated with admission and 2) describe the proportion of syncope presentations resulting in admission across different hospitals. **Methods:** Multicentre retrospective cohort study using electronic administrative data from 101 Albertan EDs for patients > 17 years of age with International Classification of Disease (ICD)-10 diagnosis of syncope (R55) as a primary or secondary diagnosis from 2007 to 2011. Primary outcomes

were factors associated with index visit hospitalization and ED revisits or readmission within 7 days following ED discharge. Outcomes were adjusted using multivariable logistic regression and reported as odds ratio (OR) with 95% confidence intervals (CIs). **Results:** Over 4 years, 44,521 syncope visits (mean age 54.2 years, 46.2% male) occurred; proportions admitted varied widely (from 9 to 43%) among hospitals, as did 7-day readmissions (from 3 to 29%). Increased age (1.03 per year; 95% CI 1.02–1.05); increased ED length of stay (LOS) (1.04 per hour; 95% CI 1.03–1.05); performance of chest x-ray (CXR) (1.54; 95% CI 1.27–1.86); transport by ground ambulance (1.31; 95% CI 1.07–1.60); and treatment at a low-volume (nonteaching or nonlarge urban) hospital (1.32; 95% CI 1.09–1.60) were independently associated with index syncope visit admission. Age (1.006 per year; 95% CI 1.00–1.01); ED LOS (1.02 per hour; 95% CI 1.01–1.05); CXR (1.07; 95% CI 1.01–1.13); and hospital admission at index presentation (1.79; 95% CI 1.38–2.33) were associated with higher 7-day readmission. Ground ambulance transport reduced admission (0.90; 95% CI 0.83–0.97). **Conclusions:** These results identify variations in practice and factors associated with hospitalization and readmission for syncope. Development of evidence-based guidelines and research examining urban and nonurban centre differences are needed.

5501

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BETWEEN-RATER reliability of historical variables used in a routine ED patient evaluation

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Keywords: clinical assessment, clinical practice, emergency medicine

Introduction: In the emergency department (ED), historical information is commonly collected in duplicate by multiple care providers. **Objective:** To assess the interrater reliability between physicians and nurses in collecting a set of common historical variables. **Methods:** This prospective observational study enrolled a systematic sample of patients presenting to an urban academic ED. After enrolment, physicians and nurses independently and blinded to each other's evaluations rated a set of historical variables previously selected because of their association with the ED diagnosis of an adverse drug event (ADE). Interrater reliability was calculated using kappa scores (κ) and their associated 95% confidence intervals (CIs). **Results:** Nurses and physicians evaluated 51 patients with an average age of 57.8 years, of whom 26 (51%) were female. Their interrater agreement was excellent for a history of atrial fibrillation (κ = 1, 95% CI 1–1), diabetes (κ = 0.86, 95% CI 0.68–1), and the use of opioids or benzodiazepines (κ = 0.85, 95% CI 0.70–1). Agreement was substantial for use of insulin or oral hypoglycemic agents (κ = 0.74, 95% CI 0.45–1), antihypertensives or diuretics (κ = 0.72, 95% CI 0.51–0.93), anticoagulants or antiplatelet agents (κ = 0.65, 95% CI 0.20–1), and a history of congestive heart failure (κ = 0.66, 95% CI 0.032–1). Agreement was moderate for a change in medications within 28 days (κ = 0.60, 95% CI 0.37–0.82), use of aspirin or salicylates (κ = 0.59, 95% CI 0.30–0.89), a history of renal failure (κ = 0.48, 95% CI –0.12–1), and a previous ADE diagnosis (κ = 0.43, 95% CI 0.05–0.81). Agreement was only fair for determining whether a patient used recreational or street drugs (κ = 0.29, 95% CI –0.21–0.78). **Conclusions:** There is significant variability in the interrater reliability between common historical features often collected in the ED. Variables with high interrater reliability may not need to be collected in duplicate for clinical care purposes and can be considered candidate predictor variables for clinical decision rule development.

5502

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A CONTROLLED trial of traditional versus Web-based teaching of point-of-care ultrasound to medical students

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Keywords: education/teaching, e-learning, medical students, ultrasound

Introduction: Although point-of-care ultrasonography (POCUS) is an essential skill for all emergency physicians, methods of instruction at the undergraduate level have not been extensively evaluated. We studied the effectiveness of a brief, medical student practical workshop on focused assessment with sonography in trauma (FAST) compared to a Web-based course alone. **Methods:** We conducted a controlled educational trial comparing a traditional format (T) to Web-based (W) instruction alone. All third-year medical students received FAST instruction and pre- and posttests during their 4-week emergency medicine rotation. The T group received a 30-minute lecture on the FAST examination followed by 1-hour hands-on instruction. Students in the W group viewed a 45-minute FAST *PowerPoint* lecture, which included instruction of hands-on use. Students in both groups completed validated MCQ knowledge tests before and after instruction, as well as a skills assessment postinstruction using a validated performance assessment instrument. Groups were compared with standard univariate analyses. **Results:** The 84 participating students in the T (n = 42) and W (n = 42) groups, respectively, were similar for age (25.1 v. 26.5), female sex (58.4% v. 50.0%), previous experience with POCUS (55.2% v. 57.5%), field of medical interest (p = 0.45), or baseline knowledge scores (47.2% v. 52.1%). After instruction, knowledge scores were better in both traditional and Web groups (69.6% v. 65.7%; p = 0.07). The traditional group met or exceeded criteria for an adequate FAST on the global performance scale much more often than those in the Web group (56.4% v. 5.0%; $p < 0.0001$) and performed better on all subcomponents ($p < 0.001$). **Conclusions:** Hands-on instruction is essential for acquisition of fundamental clinical ultrasound skills. Although knowledge transfer can be accomplished with Web-based instruction, it is inadequate to ensure progression of POCUS competence.

5504

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MEDICAL clearance of ED patients with psychiatric diagnoses: evaluation of the physical examination

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Keywords: clinical practice, emergency medicine, mental illness, physical assessment

Introduction: Patients who present to the emergency department (ED) with psychiatric diagnoses often require a focused medical assessment prior to psychiatric admission. The aim of this study was to assess the completeness of the physical examination of ED patients with psychiatric diagnoses and to determine associations with patient outcomes. **Methods:** We conducted a retrospective chart review of consecutive patients from two Canadian EDs from December 2009 to January 2011. These included patients aged 18 to 65 with ED diagnoses of psychosis, depression, and anxiety and excluded intoxicated patients. We abstracted history and physical examination variables based on a departmental survey of appropriate medical clearance. A second reviewer abstracted 10% of records, and interrater reliability was measured. The hospital electronic health record was searched for adverse outcomes such as death and return ED visits. The data were analyzed with descriptive and chi-square statistics. **Results:** Of 104 patients, 64% were male with a mean age of 38.5 years. Sixty-four patients

(61.5%) had a history of psychosis and 16.3% depression. Complete vital signs were noted in 61.5% (64 of 104; 95% CI 51.9–70.3) of patients and none in 5.8% (6 of 104; 95% CI 2.7–12.0). The most frequently documented physical examination components were the mental status examination (83 of 104, 79.8%; 95% CI 71.1–86.4) and general appearance (75 of 104, 72.1%; 95% CI 62.8–79.8). All other body systems were examined less than 40% of the time. Six patients (5.8%; 95% CI 2.7–12.0) returned to the ED within 1 week, and nine (8.7%; 95% CI 4.6–15.6) admitted patients required a medicine consultation. There was no association between physical examination completeness and adverse outcomes. **Conclusions:** Our results suggest a need for improvement in documentation of the physical examination for ED patients with psychiatric diagnoses. A large prospective multicenter study is required to further evaluate the impact of this variation on clinical outcomes.

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WHICH chest pain patients with a normal ECG have an acute coronary syndrome?

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Keywords: acute coronary syndrome, cardiovascular, electrocardiogram, emergency medicine

Introduction: Although normal ECGs suggest lower risk of acute coronary syndrome (ACS), published reports suggest that 6 to 20% of chest pain (CP) patients with normal ECGs are diagnosed with ACS. Our objective was to describe outcomes and risk factors in CP patients investigated for ACS and having a normal ECG at presentation. **Methods:** Nested case-control analysis of patients recruited for a larger clinical decision rule (CDR) study designed to identify CP patients at low risk for ACS. Participants were > 25 years old and had CP as their primary complaint, a normal ECG at presentation, standard cardiac bloodwork, and prospective data collection for personal and family cardiac risk factors. Cases were those with acute MI (by serum biomarkers), cardiac revascularization, positive angiography with medical therapy, or death from any cause within 30 days. Outcomes are described and potential risk factors were assessed using manual stepwise logistic regression analysis. **Results:** Of 1,060 CDR study participants, 556 had normal ECGs. Of the 556, 36 (6.5%) had a positive ACS outcome (12 AMIs; 24 positive angiograms without AMI). Of 12 AMI patients, 5 had normal angiograms (diagnosed as coronary vasospasm). Statistically significant risk/protective factors for ACS were increased age ($p < 0.05$); serum creatinine > 80 µg/L ($p < 0.05$); CP present at rest (OR 0.15; 0.06, 0.38); and no CP radiation (OR 0.26; 0.10, 0.63). No participant died. Risk factors important in univariate analysis but not significant in multivariate modeling included "change in previous CP pattern" and the clinician's overall impression of CP pattern as "typical for ACS." **Conclusions:** In this cohort, 6.5% of CP patients with a normal ECG had an ACS. Interesting features in these patients were that only one-third had an AMI, with coronary vasospasm being the etiology in 42% of AMIs, and a larger proportion (67%) had no acute elevation of biomarkers but had positive angiography. CP without radiation and CP being present at rest were clear protective factors in this study population.

5507

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COMPARISON of rural emergency departments in British Columbia and Quebec: a pilot study

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Keywords: administration, emergency medicine, rural

Introduction: Although emergency departments (EDs) in Canada's rural areas serve 30% of the population, a serious problem in access to health care services in these regions has emerged. The survival of rural hospitals is threatened by a shortage of doctors and nursing staff and by the impact of budget cuts. With the purpose of planning a large-scale nationwide study, this pilot project's main objective was to compare access to support services to EDs between British Columbia and Quebec. **Methods:** Rural EDs were identified through the *Guide of Canadian Healthcare Facilities*. We selected hospitals with 24/7 ED physician coverage and hospitalization beds that were located in rural communities (rural small town definition - Statistics Canada). Data were collected from several sources: ministries of health, local health authorities, and ED statistics. A semistructured interview was administered by telephone to ED managers to collect denominative user data statistics and confirm the status of services. **Results:** British Columbia has more rural EDs ($n = 32$) than Quebec ($n = 26$). EDs in Quebec serve larger populations (average = 21,000) than British Columbia (average = 10,000) and have higher volumes (19,000 v. 8,000 annual visits). With respect to support services, 81% of Quebec rural EDs have a 24/7 on-call general surgeon compared with 11% for British Columbia. Nearly 75% of Quebec rural EDs have a CT scan versus only 3% for British Columbia. Rural EDs in Quebec are also supported by a greater proportion of intensive care units (88% v. 12%). **Conclusions:** Preliminary results suggest that major differences exist in access to support services in rural EDs in British Columbia and Quebec. A nationwide study is justified to address this issue of variability in rural and remote health service delivery.

5509

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THROMBOEMBOLIC events following elective hip and knee arthroplasty using oral factor Xa inhibitor (rivaroxaban)

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Keywords: clinical practice, emergency medicine, thromboprophylaxis

Introduction: Rivoroxaban is licensed for thromboprophylaxis following total hip (THA) and total knee (TKA) arthroplasties. With shorter hospital stays, more patients treated with this drug will be seen in emergency departments. The study documented the incidence and timing of thromboembolic events. **Methods:** Prospective, observational study following primary and revision THA and TKA. Patients were consented. Patients were treated with rivaroxaban 10 mg po starting postoperative day (POD) 1 for 15 days. Patients were routinely discharged on POD 4. Follow-up at 6 weeks and 3 months. Doppler ultrasound or venograms were used to diagnose proximal DVT. Spiral CT angiograms, angiograms, or V/Q scan were used to diagnose PE. Event rates were reported. Ethics approval was obtained. **Results:** From June 2010 to Aug 2011, 2,178 patients underwent total joint arthroplasty; 1,953 patients (90%) participated in the study. Thirty-six patients were lost to follow-up, and 116 patients were treated with other anticoagulants, leaving 1,801 for analysis: 695 men, 1,106 women; mean age 66. TKA 1,035 (primary 909, bilateral 42, revision 84). THA 766 (primary 688, bilateral 4, revision 74). DVT: two by 6 weeks. Six DVTs were reported at 3 months: total DVT = 8 of 1,801 = 0.4%. PE: There were seven confirmed PEs during 7 days after surgery: Two PEs occurred by 6 weeks. Four PEs reported at 3 months. Total PE = 13 of 1,801 = 0.7%. There were three deaths during the study period. None of these

deaths were related to surgery, DVT, pulmonary embolism, or bleeding. **Conclusions:** The incidence of DVT was 8 of 1,801 (0.4%) within a period of 3 months and 13 of 1,801 (0.7%) for PE. Preliminary results are surprising for the number of PE that occurred within 7 days of surgery and for the number of DVTs that occurred between 6 weeks and 3 months. The majority of DVTs occurring after 6 weeks were in THA (4 of 5).

5510

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EXPERIENCE with emergency ultrasound training by Canadian emergency medicine residents: a national survey

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Keywords: education/teaching, emergency medicine, ultrasound

Introduction: The Canadian Association of Emergency Physicians (CAEP) issued a position statement in 2006 stating that emergency ultrasound (EUS) training should be incorporated into emergency medicine (EM) residency programs accredited by the Royal College of Physicians and Surgeons of Canada. However, there is currently a paucity of data about ultrasound training in Canadian EM programs. The objective of this study is to describe the current experience with EUS training by Canadian Royal College EM residents. **Methods:** All final-year (PGY-5) residents of all 13 Royal College EM programs across Canada were invited to participate in this study. Using a modified Dillman method, potential resident participants were e-mailed a link to a website-based survey in January 2011. Descriptive statistics were reported using number and proportion. **Results:** Survey response rate was 95% (37 of 39). EUS was part of the formal residency curriculum for 86% of respondents (32 of 37). Residents most commonly received training in focused assessment with sonography for trauma (FAST), intrauterine pregnancy, abdominal aortic aneurysm, and cardiac, thoracic, and procedural guidance. All respondents (100% [37 of 37]) received training in ultrasound-guided central line placement. Although the most commonly provided instructional material (86% [32 of 37]) was an ultrasound course, 73% (27 of 37) of residents used educational resources outside residency training to supplement their ultrasound knowledge. Most residents (95% [35 of 37]) made clinical decisions and patient dispositions based on their EUS interpretation without a consultative study by radiology. **Conclusions:** Although EUS training was prevalent, there was heterogeneity among residents in their training and practice of EUS. This may explain why a majority of residents used educational resources outside their residency training to supplement their ultrasound knowledge. This suggests variability in both the level and quality of EUS training in Canadian Royal College EM residency programs.

5513

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COMMUNICATION in the emergency department between physicians and paramedics: a pilot quantitative study to determine emergency physicians' accuracy, awareness, and satisfaction with paramedic handover

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Keywords: communication, emergency medical services, emergency medicine handover

Introduction: In high-acuity settings such as the emergency department (ED), minimizing communication errors is important. This pilot study sought to determine the accuracy of, awareness of, and satisfaction with paramedic handover of prehospital interventions from the perspective of emergency physicians (EPs) treating patients brought in by paramedics. **Methods:** We enrolled a convenience sample of 36 EPs (attendings and residents) at two hospitals in a single Canadian city from August 2010 to April 2011. We interviewed EPs prior to doctor-patient encounters to determine satisfaction with communication from paramedics and nurses (RNs) and knowledge of prehospital interventions performed. We included encounters with patients involving one of three presentations: chest pain, shortness of breath, and altered level of consciousness/weakness. We asked EPs about (a) satisfaction with handover concerning prehospital interventions (5-point Likert scale) and (b) which interventions were performed. We compared EPs' recall of interventions to ambulance call reports (ACRs) as the reference standard. **Results:** Thirty-six encounters were recorded; nine ACRs were lost to follow-up. Accuracy rates regarding interventions performed were found to be chest pain 40% (95% CI 6.7–73); shortness of breath 33% (18–48%); and altered level of consciousness 16% (7.4–25%). Through stepwise regression, we determined that EPs' satisfaction with paramedic verbal and RN written handover was correlated with EPs' overall satisfaction and accuracy ($p = 0.002$, $p = 0.008$). EPs' satisfaction with direct RNs' verbal handover satisfaction was related to accuracy ($p = 0.03$). When EPs received direct handover from paramedics, neither RN verbal nor written handover was correlated with EP satisfaction. **Conclusions:** EPs had poor accuracy with respect to knowledge of interventions performed by paramedics in these three cardinal presentations. Paramedic verbal reports and RN written notes are related to overall EP satisfaction and accuracy about prehospital interventions.

5514

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COMMUNICATION in the emergency department between physicians and paramedics: a pilot qualitative study to determine areas for improvement

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Keywords: communication, emergency medical services, emergency medicine, handover

Introduction: Handover of patient information is a vital component of clinical practice in the emergency department (ED). This pilot study sought to identify qualitative themes of potential process errors and areas for improvement of communication between emergency physicians (EPs) and paramedics. We present qualitative data from a pilot study to solve process problems identified by the EPs. **Methods:** From August 2010 to April 2011, we enrolled a convenience sample of 36 participants consisting of EPs and residents at two hospitals in a single Canadian city. During a 3-minute interview, participants were asked to provide comments or suggestions to improve the current communication system. We analyzed qualitative responses using inductive methods associated with grounded theory. We redundantly coded all of the comments to measure the interrater agreement. A third collaborator performed an external audit to ensure the trustworthiness of the analysis. **Results:** Of the 36 participants, only 24 commented about or gave suggestions for improving handover communication between paramedics and the ED staff. We found four key themes, which were reliably able to indentify them during the second data extraction with an interrater agreement of 96%. Four themes commented on by EPs were 1) prehospital communication and paramedic actions; 2) the role of nursing communication during the paramedic-ED handover process; 3) EP perceptions of the paramedic-ED handover process; and 4) teamwork. The participating EPs contributed suggestions for improving

information handover about prehospital interventions along these four themes. Solutions heavily emphasized the importance of nurses, institutional methods for acquiring and recording data, and effective teamwork. **Conclusions:** We provide qualitative information about EPs' perceptions of paramedic-ED handovers. We provide insight into themes identified by EPs as important to the paramedic-ED handover process.

5515

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CPR training for children: when should we begin?

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Keywords: cardiovascular, education, emergency medicine, pediatrics, resuscitation

Introduction: In a recent CAEP statement, schools have been proposed to be the best place to learn CPR. However, the optimal age to begin training is still a matter of debate. This study aims to determine if schoolchildren from 10 to 12 years old have sufficient physical strength to administer CPR efficiently. **Methods:** The study took place between August 2006 and June 2007 in an elementary school located in Quebec City. Eighty-two children (n = 82) between 10 and 12 years old received a 6-hour CPR course based on the American Heart Association (AHA) guidelines. A convenience sample of adults (n = 20) was recruited as a control group from similar courses given by the same instructors who taught the children. After their training, all subjects were recorded on video, performing CPR on a Laerdal SkillReporter Manikin. The primary outcome was depth of chest compression. Chest compression rate, volume of insufflation, and respect of CPR sequence of actions were the secondary outcomes. Video recordings were reviewed by two independent evaluators to assess the CPR sequence of actions using a validated overall performance scale. Children were compared to the AHA standards and to the adult group. **Results:** Schoolchildren did not reach the lower acceptable thresholds for depth (mean 28.1 mm ± 5.9 v. 38 mm; one-sided t-test p = 1.0) and volume of insufflation (mean 367.8 mL ± 304.6 v. 500 mL; one-sided t-test p = 0.99) as defined in the AHA guidelines. Likewise, they did not perform as well as the adults regarding the depth of compressions (Wilcoxon rank sum: $p < 0.0001$). However, children reached the minimal threshold for rate (mean 113.9/min ± 18.3 v. 90/min; one-sided t-test $p < 0.0001$) and were comparable to the adult group for the volume of insufflation (Wilcoxon rank sum: $p < 0.0001$) and the CPR sequence of actions. **Conclusions:** Schoolchildren of 10 to 12 years old are not strong enough to perform CPR with adequate depth and volume, but they achieve adequate rate and perform the CPR sequence similarly to adults.

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ASSESSMENT of scribes in Calgary emergency departments

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Keywords: administration, efficiency, emergency medicine, scribes

Introduction: As emergency departments (EDs) have become increasingly overcrowded, methods to improve the efficiency of the department are sought. Scribes have been used in US EDs for decades, and some studies have suggested increased physician efficiency, greater medical record legibility, improved physician-patient interactions, and increased patient satisfaction. We carried out a pilot project to introduce scribes to the EDs in Calgary. **Methods:** A convenience sample of 15 emergency physicians was recruited through the University of Calgary Faculty of Medicine to work eight control shifts and eight scribe shifts. Selection of shifts was chosen to ensure similar shift mix and patient characteristics. The primary outcome measure was patients seen per hour by physicians as recorded by the Regional Emergency Department Information System (REDIS). Secondary outcome measures were time from physician sign-up to disposition, physician satisfaction, and nursing satisfaction. Outcome data for each physician-scribe pair were analyzed using paired t-tests for quantitative data and descriptive statistics where appropriate. **Results:** Productivity increased from 1.77 to 1.81 patients per hour when physicians were working with their scribe (Δ = 0.04; 95% CI –0.68 to 0.76; p = 0.77), whereas time to disposition increased by 16.4 minutes (95% CI –88.6 to 55.7, p = 0.22). Physicians reported that they spent more time on clinical tasks versus clerical tasks, and surveys showed improvements in physician satisfaction, nursing satisfaction, and chart legibility. **Conclusions:** Our data show no evidence of enhanced efficiency with the use of scribes in our ED but improvements in chart legibility and increased nurse-physician satisfaction. Future studies should consider longer evaluation periods to determine the presence or absence of training effects.

5520

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PROTECTIVE effects of adiponectin in paraquat-induced lung injury

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Keywords: antiinflammatory, antioxidant, emergency medicine, protective effects, toxicology

Introduction: Adiponectin is an adipose tissue–derived hormone that exhibits antioxidative and antiinflammatory effects. In this study, we evaluated whether an exogenous globular form of adiponectin could protect against lung injury and pulmonary fibrosis in paraquat-treated mice. **Methods:** BALB/c mice were divided into four groups (control group, paraquat intoxication group, paraquat + high-dose adiponectin pretreated group, and paraquat + low-dose adiponectin pretreated group) and sacrificed at hours 3, 6, 12, 24, and 72. Lung tissue and blood were collected and analyzed biochemically and histologically. **Results:** Paraquat intoxication significantly increased nitric oxide (NO), superoxide dismutase (SOD), and malondialdehyde (MDA) levels in lung tissue. There were also increased tissue inhibitor of metalloproteinase 1 (TIMP-1) level in blood but no marked change in 3-nitrotyrosine level. Histologic examination of paraquat-treated mice showed acute injury with interstitial edema and widespread inflammatory cell infiltration in the alveolar space and septum, as well as fibrosis. After adiponectin treatment, levels of NO, SOD, MDA, and TIMP-1 decreased remarkably. Histologic examination showed that adiponectin decreased interstitial edema and inflammatory cell infiltration and prevented the process of pulmonary fibrosis. All of these changes were more noticeable in the high-dose adiponectin group compared with the low-dose adiponectin group. **Conclusions:** Together, the above data indicate the protective effects of adiponectin in paraquat-induced lung injury.

5526

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DO emergency physicians know the costs of commonly ordered emergency department investigations?

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Keywords: budget, clinical practice, costing, emergency medicine, investigations

Introduction: Bloodwork and diagnostic imaging tests are routinely ordered in the emergency department (ED) as part of the patient assessment process. However, there is no formal training to educate ED staff about the actual costs of these investigations. The primary objective of this study was to determine physicians and residents' perceived costs of commonly ordered ED investigations. **Methods:** An online, 23-item survey was distributed to all physicians and residents working in the EDs of an academic tertiary care centre (combined annual census 150,000) in February 2011. Participants were asked some background questions and to estimate the costs of various medical directives and imaging tests. **Results:** Of the 65 invited participants, 52 (80%) completed the survey. As a group, ED staff and residents disagreed that they received adequate training on the costs of commonly ordered investigations; they also disagreed about having adequate access to cost information. For ACS/Stroke, Upper abdomen, Sepsis and Toxicology care sets, > 60% of the survey respondents underestimated the true costs by at least 50% per care set. Similarly, > 75% of the survey respondents underestimated the true costs of ECGs and chest x-rays by 42% and 38%, respectively. After learning the actual costs of various investigations postsurvey, more than 90% of the respondents stated that they would not change their test-ordering behaviour. **Conclusions:** The results of this survey are useful to establish baseline perceived medical costs. Although cost awareness does not appear to influence test-ordering behaviour among the majority of the physicians surveyed, we believe that in a health care system with limited resources, there is still merit in implementing cost-awareness teaching modules and strategies.

5530

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INITIAL rhythm, therapeutic hypothermia, and patient outcomes in cardiac arrest patients

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Keywords: cardiac arrest, cardiovascular, emergency medicine, therapeutic hypothermia

Introduction: The AHA and ILCOR recommend that patients with return of spontaneous circulation following cardiac arrest undergo postresuscitation therapeutic hypothermia. The objective of this study was to explore clinical practice regarding the use of therapeutic hypothermia and compare survival outcomes in post–cardiac arrest patients. A secondary outcome was to assess whether the initial presenting cardiac arrest rhythm (ventricular fibrillation/ventricular tachycardia [VF/VT] versus pulseless electrical activity [PEA] or asystole) was associated with differences in outcomes. **Methods:** A retrospective medical record review was conducted for all adult (≥ 18 years) post–cardiac arrest patients admitted to the ICU of an academic tertiary care centre (annual ED census 150,000) from 2006 to 2007. Data were extracted using a standardized data collection tool by trained research personnel. **Results:** Two hundred patients were enrolled. Of 58 (29.0%) patients treated with hypothermia, 27 (46.6%) presented with an initial rhythm of VF/VT and 31 (53.4%) presented with PEA or asystole. Nine (33.3%) patients with VF/VT were treated with therapeutic hypothermia and discharged from hospital compared to 2 (6.4%) patients with PEA or asystole (Δ 26.9%; 95% CI 6.4–46.3). Of 142 patients not treated with hypothermia, 37 (26.1%) presented with VF/VT, 93 (65.5%) presented with PEA or asystole, and 12 (8.4%) initial rhythms were unknown. Fifteen (40.5%) patients with VF/VT, not treated with hypothermia, were discharged from hospital compared to 13 (13.9%) patients with PEA or asystole (Δ 26.6%; 95% CI 10.0–43.5). Regardless of initial presenting rhythm or initiation of therapeutic hypothermia, 37 (88.1%) discharged patients had good neurologic function as assessed by the cerebral performance category (CPC score 1–2). **Conclusions:** Although recommended, post–cardiac arrest therapeutic hypothermia was not routinely used. Patients with VF/VT and treated with hypothermia had better outcomes than those with PEA or asystole.

5532

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EXTENDING the hours of Doppler ultrasound availability to rule out deep vein thrombosis in the emergency department

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Keywords: deep vein thrombosis, diagnostic technologies/imaging, emergency medicine, ultrasound

Introduction: Standard practice for patients presenting to our emergency departments (EDs) with suspected deep vein thrombosis (DVT) outside regular business hours is to anticoagulate them with low-molecular-weight heparin and to have them return the next business day for a diagnostic leg ultrasound. The objectives of this study were to determine the number of patients who had a negative imaging test when they returned the next business day and to determine the number of return ED visits that could have been reduced by extending hours of ultrasound availability. **Methods:** A retrospective medical record review was conducted for all adult (≥ 18 years) patients who had an ED-ordered leg ultrasound between April 1, 2009, and March 31, 2010. Data were recorded using a standardized data extraction tool. Patients who had a leg ultrasound for an indication other than suspected DVT were excluded. **Results:** There were 863 ED-ordered leg ultrasounds to rule out DVT. Thirteen did not meet inclusion criteria. Of the remaining 850 cases, 51.9% (441 of 850) returned the next business day, 89.6% (395 of 441) of whom had a negative leg ultrasound. By extending ultrasound availability to 5 pm, 6 pm, 7 pm, 8 pm, and 9 pm on weekdays; 30 (6.8%), 49 (11.1%), 74 (16.8%), 96 (21.8%), and 116 (26.3%) return ED visits could be prevented, respectively. **Conclusions:** Most patients who returned for a leg ultrasound had a negative scan, most of whom likely received an unnecessary dose of anticoagulation. Extending ultrasound availability to all hours would eliminate 441 return visits. Extending the hours to 9 pm on weekdays would eliminate 116 return visits or roughly one visit per hospital site per week. A cost analysis is needed to assess the impact that these additional expenses have on the patient and hospital.

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DEMOGRAPHIC predictors of poor performance on the National Registry of Emergency Medical Technicians Exam by southwest Ontario paramedics

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Keywords: education/teaching, emergency medical services, emergency medicine

Introduction: In order to become a paramedic in the United States, each candidate must successfully complete the National Registry of Emergency Medical Technicians (NREMT) Exam. The examination is a computer adaptive test, in which questions are generated based on each candidate's response to previous questions, with the level of difficulty adjusted until a level of competency is established. To become a paramedic in Ontario, candidates become certified following successful completion of the Advanced Emergency Medical Care Assistant (AEMCA) Examination, a 6-hour multiple-choice examination. As the NREMT is a US-based test, its utility and validity in a Canadian training system are unknown. In 2009, a cohort of Southwest Ontario

Regional Base Hospital (SWORBH) paramedics completed the NREMT. The objective of this study was to determine variables related to poor NREMT performance. **Methods:** This was a retrospective review of all SWORBH paramedics who completed the NREMT. Demographic and performance information was collected from SWORBH and each participating service. **Results:** There were 133 cases reviewed. The average (SD) age was 36 (11), and 42.1% were female. There were 20 (15.0%) NREMT failures. NREMT failure was associated with age > 45 years (11.7% v. 26.7%, Δ 15.0%, 95% CI 1.1, 32.4), AEMCA certification > 15 years (12.3% v. 45.5%, Δ 33.2%; 95% CI 8.0, 60.1), < 10 patches in the last year (11.1% v. 25.6%, Δ 14.5%; 95% CI 1.1, 29.9), and score < 90% on any SWORBH recertification examination in the last 2 years (4.5% v. 26.2%, Δ 21.7%; 95% CI 9.5, 33.8). **Conclusions:** Being able to identify predictors of poor performance may allow base hospitals to make improvements to their training and education practices and to better inform paramedics about deficiencies in their own learning.

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ASSESSMENT of emergency department timeliness to remove cervical spine immobilized patients from rigid backboards

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Keywords: cervical spine immobilization, clinical practice, emergency medicine

Introduction: Trauma patients are often transported to hospitals in cervical spine immobilization on a rigid backboard. Studies of immobilization have shown immediate reduced respiratory function, false-positive midline cervical tenderness if on the backboard for longer than 20 minutes, moderate to severe pain by 30 minutes, irreversible tissue damage by 60 minutes, and pressure ulcers in less than 120 minutes. The current study objective was to determine the timeliness of ED physicians to remove patients from rigid backboards. **Methods:** A retrospective medical record review was conducted for a random sample of motor vehicle accident adult (≥ 18 years) patients transported by EMS to one of two EDs between April 1, 2009, and March 31, 2010. Charts were excluded if the patient was not in spinal immobilization, was received at hospital by a trauma team, or was assessed by a medical student but without documentation of an assessment by a resident or staff. Data were recorded by trained research personnel using a standardized data extraction tool. **Results:** Of 202 charts screened, 107 were included for analysis. The mean (SD) age was 44 (19) years, 56 (52.3%) were female, and 72 (67.3%) were CTAS-3. The median (IQR) time from ED triage until time off backboard (ED-TOB) was 50 (26.5, 75.5) minutes. There was no difference when stratified by age group, gender, season of presentation, ED site, or radiologic investigations ordered. However, ED-TOB was predictably affected by CTAS score, with more severely injured patients evaluated sooner. When including EMS transport time, the total median (IQR) time on backboard (Total-TOB) was 78 (48, 109) minutes. **Conclusions:** The ED-TOB contributed approximately two-thirds to the Total-TOB, which was in excess of the above-noted immobilization times likely to cause negative patient consequences. Efforts should be made to identify ways to decrease time of immobilization on a rigid backboard.

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FACTORS affecting choice of imaging investigations for patients with suspected renal colic in the emergency department

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Keywords: diagnostic technologies/imaging, emergency medicine, renal colic

Introduction: There is significant variability in the practice patterns of emergency physicians with respect to the appropriate workup of patients with suspected renal colic. The objective of this study was to determine how often emergency physicians order imaging investigations and the factors that influence the choice of imaging modality used to diagnose urolithiasis. **Methods:** This was a prospective cohort study involving adult (≥ 18 years) patients presenting to the EDs of a tertiary care centre (combined census 150,000) with suspected renal colic over a 1-year period. After the initial clinical assessment, physicians completed a data collection form regarding imaging investigations and factors that affected their imaging modality of choice. **Results:** A total of 514 patients were screened for study eligibility at triage. Of 397 patients enrolled, 369 (93.0%) data collection forms were completed; 301 (81.6%) were rated by physicians as either likely or highly likely to have urolithiasis, 274 (74.2%) ordered imaging investigations for their patients, 167 (60.9%) ordered US alone, 46 (16.8%) ordered CT alone, 28 (10.2%) ordered x-ray and US, 25 (9.1%) ordered x-ray alone, 4 (1.5%) ordered US and CT, and 4 (1.5%) ordered x-ray and CT. Lack of radiation exposure (52.5%) and patient age (47.0%) were the most commonly reported factors that affected the physician's choice to image with US. Advanced patient age (68.5%) and high likelihood of other abdominal pathology (48.1%) were the most commonly reported factors that affected the physician's choice to image with CT. The most common reasons why physicians did not order imaging in the ED were a high clinical likelihood of uncomplicated renal colic and previously completed recent imaging. **Conclusions:** Although CT is commonly selected for older patients and where other abdominal pathology is suspected, US is the imaging modality of choice at our centre for younger patients with a high clinical likelihood of urolithiasis.

5545

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DEVELOPMENT of an in-hospital standardized mortality ratio for emergency department–sensitive conditions

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Keywords: administration, emergency medicine, hospital standardized mortality ratio

Introduction: The Canadian Institute for Health Information (CIHI) estimates for each Canadian hospital four types of hospital standardized mortality ratio (HSMR), but none of them specifically captures the outcomes of admitted patients with conditions on which emergency physician management would be expected to have an impact (emergency-sensitive conditions). We propose to develop a HSMR specific to emergency-sensitive conditions as one tool for measuring ED care performance. **Methods:** To develop a HSMR specific to emergency-sensitive conditions, we first aim to identify those conditions by conducting a mixed method study in two steps: 1) an expert panel of emergency care providers and managers (n = 12) will be presented with the 65 diagnosis-related groups (DRGs) included in the CIHI HSMR and will be asked to select DRGs reflecting emergency-sensitive conditions using a modified Delphi method and 2) a stratified random sample of emergency physicians selected through the Canadian Association of Emergency Physicians membership list will be surveyed to test the face validity of the emergency-sensitive conditions selected by the expert panel (n = 70, with a 70% response rate, seeking 80% agreement on emergency-sensitive conditions, 95% CI ± 5, 7%). **Results:** We have developed two Web-based instruments: one to poll our panelists and another to survey a group of emergency physicians. The panelist tool contains a nine-level rating scale for each 65 DRGs measur-

ing the extent to which each one is considered an emergency-sensitive condition by the panel. We are recruiting panelists from multiple backgrounds (emergency physicians, emergency nurses, care providers from different specialties, and health care managers). Consensus panel ratings and survey results will be subsequently presented. **Conclusions:** The development of an emergency-sensitive conditions list will enable the calculation of the first in-hospital standardized mortality ratio related to emergency care. This HSMR will improve understanding of ED performance.

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ACUTE pediatric musculoskeletal pain treatment: a North American survey of practice variation

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Keywords: analgesia, emergency medicine, musculoskeletal injury, pain, pediatrics

Introduction: Musculoskeletal (MSK) injuries are a common, painful pediatric presentation to the emergency department (ED). Still, children's pain in the ED remains poorly managed. The objective of this study was to assess ED analgesia administration practice variation and pharmacologic discharge advice for the pediatric-aged patient with acute MSK pain. **Methods:** A descriptive, cross-sectional survey of pediatric emergency physicians (Canada and the United States) and orthopedic surgeons (Canada) was conducted between November 2009 and May 2010. A novel tool was created and administered (via e-mail and post) using modified Dillman methodology. Survey themes included analgesic choice for standardized pain scenarios and oral opioid of choice by age. **Results:** A total of 683 responses were received, with a cumulative response rate of 28%; Pediatric Emergency Research Canada provided 138 of 243 (57%), the American Academy of Pediatrics Section on Emergency Medicine 202 of 962 (21%), and the Canadian Orthopaedic Association 343 of 1,277 (27%) responses. Ibuprofen was the most commonly recommended analgesic in the ED (52%) and at discharge (68%). Codeine-containing compounds were recommended in the ED by 38% and at discharge by 51%. The three most frequently prescribed narcotics for infants were codeine and acetaminophen (C&A) (27%) and codeine alone (26%), with 16% reporting never prescribing an opioid; for preschool-age children: C&A (33%), codeine alone (24%), codeine and ibuprofen (10%); for school-age children: C&A (40%), codeine alone (15%), codeine and ibuprofen (10%); for teenagers: C&A (40%), oxycodone and acetaminophen (17%), hydrocodone and acetaminophen (16%). **Conclusions:** Although ibuprofen is the most commonly recommended analgesic, narcotic-containing compounds are often prescribed in the ED and at discharge to pediatric patients. Younger children are offered less analgesia than older children with similar pain scores. With narcotics being so commonly used, further research is required to determine the best choice for children.

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PEDIATRIC musculoskeletal pain management in the ED: a medical record review

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Keywords: analgesia, emergency medicine, musculoskeletal injury, pain, pediatrics

Introduction: Musculoskeletal (MSK) injuries are a common, painful pediatric presentation to the emergency department (ED). Acute MSK injuries include dislocations, sprains, strains, and fractures. The primary objective of this study was to assess analgesia administration practice for children's MSK pain in the ED and at the time of discharge. **Methods:** This medical record review identified all consecutive pediatric patients who presented to the Stollery Children's Hospital (pediatric) or the Royal Alexandra Hospital (general) EDs (Edmonton, Alberta) during the months of January, April, July, and October 2008 with a diagnosis of fracture, dislocation, or sprain of a limb. Abstracted data included demographics, administered analgesics, pain scores, discharge analgesia, and the timing of all pain-related assessments and interventions. **Results:** A total of 543 medical records were reviewed (n = 468 pediatric ED, n = 75 general ED). The most common diagnosis was fracture of the forearm (27%). Nineteen percent of patients received prehospital analgesia, 34% received analgesia in the ED, 13% received procedural sedation, and 24% received discharge analgesia advice. Of those children receiving analgesia in the ED, 59% (126 of 214) received ibuprofen. Pain scores were recorded for 6% of patients. At discharge, ibuprofen was recommended to 47% and codeine-containing compounds to 21% of children. The average time from triage to administration of analgesia in the ED was 121 ± 84 minutes. **Conclusions:** Despite an increase in pediatric pain research over the past decade, children's pain in the ED remains poorly managed. Pediatric patients with MSK pain do not receive timely or adequate analgesia prior to ED arrival or in the ED. Interventions must be developed to improve "door to analgesia" time for children in pain. Further, codeine was frequently prescribed at discharge, but given recent concerns with its use in children, further research is required to determine the appropriate narcotic for children with MSK pain.

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EFFECT of an emergency department guideline on time to fluid resuscitation in pediatric severe sepsis

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Keywords: emergency medicine, guidelines, pediatrics, sepsis

Introduction: Sepsis is a leading cause of mortality worldwide. Current literature demonstrates a direct correlation between delayed reversal of shock in pediatric sepsis and morbidity/mortality. Internationally recognized guidelines for the management of pediatric sepsis stress early administration of fluids and antibiotics. The objective of this study was to determine the impact of a local sepsis guideline on time to fluid and antibiotic administration at a pediatric emergency department (PED). **Methods:** Using a pre-/post-implementation methodology, we conducted a retrospective health record review of children aged 3 months to 17 years managed in our PED for severe sepsis/septic shock. To control for structural and administrative changes influencing departmental flow, cases were compared to 20 randomly selected controls presenting with diabetic ketoacidosis (DKA) during each time period. DKA cases were chosen due to similar requirements for rapid initiation (not rate or volume) of fluid administration. **Results:** From May 1, 2004, to May 1, 2011, 89 children were managed for suspected severe sepsis/septic shock. Median reduction in time to first fluids for sepsis cases was 18 minutes (27%) compared to 5 minutes (9%) for DKA controls (p = 0.03). Time to first antibiotics for septic children was reduced by 7 minutes (5%). The proportion of children receiving antibiotics within 1 hour from triage increased marginally postimplementation from 20 to 24%, whereas those receiving antibiotics within 1 hour of fluid initiation remained constant at 60%. **Conclusions:** The implementation of a local sepsis guideline produced a significant positive impact on time to first fluids for children presenting to the PED with severe sepsis/septic shock. Early initiation of antibiotics remains a significant challenge as only 60% of children receive antibiotics within

1 hour of fluid initiation and less than 25% receive antibiotics within 1 hour of triage. Future research regarding barriers to early antibiotic administration is needed.

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SEPSIS in Canadian children: a national analysis using administrative data

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Keywords: administration, emergency medicine, pediatrics, sepsis

Introduction: Advances in the management of pediatric sepsis have led to significant improvements in morbidity and mortality. Developing future outcome-based research strategies, including those related to emergency department (ED) resuscitation and guideline implementation, requires an understanding of the current status of sepsis in children. This study provides national-level hospitalization metrics, to be used as baseline data in future studies targeting outcome improvements in pediatric sepsis. **Methods:** Using population-wide administrative data for sepsis hospitalizations previously collated by the Canadian Institute for Health Information (CIHI), a secondary analysis limited to pediatric patients (aged 0–17 years) was performed. The cohort was identified using International Classification of Diseases (ICD-10-CA) and Canadian Classification of Health Interventions (CCI) coding. Children admitted to hospital from April 2004 through March 2009 were included. **Results:** Hospitalization data on 20,130 children were analyzed. Neonates represented 56.3% of the population. Severe sepsis (SS) occurred in 20 to 25% across age groups except adolescents (33.7%). Respiratory and cardiovascular systems were most likely to fail (81.2% and 23.7%) in SS, whereas failure of hepatic and central nervous systems demonstrated the highest mortality (56.0% and 50.0%). Odds of mortality increased with number of systems failed (odds ratio of 3 v. 1 systems = 52.9, 95% CI 29.3–95.4). The median length of stay (LOS) for all comers was 12.0 days and 61.0 days in SS. Median intensive care unit LOS for SS was 29.4 days. Overall in-hospital crude mortality rates remained consistent (5.2–5.4%). **Conclusions:** Sepsis remains an important cause of morbidity and mortality in Canadian children, posing a significant burden on health care resources. Future research agendas may include targeting prevention strategies as well as therapies preventing and managing organ failure. This study provides baseline metrics for future outcome-based research.

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A COMPARATIVE study of patient characteristics, opinions, and outcomes for patients who leave the emergency department before medical assessment

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Keywords: administration, emergency medicine, left without being seen, outcomes, patient characteristics

Introduction: We studied the characteristics of emergency department (ED) patients who left without being seen to determine causative factors and subsequent events. We also sought to compare their responses to a demographically matched control group of patients who waited to be seen. **Methods:** We collected demographic data on patients who LWBS at the ED in an urban tertiary referral centre and at a neighbouring urgent care centre. Sequential LWBS patients were contacted and surveyed using a standardized telephone survey. A matched group of patients who did not leave the ED were also surveyed. Categorical data were analyzed using the Fisher exact test. **Results:** The LWBS group ($n = 467$) and the control group ($n = 437$) did not differ for triage category, employment and education, distance from hospital to home, or having a family physician. The mode for time to leaving was 1 to 2 hours compared with 2 to 3 hours to being seen. The commonest reason for leaving was long wait time (79%) and for staying was concern about medical condition (96%). Both groups considered an appropriate wait time to be 1 to 2 hours (LWBS group 49%; control 35%). The top responses for improved likelihood of waiting, or waiting conditions, were shorter wait times (LWBS 66%; control 31%) and more information on wait times (41%; 23%). A majority in both groups felt that their condition was a true emergency (63%; 72%). LWBS patients were more likely to seek further health care (63% v. 28%; $p < 0.001$) and sooner (median time 1 v. 2–4 days; $p = 0.002$). The top reason given for ED attendance was inability to see their family doctor (62%; 62%). **Conclusions:** LWBS patients had similar opinions, experiences, and expectations as controls. The main reason for leaving was waiting longer than expected. LWBS patients were more likely to seek further care and did so sooner.

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CRITICAL dynamics study of burnout in emergency department health professionals in New Brunswick: early findings

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Keywords: administration, burnout, emergency medicine, psychology, workplace stress

Introduction: Previous studies suggest elevated levels of burnout in emergency department health professionals (EDHPs). This multicentre survey examined levels of burnout and its correlation with psychological coping strategies used by EDHPs at seven emergency departments (EDs) in a New Brunswick health region. **Methods:** A survey of all EDHPs at seven EDs (three urban referral centres, two community EDs, and two small rural facilities) was performed during a 3-month period in 2011. A demographics questionnaire, the Maslach Burnout Inventory (MBI), a validated tool measuring emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA), and the Coping Inventory for Stressful Situations (CISS), measuring task-oriented (TO), emotion-oriented (EO), and avoidance-oriented (AO) coping styles), were collected. Site coordinators administered the survey to ED staff, with anonymous completion. **Results:** The response rate was 60% ($n = 315$). MBI and CISS scores were examined using χ^2 and Pearson correlation (r). MBI scores revealed levels of burnout in the average normative range for EE for all sites combined. PA, and DP scores reflected low levels of burnout compared to the normative group on scales PA ($\chi^2 = 41.87$, $df = 2$, $p < 0.01$) and scale DP ($\chi^2 = 14.07$, $df = 2$, $p < 0.01$). The CISS revealed significant inverse correlation between TO and burnout on all three MBI scales (DP, $r = –0.20$; EE, $r = –0.21$; PA, $r = 0.34$) and significant positive correlation between EO and burnout (DP, $r = 0.31$; EE, $r = 0.35$; PA, $r = –0.28$). **Conclusions:** Levels of burnout among EDHPs were lower than the normative group in our sample. Task-oriented copers show less burnout. Emotionally oriented copers show more burnout. Analysis of coping strategies used by individual EDHPs may be useful in predicting burnout and providing protective interventions.

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AN EVALUATION of an atrial fibrillation clinic for the follow-up of patients presenting to the emergency department with newly diagnosed or symptomatic arrhythmia

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Keywords: atrial fibrillation, cardiovascular, emergency medicine, outpatient care

Introduction: Atrial fibrillation (AF) is the most common arrhythmia treated in the ED, leading to high rates of hospitalization and resource use. Dedicated AF clinics may reduce the ED visit and admission burden through better follow-up and education. Our objective was to compare the number of ED visits and hospitalizations among discharged ED patients with a primary diagnosis of AF who followed up with an AF clinic and similar patients who did not. **Methods:** A retrospective cohort study and medical records review of three hospitals in Calgary were undertaken during a 1-year window from Oct 2010 to 2011. A sample of 200 patients referred to the AF clinic from the Calgary-zone EDs were compared to 400 age-, sex-, and CTAS-matched control patients who were referred to other providers for follow-up. Inclusion criteria were patients over the age of 18 discharged at the index visit. The primary outcome was the number of cardiovascular (CV)-related ED visits and hospitalizations, and chi-squared was used to measure statistical significance. **Results:** Patients in the control and AF clinic cohorts were similar for all baseline characteristics except for a higher proportion of first episode patients in the intervention arm. In the 6 months following the index ED visit, 55 study group patients (27.5%) made 95 visits (0.48 visits/pt), with 12 hospitalized (6.0% admission rate). In the control group, 122 patients (30.5%) made 193 visits (0.48 visits/pt), with 44 (11.0%) admitted on 55 occasions. We found no significant difference in ED visit rates ($p = 0.5063$) or hospitalizations ($p = 0.0664$) between the control and AF clinic cohorts. **Conclusions:** Referral from the ED to an AF clinic is not associated with a significant reduction in subsequent CV-related ED visits and hospitalizations. Due to the possibility of residual confounding, randomized trials should be performed to evaluate the efficacy of AF clinics.

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EVALUATION of a novel research education rotation for Royal College of Physicians and Surgeons emergency medicine residents

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Keywords: education/teaching, emergency medicine, research, residency

Introduction: Royal College of Physicians and Surgeons (RCPS) emergency medicine (EM) residents must complete a scholarly project; however, significant variation exists in Canadian EM resident research education. We sought to evaluate a novel mandatory research education rotation for RCPS EM residents hypothesized to increase knowledge, faculty collaborations, and scholarly output. **Methods:** A 4-week rotation was developed involving 36 faculty-led didactic, critical appraisal, and workshop seminars and supporting the development of residents' research projects. The rotation was delivered in the fall of 2011. Residents completed daily evaluations and participated in an exit focus group analyzed using a constant comparative method. Knowledge acquisition was assessed with pre- and postcompletion of a comprehensive examination instrument evaluated by a paired *t*-test. REB approval and informed consent were obtained. **Results:** Twelve RCPS EM residents participated (100% recruitment). Evaluations indicated high satisfaction throughout the rotation; however, significant rating differences between seminars were found regarding content, applicability, presenter, and global factors. Focus group analysis indicated that residents felt two important but competing goals existed: developing a research project and developing critical appraisal skills. Residents varied in their assessment of the overall impact of the rotation based on which goal they felt was best supported and how this aligned with their expectations. Research knowledge of all participants improved significantly (mean/SD examination change +35.4%/+10.4%, range +20.0% to +53.6%, $p < 0.001$), and several new resident/faculty research collaborations arose from the rotation. **Conclusions:** RCPS EM residents report high satisfaction with a novel 1-month mandatory research rotation. Content knowledge increases significantly from such a rotation, as do faculty collaborations. Longitudinal tracking of the participating resident cohort remains ongoing to assess the scholarly output impact of the rotation.

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A SOCIAL determinants interpretation of emergency department utilization in Ontario, Canada

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Keywords: emergency medicine, overcrowding, patient flow

Introduction: Emergency department (ED) overcrowding is a complex system-wide problem with multiple causes and no simple solutions. In Canada, overcrowding of EDs has been escalating, resulting in prolonged wait times, service declines, increased patient suffering, and adverse patient outcomes. A significant component of this problem is patient flow into EDs. Understanding what drives ED use will be instrumental in making gains into shortening ED wait times. Socioeconomic status (SES) has been linked to health status and is therefore also potentially linked to ED use. The relationship between SES and ED use in Canada's universal health care system is examined in Ontario over a 7-year period. **Methods:** In this retrospective study, information from all ED visits in Ontario between April 1, 2003, and March 31, 2010, was obtained from the National Ambulatory Care Reporting System database. SES was defined based on material and social deprivation. Although there is no direct measure of SES available from the ED visit record, SES can be proxied from the patient's residential neighbourhood using a Deprivation Index developed by Pampalon et al. A Deprivation Index score was computed using Statistics Canada's Postal Code Conversion File, which links postal and census geography. **Results:** A total of 36,765,189 visits occurred during the study period. Initial data review revealed a significant cross-province trend wherein the most deprived population used EDs disproportionally more than populations with higher SES. This trend was stable across the entire study period. **Conclusions:** Social determinants of health appear to impact ED use. People of low SES use ED services disproportionally more than other socioeconomic groups. This study provides a novel view of ED use and contributions to ED overcrowding in Canada. It has the potential to direct health system planning and policy development toward improving primary health care in a long-term effort to decrease ED use.

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A NATIONAL faculty development needs assessment in emergency medicine

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Keywords: academics, education, emergency medicine, faculty

Introduction: Academic emergency physicians (AEPs) are expected to fulfill the ever-expanding roles of leaders, scholars, researchers, and educators. The skills and knowledge that enable success in these roles are supported by faculty development (FD), for which our knowledge of needs is limited. We conducted a national study of Canadian AEPs to 1) determine their current FD activities, 2) provide a detailed understanding of their FD needs and interests, 3) elucidate the perceived barriers to and motivation for engaging in FD, and 4) identify preferred methods of delivery for FD activities. **Methods:** This was a multicentre, cross-sectional survey of the current FD needs and interests of AEPs in eight academic centres across Canada. The key domains of this piloted instrument were research, social accountability, scholarship, leadership, and education. Multiple-response and 5-point Likert scale questions were used; mean Likert responses are reported. All EM faculty within the academic centre were approached using a modified Dillman technique of multiple respondent contacts. The survey was administered with surveymonkey.com and championed by local faculty. **Results:** Responses are reported from 251 motivated AEPs at six of eight national centres (response rates 31–60%). Most AEPs reported current participation in educational (97.6%), leadership (77.7%), and scholarly (71.7%) activities. Overall interest in future FD paralleled these trends. The most popular future activities include learning about developing "techniques for teaching around cases" (50.2%) and "providing constructive feedback" (47.4%). Participation in FD is motivated by personal satisfaction (4.42 of 5) and a desire to enhance bedside teaching (4.14 of 5). Optimal FD activities are held during weekday lunches (69.3%) and located within the hospital of practice (95.7%). **Conclusions:** AEPs report an interest in developing their academic skills. This project provides additional insight as to where FD resource allocation and programming efforts should be focused.

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THE EFFECT of an emergency department nurse–initiated analgesia protocol on the timeliness of analgesia delivery for patients presenting with renal colic

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Keywords: analgesia, clinical practice, emergency medicine, renal colic

Introduction: Painful conditions are one of the most common reasons for presentation to an emergency department, and there is a reasonable expectation that adequate analgesia will be promptly provided. An ED protocol where nurses can administer analgesics without physician authorization has been proposed as a safe means to reduce the delay from triage to receipt of analgesia. A nurse-initiated analgesia (NIA) protocol has been initiated at the Cape Breton Regional Hospital Emergency Department wherein nurses can give intravenous morphine to eligible patients presenting with acutely painful conditions. The objective of this study is to assess whether since the initiation of this program the time from triage to receipt of analgesia is reduced in patients presenting with renal colic. **Methods:** A retrospective chart review was conducted on patient charts with a final diagnosis of renal colic. A total of 150 charts were reviewed prior to protocol initiation and 131 charts following. Triage time and time of first analgesia were recorded as well as any medication adverse events. **Results:** Of the 150 charts reviewed prior to protocol initiation and 131 post, 83 and 81 met the inclusion criteria, respectively. The mean time from triage to receipt of analgesia was reduced following protocol initiation from 80.8 to 61.1 minutes ($p < 0.05$). No predefined adverse events were observed in patients enrolled in the NIA protocol. **Conclusions:** Since implementation of an NIA protocol, time from triage to analgesia in patients presenting with renal colic has been reduced, with no adverse events observed.

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CHILDREN discharged from the emergency department with serious infections: a population-based study in Ontario

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Keywords: discharge, emergency medicine, pediatrics, sepsis

Introduction: Delay in the diagnosis of serious infections remains a significant cause of morbidity and death in children. In an era of pneumococcal conjugate vaccination, changes in incidence of serious infections among children presenting to emergency departments (EDs) may influence accurate diagnosis. Our objective was to describe the incidence of prior related ED visits among children admitted to hospital for serious infection in Ontario. **Methods:** In a retrospective observational data set of linked population-based health administrative records over 5 years (2005–2010), we identified all children aged 28 days to 5 years old admitted from the ED to an Ontario hospital for ≥ 4 days with a diagnosis of serious infection (respiratory, urinary tract, septicemia, or meningitis). We identified all ED visits in the 5 days preceding the ED visit resulting in hospitalization. ED visits were deemed related to the admission if the ED discharge diagnosis suggested an infectious process. We compared children with and without a prior related ED visit. A secondary analysis was performed for children admitted for septicemia or meningitis. **Results:** A total of 5,234 children were admitted for a serious infection, of whom 1,117 (21.3%) had a prior related ED visit. Children aged 2 to 5 years were more likely to have a prior related ED visit (24%) compared with the very young 28 to 60 days (13%). Critical care use (8.5% v. 8.1%) and mortality (< 1%) were similar between the two groups. Of the 772 children admitted with septicemia or meningitis, 191 (25%) had a prior related ED visit. **Conclusions:** About 1 in 5 children admitted for a serious infection was previously seen for infectious symptoms in the ED and discharged home. The high rate of prior related ED visits among children with septicemia or meningitis, conditions usually requiring hospitalization, suggested opportunities for improvements in the assessment and diagnosis of serious infections in children in the ED.

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TO DRILL or not to drill: the use of burr hole trephination in Alberta

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Keywords: burr hole trephination, emergency medicine, epidural hematoma, injury/trauma

Introduction: Epidural hematomas are life-threatening but salvageable traumatic entities. It is commonly believed that patients presenting to the emergency department with an epidural hematoma should receive surgical treatment within 4 hours. Burr hole trephination is thought to be a safe and effective method to use in remote settings. However, few data exist on how often this is performed in Canada. Our study was designed to measure how many patients out of those presenting to emergency departments in Alberta received burr hole trephination. **Methods:** Data were gathered from the Alberta Health Services' Data Integration, Measurement, and Reporting database on patients presenting to emergency departments across the province with ICD-10 codes of either traumatic or nontraumatic epidural hematoma between Janu-

ary 2004 and February 2011. This was divided into patients presenting to large urban, regional, rural ambulatory, suburban/rural, and teaching emergency departments. From this data set, we determined the number of patients who received a Canadian Classification of Health Interventions code of burr hole technique. Our primary outcome was the number of patients with epidural hematomas presenting to emergency departments in Alberta who received burr hole trephination. **Results:** A total of 756 patients presented to emergency departments in Alberta with epidural hematomas over the study period. The incident rate for this condition was 3.03 per 100,000 person-years. Of those patients, 169 presented to large urban, 77 to regional, 2 to rural ambulatory, 48 to suburban/rural, and 460 to teaching emergency departments. Only 3 of the 756 (0.4%) patients received burr hole trephination in an emergency room: 2 in regional hospitals and 1 in a rural hospital. **Conclusions:** The low number of burr hole trephination procedures done over our 8-year study period suggests that there is little value in including this knowledge in trauma courses in Canada.

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EVIDENCE-BASED antiemetics for ED patients: a GRADE-based evaluation of medical literature and recommendations for practice

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Keywords: antiemetic, clinical practice, emergency medicine, nausea, vomiting

Introduction: Nausea and vomiting are among the most common ED presentations. To proceed toward the development of guidelines for antiemetic use, we evaluated the medical literature using the Grading Assessment, Development, and Evaluation (GRADE) tool. In addition to optimal management of nausea and vomiting (N&V), we sought to evaluate the evidence present in the literature and develop recommendations for the prophylactic use of antiemetics with opioids. **Methods:** Three clinical PICO-based (patient, intervention, comparison, and outcome) questions comparing common ED antiemetics were developed, as was a PICO for antiemetic prophylaxis with opioids. A literature search was conducted for each question using *OVID Medline*, *PubMed*, *EMBASE*, and *Cochrane*. Article titles and abstracts were screened for studies that met the inclusion criteria. Data were abstracted and entered into summary of findings (SoF) tables for each PICO using *GRADE-Pro* software. **Results:** A total of 127 abstracts were screened, and 12 of those studies were included in the analysis. The GRADE profiles suggested the use of ondansetron over promethazine based on less sedation and over metoclopramide due to superior emetic control (weak recommendations with moderate-quality evidence). The use of metoclopramide over prochlorperazine is suggested based on a lower level of side effects (weak recommendation, low-quality evidence). The profiles yielded a strong recommendation against the use of antiemetic prophylaxis for patients receiving opioids (strong recommendation, moderate-quality evidence). No comparative studies using dimenhydrinate were identified. **Conclusions:** Based on the limited number of studies comparing antiemetics in an ED setting and using available evidence and the GRADE system, we have developed recommendations for commonly used antiemetics. Using these recommendations, ED physicians and guideline panels may go on to create specific order sets in the future.

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PROGRAM regionalization is associated with differential management patterns for patients with renal colic

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Keywords: clinical practice, emergency medicine, renal colic

Introduction: Calgary's three adult hospitals are regionally integrated, sharing common processes and information systems. Urologic interventions are limited to one of the three hospitals (site A). Our hypothesis was that renal colic patients treated at site A would have higher hospitalization and intervention rates than those at other sites. **Methods:** For a 1-year period (Jan–Dec 2011), all Calgary patients with an ED diagnosis of renal colic were eligible for study. To mitigate referral bias, only first ED visits were studied. Patients with a prior renal colic visit within 30 days were excluded. Our primary outcome was hospitalization at index visit. Secondary outcomes included ED revisit, hospitalization, urologic intervention, or acute kidney injury (AKI = creatinine rise > 25%) within 30 days. **Results:** A total of 2,631 ED renal colic patients were studied, including 1,493 at site A, 493 at site B, and 645 at site C. Patients were similar at all sites, with a mean age of 47 years, 64% male, 39% CTAS 2, and 20% EMS arrival. Overall, 70% had CT and 10% had ultrasound imaging, with no between-site differences. Most received parenteral opioids (79%, 72%, and 74% at sites A, B, and C) as well as IV ketorolac (74%, 58%, 61%). Seven percent received an oral opioid (9%, 5%, 6%). Median ED lengths of stay were 5.5, 5.6, and 4.9 hours. Index (and 30-day) hospitalization rates were 51% (59%) for patients treated at site A, 30% (41%) at site B, and 25% (37%) at site C, whereas 30-day ED revisit rates were 25%, 32%, and 29%. By 30 days, surgical intervention (and lithotripsy) occurred in 54% (4%), 37% (4%), and 35% (2%) of patients, respectively. At 30 days, 1.6% of site A patients had documented AKI, compared to 2% at the other sites. **Conclusions:** The presence of urology intervention capability was associated with higher rates of hospitalization and intervention but no difference in AKI. Patients discharged from the ED had a substantial likelihood of ED revisit or hospitalization.

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PARAMEDIC clinical management of acute myocardial infarction with fibrinolytics: a process map and hazard analysis

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Keywords: emergency medical services, emergency medicine, myocardial infarction, prehospital fibrinolysis

Introduction: Despite the supporting published evidence for prehospital fibrinolysis for ST-elevation myocardial infarction (STEMI) patients by paramedics, the complexity of the process has been rigorously explored. **Methods:** A health care failure mode and effect analysis was conducted on EMS management of STEMI. Steps were identified and organized into major call phases. Each step was categorized as a decision, technical skill. or task. The role required to perform each was identified: emergency medical dispatcher (EMD) or primary (PCP) or advanced care paramedic (ACP). The map was validated against a videotaped STEMI scenario. Once finalized, the steps with potential for risk to safety or outcome (hazard modes [HMs]) were identified. HMs were scored by consensus for probability to occur and likely severity of impact to patients (minimum = 2, maximum = 16, > = 8 considered high risk). **Results:** The map consisted of 18 phases and 167 steps, of which 37 (22.2%) were decisions, 67 (40.1%) were technical skills, and 63 (37.7%) were tasks. Ten steps could be completed by an EMD (6.0%), 76 (45.5%) by a PCP, and 81 (48.5%) by an ACP. The phases with the most steps were initial treatment, n = 31 steps (18.0%), and reperfusion therapy, n = 30 steps (18.0%). Seventy-four HMs were identified, mean score 4.69 (95% CI 4.18–5.20), 7 of which scored 8 or above (9.5%). The highest scoring HMs were history taking, obtaining 12-lead, and transmitting 12-lead (all score = 12). The phases with the most HMs were initial treatment (n = 12) and

reperfusion therapy (n = 12). **Conclusions:** EMS management of STEMI requires a complex series of steps; however, few individual steps were found to be high risk, indicating that paramedic fibrinolytic administration is likely safe. The most complex phases present the greatest opportunity for risk to safety and outcome. This analysis provided a deeper understanding of EMS STEMI management and direction for training and quality improvement.

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GUIDELINES Appraisal Project (GAP) for EMS: a systematic review of the quality and relevance to EMS of published clinical practice guidelines

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Keywords: emergency medical services, emergency medicine, guidelines

Introduction: To develop or improve clinical protocols, emergency medical services (EMS) staff reference expert opinion, research, and/or published clinical practice guidelines. It is unknown how relevant published guidelines are to EMS, if those that are relevant are of good quality, and which EMS clinical areas are not well covered by published guidelines. **Methods:** Using contemporary systematic review methods, 19 electronic databases were searched for guidelines with two author independent review for inclusion with third-party adjudication. Guidelines were assigned to 1 of 33 predefined protocol categories and categorized as evidence based (EBG) or non–evidence based (N-EBG). Each EBG was randomly assigned to 2 of 21 trained appraisers, who independently scored guidelines for 1) quality using a validated tool and 2) relevance to EMS. Quality scores were averaged (score range 1–7). Two members of the study team independently ranked N-EBGs for relevance, with third-party adjudication. **Results:** The search produced 481 potentially relevant clinical practice guidelines. After the review for inclusion, 223 guidelines remained (kappa = 0.27): 99 EBGs and 124 N-EBGs (kappa = 0.71). The protocol area with the most guidelines is respiratory (n = 32: EBG n = 10, N-EBG n = 22). No guidelines were found for 19 (57.6%) protocol categories. There were 93 (41.7%) guidelines highly relevant to EMS, 110 (49.3%) guidelines were somewhat relevant, and 20 (9.0%) were not relevant. The mean quality score of the EBGs was 5.48 (95% CI 5.23–5.67). The protocol area with the highest quality EBG was "burn protocol" (mean score 6.5, n = 1) and lowest is "EENT protocol" (mean score 3.5, n = 1). **Conclusions:** Most guidelines that were potentially relevant to EMS care are not evidence based. The guidelines that were based on evidence were found to be of good quality. Several protocol areas have no relevant guideline, which presents an opportunity to develop EMS-specific evidence-based guidelines.

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DOES parental presence during fracture reduction decrease anxiety in children and their parents in the emergency department? A pilot study

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Keywords: anxiolysis, emergency medicine, parental presence, pediatrics, procedures

Introduction: Studies suggest that parental presence (PP) during invasive pediatric procedures can benefit parents, children, and health care providers. Most studies have not involved a control group, and patients' perspectives are lacking. We sought to assess whether PP during fracture reduction in the emergency department (ED) influences patients' and parents' anxiety levels. **Methods:** This randomized controlled pilot study took place in a tertiary care pediatric ED from June 2009 to August 2011. Participants consisted of a convenience sample of children (8 to 18 years) presenting to the ED and requiring sedation for fracture reduction. They were randomized to one of two groups. In the intervention group, one parent was invited to stay at the child's bedside for the procedure, whereas in the control group, parents were asked to leave once sedation began. Patients completed the State-Trait Anxiety Inventory (STAI) or STAI for Children (STAIC) before randomization, sedation, and discharge. Parents completed the STAI before randomization and discharge. The primary outcome was the mean difference in STAI state scores at discharge in both groups, compared using a Student t-test. Primary analysis was based on intention to treat. **Results:** Twelve children were enrolled. Randomization led to unbalanced groups. Three patients were assigned to the intervention group and nine to the control group. Parents' anxiety was lower in the intervention group as shown by a greater decrease in the STAI state scores between study inclusion and discharge (–14.7 v. –1.8, a difference of 12.8; 95% CI 4.6 to 21.0). Children showed a trend toward lower anxiety in the intervention group (–10.3 v. –4.4, difference 5.9; 95% CI –1.1 to 12.9). Procedures were not interrupted. **Conclusions:** In this study, offering the possibility of parental presence decreased anxiety levels at discharge for parents, with a modest impact on anxiety levels for children. This study suggests that this approach is feasible and potentially beneficial to patients and their parents.

5585

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A SYSTEMATIC review of medical assessment units: effects on emergency department and inpatient unit length of stay

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Keywords: administration, emergency medicine

Introduction: Many health care centres are considering or have implemented medical assessment units (MAUs) to improve the efficiency of care for patients requiring admission. The objective was to examine the effectiveness of MAUs on emergency department (ED) and inpatient length of stay (LOS). **Methods:** Using an a priori protocol, electronic databases (*Medline*, *EMBASE*, *CINAHL*, *Cochrane*, etc) were searched to identify potentially relevant studies, supplemented by review of references as well as conference proceedings. Eligible studies were primary research studies with the following designs: randomized control trials, prospective or retrospective cohort studies, interrupted time series, case-control studies, and before-after designs. Primary outcomes included LOS in both ED and inpatient units. Secondary outcomes included readmission to the ED within 30 days, admission to the MAU, patients left without being seen, patient satisfaction, provider satisfaction, mortality, adverse events, medication error, and occupancy rates. Independent assessment was performed for relevance, inclusion, and assessment of methodological quality (using the Newcastle-Ottawa scale). **Results:** From 1,600 potentially relevant studies, 5 unique studies were included. All studies were before-after studies, and each MAU was unique. Pooling/meta-analysis was not possible given the heterogeneity of the measures and outcomes reported. The primary outcome of ED LOS was not reported in any study. Inpatient LOS was reported in four studies, and a significant decrease was demonstrated in two (p < 0.01). One study reported improvement in mortality (p < 0.0001), and one study demonstrated increased 28-day readmission (p < 0.01). Other outcomes were not assessed by the included papers. **Conclusions:** MAUs appear beneficial with respect to inpatient LOS. More evidence is needed to determine the impact on ED LOS, inpatient mortality, and

increased readmission rates. Improved research quality is required to make valid MAU policy decisions.

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USEFULNESS of the media in launching a study: the Quebec Rural Emergency Medicine Project

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Keywords: emergency medicine, knowledge translation, media, methodology

Introduction: Few studies have described the usefulness of the media as a knowledge translation (KT) tool in launching a research project. Encouraging participation in research projects is challenging, especially in rural and remote communities that have limited contact with academic centres. In the context of the launch of the first large-scale study of rural emergency services in the province of Quebec (26 potential study sites), the objective of the present study was to describe the experience in KT through the use of a media press release. **Methods:** In conjunction with Laval University's communications department, a press release announcing the launch of the Quebec Rural Emergency Medicine Project was sent to major mainstream and specialized media, as well as smaller regional/rural media. Media impact was measured using two independent media monitoring firms. An online survey was sent to hospital CEOs and nursing and medical directors 1 month after the press release. Questions pertained to awareness of the project, interest in participating, and perceived relevance of the study variables. **Results:** The press release generated 51 news items and 20 media requests for interviews. Four centres spontaneously contacted the principal investigator before the survey. Considering the relatively small number of news outlets in rural Quebec, the media coverage is considered "high impact." Seventy-seven percent (20 of 26) of centres completed the survey. Forty percent had previously heard of the study: 50% through the media, 30% at a conference, 10% by word of mouth, and 10% at a meeting. **Conclusions:** A single press release received considerable media attention for a project launch. Media participation was a useful KT strategy in informing rural communities and decision-makers of upcoming local research initiatives and generating interest in participation.

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BOUGIE-assisted versus Seldinger cricothyrotomy

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Keywords: airway, bougie, cricothyrotomy, emergency medicine, respiratory

Objective: The military medical services and several case studies have described the use of a new cricothyrotomy technique for the "can't intubate, can't ventilate" situation when caring for the critical ill patient. Called the bougie-assisted cricothyrotomy, it has never been tested in a scientifically designed study. Our goal is to design a study that will test the bougie-assisted technique against the well-known Seldinger technique. Our end points that will be measured are success rates and time to first ventilation. We hypothesize that the bougie-assisted cricothyrotomy will be superior in both end points. **Methods:** Seventy primary care paramedics with no experience with cricothyrotomy will be recruited. They will then be instructed in both the bougie-assisted and Seldinger techniques. Following this, they will perform both techniques, with the first one randomly chosen. Success/failure rates and time to first ventilation will be recorded and then analyzed for statically significant differences between the two techniques. **Results:** Data collection is now complete. Currently analyzing data, and results TBA. **Conclusions:** TBA.

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EMERGENCY department rhabdomyolysis: patient characteristics and 30-day outcomes

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Keywords: emergency medicine, outcomes, patient characteristics, rhabdomyolysis

Introduction: The diagnosis of rhabdomyolysis is a common occurrence in the emergency department (ED); however, few data exist examining the characteristics of these patients specifically in the risk of progression to acute kidney injury (AKI), need for hemodialysis, or death. **Methods:** Data were collected in a retrospective cohort design from the electronic databases of two urban teaching hospitals. All consecutive patients with a creatine kinase (CK) value > 1,000 between January 2006 and January 2009 were included in the analysis. The provincial vital statistics registry and the regional ED database were interrogated to identify subsequent ED visits and mortality. The primary outcome was the combined occurrence of death or need for hemodialysis. Secondary outcomes were AKI and ED subsequent visits. Patient characteristics and laboratory data were analyzed for associations with poor outcomes. **Results:** A total of 425 consecutive patients with CK values > 1,000 were identified. Of these patients, 72% were admitted and 37% had AKI. Mortality was 3%, and need for dialysis was 7%. Only two patients under the age of 40 had a primary outcome. There were no patients who presented with a Cr < 100 who required hemodialysis. **Conclusions:** Death or need for dialysis is an uncommon occurrence with patients who present to the ED with elevated CK values, especially in those under 40 years of age. Further data analysis is pending.

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DIAGNOSTIC errors: a controlled trial of rapid versus reflective reasoning

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Keywords: education/teaching, emergency medicine, error, reasoning

Introduction: There is general consensus that clinical diagnostic reasoning involves two distinct processes: system 1, which is rapid, unconscious, and based on prior experience and patterns, and system 2, which is slow, effortful, and based on analysis and logic. Less clear is the relation to diagnostic errors; it has been argued that errors result primarily from system 1 reasoning. "Most errors occur with [system] 1 and may to some extent be expected, whereas [system] 2 errors are infrequent and unexpected."[1] However, there is little experimental evidence to support such claims. **Methods:** We conducted a controlled trial to investigate sources of errors in reasoning. Residents from Hamilton, Ottawa, and Montreal, who were sitting the Medical Council of Canada Qualifying Exam Part 2 in 2010 and 2011 and sequestered at the completion of the examination, were approached. Residents in 2010 completed 20 computer-based cases with instruc-

tions to "proceed as rapidly as possible but try not to make any mistakes." Residents in 2011 were told to "take your time. Be as thorough as possible." Total time was 30 minutes in 2010 and 40 minutes in 2011. Analysis looked at response time per case and accuracy. Analysis was restricted to Canadian graduates to reduce the effect of reading ability. **Results:** The number of Canadian graduates participating was 76 in 2010 and 91 in 2011. The majority of residents were in their second year. Average time to diagnosis under speeded instructions was 63.3 seconds versus 84.5 seconds for the unspeeded group ($t = 6.9$, $p < .00001$). However, there was no difference in accuracy between the two groups (45.1% v. 45.7%, $t = 0.32$, $p = 0.75$). **Conclusions:** There is no evidence from this study that greater speed of diagnosis results in increased errors. The findings are inconsistent with explanations that implicate system 1 processes as a major source of diagnostic errors. 1. Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. *Acad Med* 2003;78:775-80.

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IMPACT of emergency department discharge processes on length of stay: a prospective evaluation

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Keywords: administration, crowding, discharge processes, emergency medicine, length of stay

Introduction: Prolonged ED length of stay (LOS) is the main cause of access block (crowding). Reductions in ED LOS can free up many hours of stretcher and RN time. The discharge process consumes substantial time and can be improved. Our objectives were to measure the duration and variability of the discharge process and identify determinants of discharge delays. **Methods:** In this prospective time-motion study, a research assistant shadowed ED physicians in three urban EDs, documenting discharge decision time, MD and RN discharge activities, discharge communications, and time bed vacated. **Results:** A total of 374 discharges were studied and 16 were excluded because decision time or bed vacate time were not observed. Times from DC initiation to bed vacated were highly variable but averaged 22.2 minutes. Mean time (95% CI) to bed vacated was 26.2 minutes (21.3–30.7) when physicians asked nurses to discharge patients, 28.9 minutes (23.1–34.7) when physicians notified nurses via electronic discharge order, 24.4 minutes (13.9–34.9) when they wrote a discharge order on the chart, and 6.9 minutes (3.6–10.2) when they discharged patients independently. Delay to MD discharge initiation was measured in 103 cases and averaged 32.5 minutes. MD discharge activities averaged 4.1 minutes per patient, including patient instruction ($n = 324$), charting ($n = 274$), electronic DC order (155), prescription (83), preparing information for patients (37), arranging follow-up (26), and speaking with other providers (13). RN activities averaged 2.8 minutes per patient, including documentation ($n = 182$), disconnecting IVs (163), patient instructions (94), giving medications (67), dressing and ambulating (29), arranging follow-up (26) or transportation (11), wound care (8), and housekeeping activities (5). **Conclusions:** The longest delay (32.5 minutes) was for physicians to reassess and initiate discharge. The process involved 6.9 minutes of MD and RN value added time but consumed 22 minutes from initiation to bed vacated. Discharge delays were shortest when MDs discharged patients independently (probable queuing effect).

5597

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AN EMERGENCY department systems analysis of delays to antibiotics

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Keywords: antimicrobials, clinical practice, emergency medicine, systems

Introduction: There is strong evidence that delayed administration of antibiotics contributes to adverse outcomes. Our objective was to examine the timing of intravenous (IV) antibiotics and to understand the factors contributing to delays in an emergency department (ED) setting. **Methods:** We conducted a retrospective analysis of patients ≥ 16 years who received IV antibiotics in the ED of Sunnybrook Health Sciences Centre, using data obtained from our ED information system and chart reviews. Data collected included demographic information, patient acuity, ED crowding (defined as the median length of stay [LOS] for all patients who arrived at the ED during the same 8-hour shift), patient diagnosis, and time taken to complete process points. Factors affecting the time to administer antibiotics were investigated through stratified analysis and multivariable logistic regression. **Results:** Of 595 unique patient encounters, the average time from triage to IV antibiotics was 5.7 hours (95% CI 5.3–6.0 hours), with 22% of patients waiting > 8 hours. Canadian Triage and Acuity Score (CTAS) was associated with delayed antibiotic treatment; patients triaged as intermediate acuity (CTAS 2 and 3) incurred the longest waiting times (5.4 hours and 6.5 hours, respectively), whereas CTAS 1 and 4 waited the least (2.4 hours and 2.9 hours, respectively). ED crowding was predictive of > 8-hour wait times to antibiotics (OR 1.4 [CI 1.1–1.7] per hour increase in median LOS). Being triaged fast track versus major/acute was highly protective (OR 0.1 [CI 0.04–0.4]). Being placed in the "holding" zone versus the acute zone was associated with an increased risk of waiting > 8 hours for antibiotics (OR 2.0 [CI 1.2–3.2]). **Conclusions:** We found that an intermediate CTAS score and being triaged to a holding zone were associated with longer wait times to IV antibiotics. Increased ED crowding also negatively impacted time to antibiotics. Further studies should explore ways to identify potentially septic patients earlier and reduce times to IV antibiotics.

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VALIDITY of CTAS assessments done by triage nurses compared to patient self-assessed acuity

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Keywords: administration, emergency medicine, self-assessment, triage

Background: Patients may consider their acuity to be higher or lower than triage nurses do. Our objective was to compare nurse-assessed acuity scores to patient self-assessed acuity in predicting the need for emergency-based care. **Methods:** This prospective study was conducted in two urban emergency departments: one community and one inner city. On arrival, stable alert patients were asked to self-report their illness acuity using a validated five-level self-assessment tool analogous to CTAS. Concurrent blinded triage nurse-assigned CTAS scores were recorded. For each case, patient- and nurse-assessed acuity levels were correlated with the following prespecified outcome events: hospitalization; airway intervention; oxygen desaturation < 94%; bolus infusion > 1,000 cc, unplanned transfusion; urgent procedure (chest tube, central line, lumbar puncture, abscess drainage, fracture or dislocation reduction, bladder catheterization); or IV administration of general anesthetic, anticoagulant, antiarrhythmic, antibiotic, corticosteroid, opioid analgesic, or SC epinephrine. Sensitivity, specificity, and accuracy were determined for CTAS scores and patient self-assessments. **Results:** A total of 490 patients were eligible, including 236 (48%)

inner-city and 254 (52%) community patients. Of these, 9%, 45%, 42%, and 4% were in CTAS levels 2 to 5, respectively. Mean age was 47 years, 62% were male, and 16% arrived by EMS. Overall, 152 (31%) had an outcome event, including hospitalization (63), specified ED drug (34), urgent procedure (20), IV opioid (17), IV bolus (11), oxygen desaturation (5), and unplanned transfusion (2). Nurses placed 117 (77%) of the 152 into CTAS 2 or 3 (emergent or urgent) categories. CTAS sensitivity, specificity, and accuracy for specified outcome events were 77%, 57%, and 63%, whereas patient sensitivity, specificity, and accuracy were 51%, 66%, and 61%. **Conclusions:** CTAS acuity scores and patient self-assessed acuity scores have similar accuracy in predicting the need for ED-based care. Nurses have higher sensitivity, whereas patients have higher specificity.

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USING artificial intelligence to improve the emergency department influenza surveillance system

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Keywords: artificial intelligence, emergency medicine, influenza, informatics

Objective: The 2009 H1N1 outbreak demonstrated the vulnerability of the health care system to emerge infectious diseases. Emergency departments (EDs) can be especially susceptible to an influx of patients presenting with influenza-like illnesses (ILIs). To better prepare for potential future outbreaks, we hypothesize that artificial intelligence (AI) algorithms can compensate for missing and inaccurate source data from an emergency department information system (EDIS) to improve ILI surveillance reporting and be more useful in real-time ILI risk prediction compared to the existing surveillance approach of screening by chief presenting complaint. **Methods:** A sample of over 20,000 records consisting of 21 clinical indicators from Oct 2009 to Apr 2010 was extracted from the EDIS of a midsized Canadian city served by seven EDs. A data cleaning system was developed and applied to overcome missing and incorrect source data typical of EDIS. It identified 3,717 records optimal for AI training and analysis. A novel enhanced feature selection algorithm was created to calculate the contributing score for each clinical feature to improve classification of likely ILI diagnosis based on key clinical indicators. Three AI algorithms (Artifical Neural Networks, Support Vector Machine, and C4.5) were then tested to determine accuracy and computing efficiency of ILI classification. **Results:** C4.5 Decision Tree returned the best results, with the fastest execution time (63 seconds) and classification accuracy of 89% (specificity of 95.3%). When validated against 476 actual patient charts, the new prediction rule correctly identified 31 non-ILI cases more than the previous system. Overall, the system accuracy has been improved by 7.1%. **Conclusions:** Applying AI to the problem of influenza surveillance both improved surveillance accuracy by overcoming uncertainty caused by missing/incorrect data and will enable real-time ILI risk prediction, perhaps resulting in necessary ILI precautions being taken sooner in busy EDs.

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AGREEMENT of patient-assessed and nurse-assessed illness acuity at two urban emergency departments

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Keywords: administration, emergency medicine, self-assessment, triage

Introduction: Self-diversion of less urgent patients could reduce stress on emergency departments (EDs), but only if patients can accurately assess their own illness severity. Our primary objective was to estimate patient sensitivity for recognizing high-acuity conditions. Our hypothesis was that 90% of CTAS 2 patients and 80% of CTAS 3 patients would correctly identify that they have a possibly life-threatening or urgent condition. Our secondary objective was to assess agreement (kappa) between patient-perceived acuity and nurse-assessed acuity. **Methods:** This cross-sectional survey was conducted in one community and one inner-city ED. After arrival, stable, alert adult patients were asked to report the acuity of their presenting condition using a validated five-level descriptive urgency scale (life-threatening, possibly life-threatening, urgent, somewhat urgent, not urgent) analogous to the Canadian Triage and Acuity Scale (CTAS). Patient acuity levels were compared with concurrent blinded triage nurse assessments. Patient sensitivity for recognizing urgent and emergent (CTAS 2–3) conditions and kappa values for interrater agreement were calculated. **Results:** A total of 491 patients were studied, including 9%, 45%, 42%, and 4% in CTAS levels 2 to 5, respectively. Patients often assigned themselves to lower acuity categories, with 1%, 9%, 29%, 43%, and 18% in levels 1 to 5, respectively. Exact agreement on acuity level occurred in 161 cases (33%), but only 25 of 42 CTAS 2 patients (60%) and 90 of 219 CTAS 3 patients (41%) considered their condition to be urgent or possibly life-threatening. Unweighted kappa was 0.014 (95% CI –0.05–0.07), and weighted kappa was 0.10 (95% CI 0.04–0.16), suggesting very poor agreement between patients and nurses. **Conclusions:** Patients often assign themselves lower acuity scores, and only half of CTAS 2 to 3 patients correctly identified their condition as urgent or possibly life-threatening. Without guidance, many urgent and emergent patients may incorrectly triage themselves away from EDs.

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mTBI on the rise: more concussions or improved awareness

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Keywords: concussion, emergency medicine, epidemiology, neurosciences

Background: Minor traumatic brain injury (mTBI or concussion) has seen changes in resources devoted to education and awareness as well as structured limitations on athletic concerns. Few studies to date have attempted to determine whether increased occurrence is related to change in injury patterns or improvements in physician and public awareness and diagnosis. **Objectives:** To determine if mTBI rates are increasing faster than other traumatic injuries and whether detection is related to better diagnosis or increased occurrence. **Methods:** The emergency department (ED) and trauma centre records were analyzed at ED and trauma centres in two metropolitan areas for the past decade, 2000 to 2010. Trauma registries and the ED database were analyzed for trauma admissions, ED visits and mTBI rates, and treatment interventions, including use of radiographic study and dispositions. mTBI defined as arrival GCS 15, possible LOC, and no other injury. IRB approval and data analysis were obtained and performed. **Results:** Over 10 years, the study found a rapid rise in the past 5 years with number of concussions, which increased by 140% compared to ED patient census, and trauma patient volume increased only by 23.9%; $p < 0.02$. There were also increases in the use of CT for concussion by 25.8%, with less than 1.2% of mTBI patients having a positive finding on head CT and none requiring neurosurgical intervention. Patient in-hospital admisions rose at the same rate as new concussions. Despite

the rise in mTBI and neurosurgical admissions, there was no rise in neurosurgical operative cases. **Conclusions:** There has been an effective impact on mTBI presentation and admission to our ED and trauma centres in the past 5 years. CT increased in use, with no improved treatment intervention. Future studies will need to determine the utility of admission compared to outpatient observation and neuropsychiatric intervention.

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PEDIATRIC cardiac arrest: is there variability in institutional practice? A survey of Canadian pediatric CPR committee chairs

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Keywords: cardiac arrest, emergency medicine, pediatrics, practice variability, resuscitation

Introduction: Survival following pediatric cardiac arrest remains poor for both the in- and out-of-hospital settings. Guidelines for pediatric resuscitation are updated every 5 years by the Heart and Stroke Foundation of Canada and the American Heart Association, yet little is known on the implementation of these guidelines in Canada. **Methods:** Telephone survey of the CPR committee chairs, or pediatric expert designate, for each major Canadian pediatric teaching hospital affiliated with a university and with a dedicated pediatric intensive care unit (n = 16). Unanswered questions were subsequently completed by e-mail or follow-up interview with another expert committee member. Participants were surveyed for resuscitation interventions, including routine use of 1) end-tidal CO_2 monitoring and/or feedback devices to guide CPR quality; 2) targeted temperature control after return of spontaneous circulation, and 3) extracorporeal membrane oxygenation (ECMO) as a rescue measure for refractory cardiac arrest. **Results:** Surveys were completed for 15 of 16 eligible centres between March 6 and June 13, 2011. Twenty-six percent (4 of 15) of centres routinely cooled patients following cardiac arrest. Seventy-four percent (11 of 15) selectively cooled for particular arrest rhythms, left the decision to the discretion of the treating physician, or did not cool at all. Of the four centres that routinely cooled, none employed a defined cooling protocol. Fifty-three percent (8 of 15) of centres used end-tidal CO_2 to guide CPR delivery, whereas 47% (7 of 15) of centres had not routinely implemented this practice. None of the 15 centres in Canada used CPR feedback devices to guide CPR quality. Fifty-three percent (8 of 15) centres have used ECMO for refractory cardiac arrest, with 20% (3 of 15) of centres using ECMO for out-of-hospital cardiac arrest. **Conclusions:** There is considerable practice variability in the major pediatric resuscitation centres in Canada. Further research into the barriers for guidelines uptake is needed. Access to lifesaving therapy (ECMO) for pediatric cardiac arrest victims is variable across Canada.

5609

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PEDIATRIC mental health presentations to emergency departments in Alberta, Canada: examining wait times and treatment times

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Keywords: emergency medicine, mental illness, pediatrics, wait times

Introduction: In this study, we described the relationship between Canadian Triage and Acuity Scale (CTAS) score, centre location, diagnosis, and wait time and treatment times for pediatric (< 18 years) mental health visits to emergency departments (EDs) in Alberta. **Methods:** This was a retrospective cohort analysis of mental health visits made by children (n = 30,656) from April 2002 to March 2008 using administrative data. Data were summarized using medians and interquartile ranges (IQRs) and graphically displayed using boxplots. **Results:** Nearly 60% of these visits were made by females, and the largest age group presenting was 15- to 17-year-olds. Most ED visits were for anxiety (26.1%), mental health problems due to substance use (24.4%), and mood disorders (16.6%). Visits for anxiety involved a median wait time of 1 hour 42 minutes (IQR 57 minutes, 2 hours, 44 minutes) and treatment time of 2 hours 5 minutes (IQR 1 hour 1 minute, 3 hours 49 minutes). Most visits were triaged as CTAS 4 and 5. The highest triage level (CTAS 1) was most often assigned to substance use visits, which involved shorter wait (median 1 hour 1 minute; IQR 30 minutes, 2 hours) and longer treatment (median 3 hour 28 minutes; IQR 1 hour 35 minutes, 6 hour 30 minutes) times. Visits for mood disorders had a median wait time of 1 hour 53 minutes (IQR 1 hour 4 minutes, 3 hours 6 minutes) and a treatment time of 3 hours (IQR 1 hour 31 minutes, 5 hours 18 minutes). **Conclusions:** In the ED, CTAS scores correlate to suggested wait times. However, wait times for pediatric mental health ED visits often exceeded national recommendations. Treatment times differed by illness acuity and type. For example, visits for anxiety were often lower in acuity and had longer wait times and shorter treatment times, suggesting that the ED may not be an appropriate setting for care. Future research should explore if longer waits are associated with adverse outcomes and whether current treatment times are warranted to ensure that ED throughput is optimized.

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DOES pelvic ultrasound lead to a significant delay in management of acute pediatric appendicitis?

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Keywords: appendicitis, diagnostic technologies/imaging, emergency medicine, ultrasound

Introduction: Appendicitis is the most common condition requiring urgent abdominal surgery. Early appendectomy is essential as the risk of perforation is directly proportional to the time to diagnosis. The use of ultrasound to diagnose appendicitis is now the standard of care. The objective was to investigate whether or not ultrasound is associated with a delay in time to appendectomy. **Methods:** This study involved a retrospective chart review to compare time to appendectomy in children aged 0 to 17 years who did and did not receive a diagnostic pelvic ultrasound. The study included all children who presented to the pediatric emergency department from 2000 to 2010 with a discharge diagnosis of appendicitis. The primary outcome variable was the time interval from initial assessment to appendectomy. Results were analyzed using *SPSS*. **Results:** A total of 332 patients (66% male), ranging in age from 20 months to 17 years, were included. A total of 209 patients (63%) received an ultrasound. The proportion of ultrasound performed was significantly greater in females (77%) compared to males (57%), ($\chi^2 = 12.9$, $p < 0.001$). The overall frequencies of perforation, abscess, and shock were 54 of 332 (16%), 13 of 332 (4%), and 1 of 332 (0.3%), respectively. There were no significant associations in the frequency of complications between those who did and did not receive an ultrasound. The time to appendectomy from initial assessment by an ED physician was significantly greater in patients who received an ultrasound (11 + 6 hours) compared to those who did not (7.2 + 5.5 hours), $t = 5.8$, $p < 0.001$, unequal variances assumed (CI 2.5, 5.1). **Conclu-**

sions: This study has shown that in children who presented to the ED with a discharge diagnosis of appendicitis, an ultrasound is associated with a significantly increased time to appendectomy but is not associated with an increase in appendicitis-related complications.

5613

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Presence of third molars and rates of mandible fractures after punched-in face

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Keywords: emergency medicine, facial fractures, injury/trauma

Introduction: Facial trauma is a common cause of mandible fracture. The majority of cases are young men, and the mechanism of injury is often due to assault, vehicular accident, or falls. **Objective:** To determine if the presence of third molars, particularly impacted teeth, creates an increased risk for mandible fracture compared to persons with an already extracted third molar due to ossification and a stronger mandible in that region. **Methods:** Retrospective analysis of 4 years of consecutive presentations of mandible fractures to the emergency and trauma centre was performed. Radiographic analysis by expert reviewers confirmed the presence and location of fractures and third molars as well as the angulation of the third molar. **Results:** A total of 569 patients were evaluated, with 34 excluded due to incomplete data. The mean age of patients was 29.6 (95% CI 26.7 to 31.5), with 87% male, 71.5% AA, and 12.1% Caucasian included. A total of 312 patients were admitted for immediate fixation (54.8%); 82.4% had third molars present, with 53% impacted and 47% nonimpacted; 95.9% (513) sent for evaluation had a fracture, with 82% requiring operative repair and fixation; and 62.4% underwent ORIF, 52.4% were fitted with arch bars, and 36% also required extraction. Sensitivity of third molars predicting angle fractures was 88.31%. An odds ratio of 2.4 was calculated for the presence of impacted third molars and mandible angle fractures (95% CI 1.664–3.448). An odds ratio of 3.6 was calculated or the presence of all impacted and nonimpacted third molars and mandible angle fractures (95% CI 2.52–5.347). **Conclusions:** The presence of a third molar increases the likelihood of a mandible angle fracture following trauma. The presence of an impacted third molar results in the leading point for a fracture site. Strong recommendations for prophylactic removal of third molars may be indicated for all student and professional athletes alike who participate in contact sports.

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CPR ANYTIME ANY-SCHOOL: a randomized trial of strategies to teach CPR and use of AED to high school students

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Keywords: cardiopulmonary resuscitation, education/teaching, emergency medicine, students

Introduction: School-based cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) use training currently occur in approximately 50% of schools. Many attribute this to the increased time and cost of instructor-led programs. Previous studies have demonstrated the effectiveness of video-based CPR training programs in adults, but little is known about the impact of this technique in schoolchildren. We compared skill, willingness, and confidence in performing CPR and applying an AED between students receiving training though a traditional instructor-led course and a video-based training program. **Methods:** Grade 9 students were randomized to a 4-hour instructor-led course or a 45-minute video-based training course. Each student completed an attitudinal questionnaire (confidence, competence, willingness) at three time points: pretraining, immediately posttraining, and 6 months posttraining. Performance skill testing was completed posttraining and 6 months later. Skill testing included evaluation of CPR quality and a measure of overall competence using a previously validated scoring tool. **Results:** A total of 307 students were randomized and completed the initial training; 86% completed follow-up testing at 6 months. Significant improvements in both training groups occurred across all attitudinal domains following training ($p < 0.001$). The Cronbach alpha for each attitudinal domain was 0.751 (confidence), 0.902 (competence), and 0.779 (willingness). Performance skill testing of CPR quality and overall competence score were not significantly different across training interventions when evaluated posttraining and 6 months later. **Conclusions:** Both groups reported improved confidence, competence, and willingness to perform CPR and use an AED after training. Both groups demonstrated similar skill test performance scores posttraining. These results suggest that expedited video-based training may be an effective alternative to traditional teaching models in schools.

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ARE CTAS time targets appropriate? What are emergency department patients' beliefs regarding appropriate physician response times?

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Keywords: administration, emergency medicine, patient expectations, triage

Introduction: The Canadian Triage and Acuity Scale (CTAS) recommends MD response times of 0, 15, 30, 60, and 120 minutes for CTAS levels 1 to 5, respectively. These targets are not evidence based, few emergency departments (EDs) achieve them, and many feel they are unrealistic. Our objective was to determine what patients believe are appropriate wait times and whether patient expectations differ by age, gender, socioeconomics, or acuity. **Methods:** This prospective survey was conducted in one community and one inner-city ED. An investigator invited consenting stable, alert patients to identify acceptable wait times (to see a physician) for patients with conditions similar to their own. Our primary outcome was the acceptable wait time specified by patients (median, IQR) and stratified by acuity level. Secondary outcomes included wait time expectations for specified patient subgroups. **Results:** A total of 521 patients were eligible, including 284 (55%) community and 237 (45%) inner-city patients. Of these, 8%, 44%, 44%, and 5% were in CTAS levels 2 through 5, respectively. Mean age was 47 years, 61% were males, 16% arrived by EMS, and 13% required admission. Median patient-identified acceptable wait time was 60 minutes overall (IQR = 30–120) and 30, 45, 60, and 60 minutes for patients in CTAS 2 to 5, respectively. Male expectations were 30, 45, 60, and 120 minutes, whereas female expectations were 30, 60, 60, and 60 minutes in CTAS 2 to 5. Inner-city patients expected 5-, 30-, 60-, and 60-minute waits (CTAS 2, 3, 4, 5), whereas community patients expected 60-, 60-, 60-, and 90-minute waits. Patients requiring admission expected shorter waits than those who were discharged (median 45 v. 60 minutes), but age did not significantly impact perceived acceptable wait time. **Conclusions:** This sample of ED patients identified 60 minutes as an acceptable overall wait time. Median expectations were 30, 45, 60, and 60 minutes in CTAS 2 to 5, respectively. If validated in other settings, these findings should prompt reconsideration of CTAS time targets.

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PCP-INTOXICATED patients delay care and lengthen ED stay for themselves and other patients

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Keywords: emergency medicine, intoxication, psychiatric/social, wait times

Introduction: Phencyclidine (PCP) is a hallucinogenic and neurotoxic street drug with multiple pharmacologic actions. PCP abusers are often brought to the emergency department (ED) in a state of psychotic agitation and due to the analgesic and dissociative aspects of the drug often have extreme strength and are subsequently difficult to control and extremely disruptive to the flow of care in the ED. Illegal use of the drug peaked in the 1960s and early 1970s but significantly declined and was not commonly seen throughout the 1980s and 1990s. However, since the late 1990s, there has been a resurgence in PCP abuse, especially in Washington, DC. **Methods:** Retrospective review of EMR from a 951-bed urban teaching hospital in Washington, DC, to examine the trends in PCP-related ED visits and to assess what impact these patients are having on already overcrowded EDs. All patients with diagnosed PCP use by either drug testing or verbal admission on ED discharge were included in the study. **Results:** A total of 476 consecutive patients were included, with 76% male, mean age 32.1 years (95% CI 27.2–35.8). The mean ED stay for patients was 5.7 hours (95% CI 3.8–7.4) compared to a mean stay of 4.2 hours (95% CI 1.9–6.9) for ETOh-intoxicated patients; $p < 0.04$. PCP patients required a mean four security guards and three RNs during the acute management phase where the attending requested restraints on 84% of the visits and used medication in 86% of patients (90% haloperidol and benzodiazepines additionally in 62% of patients). **Discussion:** Our data continue an exponentially increasing trend of PCP-related ED visits and show that patients who use PCP are extremely taxing on EDs. The worrisome upward trend in PCP-related ED visits and the proven impact these patients have on the flow of care in EDs demonstrate a need for further research into more effective management strategies of acute PCP intoxication.

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DEVELOPING seasonal physician shift schedules in the emergency department to meet patient demand

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Keywords: administration, emergency medicine, mapping, physician scheduling

Introduction: The Ontario government has developed performance guidelines for hospital emergency departments (EDs). One important factor in meeting the performance targets is proper scheduling of physicians to meet the demand by incoming patients. At the Thunder Bay Regional Health Sciences Centre (TBRHSC), the physician schedule in the ED is similar for all days of the year. However, the number of patients arriving hourly can vary greatly by day and season. This research will examine how physician scheduling in the ED (i.e., the time at which shifts start each day) can be improved to better meet patient demand. **Methods:** Using historical data, we intend to perform a cluster analysis on hourly patient arrival data in the ED. Individual days will be grouped by day of the week and season based on similar patterns of patient arrival. To develop optimal schedules that meet patient demand, a mathematical modeling technique known as mixed-integer programming will be used on the grouped patient arrival data. The new physician schedule will be compared to the old schedule to determine whether patient demand was better met. **Results:** Preliminary analysis using the model on a subset of the data showed that physician start time at TBRHSC can be adjusted to better meet patient arrival time in the ED. As well, by scheduling more physicians on certain days of the week, the high demand by arriving patients on those days of the week can be better met. **Conclusions:** ED performance can be improved in many ways, and the results from this study show that having the proper resources available to meet incoming patient demand is one potential avenue for ED improvement. The techniques used in this study could be applied to other personnel in the ED to ensure that their services are not limiting system performance.

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PROSPECTIVE outcomes of symptomatic early pregnancy correlated with emergency department ultrasound findings

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Keywords: diagnostic technologies/imaging, emergency medicine, pregnancy, ultrasound

Introduction: Symptomatic early pregnancy (SEP) accounts for roughly 2% of all emergency department (ED) visits. Although emergency physicians (EPs) are primarily concerned with ruling out ectopic pregnancy, patients are most concerned about their probability of miscarriage. Our team examined emergency department ultrasound (EDUS) findings in SEP correlated with pregnancy outcome to see if it held any prognostic value for the rate of miscarriage. **Methods:** We prospectively studied a convenience sample of women over the age of 18 with SEP (less than 20 weeks' gestation) who presented to any of the three EDs in Saskatoon. Our primary goal was to correlate EDUS with rate of miscarriage. EDUS results were classified as live intrauterine pregnancy (LIUP), intrauterine pregnancy (IUP), or no definite intrauterine pregnancy (NDIUP), based on Canadian Emergency Ultrasound Society (CEUS) standards. Our primary outcome was viability at 20 weeks' gestation. This outcome was determined by accessing radiology reports of ultrasounds beyond 20 weeks or communication with the patient's family physician or obstetrician. **Results**: During the 3-month study period, we enrolled 93 patients with SEP. As of January 4, 2012, follow-up data were available for 72 patients (77.4%). Initial EDUS findings were as follows: LIUP 24 of 93, IUP 19 of 93, and NDIUP 51 of 93. Miscarriage rates were LIUP 2 of 14 (14.3%), IUP 10 of 15 (66.7%), and NDIUP 35 of 43 (81.4%), with 7 of 43 (16.3%) NDIUPs being ectopic pregnancies. The overall rate of miscarriage in the study was 47 of 72 (65.2%), and the overall rate of ectopic pregnancy was 7 of 72 (9.7%). **Conclusions:** Our results show that an EDUS finding of LIUP in SEP has a lower rate of miscarriage when compared to EDUS findings of IUP and NDIUP. Our findings are consistent with other published studies. This will be valuable information to EPs counseling their patients with SEP.

Poster

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PREHOSPITAL use of hydroxocobalamin for cyanide toxicity in a rotary-wing primary aeromedical evacuation program

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Keywords: cyanide, emergency medical services, emergency medicine, toxicology
Introduction: Cyanide (CN) toxicity is an underreported and underrecognized cause of morbidity and mortality associated with closed-space severe burns and inhalation injury. The risk of CN toxicity from acts of terrorism or industrial accidents remains high. With the recent release of hydroxocobalamin (OHCo) in North America, the ability of EMS personnel to mitigate the morbidity and mortality associated with suspected or confirmed CN toxicity has improved substantially. **Methods:** OHCo was introduced into our prehospital CBRNE hazardous substance response program in June 2011. This program has 24-hour CBRNE paramedic advisors screening such calls and 24-hour online medical oversight. Our CCP flight paramedics are equipped for the prehospital use of OHCo for confirmed or suspected CN toxicity. Our teams have monitoring and point-of-care field testing allowing for on-scene assessment of ABGs, lactate, and carboxyhemoglobin, thereby facilitating prehospital triage and decision-making processes to expedite administration of the antidote in the field. Indications for the administration of OHCo include CN level > 39 umol/L or a high clinical index of exposure (e.g., smoke inhalation, known CN exposure/ingestion) and altered LOC (GCS < 13), shock (SBP < 90 mm Hg), or lactate > 8 mmol/L. **Results:** Over a 4-month period, OHCo has been used three times. All three patients were involved in separate trailer/vehicle fires with severe burns (30%, 45%, 90% TBSA full-thickness burns). Two had a pH of 7.20, one had a lactate of 4 mmol/L, and one had a COHgb level of 21%. All were obtunded with GCS 3, 6, and 7 prior to intubation. There were no reported complications with the administration of OHCo in any patient. All were successfully transported to definitive care. **Conclusions:** We report the successful implementation of a prehospital OHCo program for confirmed or suspected CN toxicity. Further studies are required to assess the effect of the antidote in this patient population.

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PREHOSPITAL use of tranexamic acid for hemorrhagic shock in primary and secondary aeromedical evacuation

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Keywords: emergency medical services, emergency medicine, injury/trauma, tranexamic acid
Introduction: Major hemorrhage remains a leading cause of death in both military and civilian trauma. We report the use of a tranexamic acid (TXA) as part of a trauma exsanguination/massive transfusion protocol in the management of hemorrhagic shock in a civilian primary and secondary aeromedical evacuation (AME) helicopter EMS program. **Methods:** TXA was introduced into our critical care flight paramedic program in June of 2011. Indications for use include age > 16 years, major trauma (defined a priori, based on mechanism of injury or findings on primary survey), and HR > 110 bpm or SBP < 90 mm Hg. Our protocol includes 24-hour online medical oversight, rapid initiation of transport, permissive hypotension in select patients, early use of blood products (secondary AME only), and infusion of TXA while en route to a major trauma centre. **Results:** Over a 4-month period, our CCP flight crews used TXA a total of 13 times. Patients had an average HR of 111 bpm (95% CI 90.71–131.90), SBP of 91 mm Hg (95% CI 64.48–118.60), and GCS of 7 (95% CI 4.65–9.96). For primary AME, average response time was 33 minutes (95% CI 19.03–47.72), scene time was 22 minutes (95% CI 20.23–24.27), and time to TXA administration was 32 minutes (95% CI 25.76–38.99) from first patient contact. There were no reported complications with the administration of TXA in any patient. **Conclusions:** We report the first successful integration of TXA into a primary and secondary aeromedical evacuation program in the setting of major trauma with confirmed or suspected hemorrhagic shock. Further studies are needed to assess the effect of such a protocol in this patient population on outcomes.

5447

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PREP: Paediatric Readiness in the Emergency department Project

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Keywords: emergency medicine, neonatal resuscitation, pediatrics
Introduction: Neonatal resuscitation (NNR) in the emergency department (ED) requires the expertise of all ED staff, although among adult ED staff, levels of NNR expertise vary. **Methods:** We followed Dillman methodology to survey full-time ED physicians and nurses. The Web-based survey rated knowledge, comfort, and experience on 5-point Likert scales. **Results:** The overall response rate was 67.7% (n = 108). A total of 95.8% reported never having been involved in a NNR at this urban centre, and only 38.7% reported ever having participated in a NNR course. Participants rated the following as poor or very poor: comfort level in caring for neonates in the ED, 75.0%; sense of preparedness, 84.4%; and knowledge of managing a sick neonate, 76.3%. Logistic regression showed that participation in NNR within 6 months was the strongest predictor of perceived comfort in NNR (OR = 22.2), as was completion of the Neonatal Resuscitation Provider course (OR = 3.1), controlling for years of experience, working in another ED, or completing other pediatric training. **Conclusions:** Perceived comfort, knowledge, and preparedness for NNR were poor in an adult ED prior to the addition of a neonatal ICU. Recent NNR experience was the strongest predictor of improved NNR comfort, as was participation in the Neonatal Resuscitation Provider course. Educational opportunities exist to improved comfort with NNR among ED staff who primarily treat adults.

5449

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THE PRESENTATION of Kawasaki disease at a pediatric emergency department in Singapore

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Keywords: emergency medicine, Kawasaki disease, pediatrics
Introduction: Kawasaki disease (KD) is an acute multisystem inflammatory condition in children. Early recognition of the condition is important as early treatment significantly reduces long-term morbidity. **Methods:** A retrospective analysis of ED and inpatient records of all children discharged from hospital with a diagnosis of KD was performed. Data on demographics as well as disease characteristics and presentation were collected and analyzed using *SPSS*. **Results:** A total of 405 children were seen for KD between April 2007 and December 2010; 63.4% of the patients were less than 2 years old and 64.4% were male. The diagnosis of KD was suspected in 70.1% of patients on admission at the ED. The remaining cases were admitted for other conditions such as lymphadenitis, viral exanthem, gastroenteritis, unexplained fever, upper and lower respiratory tract infections, allergies, scarlet fever, and urinary tract infection. All patients had fever, 41.2% had lymphadenopathy, 64.2% had conjunctivitis, 63.2% had mucositis, 42.2% had changes in the peripheries, and 76.5% had a rash. Other associated symptoms were vomiting (19.3%), diarrhea (12.3%), abdominal pain (4.9%), and jaundice (1.2%). One patient presented with a facial nerve palsy. At the point of admission, 61.7% of patients had at least three diagnositic criteria for KD other than fever. For those admitted with other diagnoses (non-KD), 86.5% had two or less KD diagnostic criteria other than fever. Thirty-one percent of these patients had fever of 5 days' duration or more, but only 21.6% of these had

three or more other diagnostic criteria for KD. The presence of a rash was the most consistent sign in these patients (47.1%), followed by lymphadenopathy (25.6%), mucositis (21%), and conjunctivitis (20.2%). **Conclusions:** KD can present to the ED in many different forms, and ED doctors must be vigilant and consider it as a differential in any child with persistent fever. The similarities between KD and other clinical entities make diagnosis difficult at times.

5466

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A PATIENT safety analysis of the emergency assessment of patients with acute heart failure and exacerbations of chronic obstructive pulmonary disease: a multicentre cohort study

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Keywords: chronic obstructive pulmonary disease, emergency medicine, heart failure, respiratory

Introduction: There is a current lack of emergency medicine–based clinical practice guidelines for the appropriate workup of acute heart failure (HF) and acute exacerbations of chronic obstructive pulmonary disease (AECOPD), and this creates a potential risk for patient safety. We aimed to assess the adherence to evidence-based care of patients with HF and AECOPD in the emergency department (ED). **Methods:** We conducted a secondary review of cases from a multicentre prospective cohort study in five Canadian EDs. We included ED-discharged adults with HF and AECOPD who experienced the following flagged outcomes: admission, return ED visit, or death within 14 days. An expert panel developed 10 critical actions for ED workup of HF and 13 for AECOPD based on national and international clinical practice guidelines. Data abstracted from the index visits of patients with flagged outcomes were independently scored for completion of critical actions by two trained reviewers. Descriptive statistics were used to analyze the data. **Results:** Of 1,730 patients enrolled in the prospective cohort study, we found 125 patients with flagged outcomes (54 [43.2%] HF, 72 [57.6%] AECOPD). The mean age was 74.5 (SD 10.4), and 47.2% were female. For critical actions required for all patients, the mean proportion of criteria met was 9.6 of 10 for HF (96.3% of the time, SD 6.1%) and 11.2 of 13 for AECOPD (86.2% of the time, SD 10.2%). A full set of vital signs was not obtained 14.0% of the time for HF patients and 21.7% for AECOPD; an ECG was absent 3.4% of the time for HF and 27.1% for AECOPD; and appropriate bloodwork was not drawn 0% of the time for HF and 15.5% for AECOPD. **Conclusions:** We found areas for improvement in the documentation of vital signs and ECGs. Future studies should assess whether these omissions lead to adverse outcomes.

5473

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RESIDENT-advanced cardiac life support experience and comfort level: a standardized survey at the University of Western Ontario

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Keywords: Advanced Cardiac Life Support, education/teaching, emergency medicine

Introduction: A cross-sectional online survey to measure resident experience and comfort level with Advanced Cardiac Life Support (ACLS). Resident input for ACLS training tools was also solicited. **Methods:** One hundred fifty-eight of 557 residents from all programs at the University of Western Ontario replied to an online survey at fluidsurveys.com, administered via a modified Dillman method. Chi-square analyses were performed to compare results between postgraduate years and between residents from programs with high exposure to ACLS and those with low exposure. **Results:** In the last 12 months, 66.2% had observed a code (without participating); 54.8% had helped (chest compressions, airway, or venous access); and 20.5% had led cardiac arrest teams. Regarding personal sense of proficiency, 84.7% felt comfortable with chest compressions; 47.5% with airway management; 38.2% with venous access; and 20.4% with leading a cardiac arrest team. Full-scale simulation was rated as the most effective training tool (94.2%) for ACLS education. **Conclusions:** Residents do not accrue a great deal of experience leading cardiac arrest teams and are generally not comfortable in this role, although this sentiment decreases modestly with postgraduate years of training. Residents feel that full-scale simulation is the most effective training modality. ACLS educational opportunities should be increased and focus primarily on leading cardiac arrest teams and on the skill of airway management.

5476

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CT HEAD and cervical spine in trauma: is there a difference in interpretation between on-call radiology residents and staff radiologists?

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Keywords: diagnostic technologies/imaging, emergency medicine, radiologic interpretation, training

Introduction: Computed tomographic (CT) scans are typically interpreted by radiology residents at most academic hospitals outside of routine working hours and reviewed by staff radiologists the next day. Although discrepancies are reported to the relevant service, the delay in accurate interpretation has a potential impact on patient management and clinical outcome. **Methods:** This medical record review of cases from a regional adult trauma database was approved by the local research ethics board. For the period of Sep 2009 to Dec 2010, we reviewed the radiology reports of all CT heads and cervical spines performed between the hours of 1700 and 0800 hours at the trauma centre. We compared the preliminary resident reports to the final staff reports and reviewed the charts of all discrepant cases to determine if the difference in interpretation resulted in any change in patient management or increased morbidity. **Results:** We found 246 CT head and 247 CT cervical spine reports. We excluded 9 cases in each CT category due to missing resident reports or the presence of imported reports from the transferring facility. The discrepancy rate between resident and staff reports was 18 of 237 (7.5%) for CT heads and 13 of 238 (5%) for CT cervical spines. These discrepancies resulted in one case of missed cervical spinal cord compression and one patient unnecessarily remaining in a rigid cervical collar for a prolonged time period (5 days). **Conclusions:** These results demonstrate that delayed interpretation of CT cervical spines by staff radiologists has a clinically significant impact on patient management and outcome.

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BRITISH COLUMBIA major burns clinical practice guidelines

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Keywords: burns, emergency medicine, injury/trauma

Introduction: Major burns, including those complicated by inhalation injury, are associated with significant morbidity and mortality and can consume a substantial amount of resources in acute, subacute, and rehabilitation phases of illness. Much attention has been placed recently on the risks of both under- and overresuscitation in the first 24 hours of burn care and how these crucial early hours can affect acute

and long-term outcomes. **Methods:** Following PRISMA methodology of systematic reviews, an in-depth search of articles on the early management of burns patients was conducted. Standard definitions for major burns applied (i.e., partial- or full-thickness > 20% TBSA any age group, > 10% TBSA ages < 10 or > 50 years, burns to hands, face, feet, genitalia, joints, full-thickness burns > 5% any age, electrical/chemical burns, inhalation injury, burns associated with major trauma). **Results:** After screening 25 articles for eligibility, 8 articles were included for review. A multidisciplinary team of physicians representing specialty services from burns and plastic surgery, trauma surgery, ICU, ER, anesthesiology, and EMS reviewed content and developed the first set of major burns clinical practice guidelines (CPGs) for our province. Highlights from these guidelines include use of a resuscitation formula (set starting rate 3 cc/kg/TBSA for the first 24 hours postburn), strict urine output goals (30–50 cc/hr) with selective, early use of colloids to mitigate the risk associated with high-volume crystalloid resuscitation, and use of the Lund-Browder system for more consistent estimation of TBSA. Special considerations remain for burns complicated by inhalation and/or electrocution. **Conclusions:** Major burns are associated with significant morbidity and mortality. Recent literature highlights the risk of both under- and overresuscitation in acute and subacute phases. We present the first known BC provincial major burns CPGs in an attempt to provide more consistent evidence-based, rationale-guided best practice for rural and urban practitioners.

5478

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FACTORS associated with hospital admissions for adults due to hypoglycemia events in Canada

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Keywords: clinical practice, emergency medicine, hypoglycemia

Introduction: Hypoglycemic reactions represent serious conditions for individuals with diabetes mellitus (DM). This study identified factors associated with hospital admissions due to hypoglycemia events in adults with known DM across a representative sample of Canadian emergency departments (EDs). **Methods:** This observational study used retrospective medical chart review methods and involved 12 Canadian EDs. Randomized samples of cases were obtained from all sites using medical records lists. Descriptive analyses were performed comparing admitted and nonadmitted cases. Factors associated with hospital admission were determined through a logistic regression model; odds ratios (ORs) and 95% confidence intervals (CIs) are reported. **Results:** A total of 1,039 adults were included in the study; 33.4% were classified as type 1 and 66.6% were classified as type 2 DM. Cases with type 2 DM were more often male, were significantly older (73 v. 49; $p < 0.0001$), and had more comorbidities ($p < 0.001$) than subjects with type 1 DM. Overall, 241 (23.2%) were admitted for at least 1 day, and the median ED length of stay was 16.0 hours (IQR 9.2, 22.5) prior to inpatient transfer. Admissions ranged from 16 to 34% across the sites. More subjects with type 2 DM were admitted to the hospital (30.3% v. 8.9%; $p < 0.001$). Sociodemographic (age [OR 1.02; 95% CI 1.01, 1.03]; male sex [OR 1.4; 95% CI 1.03, 2.00]), DM history (type 2 DM [OR 2.5; 95% CI 1.6, 3.9]), and in-ED factors (receiving interventions [OR 5.5; 95% CI 2.3, 12.9]; receiving simple or advanced imaging [OR 4.9; 95% CI 3.4, 7.0]) were factors associated with hospitalization. **Conclusions:** Males with type 2 DM and advanced age who require ED treatment and imaging while in the ED are at higher risk of being admitted to hospital. These individuals consume considerable health care resources, and ED practice variation in this setting is widespread.

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EMERGENCY department staffing decisions using trial data: what really matters?

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Keywords: crowding, emergency medicine, methodology

Introduction: Emergency department (ED) overcrowding is a common and growing problem. Volume-based staffing is a potential solution that has been infrequently described. Prior to conducting a randomized controlled trial (RCT) of adding an additional shift in a moderate case-complexity area of a typical urban, high-volume, academic ED, we asked physicians to estimate the minimally clinically important difference (MCID) for trial success. **Methods:** Emergency physicians were asked to determine the MCID for length of stay (LOS) on admitted and discharge patients, physician initial assessment (PIA), left without being seen (LWBS), and left against medical advice (LAMA). An 8-week unblinded, parallel-group, randomized controlled trial was completed between 24/06 and 18/08/2011. Staff satisfaction was evaluated through pre/post shift and study surveys; administrative data were collected from EDIS. Data are presented as proportions and medians with interquartile ranges (IQRs); bivariable analyses were performed. **Results:** Overall, 30 of 33 (91%) emergency physicians responded. The trial failed to meet a priori criteria (6-minute reduction) for success for LOS ($p = 0.21$) metrics. LWBS (25% reduction) and LAMA (43% reduction) improvements met criteria, whereas PIA decreased in statistical ($p < 0.001$) but not clinically important (change: 6 minutes) ways. Although physicians saw fewer patients during the intervention study period, the overall patient volume increased, and satisfaction among ED physicians was rated higher. Physicians voted overwhelmingly to continue the shift change. **Conclusions:** Although this study did not meet predefined MCID measures and despite seeing fewer patients, physicians voted to retain the shift due to "softer" outcomes. Operations research should collect MCID prior to the study and may require mixed methods to evaluate the effectiveness of ED interventions.

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A SURVEY of prevailing attitudes toward trauma protocols and algorithms and their use across Canada

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Keywords: emergency medicine, injury/trauma, protocols and algorithms

Introduction: No comprehensive data exist regarding the use of trauma protocols and algorithms in trauma centres in Canada. This is in spite of research showing increasing prevalence of trauma protocols and algorithms in centres throughout Europe and the United States. Additionally, there is a recognized diversity of opinions toward trauma protocols and algorithms among Canadian trauma team leaders. This study involved the design of a questionnaire meant to quantify and characterize the use of trauma protocols and algorithms in regional trauma centres across Canada, as well as to explore the attitudes of trauma team leaders regarding their efficacy. The information compiled was intended to aid in recognizing trends in national trauma care relating to the use of trauma protocols and algorithms. **Methods:** Canadian level I trauma centre program directors were asked to participate in an online survey asking if their hospital used trauma protocols and, if so, which conditions their protocols addressed. In addition,

opinion on trauma protocol efficacy and openness to sharing between hospitals were queried. **Results:** Eight of 17 regional trauma centres responded to the survey, with 5 reporting that their institutions used trauma protocols and algorithms (beyond Advanced Trauma Life Support). In addition, two of the three institutions without trauma protocols and algorithms were in the process of developing them. The most common trauma protocols reported were massive transfusion, penetrating abdominal injury, penetrating neck injury, and C-spine clearance. **Conclusions:** Consistent with international trends, many large Canadian trauma centres have adopted trauma protocols and algorithms, and trauma program directors generally agree that they are effective in improving trauma patient care. Given a growing body of research showing that trauma protocols result in faster decision making, reduce human errors, and improve medical education, other centres may follow suit.

5489

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CLINICAL presentation and evaluation of pediatric myocarditis in the Asian population: the emergency physician's perspective

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Keywords: emergency medicine, myocarditis, pediatrics

Introduction: Myocarditis is a recognized cause of cardiac failure in the pediatric population and potentially life-threatening. Although it is imperative for the emergency physician to diagnose myocarditis promptly, this diagnosis in the pediatric population is challenging because it can present in a myriad of ways, frequently mimicking other common disorders. **Methods:** Our primary objective was to review the frequencies of various clinical presentations in acute myocarditis. A retrospective chart review over a 10-year span from Jan 2001 to Dec 2010 was performed for children presenting to the Children Emergency Department (ED) in Kandang Kerbau Hospital, Singapore. We compared the true cases of myocarditis to those who were suspected to have myocarditis at the ED but who subsequently turned out to have other diagnoses on discharge. We then derived an "M" score to assist the ED physician in his clinical decision making. **Results:** Thirty-nine cases of true myocarditis were identified, whereas 51 cases were suspected at ED but did not have a final diagnosis of acute myocarditis. Among the true cases of myocarditis, the average age at presentation was 5.4 years. Twelve (30.8%) cases had biopsy-proven myocarditis. The most discriminatory symptom complex was that of hypoperfusion, with 24 (61%) actual cases, compared to 9 (17.6%) suspected cases. Using logistic regression, we derived five components of the M score: 1) symptoms of hypoperfusion, 2) gastrointestinal symptoms, 3) hypoxia, 4) respiratory distress, and 5) hepatomegaly. **Conclusions:** Pediatric myocarditis presents predominantly with nonspecific symptoms. The M score is useful to the emergency physician in detecting acute myocarditis. A chest radiograph and ECG should be ordered whenever one or more components of the M score are present, especially in the presence of hypoperfusion.

5497

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KNOCKED senseless and SCATter brained: information sources about concussion and the Sport and Concussion Assessment Tool 2

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Keywords: education/teaching, emergency medicine, head injury, sport

Introduction: Information regarding the impact of concussions on young participants in sport is a hot-button issue. Parents with children involved in community- or school-based sports organizations receive information from a plethora of sources, including television, the Internet, and medical personnel in regards to concussions. Over 3 years have elapsed since the consensus statement from the Zurich 3rd International Conference on concussion in sport and the accompanying Sport Concussion Assessment Tool 2 (SCAT2) was published. To educate parents about concussions, it is important to know where they receive their information from and where they would seek advice when a concussion is suspected. **Methods:** A total of 93 parents of football players (mean age 42.9 ± 5.2) completed a paper (n = 77) or an online (n = 16) version of a concussion knowledge survey. The survey included qualitative questions inquiring from where or whom people would seek advice if they were aware of or suspected a concussion. In addition, parents were asked where their knowledge of concussions came from and if they were aware of the SCAT2. **Results:** Participants listed their family doctor most often when asked where they would seek concussion advice (79.6%), followed by the hospital ED (71.0%). Regarding concussion knowledge, participants listed printed material (e.g., newspaper, magazines, etc.) as their top source (41.9%), followed by television (40.9%). Only 11.8% of the participants indicated that their knowledge came from the minor football league their child played in. Twelve percent of the participants indicated that they have heard of the SCAT2. **Conclusions:** It is important for family physicians and emergency department physicians to inform parents of concussion symptoms and the SCAT2 since they are often the first to be asked for medical advice. As our results suggest, minor football leagues could also play a larger role in educating parents in this regard.

5498

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INTERPHYSICIAN variability in CT use at an academic emergency department

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Keywords: computed tomography, diagnostic technologies/imaging, emergency medicine, service use

Introduction: Emergency physicians (EPs) have been alerted to the potential danger of ionizing radiation associated with computed tomography (CT). Several studies, however, have demonstrated variation in the use of diagnostic tests among physicians. This study's objective was to determine the per-physician rates of CT use at our institution. **Methods:** We conducted a health records review of consecutive adult patients seen at a busy academic tertiary care emergency department (ED) over a 1-month period who had undergone CT scanning ordered by EPs. The number of CTs ordered was determined by searching a PACS database. Data collected included patient age and sex, ordering physician, study indication, scanner model, body area, and reported dose-length product (DLP). Data were collected on a standardized data form and entered in an electronic database. The number of patients seen per physician was determined using our departmental billing data. We excluded from analysis physicians who had seen fewer than 50 patients. Data were described using descriptive statistics. **Results:** During the study period, 50 EPs had 9,900 patient encounters. Of these, 1,370 patients underwent 1,436 CT scans. The overall rate of CT scanning was 13.8%. Four physicians saw fewer than 50 patients and so were excluded. Among the remaining 46 physicians, the rate of scanning varied from a low of 4.9% of patients seen to a high of 30.4%, a more than sixfold variation. The median rate of scanning was 14.1% (interquartile range 11.2–16.6). **Conclusions:** We measured considerable variation in physician use of CT scanning. Efforts to reduce patients' radiation exposure must address this variation.

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DEFINING, characterizing, and quantifying the burden of frequent users of a suburban emergency department

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Keywords: clinical practice, emergency medicine, frequent users

Introduction: Frequent emergency department (ED) users are inconsistently defined and poorly studied in Canada. This study aims to develop uniform definitions and to quantify ED burden and characterize frequent users from one suburban community ED using these definitions. **Methods:** This is a retrospective administrative database study of 30,908 ED visits during fiscal year 2010, excluding visits by patients less than 18 years old and intentional returns. Frequent and extreme frequent users were defined as patients with yearly visit numbers above the 95th and above the 99th percentiles, respectively. Nonfrequent users had one to four, frequent users five or more, and extreme frequent users eight or more yearly visits. Age, sex, ED length of stay (LOS), diagnoses, CTAS, and postvisit disposition were examined. Extreme frequent users were analyzed by age subgroups. **Results:** The study included 22,333 visits by 14,223 patients. Frequent users represented 3.1% of patients and 13.8% of visits. Extreme frequent users represented 0.8% of patients, 5.4% of visits, and 568,879 cumulative ED minutes (395 days). Frequent and extreme frequent users were older, with longer, higher-acuity visits. Extreme frequent user profiles emerged: younger patients with shorter, lower-acuity visits for somatic and mental disorders; sicker patients in their 50s to 80s with longer, higher-acuity visits, more admissions, and chronic disease-related diagnoses; and elderly patients discharged often to residences with support services. **Conclusions:** We propose a reproducible definition for frequent ED users and provide evidence of their burden of care and heterogeneity at one community Canadian ED. Using this framework, individual regional profiles of frequent and extreme frequent users can be studied and community-specific interventions planned.

5508

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AN ASSESSMENT of patient safety during a primary care paramedic field primary PCI STEMI bypass protocol

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Keywords: bypass protocol, emergency medical services, emergency medicine, myocardial infarction

Introduction: Field identification of STEMI patients and bypass for primary PCI plays a crucial role in their outcome. An urban STEMI bypass protocol with a dual primary care paramedic (PCP) crew configuration should expect to encounter patient care complications. **Methods:** This retrospective case review of 455 consecutive paramedic transfers directly to the only PCI facility in the city of Ottawa between January 1 and December 31, 2010, identifies potential adverse events during field STEMI transports and the need for ALS interventions. Evaluation focused on airway interventions, rhythm disturbances, major circulatory events, as well as clinically relevant time intervals: field response times, transport times, and door-to-balloon times. First medical contact was defined as the paramedic arriving at the patient. **Results:** Of the 455 cases, 42.19% (n = 192) were field STEMI bypass initiated by a paramedic based solely on paramedic ECG interpretation and clinical assessment; 84.9% (n = 163) were attended by advanced care paramedics and 15.1% (n = 29) by PCPs. In the PCP group, 2 patients (6.8%) were identified as needing intervention with fluid resuscitation (hypotension) and 7 (24.1%) had a combination of hypotension and/or bradycardia without any need for intervention. No cardiac arrests occurred during transport. For these 29 patients assessed and transported by dual PCP crews, the average response time was 6.8 minutes, average transport time was 10.6 minutes, and average door-to-balloon time was 52.8 minutes (median time 52 minutes [IQR 40–64.5]). Sixyt-two percent (n = 15) of patients had a door-to-balloon time of < 60 minutes, with only one patient exceeding 90 minutes. First medical contact to door was an average 30.7 minutes with a median of 29 minutes (IQR 23–40), and first medical contact to balloon was an average 83.6 minutes (median of 80 minutes) (IQR 70–97). **Conclusions:** A primary PCI field STEMI protocol can be serviced safely by PCPs while still respecting the AHA time guidelines in an urban setting.

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EMERGENCY medicine residents' contribution to an Internet-based collaborative teaching tool (Google Docs slideshow presentation)

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Keywords: education/teaching, e-learning, emergency medicine

Introduction: In 2008, a Google Docs slideshow presentation was created to supplement the National Review Course in Emergency Medicine given to all fifth-year residents enrolled in a Royal College of Physicians and Surgeons of Canada Emergency Medicine residency program. The slideshow supplements a 90-minute review of landmark articles in emergency medicine given during the course. After the course, participants are invited by e-mail to consult, edit, comment, and update the online slideshow throughout the year. The goal of this study was to measure the contribution of residents to this collaborative writing project. **Methods:** All data were collected directly from the Google Docs presentation, which allows viewing who has access to the presentation, the number and author of the editions, as well as the number of articles summarized. We counted the number of articles summarized, the frequency of editions made by residents, and the number of residents having access to this collaborative tool in 2008, 2009, and 2010. These editions included changing the order of the slides, adding slides, or modifying slides. **Results:** As of 2010, all 108 residents who attended the course (out of a potential 111) had accepted the invitation to access the slideshow. Overall, 142 landmark articles had been summarized and critically reviewed and 2,280 revisions had been made to the presentation by 19 different editors. Only 2.5% (59 of 2,280) of the modifications were made by the residents, and the original author of the slideshow performed the remaining changes, 97.5% (2,221 of 2,280). **Conclusions:** Residents' contributions to the Google Docs slideshow were surprisingly low. The reasons for their low contribution rate are currently being investigated. Based on the Theory of Planned Behavior, the residents' salient beliefs that define their contribution to the presentation will be identified.

5512

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EXPLORING the challenges and feasibility of using high-fidelity simulation to train medical students in cardiac arrest management

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Keywords: education/teaching, emergency medicine, simulation
Introduction: Medical students rarely enter clerkship with the training to participate in medical crisis situations, and there is some question whether they are capable of acquiring the necessary skills. The aim of this study was to assess the feasibility and examine the barriers to training medical students in cardiac arrest management with a high-fidelity simulation-based training program. **Methods:** Eight second-year undergraduate medical students from Queen's University participated in a 30-hour simulation-based cardiac arrest training program at the Kingston Resuscitation Institute that took place throughout their fourth term of study. The students were entered into a resuscitation competition for evaluation of their skills compared to functioning resuscitation teams by a panel of expert judges. The educator and learners participated in semistructured interviews that were analyzed using a grounded theory approach. **Results:** The learners were able to successfully fulfill all of the roles on a cardiac arrest team and function at a level acceptable for patient care and better than some resident teams. It was considered to be a valuable and highly motivating learning experience by students. The main barriers identified included scheduling conflicts, optimization of program structure, resource constraints, student anxiety around leadership, and inadequate background knowledge. **Conclusions:** Simulation can be used to train medical students to function well in cardiac arrest situations despite knowledge deficits and can motivate further study. Implementation to include an entire medical class would require substantial resources.

5517
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USE OF FORCE in police-public encounters and medical outcomes: issues with linking police and emergency medical services (EMS) data
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Keywords: emergency medical services, emergency medicine, police
Introduction: There are no national or provincial estimates on the number of police-related EMS calls or a description of the context in which police-related EMS care occurs. No standardized data are collected to document when EMS personnel request police assistance. Available data are not linked across public sectors, and no unique identifier exists that would enable electronic data linkage. Manual linkage of EMS and police encounter data invokes major privacy and security issues and is extremely difficult for unidentified subjects or those with multiple aliases. **Methods:** Data on police-related EMS calls from one midsized Canadian city were drawn from a larger national multisite prospective, consecutive cohort study of police use of force. Inclusion criteria were all subjects > 18 years of age with whom police use of force occurred during a police-public encounter. Prospective, standardized police reporting reflected when EMS had attended the scene from January 1, 2010, to October 1, 2011. It was anticipated that ~20% of police use of force events would result in EMS calls. **Results:** Standardized police reporting during the study indicated that EMS attended 102 use of force events (19%). Manual data linkage acquired 40 EMS run sheets (< 40% of reported EMS attendance). Of the 40 EMS run sheets, 32 involved EMS transporting subject to hospital (80%). In slightly less than half of the police-related EMS calls (43%), EMS staff risk was documented with subjects struggling (n = 17) and requiring either police (59%) and/or EMS (65%) restraint. In one case (2.5%), chemical sedation was used. **Conclusions:** Our data reflect problems with linkage across public sectors resulting in an underestimation of risk for EMS personnel who respond to police calls. An e-health information platform using unique identifiers would protect patient confidentiality, enable province-wide standardized reporting, and track "real-time" resource allocation, as well as medical outcomes.

5518
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RISKS of plain radiograph discrepancy in the emergency department
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Keywords: diagnostic technologies/imaging, emergency medicine, radiography, risk
Introduction: Previous research into plain radiograph interpretation discrepancies in the emergency department (ED) has quantified the rate of error between emergency physicians (EPs) and radiologists. This study was designed to identify specific patient demographic and clinical characteristics that predict these discrepancies. **Methods:** Discrepancies were defined as errors leading to a change in management. A panel of experts consisting of both EPs and radiologists identified 11 possible risk factors for interpretation error. A retrospective chart review of all plain radiographs ordered in two EDs from July 2010 to June 2011 was conducted. The discrepancies were analyzed using multiple logistic regression analysis to evaluate these factors. **Results:** A total of 29,178 plain radiographs were ordered from the ED over the study period, and 294 (1.0%) clinically significant discrepancies were compared to 499 x-rays with correct interpretations. Patients who were children (odds ratio [OR] 2.00; 95% confidence interval [CI] 1.13–3.53) or seniors (OR 1.91; 95% CI 1.25–2.91), received a chest x-ray (OR 2.90; 95% CI 1.17–7.18), were symptomatic for 1 to 2 weeks (OR 2.28; 95% CI 1.05–4.95), in the ED for < 2 hours (OR 4.93; 95% CI 1.32–18.40) or from 2 to 8 hours (OR 4.23; 95% CI 1.18–15.17), or who were discharged without follow-up (OR 3.54; 95% CI 1.77–7.09) were at greatest risk for discrepancy. **Conclusions:** EP interpretation of plain radiographs in the ED is generally in accordance with the radiologist. However, this study outlines specific factors that could be used in the future to mitigate the potential for discrepancies, with the ultimate goal of improving patient care.

5521
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WHAT are kids getting into these days? Trending substance use presenting to the pediatric emergency department in Edmonton, Alberta
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Keywords: emergency medicine, pediatrics, substance use
Introduction: The prevalence of substance use among Canadian youth is significant and rising. To create effective educational and prevention strategies targeted at reducing dangerous substance use, we must first characterize the population trends. Local data on this population are scarce. **Methods:** We conducted a retrospective review of all youth, aged 10 to 16 years, who consecutively presented to the pediatric emergency department (ED) in Edmonton, Alberta, from 2007 to 2009 with complaints related to recreational drug use (n = 641). We used a study-specific tool to record drug exposures, medical management, morbidity/mortality, and sociodemographic characteristics. Cases of intentional self-harm were excluded. **Results:** The median age of patients was 15 years; 56% were female. Most (80%) came from low-middle class households; 6% of patients were homeless, and 21% were wards of the state. The most frequent ingestions included ethanol (74%), marijuana (20%), ecstasy (19%), and medications (15%). Over one-third of patients had polydrug use, defined as having ingested two or more substances at the time of presentation. Ninety percent were

brought to the ED by emergency medical services; 63% of these were activated by nonacquaintances. Of the 47% of youth who presented with decreased level of consciousness, half had a Glascow Coma Scale ≤ 12. The Canadian Triage Acuity Scale score was 1 or 2 for 44% of patients. Sixty-eight percent received IV fluids, 42% received medication, and 4% were intubated. The admission rate was 9%, with one-third of patients requiring intensive care. There were two deaths during the study period. **Conclusions:** Preliminary analyses suggest that youth who present to the ED for substance use represent a socially vulnerable population whose use of recreational substances results in high medical acuity, considerable use of medical resources, and significant morbidity. Further study of the economic impact of these presentations should be considered, as should development and study of intervention programs for these high-risk youth.

5523

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FREQUENCY and description of documentation error types by electronic versus paper ambulance call reports

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Keywords: emergency medical services, emergency medicine, error

Introduction: Base hospital physicians delegate controlled medical acts to paramedics through medical directives. Delegation relies on robust quality assurance performed by auditing ambulance call report (ACR) documentation for compliance with directives. Electronic ambulance call reports (eACRs) are marketed with the promise of minimizing documentation errors. The primary objective of this study was to compare the frequency of documentation errors between eACR and paper ACRs (pACRs). **Methods:** The Southwest Ontario Regional Base Hospital Program (SWORBHP) completed a retrospective chart review of 32,785 ACRs from April 1, 2010, to March 31, 2011. Two different commercial ACRs were in use. Both eACRs and abstracted pACRs were put through a computer-based filtering system. Potential medical directive errors, identified by the filters, were reviewed manually. Documentation errors were defined as absent or inaccurate information determined after investigation by a professional standards specialist. **Results:** A total of 32,785 ACRs were audited (7,724 eACRs and 25,061 pACRs). A total of 407 documentation errors were found after manual review of flagged ACRs. Overall, errors were found in 1.2% of ACRs. There were errors in 3.3% of eACRs (252 of 7,24) and in 0.6% of pACRs (155 of 25,061). The eACR error rate was significantly higher (Δ 2.7%; 95% CI 2.3–3.1). Seventy percent of the documentation errors in eACRs and 69% in pACRs were found in the clinical information sections of the ACRs. **Conclusions:** Significantly more frequent documentation errors were found in eACRs compared to pACRs used by the EMS services in the SWORBHP region. It is not clear why this occurred. It may be that the use of eACRs increases the number of documentation errors, despite vendor's claims to the contrary. In a retrospective review of 32,785 ACRs from a regional base hospital system, the rate of documentation errors found in electronic ACRs was 5.5 times higher than the documentation error rate in paper ACRs.

5524

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DO EMERGENCY physicians consider radiation doses when investigating for acute pulmonary embolism?

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Keywords: diagnostic technologies/imaging, emergency medicine, radiation exposure, safety

Introduction: There is growing concern over the biologic effects of ionizing radiation from diagnostic imaging, especially in young adults and women. Investigations for acute pulmonary embolism (PE) include CT pulmonary angiogram (CTPA) and ventilation perfusion scan (V/Q), the former having a radiation dose approximately five times greater than the latter. The objectives of this study were to survey emergency physicians to determine which tests they would order to investigate PE in various patient populations and to compare these results to a retrospective chart review to determine which tests were actually employed. **Methods:** An online survey was sent to adult emergency physicians working at an academic tertiary care centre (annual census 150,000) to establish imaging choices for investigating PE in various patient populations. A retrospective review of medical records was performed for all patients who underwent CTPAs and V/Qs in two academic adult emergency departments from April 2009 to March 2010. Patient demographics, history, study results, and follow-up studies within 3 months were collected. **Results:** Thirty-one of 42 physicians (71%) responded to the survey. For patients < 30 years old, 83.9% of physicians chose V/Q as their test of choice, regardless of gender. In the retrospective review, 663 charts were reviewed, including 200 CTPAs and 463 V/Qs. V/Q was the preferred modality in female patients (75.9%) and in patients < 30 years old (87.9% v. CTPA 12.1%, Δ 75.8 [64.6, 82.9]). The frequency of CTPAs increased with age and comorbidities in both the survey and the retrospective review. The overall incidence of PE was 13.9% (92 of 663) in this study. **Conclusions:** Surveyed physicians stated that they would choose the lower ionizing radiation dose V/Q for patients < 30 years old. This observation was validated by the retrospective chart review. Thus, physicians at our institution are conscious of radiation exposures to high-risk populations when investigating for PE.

5525

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SEPSIS and cultures: what are we looking for? A retrospective review of patient mortality and culture results

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Keywords: clinical practice, emergency medicine, microbiology, sepsis

Introduction: Sepsis is a continuum ranging from systemic infection to septic shock and can lead to multiorgan dysfunction and death. Although the presence of bacteria as evidenced by positive blood culture is indicative of sepsis, cultures may be negative in as many as 30% of septic patients. The primary objective was to determine the proportion of patients admitted from the emergency department (ED) with a diagnosis of sepsis who died in hospital with sepsis as the direct cause of death. A secondary objective was to stratify culture results by system and the presence or absence of an organism. **Methods:** A retrospective chart review was conducted for all adult (≥ 18 years) patients admitted from the ED of an academic tertiary care centre (annual census 75,000) with a primary diagnosis of sepsis from 2005 to 2009. Data were recorded using a standardized data extraction tool by trained research personnel. **Results:** A total of 348 patients were identified; 28 were excluded as direct admissions and 7 charts were unavailable, leaving 313 included in the review. The mean (SD) age was 64.8 (18.8) years, and 53.7% were male. Sixty (19.2%) patients died in hospital, with sepsis as the direct cause of death in 50 (83.3%) of these patients. A total of 302 (96.5%) patients had cultures drawn in the ED. Of those cultured, 104 (34.4%) patients had no organism detected. Blood was the most common source of a positive culture (n = 134), followed by urine (n = 67). *E. coli* was the most common organism cultured (n = 41), followed by *Staphylococcus aureus* (n = 30). Of the 50 patients who died in hospital from sepsis, 21 (42.0%) had negative cultures. **Conclusions:** Although many patients who died from sepsis

had a positive blood culture, 104 patients did not have an organism cultured. This potentially makes treatment difficult as physicians may not be able to rely on culture sensitivities to tailor antibiotic therapy.

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PROPORTION of emergency department medical records containing the electronic prehospital care record (ePCR) after the implementation of an ePCR "pull" system

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Keywords: documentation, emergency medical services, emergency medicine

Introduction: Anchorage fire department uses an electronic prehospital care record (ePCR). Emergency department (ED) clerks are required to "pull" them to add to the ED record. Prior to November 2009, the PCR was printed prior to medic departure and given to clerks to place with the chart. This study investigates whether the change in method of "push" versus "pull" led to a change in the proportion of ePCRs incorporated into the medical record. **Methods:** A retrospective review of all Code 99 (cardiac arrest) and Status 1 patients (highest acuity) and a random sample of Status 3 (stable) patients who were transported to two EDs were examined to determine the proportion of charts that contained the ePCR prior to ePCR "push" and after the implementation of "ePCR pull." **Results:** A total of 167 Code 99 and Status 1 charts (78 preimplementation, 89 postimplementation) and 172 Status 3 charts were reviewed (78 preimplementation, 94 postimplementation). Prior to ePCR "pull," 95.8% of Code 99 and Status 1 transports to Regional and 92.6% of Code 99 and Status 1 transports to Providence had the ePCR included. After the implementation of ePCR "pull," 29.6% of Code 99 and Status 1 transports to Regional (Δ 66.2; 95% CI 41.4, 80.4) and 83.9% of Code 99 and Status 1 transports to Providence (Δ 8.72; 95% CI –3.7, 20.7) had the ePCR included. Prior to the ePCR pull, 83.3% of Status 3 transports to Regional and 94.4% of Status 3 transports to Providence had the ePCR included. After the implementation of ePCR "pull," 3.1% of Status 3 transports to Regional (Δ 80.2; 95% CI 59.1, 89.9) and 77.4% of Status 3 transports to Providence (Δ 17.0; 95% CI 4.2, 29.4) had the ePCR included. **Conclusions:** Since implementing the ePCR "pull" system, there are fewer ePCRs being incorporated into the medical record.

5529

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OUTCOMES in post–cardiac arrest patients with and without significant intracranial pathology on head CT

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Keywords: cardiac arrest, cardiovascular, computed tomography, emergency medicine

Introduction: When survivors of sudden cardiac arrest arrive at the emergency department (ED) with return of spontaneous circulation (ROSC), the etiology of the cardiac arrest (i.e., cardiac, neurologic, respiratory, etc.) should be ascertained. The objective of this study was to explore clinical practice regarding the use of head CT in the immediate post–cardiac arrest period in patients with ROSC and to compare outcomes of patients with significant (SAH, edema, or infarct) versus nonsignificant findings on head CT. **Methods:** A retrospective medical record review was conducted for all adult (≥ 18 years) post–cardiac arrest patients admitted to the intensive care unit (ICU) of an academic tertiary care centre (annual ED census 150,000) from 2006 to 2007. Data were extracted using a standardized data collection tool by trained research personnel. **Results:** A total of 200 patients were enrolled; 79 (39.5%) had a head CT within 24 hours of ICU admission, and 14 (17.7%) had significant findings on head CT. Of these, 1 (7.1%) patient survived to ICU discharge, compared to 11 of 65 (16.9%) patients with nonsignificant findings (Δ –9.8; 95% CI –22.2, 15.6). Of those with significant findings on head CT, median (IQR) ICU length of stay was 1 (1, 2.5) day compared to 4 (2, 4) days for patients with nonsignificant findings. Survival to hospital discharge was not different for patients with significant findings on head CT (1; 7.1%) compared to those with nonsignificant (9; 13.8%) findings (Δ –6.7; 95% CI –18.7, 18.5). No patients with significant head CT findings survived to 1 year, compared to 9 (13.8%) patients with nonsignificant findings (Δ –13.8; 95% CI –24.3, 8.6). **Conclusions:** The use of post–cardiac arrest head CT was variable, with less than half of patients undergoing head CT within 24 hours. Further research is required to more accurately determine the prognostic utility of this imaging modality.

5531

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CAN PARAMEDICS safely transport patients with ST-segment elevation myocardial infarction (STEMI) directly to a PCI-capable centre?

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Keywords: emergency medical services, emergency medicine, myocardial infarction, transportation

Introduction: The local "CODE STEMI" protocol involves patient identification via electronic interpretation of prehospital ECGs (pECG), prehospital communication with interventional cardiology, and direct transport to a PCI-capable center, often "bypassing" EDs in non–PCI-capable centres. The study objective was to determine if paramedics can safely transport STEMI patients within one municipality. **Methods:** This was a retrospective review of all EMS-transported STEMI patients in 2010. Patients were included if a STEMI was identified prehospital. Patients were excluded if there was no pECG, the pECG was nondiagnostic (including LBBB), if instability precluded CODE STEMI activation, or if prehospital records were unavailable. The primary outcome was a composite of adverse events (AEs), including cardiac arrest, hemodynamic instability, respiratory distress, decreased GCS, and diversion to the nearest hospital. **Results:** Eighty of 120 EMS-transported CODE STEMI patients were included. The median (IQR) transport time (pECG to hospital arrival) was 21 (15, 24) minutes. Median (IQR) drive time was 9 (7, 13.5) minutes, and EMS contact-to-balloon time was 66.5 (58, 78.8) minutes. Twenty-six (32.5%) patients experienced 31 prehospital AE. Thirteen patients had hypotension (SBP < 90 mm Hg); five additional patients had an SBP drop of > 30% without hypotension. Four episodes of tachycardia (> 120 bpm) and seven episodes of bradycardia (< 50 bpm) occurred. Two patients had a decrease in GCS. No patients arrested, and no patients were diverted. One patient required conversion of aflutter by the ED physician before proceeding to the laboratory. Seven (8.7%) patients had interventions for an AE. All interventions included a fluid bolus. One patient also received atropine. All interventions were provided by advanced care paramedics. **Conclusions:** Many EMS-activated CODE STEMI patients experienced a prehospital AE. The number of interventions was low, and no patients died during transport. The overall transport time was short. Further study is required for protocols allowing longer transport times.

5533

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THE INCIDENCE of acute myocardial infarction following a previous discharge within 30 days from the emergency department

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Keywords: cardiovascular, emergency medicine, myocardial infarction

Introduction: The objective of this study was to determine the proportion of patients with an acute myocardial infarction (AMI) who had a prior visit to the emergency department (ED) within 30 days and to identify whether appropriate steps had been undertaken to rule out AMI based on current standard of care practice. **Methods:** A retrospective medical record review was conducted for all adult (≥ 18 years) patients who had a diagnosis of AMI from the cardiology care unit following a previous discharge within 30 days from the ED over a 2-year study period (January 1, 2008, to March 31, 2010). A standardized data extraction tool was used to collect relevant patient information. A further in-depth analysis was performed on true "missed AMI" cases. **Results:** Fifty-four charts were reviewed. Of these, 5 (9.3%) did not have an AMI; 6 (12%) were actually referred to Cardiology (and subsequently discharged home) during their initial ED visit; 2 (3.7%) left without being seen by the ED physician; 2 (3.7%) were direct assessments to another service; and there were 2 (3.7%) missing charts. Another 17 (34%) were excluded because the initial ED visit was greater than 30 days prior to admission. Twenty patient charts were then reviewed in detail. Eight (40%) patients presented with "chest pain," 11 (55%) had abnormal vital signs, 2 (10%) had more than one ECG done, 2 (10%) did not have an 8-hour cardiac enzyme level done, and 13 (65%) were given instructions to follow up with either a cardiologist or family doctor. During this period, there were 670 inpatient cases of AMI. Hence, only 2.9% of these patients had an assessment and discharge from the ED in the month prior. **Conclusions:** The limited data in this pilot study suggest that the incidence of inappropriate discharges from the ED is low.

5536

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PAIN management of ankle fractures in the emergency department

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Keywords: analgesia, ankle fracture, clinical practice, emergency medicine

Introduction: The management of acute pain in emergency departments (EDs) continues to be suboptimal. The objective of this study was to assess the current practice of emergency physicians working in an academic ED with respect to acute pain management. **Methods:** A retrospective medical record review was conducted from a random sample of adult (> 18 years) patients with an ED diagnosis of "ankle fracture" between April 1, 2009, and March 31, 2010. Data collected included sex, age, triage/MD assessment time, x-ray/CT time, analgesia time, analgesia given, and discharge prescription. An online, five-item questionnaire was sent to the emergency physicians and residents to assess their perception of how they manage acute pain. **Results:** Fifty patient charts were reviewed. The median (IQR) time to be seen by a physician was 64 (30, 103) minutes. The median (IQR) time to first analgesia after being assessed by a physician was 75 (25, 125) minutes. Only 36 (72%) patients received analgesia in the ED. Four (8%) patients received analgesia prior to physician assessment. Of the 36 patients who received analgesia in the ED, 26 (72%) received opiate analgesic, whereas 10 (28%) received Tylenol/NSAIDs. Only 13 (26%) patients received analgesia prior to going for x-ray. Thirty-three (66%) patients were admitted for management of their fracture. Of the 17 (34%) patients discharged home, only 7 (41%) received an opiate prescription, whereas 1 (6%) patient received a script for NSAIDs. Forty-nine of 68 physicians responded to the survey. Of those respondents, almost all (95%) indicated that they would feel comfortable providing analgesia to patients with suspected fractures before x-ray results were available. **Conclusions:** Physicians seem to believe that they are treating ankle fracture pain more aggressively than their charts indicate. Being more cognizant of potentially painful conditions within EDs could lead to faster analgesia administration and decreased patient suffering.

5542

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ARE CT SCANS routinely done before lumbar puncture in suspected cases of meningitis?

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Keywords: clinical practice, computed tomography, emergency medicine, lumbar puncture

Introduction: Cerebrospinal fluid (CSF) is required for the diagnosis of meningitis. Physicians may order a CT head before lumbar puncture (LP) to exclude intracranial pathology that could cause brain herniation with removal of CSF. Research has shown that CT scans rarely contraindicate LP when no signs of increased intracranial pressure or neurologic deficits are present, yet many physicians continue to order them. The objectives of this study were to determine if CT scans are ordered for patients with suspected meningitis in the emergency department (ED) despite no signs or symptoms of neurologic compromise, the percentage of CT results that contraindicate LP, and whether ordering CT scans delays antibiotic administration. **Methods:** A retrospective medical record review was conducted for a random sample of adult (≥ 18 years) patients who had an LP or an ED discharge diagnosis of meningitis between April 2009 and March 2010. **Results:** One hundred charts were reviewed. Patients worked up for reasons other than suspected meningitis (n = 55), with a history of neurologic disease (n = 4), or transferred from another site (n = 3) were excluded, leaving 38 included cases. Twenty (52.6%) patients with suspected meningitis had a CT head done prior to LP. Of these, only 6 (30%) had neurologic findings. None of the CT results contraindicated LP. There was no difference in the median time from physician assessment to antibiotic administration for those who had a CT (139 minutes) compared to those who did not (146 minutes) have one (Δ 7 minutes; 95% CI –90, 104). **Conclusions:** Despite evidence showing CT scans rarely contraindicate LP, they are still being ordered in suspected cases of meningitis when no neurologic findings or signs of increased intracranial pressure are present. Although this may not delay antibiotic administration, the unnecessary radiation exposure, time to disposition, and allocation of resources should still be considered.

5548

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THIRTY-DAY and 1-year outcomes of emergency department patients with long QT syndrome

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Keywords: cardiovascular, emergency medicine, long QT syndrome, outcome

Background: Although patients with long QT syndrome are felt to be at increased risk of death, this association has not been documented in emergency department (ED) patients. **Methods:** This was a retrospective cohort study obtained by searching the ECG database of two urban hospitals to identify consecutive patients with a corrected QT value of > 0.44 seconds (males) and > 0.46 seconds (females). We linked each patient's unique provincial health number to the provincial vital statistics database to identify subsequent deaths within 30 days and 1 year. Manual chart review was conducted to confirm rhythms and outcomes

and to identify patient comorbidities. The primary outcome was death within 30 days. **Results:** Data from 251 consecutive ED patients with long QT were collected, of whom 120 were admitted at the index ED visit (47.8%). There were 8 deaths at 30 days (3.2%, 95% CI 1.6–6.7) and 19 at 1 year (7.6%, 95% CI 4.1–11.5). All patients who died at 30 days were admitted at the index ED visit, and none appeared to die of sudden cardiac death. **Conclusions:** In this two-centre cohort of ED patients with long QT, the 30-day mortality rate was 3.2%. Deaths were typically related to concurrent medical illness rather than cardiac arrest.

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NONCOMPLIANCE with follow-up appointments to outpatient specialty clinics after pediatric emergency department discharge

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Keywords: emergency medicine, outpatient care, patient compliance, pediatrics

Introduction: Follow-up appointments in a specialty clinic are important because they offer the opportunity for re-examination and further testing. A lack of follow-up impairs the effectiveness of outpatient care through the inefficient use of resources and may lead to fewer preventive and curative health outcomes. We aimed to characterize pediatric patients referred from a tertiary-level emergency department (ED) to specialty clinics who did not complete the referral and to identify reasons for nonattendance. **Methods:** We conducted a prospective cohort study of patients who were discharged from the ED with referral to a specialty clinic from October 2010 to April 2011. Forty-eight follow-up visits that were not completed over 6 months and a random sample of 48 attended referrals composed the study sample. Multivariate logistic regression model was used to examine the association between the baseline characteristics and clinic attendance. **Results:** Compared to attenders, nonattenders had an older mean age (5.97 to 7.10 years), and fewer caregivers had postgraduate education (7 to 12). There was little difference in gender, gross family income, language, access to a family physician, or affiliation with the hospital between the attenders and nonattenders. Caregivers with ethnicity other than Caucasian/Canadian, who had less perceived severity of illness or less perceived benefits of professional intervention and who did not have access to a personal vehicle, had higher odds of not attending the follow-up visits; however, none of the estimated effects were statistically significant. The most commonly cited reason for not attending the follow-up appointment was that the patient or caregiver was not aware of the appointment (37.5%). **Conclusions:** Failure to attend follow-up visits may be associated with misdiagnoses, high complication rates, and greater rates of patient noncompliance. Reasons for nonattendance, including poorly understood discharge information, need to be targeted in the future.

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ADVANCED nursing directives in the pediatric emergency department: physician and nurse perspectives

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Keywords: advanced nursing directives, emergency medicine, pediatrics

Introduction: Advanced nursing directives (ANDs), developed using previously validated Clinical Decision Rules, have been implemented at our pediatric emergency department (PED) to empower nursing staff to initiate early investigations and management strategies prior to physician assessments. The purpose of this study is to describe the perspectives of key stakeholders with respect to three recently implemented ANDs. **Methods:** A peer-reviewed, Internet-based survey was distributed to staff nurses and attending physicians (MDs) using a modified Dillman methodology. Likert-type and open-ended questions assessed six metrics: preference over standard practice, perceived patient safety, professional autonomy, adequacy of training, practical feasibility, and effect on patient care. **Results:** The survey was distributed to 154 staff (33 MD, 121 nurses). The response rate was 63.6%; 95.9% of respondents felt that ANDs improved their practice, whereas 91.7% expressed a benefit to overall PED function. Patient safety was thought to be maintained or improved by 89.6% of respondents. Scope of nursing practice was felt to be increased by 95.9%, and 87.4% felt that nurses are confident initiating ANDs in daily practice; however, 10.6% responded that nurses may feel pressured to initiate ANDs for patients who meet criteria but whom they do not believe will receive benefit. Also, 92.5% of respondents felt that families appreciate the use of ANDs in the PED. There were no statistically significant differences between MDs and nurses in the strength of agreement/disagreement. A decrease in PED length of stay (LOS) by > 60 minutes was estimated by 44.7%. **Conclusions:** Overall, the use of ANDs was felt to be safe, to empower nursing staff by expanding scope of practice, and to have a beneficial impact on PED metrics such as LOS. Administrators and key stakeholders should consider the implementation of ANDs into daily ED practice. Future studies will evaluate the perceptions of family members/caregivers in relation to ANDs.

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EARLY diagnosis of bowel obstruction and strangulation by computed tomography in the emergency department

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Keywords: bowel obstruction, clinical practice, computed tomography, emergency medicine

Introduction: Closed-loop bowel obstruction is a specific type of mechanical obstruction with a high risk of strangulation and bowel infarction, especially in the small bowel. It is also associated with a high mortality rate. Hence, it is important for emergency physicians to identify the presence of strangulation, besides making the diagnosis of closed-loop small bowel obstruction. **Methods:** We present three cases of strangulated closed-loop small bowel obstruction in patients presenting to the emergency department with severe abdominal pain. **Results:** These cases highlight the need for urgent abdominal computed tomography (CT) and the distinctive appearance of closed-loop small bowel obstruction and signs of ischemia on emergency CT. The classic signs of strangulating, alone or in combination, have very low sensitivity and specificity. Plain abdominal radiography in evaluation of patients with clinically suspected SBO has a sensitivity of 69% and a specificity of 57%. Studies have demonstrated the accuracy of CT in confirming the diagnosis and also revealing the site, level, and cause of SBO, with a sensitivity of 94 to 100% and a specificity of 90 to 95%. Decreased enhancement of the bowel wall after administration of intravenous contrast is the most specific sign of ischemic bowel on CT. The other useful finding is the "small bowel feces sign." Other findings suggestive of ischemia and risk of strangulation, but not independently sensitive and specific, include bowel wall thickening, mesenteric edema with fat stranding appearance, ascites, mesenteric vascular congestion, intramural pneumatosis, and portal venous gas. **Conclusions:** Urgent CT scan of the abdomen serves as an important diagnostic tool in view of its ability to detect the site, level, and cause of obstruction, along with the distinctive CT appearance of closed-loop small bowel obstruction and signs of ischemia. Early definitive diagnosis will guide subsequent management and improve outcomes.

5590

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ABDOMINAL pain protocols in the emergency department: a pilot project

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Keywords: abdominal pain, clinical practice, emergency medicine, protocols and guidelines

Introduction: More than 20% of visits to the emergency department (ED) at St. Michael's Hospital are for patients with abdominal pain. Analysis defined that length of stay (LOS) for this diverse group was negatively impacted by out-of-date requisitions, inefficient communication, inconsistent use of diagnostic aids, inefficient medical imaging (MI), and overlapping subspecialty consultation practices. A quality improvement initiative was implemented to address these concerns. **Methods:** An iterative improvement cycle was used to develop and implement an abdominal pain protocol, developed by a collaborative, multidisciplinary team. The protocol had two components: RN-initiated standardized blood panels and patient care algorithms for appendicitis, pancreatitis, diverticulitis, and bowel obstruction. Chart audits were conducted for a 4-week preimplementation phase (PRE) and a 12-week postimplementation phase. Data were compared from the PRE phase to the last 4 weeks of implementation (POST). Significant results are reported. **Results:** Abdominal pain bloods: 3,124 charts were audited with 61% males, average age 45 years (range 0–95). There was a high level of acceptance and compliance with the panels. LOS decreased from 7.6 hours PRE to 6.3 hours POST. Time to consultation decreased from 5.2 hours to 4.4 hours. Pancreatitis (n = 62): LOS decreased from 15.1 hours PRE to 11.5 hours POST with a reduction in CT use over hospitalization from 20% of cases to 0%, with "no imaging" increasing from 30 to 50%. Bowel obstruction (n = 60): LOS decreased from 17.2 hours to 8.4 hours. Reduction in CT scan in the ED was 65% to 25%, with an overall reduction in CT during hospitalization from 85% to 60%. Appendicitis (n = 84): compliance was poor, with 21% young males undergoing imaging that was not required for referral. **Conclusions:** In general, protocols were well received, with a high level of compliance. Using a collaborative, multidisciplinary approach, protocols significantly reduced the LOS in the ED and MI use.

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PROCEDURAL sedation use in rural and regional emergency departments

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Keywords: clinical practice, emergency medicine, procedural sedation

Introduction: Several anesthetics and analgesics are administered during procedural sedation and analgesia (PSA) in the emergency department (ED). The purposes of this study were to determine agents commonly used for PSA in nontertiary EDs, to ascertain familiarity in nontertiary EDs with newer PSA agents and protocols, and to assess knowledge of side effects of such agents in nontertiary EDs. **Methods:** A confidential electronic survey was distributed to physicians working in nontertiary southwestern Ontario EDs. Using a 5-point Likert scale, ED physicians were asked to rate their use of and familiarity with older and newer agents used for ED PSA. **Results:** Of the respondents, 49.1% were CCFPs, 35.8% were CCFP-EMs, and the rest were CCFP-Anesthesia. The majority of respondents had 15 years of ED practice and had performed 11 or more procedural sedations. The most frequently used drugs in the nontertiary setting examined were fentanyl (66%), propofol + fentanyl (59%), and midazolam (44%); 54.2% and 77.1% of respondents stated that they rarely used ketofol (ketamine + propofol) and etomidate, respectively. Sixty-two percent of respondents felt comfortable administering propofol + fentanyl, whereas 80% were comfortable with midazolam, fentanyl, or a combination thereof. Respondents were least comfortable with etomidate, followed by ketofol. This was further reflected in knowledge of side effects as 63% of respondents were able to identify midazolam + fentanyl's side effects, whereas the side effects of etomidate and ketofol were less astutely recognized (19%, 35%). **Conclusions:** Physicians practicing in nontertiary EDs remain most comfortable with older sedation agents such as midazolam and fentanyl compared to common newer agents such as propofol. Etomidate and ketofol were used even less commonly. Respondents also had difficulty identifying side effects of newer agents. More CME on newer agents and protocols may be one way to address this now proven differential practice pattern between tertiary and nontertiary EDs surveyed in the area of PSA.

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NHL FIGHTS result in few hand injuries: comparison with ED fights on land—ice makes a big difference

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Keywords: emergency medicine, hand injury, injury/trauma, sport

Introduction: To determine if there is a different rate of metacarpal fractures when punches are thrown by two professional hockey player on ice (NHL sample) compared to a control sample of similar cohort of (ED and trauma centre) patients who traded punches on land. **Methods:** Public access Internet sites exist for all NHL fights (hockeyfights.com) as well as the availability of all injury reports for each NHL team. The impetus behind this comparative research was to identify actual injury rates for NHL players involved in fights. From available footage on the Internet, 100% of all NHL fights were observed for number of punches thrown. Injury rates from fights were determined. The electronic medical records of the emergency department, as well as the trauma registry, were reviewed for the years 2006 to 2010 to identify patients involved in assaults and those with resultant metacarpal fractures. A cohort was developed and compared to the rates of metacarpal fractures in the NHL group of combatants. Direct comparison of rates was performed using Student t-test and Fisher exact test, with $p = 0.05$. **Results:** The NHL group included all 6,150 regular season games from 2006–2007 to 2010–2011, resulting in a total of 2,955 fights. These 5,910 combatants (with up to 518 being the same participant, but subsequent fights) resulted in 114 hand injuries and 51 metacarpal fractures. The NHL rate of fracture per participant was 0.75% compared to the cohort land fight group of for 590 patients with 490 metacarpal fractures for a rate of 41%; $p < .01$. The number of punches per fight averaged 3.5 for the land group and 8.8 for the NHL group (t-test: $p < 0.01$). **Conclusions:** Professional (NHL) hockey players benefit greatly from the physics of fighting on ice, with a manifold lower rate of significant metacarpal injury from throwing many punches without injury compared to similar combatants on land. There are limitations to this comparison, but the strikingly low rate of injury is remarkable and requires further study with regard to mechanism and outcomes.

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EMERGENCY medical services use of prehospital ultrasound in Canada

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Keywords: emergency medical services, emergency medicine, ultrasound

Introduction: Ultrasound is a portable and noninvasive form of medical imaging that can rule in and rule out life-threatening pathology and can complement a myriad of procedural interventions. Recent advances in ultrasound technology have made it more accessible for use in the prehospital setting by emergency medical services (EMS). Although many potential indications for prehospital ultrasound have been described, little is known about how EMS are actually using it. This study will describe the status of prehospital ultrasound within EMS services in Canada. **Methods:** We used a survey method, consisting of multiple-choice questions and open-ended questions to evaluate EMS characteristics, practices, and attitudes related to prehospital ultrasound. Paper-based surveys were distributed to Canadian EMS stakeholders at an international meeting. **Results:** Of the 20 surveys received, 10 were excluded because they did not meet the inclusion/exclusion criteria (not completed by EMS medical directors). Among the EMS medical directors who were included in the study, none (0 of 10) were currently using ultrasound in their EMS system. These EMS medical directors represented large Canadian EMS organizations, with 7 of 10 serving a population of greater than 1 million. Most (7 of 10) stated no interest in implementing ultrasound in their system, whereas 3 were interested in implementing it in the future. The most common barriers to implementation cited were cost, challenges in training, delaying time to definitive care, and lack of evidence. **Conclusions:** Prehospital ultrasound is scarcely used in Canada if at all. Although our sample size is small, it represents a significant portion of the country's population. If prehospital ultrasound is to become part of EMS practice in Canada, there must be a decrease in cost, more evidence that it improves patient outcomes, and access to training for EMS providers.

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INFRACLAVICULAR misplacement of catheter during subclavian vein in catheterization attempts

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Keywords: central venous cannulation, clinical practice, emergency medicine

Introduction: There are few reports detailing the successful cannulation of central vessels detailing line misplacement in terms of the need for line replacement within the vein, not pneumothorax or arterial injury. Although ultrasound-guided placement has been found useful in internal jugular and femoral vein cannulation, its use is limited for subclavian vein (SCV). The objective of this study was to determine if IJ misplacement occurs frequently enough, to warrant US confirmation of internal jugular or proper inferior vena cava placement, not right atrial for catheter tip. **Methods:** A retrospective review of the past 1,000 consecutive sublavian vein emergent catheterization for emergency department vascular access or critical resuscitations was reviewed from 2007 to 2011. Only successful catheterization procedures without iatrogenic pneumothorax or arterial puncture, performed in the ED, were included. Demographic data on patients in terms of prior vascular access procedures and prior commplications were noted for the study. The IRB approved this chart review study. Data were evaluated by CXR review and review of the final dictated reports. **Results:** A total of 1,013 nonconsecutive ED patients at an urban teaching hospital and trauma centre were reviewed. After excluding particular patients without use of the access or other complications, 867 patients were included in the study; 7.5% of the SVC cannulation attempts were unsuccessful, and the internal jugular was reached. Chest radiograph confirmed proper line placement in 97% of cases. The pneumothorax rate was 4.5% in attending, 9% in EM residents, and 16% in senior medical students. **Conclusions:** The 7.5% occurrence rate of IJ misplacement of SVC catheter placement represents a significant problem that can be avoided using US guidance. Future studies by this group will confirm US utility and hopefully prevent such misplacement.

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EPIDEMIOLOGY of ED chest presentations 2010

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Keywords: cardiovascular, chest pain, emergency medicine, epidemiology

Introduction: A standardized presenting complaint list has been incorporated into the Canadian Triage and Acuity Scale (CTAS) since 2004. Chest pain, cardiac (CPC) and chest pain, noncardiac (CPNC) are 2 of the 167 complaints. This study describes the prevalence and characteristics of patients presenting to six urban emergency departments (EDs) with chest pain in Edmonton, AB, in 2010. **Methods:** Demographics; date and time of triage, physician, troponin, along with values, and ICD-10 diagnoses were abstracted from four administrative databases using unique patient identifiers. All adult patients (≥ 17 years of age) presenting to two tertiary care and four community EDs from 01/01 to 31/12/2010 with chest pain were included. Proportions and medians with interquartile ranges (IQRs) are reported and compared using χ^2 or Mann-Whitney *U* tests, respectively. **Results:** Chest pain accounted for 6.9% of all ED visits to the six study sites; 58% were CPC, and 42% were CPNC. Median length of stay was longer for CPC than CPNC (464 v. 281 minutes; $p < 0.0001$). Single troponins (12.6% v. 8.5%) were ordered with similar frequency, whereas 6-hour troponins were ordered much more often for CPC (78.2% v. 50.7%; $p < 0.001$) than CPNC patients. Acute coronary syndrome (ACS) was diagnosed more often (18.9% v. 3.0%; $p < 0.001$) and resulted in more frequent ACS admissions (11.0% v. 1.0%; $p < 0.001$) for CPC than CPNC, respectively. ACS frequency (15.3% v. 25.3%; $p < 0.001$) and admission rates (14.8% v. 28.7%, $p < 0.001$) were significantly different when comparing patients < 65 and ≥ 65 years of age, respectively. **Conclusions:** Chest pain is a common ED presentation, with nurses designating nearly 60% as cardiac chest pain. The ordering of 6-hour troponins, an ACS diagnosis, and rates of admission were higher among CPC patients, a trend that became more pronounced with advancing age.

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