2008 SCIENTIFIC ABSTRACTS

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Plenary presentations

The best in Canadian EM research

*The Grant Innes Research Paper**

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A MULTICENTRE randomized controlled trial of nebulized epinephrine and dexamethasone in outpatients with bronchiolitis

Plint AC, Johnson DW, Patel H, Wiebe N, Correll R, Brant R, Mitton C, Gouin S, Bhatt M, Joubert G, Black K, Turner T, Whitehouse S, Klassen TP; the Pediatric Emergency Research Canada (PERC). Departments of Pediatrics and Emergency Medicine, University of Ottawa, Ottawa, ON

Introduction: Bronchiolitis is the most common disease of the lower respiratory tract in the first year of life. Hospital admissions have almost doubled over the last 10–15 years in North America. The objective of this study was to determine if the treatment of infants with bronchiolitis presenting to the emergency department (ED) with nebulized epinephrine (epi), oral dexamethasone (dex) or both results in a reduction in hospital admissions. **Methods:** Infants, 6 weeks to 12 months, presenting with bronchiolitis to 8 Canadian pediatric EDs were enrolled in a double-blind, placebo-controlled 2-factor RCT. Infants were randomized to treatment with 1) epi and dex, 2) epi plus placebo, 3) nebulized placebo plus dex and 4) nebulized placebo plus oral placebo. The primary outcome measure was hospital admission up to 7 days after enrolment. **Results:** Eight-hundred subjects were enrolled. Study groups were similarin age, sex, RSV status, baseline clinical score, length of symptoms and atopy history. The epi/dex groups were significantly less likely to be admitted by day 7 than the placebo group, but neither the dex nor epi alone groups showed any significant reduction in admission compared with placebo.

Table 1, Abstract 1. Admission by day 7 following enrolment

Variable	Epi/Dex	Epi/ Placebo	Dex/ Placebo	Placebo/ Placebo
Sample size	200	199	200	201
No. admitted (and %)	35 (18)	48 (24)	51 (26)	53 (26)
OR (95% CI)	0.59 (0.36–0.96)	0.89 (0.56–1.40)	0.96 (0.61–1.51)	Reference
p value	0.03	0.6	0.8	—

The number needed to treat with epi/dex to prevent 1 admission within 7 days of the initial visit is 11.4. The epi and epi/dex group showed a significant improvement in clinical score and heart rate over the first hour of the study when compared with placebo, while the dex group did not. **Conclusion:** In this largest RCT of bronchiolitis treatment, neither dex nor epi alone lowered hospitalization rates, but combined therapy with epinephrine and dexamethasone reduced hospital admissions by 30%. Eleven infants

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would need to be treated with this combination to prevent 1 hospitalization. **Keywords:** bronchiolitis, dexamethasone, nebulized epinephrine

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The Grant Innes Research Paper and Presentation will be awarded to the top ranked abstract submitted to the annual CAEP research abstract competition. The recipient of this award will have their abstract published in *CJEM* as the Grant Innes Research Paper and they will present the abstract at the research plenary at the CAEP annual conference. A plaque and cash prize will awarded to the recipient at the plenary presentation.

2

MULTICENTRE prospective validation of the Canadian C-Spine Rule by ED triage nurses

Stiell IG, Clement C, O'Connor A, Davies B, Leclair C, Sheehan P, Clavet T, Beland C, Mackenzie T, Daigle S, Scollan MA, Rattle N, Moore M, Tessier J, O'Donohue K. University of Ottawa, Ottawa, ON

Introduction: The Canadian C-Spine Rule (CCR) for c-spine imaging was derived, validated and implemented by physicians in 3 large studies (n = 29 031). We believe ED nurses could also use the CCR to clinically clear the c-spine and rapidly remove immobilization. This study prospectively evaluated the accuracy, reliability and acceptability of the CCR when used by nurses. **Methods:** This prospective cohort study was conducted in 6 EDs (2 teaching and 4 community) and involved alert and stable adult trauma patients who presented with neck pain or on a backboard. We provided standardized 2-hour training to 203 ED triage nurses. Nurses assessed patients by the CCR, including neck tenderness and range of motion, reapplied immobilization, and completed a data form. Some patients were examined by a second RN. Analyses included sensitivity, specificity and kappa coefficient, with 95% CIs. **Results:** The 3400 patients enrolled over 32 months had these characteristics: mean age 41.4 (range 16–100), female 53.6%, ambulance arrival 74.4%, clinically important c-spine injury (CICI) 1.2%, c-spine treatment 1.1%, admission 8.0%. The CCR classified patients for 38 CICI cases with sensitivity 100.0% (95% CI 91%–100%), specificity 43.0% (95% CI 42%–45%) and would have only required immobilization for 53.6%. Early in the study, nurses misclassified 3 patients with CICI despite obvious high-risk factors. No patients suffered sequelae and retraining efforts led to no further missed cases. Overall, nursing interpretation had sensitivity for CICI of 92.1% (95% 78%–97%) and had 92.5% agreement with the adjudicated CCR interpretation. Nurses had good interobserver agreement (n = 474) for CCR interpretation with a kappa of 0.79 (0.73–0.85). Nurses rated theoretical discomfort in applying the CCR in only 4.9% of cases. **Conclusion:** We found ED nursing use of the CCR to be accurate, reliable and acceptable. Widespread implementation by triage nurses would prevent prolonged and uncomfortable immobilization for many stable trauma patients. **Keywords:** implementation, Canadian C-Spine Rule, triage nurses

3

ISOLATED recurrent vomiting rarely predicts brain injury in children with blunt minor head injury

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Introduction: Recurrent vomiting is a frequent indication for ordering a cranial CT scan in children with head injury. It is unknown whether isolated recurrent vomiting is predictive of traumatic brain injury (TBI) in children with minor head injury. **Methods:** We carried out this prospective cohort study in 10 Canadian pediatric teaching hospital EDs and enrolled consecutive children (0–16 yr) who presented with blunt head trauma, a Glasgow Coma Scale (GCS) score of 13–15 and documented loss of consciousness, amnesia, disorientation, recurrent vomiting (2 distinct episodes at least 15 min apart) or irritability. We evaluated the association of recurrent vomiting with TBI seen by CT in those patients with no other signs or symptoms of brain injury (isolated vomiting). **Results:** Of the 3867 children with minor head injury, 161 (4.2%) had TBI on CT and 24 (0.6%) required neurological intervention. Of the 1634 (42.3%) children who had recurrent vomiting, 89 (5.4%, 95% CI 4.4%–6.7%) had TBI on CT versus 72 of 2233 (3.2%, 95% CI 2.6%–4.0%) without recurrent vomiting (difference 2.2%, 95% CI 0.09%–3.6%). Neurological intervention occurred in 16 of 1634 (1.0%, 95%CI 0.6%–1.6%) children with recurrent vomiting. 226 out of 3867 (5.8%) children had isolated recurrent vomiting (mean age 2.6, SD 2.0, 72.1% ≤ 3 yr). Compared with all enrolled children, those with isolated recurrent vomiting were younger (mean age 2.6 v. 9.6 yr, $p < 0.001$). For those with isolated recurrent vomiting (i.e., without any other symptoms or signs of brain injury), 2 of 226 (0.9%, 95% CI 0.2%–3.2%) had TBI on CT and none (95% CI 0.0%–1.7%) had brain injury that required neurological intervention. **Conclusion:** Isolated recurrent vomiting following blunt head injury occurs more commonly in young children and is rarely predictive of TBI on CT or brain injury requiring neurological intervention. Cranial CT scans should be decreased in this population as they are rarely positive for TBI. **Keywords:** pediatric head trauma, clinical decision rule, CT scanning

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PARENTERAL dexamethasone for preventing recurrent migraine headaches: a systematic review of the literature

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Introduction: Acute migraine headaches are common emergency department (ED) presentations and numerous treatment agents are used. These agents are generally effective; however, migraine relapses often occur. This systematic review examined the effectiveness of parenteral corticosteroids for pain relief and prevention of recurrence in acute migraine. **Methods:** Searches of MEDLINE, EMBASE, LILACS, the Cochrane trials register and CINAHL were conducted; conference proceedings, clinical practice guidelines, contacts with industry and author correspondence were also completed. Included studies were randomized controlled trials in which corticosteroids (alone or in combination with abortive therapy) were compared to placebo or any other standard therapy for treatment of acute migraine attacks in adults. Relevance, inclusion and study quality were assessed independently by 2 reviewers. Weighted mean differences (WMD) and relative risks (RR) were calculated and reported with corresponding 95% confidence intervals (CIs). **Results:** From 666 potentially relevant abstracts, 7 studies met the inclusion criteria. All included trials employed regular abortive therapy and subsequently compared single-dose parenteral dexamethasone (DEX) to placebo, examining pain relief and headache recurrence within 72 hours. DEX and placebo provided similar pain reduction (WMD 0.37, 95% CI –0.20 to 0.94). DEX was, however, more effective than placebo in reducing rates of recurrent migraine (RR 0.74, 95% CI 0.60–0.90). Side effect profiles were similar between DEX and placebo groups. **Conclusion:** When added to standard abortive migraine therapy, single-dose parenteral dexamethasone is associated with a 26% relative reduction in recurrent headache (number needed to treat: 9) occurring within 72 hours. Further research is required to deter-

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mine whether specific patient subgroups are more likely to benefit from this treatment. **Keywords:** migraine, dexamethasone, migraine relapse, systematic review

Oral Presentations

Efficiency and overcoming ED crowding/ CAEP research productivity

5

A novel method to use routinely collected ED clinical data to measure quality of care

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Introduction: Measuring quality of care is important, but developing efficient methods of capturing valid data is challenging. We sought to develop a novel automated method to use routinely collected emergency department (ED) clinical data to measure evidence-based quality indicators. **Methods:** In a tertiary care ED, we linked 1) the ED information system (EDIS) with the medication dispensing information system (McKesson) to calculate time to antibiotics administration for pneumonia patients and 2) the EDIS with the hospital electronic patient record (EPR) electrocardiogram data to calculate time to ECG for chest pain patients. Patients were identified using specific EDIS algorithms. Data were linked using Microsoft Access. Chart reviews were carried out on all selected records; the accuracy of diagnosis, time of antibiotic administration and time of ECG were compared with those generated from electronic data linkage. **Results:** When compared with chart data, 1) the EDIS output correctly identified 40/40 (100%, 95% CI 92–100) pneumonia patients and 65/65 (100%, 95% CI 96–100) suspected ischemic chest pain patients; 2) median difference between time of antibiotic dispensing using McKesson versus chart data was 6 min (SD 14.0); 3) median difference between time of ECG in EPR and in the chart was 0 min (SD 70). Excellent linkage of EDIS and McKesson data (100% linked) and EDIS and EPR (95% linked) was achieved based on a hospital unique identifier. The percent of ED patients meeting performance criteria when calculated from chart versus electronic data was 44% versus 47% for time to antibiotics in pneumonia, and 11% versus 8% for time to ECG in chest pain. **Conclusion:** A simple and valid method for merging routinely gathered ED electronic clinical data for the purpose of quality of care measurement has been successfully piloted. Replication for other measures and in other settings may enable more comprehensive ED quality measurement in a cost-effective manner. **Keywords:** quality of care, emergency department information system (EDIS), electronic patient record (EPR)

6

SHIFT length and emergency physician productivity dynamics

Innes GD, Grafstein E, Stenstrom R. St. Paul's Hospital and the University of British Columbia, Vancouver, BC

Introduction: Managing patient flow in an emergency department (ED) is a stressful activity with high uncertainty and decision density. Stress and progressive shift exhaustion may be associated with declining efficiency and cognitive function during the latter hours of a shift. An emergency physician's (EP's) intake capacity (ability to see new patients) may vary based on individual characteristics and on number of shift hours worked. Understanding EP intake dynamics is critical in establishing optimal shift length, shift scheduling and end-of-shift etiquette (i.e., patient handovers or not). Our hypothesis was that EP intake capacity would be maximal during hour 1 and decline progressively, reaching a state at hour X when they no longer contribute meaningfully to seeing new patients and should be replaced. **Methods:** At our inner city teaching hospital, ED physicians electronically sign on to each patient at the time of initial assessment (time seen). We captured electronic time stamps for every EP–patient encounter during a 6 month period in 2007 to determine the number of new patients seen for every hour of the ED shift. **Results:** The data incorporated 1561 eight-hour day and evening shifts (n = 24 916 patients), as well as 212 five-hour night shifts (n = 2848 patients). Average new patients/hr was 2.0 during 8-hour shifts and 2.6 during 5-hour shifts ($p < 0.001$). The difference in hourly productivity was explained by profound intake reductions during hours 7 and 8 (mean 1.3 and 0.3 patients/hr, respectively) and in part by the custom of patient handovers after night shifts. Mean patients seen were 2.8, 2.5, 2.3, 2.6, 2.3, 2.0, 1.3 and 0.3 for hours 1 to 8, respectively. Patient intake was characterized by an hour 1 peak, a 25% fall to plateau (hours 2–6), then rapid decline to negligible intake in hours 7 and 8. Hourly intake volume differed significantly by physician, with the highest scoring EP seeing 41% more patients/hr. **Conclusion:** In this setting, EP productivity fell dramatically after hour 6. Shorter ED shifts may be associated with enhanced productivity. **Keywords:** physician productivity, shift-work, time-series analysis

7

ESTIMATING physician workload in the pediatric emergency department

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Introduction: The factors which contribute to emergency department (ED) physician workload are complex and likely vary from one ED setting to another. Studies designed to quantify ED physician workload have been sparse and have focused on general ED settings. The goal of this study was to develop a model which included demographic and clinical variables that would enable the prediction of physician time needed to treat patients in the pediatric ED. **Methods:** Pediatric ED physician shifts were shadowed and data was collected on 205 patient visits. Data collected included patient variables and physician time spent on patient care, educational and administrative activities. Multivariate regression was used to determine which variables had the strongest influence on physician time needed to treat patients. For model derivation, physician time was defined as the sum of direct and indirect patient care for each patient. **Results:** Physicians spent 80% of their time on patient care and 20% on educational and administrative tasks. The variables which were most strongly predictive of physician time needed to treat patients in a pediatric ED were CTAS score, arrival by ambulance, performance of a procedure by a physician, performance of a laboratory test and need for admission. Employing these 5 key variables in a regression model enabled the prediction of 40% of the variance in physician time needed to treat patients. The derived multivariate model was LN (physician time) = 3.6095 – 0.3694 (CTAS) + 0.3353(arrival by ambulance) + 0.3300 (procedure) + 0.7584 (laboratory) + 0.4083 (admitted) + 0.4075 (CTAS × laboratory). Patient age, trainee involvement, language barrier, referral by another physician and need for radiographs were not found to influence physician time needed to treat patients. **Conclusion:** The model derived in this study could be used for pediatric ED man power planning, derivation of equitable funding formulas for pediatric ED physicians and physician performance evaluation. **Keywords:** physician workload, pediatric emergency medicine, workflow analysis

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IMPACT of a rapid-assessment pod on ED overcrowding measures: a randomized trial

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Introduction: Emergency department (ED) boarding of admitted patients has delayed access to care, especially for triage (CTAS) level 3 patients in academic EDs. This study evaluated the impact of transforming acute care spaces into a rapid-assessment pod (RAP). **Methods:** Over a 6-week period from June 2007 to July 2007 block randomization was used to allocate RAP and non-RAP study days. The RAP was operational from 0900 to 2300 with 3 standard care spaces converted to 2 stretchers for clinician assessment and procedures; and 7 chairs for patients to be transferred to receive medications, IV therapy, be observed or wait for results. Outcomes included ED lengths of stay (LOS) and proportion of patients who left without being seen (LWBS). Mean values are reported and comparisons made using χ^2 and Wilcoxon rank sum tests. Daily nurse–physician questionnaires were also collected to assess satisfaction. **Results:** Patient volume, sex, age, CTAS, mode of arrival and admitted patient boarding times were similar between RAP and non-RAP days. Despite cancelling the RAP 3 times due to severe overcrowding the mean time from triage to bed location was 24 minutes shorter for CTAS level 3 patients (99 v. 123 min, $p = 0.04$), with no change in time from bed to physician (50 v. 52 min); this was maintained for overall LOS (544 v. 567 min). On RAP days there was also a non-significant decrease in LWBS for all (7.1 to 6.6%, $p = 0.42$) and CTAS 3 (3.3%–2.6%) patients. Questionnaires revealed problems with increased nursing workload, excessive patient complexity for chairs, disease transmission concerns, and concerns with eliminating 3 stretchers during excessive boarding of patients. **Conclusion:** Despite evidence that the CDU decreased waiting room time for CTAS level 3 patients, concerns about workload, patient safety, and patient complexity led staff to conclude these benefits were outweighed by the loss of treatment spaces during severe overcrowding. **Keywords:** rapid-assessment pod, ED crowding, randomized trial

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IMPACT of an overcapacity care protocol on emergency department and hospital access block

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Introduction: A hospital overcapacity protocol (OCP) was implemented at our urban teaching centre in February 2006 because of waiting room (WR) adverse events related to overcrowding (access block). OCP dictates that arriving level I–III patients are placed in overcapacity ED care spaces rather than WR areas. When the ED is overcapacity by 2 patients, boarded patients move from the ED to inpatient overcapacity care spaces. Prior data showed that OCP reduced hospital length of stay (LOS) and ED LOS for boarded patients. The objective of this study is to assess the impact of OCP on ED access block (number of WR patients) and hospital access block (number of boarded patients held in the ED). **Methods:** Our ED information system tracks real-time patient location and status using electronic bed location and electronic consult and admission orders. We used these data systems to prospectively record patient status snapshots every hour during a 6-month pre-OCP period (March through August, 2005) and a corresponding 6-month post-OCP period in 2006. Outcomes include the mean number of WR and admitted patients, stratified by hour of the day. **Results:** During the post-OCP period, ED volume increased 1.2% (30 483 to 30 846), CTAS I–III volume rose 5.7% (13 078 to 13 828) and ambulance arrivals rose 1% (46.1–46.6/d). Despite this, the mean number of WR patients fell from 16.7 to 12, a 28% reduction in ED access block ($p < 0.001$); and the mean number of boarded patients fell from 12.5 to 7.9, a 37% reduction in hospital access block ($p < 0.001$). Reductions were consistent across all hours of the day, suggesting access block improvement during busy and nonbusy periods. Improvements equate to 110.4 ED stretcher hours made available daily and a 113 hour reduction in daily WR time for sick patients. During the post-OCP period, no critical events were reported in ED waiting areas or inpatient OCP care spaces. **Conclusion:** The OCP has led to significant reductions in ED and hospital access block, and reduces the number of patients left at risk without ED evaluation. **Keywords:** overcapacity protocol, ED crowding, access block

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CAEP research grants competition: an evaluation of outcomes, dissemination and perceptions over ten years

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Introduction: Dedicated emergency research funding has been uncommon in the past and specific funding competitions have been proposed. This study examines the scholarly outcomes of the projects receiving Canadian Association of Emergency Physicians (CAEP) research grants over the first 10 years of national funding. **Methods:** Email surveys were sent to 58 ED researchers funded by CAEP between 1996 and 2005. Data collection focused on grant deliverables (completion, presentations and publications) and opinions regarding the value of the award (1–7 Likert scale). Email surveys and up to 3 reminders were sent; publications were confirmed through literature searches. **Results:** Grants were commonly awarded to residents (37%), followed by senior (26%) and junior (23%) emergency staff. Ontario (44%) and Quebec (19%) received the majority of the grants. A total of 56 (97%) survey responses were received; most (88%) projects were completed at the time of contact. Overall, 38 (76%) manuscripts had been published (or were in press) from the completed projects. Abstracts were more common, with a median of 2 presented per completed project. Local (46%), national (80%) and international (74%) abstract presentations for the completed projects were documented. Overall, 19 (33%) projects received additional funding. Despite medial funding of $5000, respondents felt CAEP funding was critical (median 6.25, interquartile range [IQR] 5–7) to completing the project and respondents felt strongly (median 7, IQR 7–7) that dedicated funding for EM research should be continued to stimulate research productivity. **Conclusion:** Overall, the CAEP research grants competition has produced impressive results, despite the small sums available for funding. This source of funding was important to ensuring study completion and in many cases assisted in securing additional funding. CAEP and similar ED organizations need to develop a more robust funding approach so that larger grant awards and more researchers can be supported on an annual basis. **Keywords:** CAEP research grants, research productivity, young investigators

CTAS and ID

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INTERRATER agreement between nurses using a computerized version of the Paediatric Canadian Triage and Acuity Scale in a pediatric emergency department

Gravel J, Gouin S, Manzano S, Arsenault M, Amre D. CHU Sainte-Justine, Montréal, QC

Introduction: The Paediatric Canadian Triage and Acuity Scale

(PaedCTAS) is a 5-level triage tool constructed from a consensus of experts. Until now, there has been no evaluation of the reliability of the tool for children presenting to emergency departments (ED) in a clinical context. **Objective:** To measure the interrater agreement for nurses who assigned triage levels to children visiting a pediatric ED using a computerized version of the PaedCTAS (Staturg from Statdev). **Methods:** This was a prospective cohort study evaluating all children (0–18 yr old) initially triaged from level II (emergent) to V (non urgent) on the PaedCTAS. Recruitment occurred on a convenience sample of patients triaged during 40 shifts from June to September 2007 in a tertiary care pediatric ED. All patients were initially triaged by a regular triage nurse using a computerized version of the PaedCTAS (Staturg). Those not requiring immediate care were eligible to participate. Research nurses recruited eligible patients immediately after their first triage to perform a second triage (within 15 min) using the same triage tool. Both triages were performed blinded to each other. The research nurses were regular ED nurses performing extra hours for research. The primary outcome measure was the interrater agreement between the two nurses measured by the quadratic weighted κ score. **Results:** There were 499 patients recruited to participate in the study and they were all evaluated by 2 nurses. The overall interrater agreement between the nurses was good as demonstrated by a quadratic weighted κ score of 0.61 (95% CI 0.52–0.69). There was a discrepancy of more than 1 level in only 10 patients (0.02). **Conclusion:** The Staturg tool is a computerized version of the PaedCTAS that demonstrates good interrater agreement between nurses assigning triage level to children presenting to a pediatric ED. **Keywords:** paediatric CTAS, interrater agreement, computerized triage

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VALIDITY of a computerized version of the Paediatric Canadian Triage and Acuity Scale

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Background: The Paediatric Canadian Triage and Acuity Scale (PaedCTAS) is a 5-level triage tool for the emergency department (ED). Staturg (from Statdev, Montréal) is a computerized version of the PaedCTAS. **Objective:** Evaluate the validity of a computerized version of the PaedCTAS (Staturg) for children visiting a pediatric ED. **Methods:** This was a retrospective cohort study evaluating all children presenting to a pediatric university-affiliated ED for a 1-year period. Data were retrieved from the ED computerized database. Information regarding triage and disposition was prospectively registered by a clerk in the ED database during patients' management. In the absence of a gold standard for triage, hospitalization, admission to pediatric intensive care unit (PICU), length of stay (LOS) in the ED and patients that left without being seen by a physician (LWBS) were used as surrogate markers of severity. The primary outcome measure was the correlation between triage level (from I to V) and hospitalization. It was estimated that the evaluation of all patients visiting the ED for 1 year would provide more than 500 patients in each triage level. **Results:** From Nov. 11, 2006, to Nov. 10, 2007, 58 569 patients were triaged in the ED. Hospitalization proportion was 63% for resuscitation (level I), 37% for emergent, 14% for urgent, 2% for semi urgent and 1% for nonurgent. There was also a good correlation between triage levels and admission to PICU, LOS and proportion of LWBS. **Conclusion:** Staturg is a computerized version of the PaedCTAS that shows good ability to predict hospitalization, admission to PICU, LOS in the ED and proportion of patient that left without being seen by a physician. These results suggest that PaedCTAS has a good validity for triage of children in a pediatric ED. **Keywords:** paediatric CTAS, computerized triage, resource use modelling

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PREVALENCE of CA-MRSA in purulent skin and soft tissue infections in patients presenting at emergency departments in the greater Toronto area

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Introduction: Community associated methicillin resistant *Staphylococcus aureus* (CA-MRSA) caused primarily by the CMRSA-10 (USA 300) clone has replaced methicillin-sensitive *Staphylococcus aureus* (MSSA) as the primary cause of skin and soft tissue infections (SSTIs) in the US. The prevalence of CA-MRSA causing SSTIs in Canada, and the optimal treatment of such patients is unknown. We document the prevalence and antimicrobial susceptibility patterns of CA-MRSA in SSTIs in the GTA. **Methods:** Prospective observational study in 7 GTA hospitals. Patients presenting with SSTIs were swabbed as per current guidelines. Patients whose swabs grew *Staph aureus* were eligible to participate and contacted by study staff for consent to participate. Patients answered a standardized health and lifestyle questionnaire by phone regarding risk factors for CA-MRSA and outcomes of treatment. MRSA isolates underwent reference susceptibility testing and molecular testing. **Results:** Two hundred and ninety-eight eligible patients were identified. One hundred and sixty-one (54%) consented to participate, and 135 (55%) of the 244 MSSA patients, and 26 (48%) of the 54 MRSA patients completed interviews. Patients with SSTIs due to typical community-associated strains of MRSA were younger ($p < 0.01$) and less likely to report healthcare exposures ($p < 0.01$) than patients with typically hospital-associated strains. Two hundred and forty three (82%) of *Staph aureus* isolates were methicillin sensitive, while 54 (18%) were methicillin resistant. Twenty-eight of 54 MRSA isolates (52%) were the CMRSA-10 clone (all were Panton-Valentine Leukocidin [PVL] positive and carried SCCmec IV). All CA-MRSA isolates were clindamycin susceptible and all were susceptible to tetracycline, doxycycline, minocycline, septra and tigecycline; 19/28 CMRSA-10 isolates were susceptible to ciprofloxacin. Only 13 MRSA isolates were CMRSA-2 (the most common healthcare associated clone). **Conclusion:** The most common isolate of CA-MRSA found in SSTIs in this population was the CMRSA-10 clone typical of community-associated MRSA. **Keywords:** community acquired MRSA, skin and soft tissue infection, antibiotic resistance

Patient Safety

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IS a prolonged stay in the ED associated with adverse events in older patients?

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Introduction: Older adults are frequent users of the ED. International patient safety studies have identified this as a high-risk group for adverse events (AEs). The purpose of the study was to determine whether a prolonged stay in the ED is associated with an increased risk in the occurrence of AEs for older patients admitted to hospital. **Methods:** This retrospective cohort study was conducted at an adult tertiary care facility in Atlantic Canada between July 1, 2005, and Mar. 31, 2006. All community-dwelling people 65 years and older

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admitted to an acute care inpatient unit from the ED were eligible for inclusion. Using the 2007 CAEP Position Statement Guidelines, the exposed group was defined as those patients that had a total length of stay (LOS) in the ED of greater than 6 hours for those triaged to CTAS levels I–III and greater than 4 hours for patients triaged to levels IV–V. The unexposed group had an ED LOS less than the benchmark times. Outcomes were determined using the previously validated Wisconsin Medical Injury Prevention Program screening criteria. The criteria were applied to diagnostic and clinical data from administrative data sources to identify AEs. The results were compared between the exposed and unexposed groups. **Results:** A total of 982 patient records were analyzed. The average age was 77.8 years (SD 7.8). The majority of patients (75.0%) experienced a prolonged ED LOS as defined by the Canadian benchmark. Of the 982 records, 140 (14.3%) had evidence of an AE. The most common AEs were procedure-related (47.2%), device-related (31.2%) and medication-related (20.8%). After adjustment, the total LOS (hr) in the ED was associated with an increased risk of an AE (OR 1.03, 95% CI 1.004–1.05). Those with an AE had twice the hospital LOS (20.2 v. 9.8 d, $p < 0.001$). **Conclusion:** A prolonged stay in the ED for older admitted patients is associated with an increased risk of an AE. The excess hospital LOS associated with AEs further reduces the availability of acute care beds thus exacerbating ED overcrowding. **Keywords:** geriatrics, ED crowding, patient safety

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ARE patient and crowding factors associated with adverse outcomes in the emergency department?

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Introduction: The emergency department (ED) has been identified as a high-risk setting for adverse outcomes (AO) because of the nature of the work (high volume, rapid intervention, etc.) and the clientele (seriously sick, anxious, etc.). This study aims to identify patient and crowding factors that are associated with AO in the ED. **Methods:** A case–control study with 20-month prospective data collection (March 2006 to November 2007) was conducted at 2 university teaching tertiary EDs in Quebec. Cases were patients who had AO due to a medical error; controls were randomly selected patients from those who had no AOs. Cases were identified by physicians, nurses, pharmacists and through database queries. Patient factors (e.g., age, triage, past admissions) were collected through administrative database and chart review. Crowding factors (e.g., inflow, occupancy) were calculated within 2 and 4 hours before the incident for cases, and before the midpoint of the emergency visit for the controls. Univariate and multivariate (GEE) approach were used for the analysis with adjustment for hospitals. Odds ratios and their 95% confidence intervals (CIs) are presented. **Results:** The study sample consisted of 292 patient visits, among which 135 were cases. Cases were mainly reported by physicians (52%) and nurses (25%). Multivariate analysis showed that 5 factors were significantly associated with AO: being older (1.2, 1.1–1.3), ambulance arrival (2.0, 1.04–4.0), urgent triage code (2.4, 1.2–4.9), admission within past 2 years (2.3, 1.1-4.8) and presented with different chief complaints (CCs) (i.e., compared with others, patients presenting with gastro (2.4, 1.2-4.7), cardiac [1.8, 1.7-2.0] and pulmonary [7.4, 1.4-39.3] problems have a higher risk of suffering AOs). None of the crowding factors were significantly associated with AOs. **Conclusion:** Older patients, patients with more urgent conditions, increased morbidity and those with specific CCs were found to be more at risk for AOs in the ED. ED crowding was not found to be associated with AOs. **Keywords:** patient safety, ED crowding, case–control study

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DOES emergency department length of stay impact the mortality and morbidity of patients in the medical–surgical intensive care unit?

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Introduction: Mortality in the intensive care unit (ICU) often reaches 30%. Many patients presenting to the emergency department (ED) have to wait for an ICU bed to become available. However, patients waiting longer in the ED may not receive optimal ICU care during a critical physiological window, and therefore may experience worse outcomes. This study hypothesized that increased ED length of stay would worsen in-hospital mortality for patients admitted to the medical–surgical ICU. **Methods:** We examined a 5-year retrospective cohort at a university hospital, including all adult patients in the ED who were subsequently admitted to the medical–surgical ICU. Relevant data was extracted from computerized databases by trained personnel. Double data entry was performed on 20% of the sample to ensure reliability. **Results:** 926 patients were identified, of which 571 were male (61.7%) with a mean age of 58 years (SD 17 yr). Median ED length of stay was 6.0 hours (IQR 6.6 hr). The in-hospital mortality for the entire sample was 27.4%. Our primary outcome was in-hospital mortality: ED length of stay was a significant independent predictor of in-hospital mortality for ICU patients (univariate logistic regression χ^2 5.7, $p = 0.017$). This relationship remained statistically significant in multivariate analysis that controlled for the effects of possible confounders, including age, sex and hospital length of stay (χ^2 8.2, $p = 0.004$). The κ coefficient for our double-data entry was 94% indicating excellent interobserver agreement. **Conclusion:** This is the first Canadian study to demonstrate that longer ED lengths of stay increase mortality for patients admitted to the ICU. Further research is underway to assess the impact of ED length of stay on ICU length of stay and other morbidity outcomes. This data, if confirmed prospectively, should be used to facilitate rapid ICU admission for patients presenting to the ED. **Keywords:** intensive care unit, ED crowding, morbidity and mortality

Cardio and respiratory

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30 DAY outcomes in an ED population undergoing DC cardioversion for atrial fibrillation or flutter

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Introduction: Despite the general belief that emergency DC cardioversion is a safe practice, there is a lack of outcomes data on atrial fibrillation/flutter patients who are cardioverted in an ED setting. The study objective was to characterize the 30-day hospitalization, CVA and mortality rates for this patient population. **Methods:** Using an emergency administrative database, we reviewed all patients with a discharge diagnosis of atrial fibrillation or flutter from 2000 to 2005 who had an ED procedure code for DC cardioversion. We linked these patient records with provincial vital statistics data and the regional emergency visit database from the same time period to ascertain which patients presenting with atrial fibrillation or atrial flutter and who received DC cardioversion died within the subsequent 30 days and/or if they subsequently presented at another of the 5 regional EDs. We excluded patients if they had an address that was out of province. **Results:** There were 1163 patients who made 1731 visits to the ED related to atrial fibrillation or flutter. Patients underwent DC cardioversion a total of 192 times (145 unique patients). Of these, 87.5% were cardioverted for atrial fibrillation, the

rest for flutter. The admission rate was 12% (23/192). Average age was 53.8 (SD 14.4). 76% (146/192) were male. All patients were triaged as CTAS level II (53%) or CTAS III (47%). The 30 day mortality for this cohort was 0% (95% CI 0%–2.1%). There were 3 visits by ED patients to other regional EDs in the subsequent 30 days. One patient was admitted and died of lung cancer during the following 30 days. The other 2 patients were treated and released. Eleven of 145 patients (7.6%; 95% CI 3.3%–11.9%) had a 30-day recurrence of atrial fibrillation. There were no associated CVAs in this cohort. **Conclusion:** This represents one of the few Canadian outcomes studies of DC cardioversion in an ED population. Mortality and CVA after cardioversion are rare events in patients with atrial fibrillation or flutter who undergo DC cardioversion in the ED. **Keywords:** atrial fibrillation, cardioversion, administrative database

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A systematic review and meta-analysis of prehospital triage and diversion for patients with ST-elevation myocardial infarction directly to percutaneous coronary intervention centres: Are emergency medical services jumping the gun?

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Introduction: The optimal prehospital strategy for facilitating rapid coronary reperfusion in ST-elevation myocardial infarction (STEMI) patients is unclear. Our objective was to determine whether emergency medical services diagnosis and diversion of adult STEMI patients to primary percutaneous coronary intervention (PCI) centres improves 30-day all-cause mortality when compared to a strategy of transportation to the closest hospital. **Methods:** MEDLINE (1980–July 2007), EMBASE (1980–July 2007), Cochrane CENTRAL database (1980–July 2007), Web of Science (1980–July 2007), CINAHL (1980–September 2006), HealthStar (1980–September 2006), Proquest Digital Dissertations (1980–September 2006), the NIH CRISP database (1980–September 2006) and clinicaltrials.gov (July 18, 2007) were searched. Two reviewers independently assessed citations for inclusion and then abstracted data. Studies with diversion to a PCI-capable centre for primary PCI, a control group transported to the closest hospital, and outcomes of treatment time intervals, all-cause mortality, reinfarction rate, stroke rate or the frequency of cardiogenic shock were included. A random effects model was used to provide pooled estimates of relative risk where data allowed. **Results:** The search identified 2264 citations. Five studies were included in the final review. There was clinical heterogeneity across studies and variable quality. The pooled relative risk (RR) for short-term mortality showed a trend towards increased survival with diversion to PCI but was not statistically significant (RR 0.51, 95% CI 0.24–1.10). One study reported a non-significant trend towards reduced reinfarction (RR 0.43 95% CI 0.11–1.60) and stroke (RR 0.33 95% CI 0.01–8.06) with diversion for PCI. **Conclusion:** There is insufficient evidence to support the use of prehospital diversion for primary PCI as compared with transportation to the closest hospital in patients with STEMI. **Keywords:** percutaneous coronary intervention, emergency medical services, systematic review

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THE Ottawa aggressive protocol leads to rapid discharge of ED patients with acute atrial fibrillation

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Introduction: We previously described the safety and efficacy of the Ottawa Aggressive Protocol for rapid ED rhythm control for patients with acute (< 48 hr) atrial fibrillation (AAF) or atrial flutter (AAFL). Our objective was to examine the impact of the protocol on admission rates and lengths of stay. **Methods:** This 5-year cohort study included consecutive visits to a university hospital ED for adults who presented with acute-onset AAF/AAFL and who were managed with the Ottawa Aggressive Protocol. Patients were identified from the National Ambulatory Care Reporting System database. The Aggressive Protocol was overseen by attending emergency physicians and included: 1) IV procainamide infusion; 2) sedation and electrical cardioversion if necessary, by ED staff; and 3) discharge from the ED with outpatient cardiology follow-up. Outcomes included admission rates and lengths of stay in ED. We conducted descriptive data analyses with 95% CIs. **Results:** Characteristics for 660 eligible patient visits were: mean age 64.5 years (range 19–92), male 55.6%, mean heart rate 113.4 beats/min (range 45–220), mean duration of symptoms 8.9 hours, AAF 95.1%, AAFL 4.9%, prior AAF 82.1%, warfarin use 33.8%. Of cases, 39.6% received IV rate control drugs prior to rhythm control. All patients received procainamide with a conversion rate of 58.3% (AAF 59.9%, AAFL 28.1%). Electrical cardioversion was attempted in 36.8% of visits with a success rate of 91.7% (AAF 91.0%, AAFL 100%). Overall, only 3.2% of patients required admission. Of those patients discharged, 93.3% were in sinus rhythm and had a mean heart rate of 68.9 beats/min. The median lengths of stay from ED arrival to discharge were, for all patients 4.9 hours (range 1.6–19.7), for those successfully converted with procainamide 3.9 hours, and for those requiring electrical conversion 6.5 hours. **Conclusion:** These data demonstrate that use of the Ottawa Aggressive Protocol is associated with very rapid conversion to sinus rhythm and discharge for ED patients with AAF and AAFL. **Keywords:** Ottawa Aggressive Protocol, atrial fibrillation, length of stay

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ASTHMA presentations by adults to emergency departments in Alberta, Canada: a population-based study

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Introduction: Asthma is a widespread disease with a prevalence of approximately 7%–10% in adults; exacerbations to the emergency department (ED) are common. The objective of this study was to describe the epidemiology of asthma presentations to EDs made by adults in the province of Alberta, Canada. **Methods:** The Ambulatory Care Classification System of Alberta and provincial administrative databases were used to obtain all ED encounters for asthma during 6 fiscal years (April 1999 to March 2005). Information extracted included demographics, ED visit timing, and subsequent visits to physicians; all data were coded by trained medical records nosologists. Data analysis included descriptive summaries and directly standardized visit rates (DSR). **Results:** There were 105 813 ED visits for asthma made by 48 942 distinct adults over the study. The DSRs have declined from 9.7/1000 adults in 1999/2000 to 6.8/1000 in 2004/05. In 2004/05, the Welfare (22.5/1000) and Aboriginal (14.9/1000) groups DSRs were higher than the Other subsidy group (6.0/1000; $p < 0.001$). Most patients (66%) had only 1 asthma-related ED visit during the study period. Daily, weekly and monthly trends were observed. The ED visits resulted in discharge 91% of the time; however, only 33% had at least 1 follow-up visit with a non-ED physician within 7 days of the ED visit. The median time to the first follow-up visit was 19 days. **Conclusion:** Asthma is a common presenting problem in EDs and further study of these trends is required to understand the factors associated with the variation in presentations. The important findings identified here include an overall decrease in the rates of presentation over the study period; however, disparities based on age, sex and socioeconomic/cultural status exist.

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Targeted interventions could be implemented to address specific groups and perhaps reduce asthma-related visits to Alberta EDs. **Keywords:** asthma, socioeconomic status, economic disparities

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DOES emergency department crowding affect the quality of care provided to patients with acute asthma exacerbation?

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Introduction: Emergency department (ED) overcrowding has the potential to delay medical assessment (DMA) and delay to treatment (DT) thereby compromising quality of care (QoC). Our objective was to quantify the relationship between ED crowding and QoC for patients with acute asthma presenting to the ED. **Methods:** Two databases were combined. The first provided measures of QoC (DMA, DT and relapse within 14 days [R14]) for patients who participated in a study designed to determine major risk factors for asthma relapse (AIR substudy). Five AIR sub-study sites provided administrative data for all ED visits during the study period. Measures of crowding (inflow, percent occupancy and boarding time) were then calculated within one hour of each AIR patients triage time. Mixed model analysis for DMA and DT with log transformation and GEE approach for R14 were used to measure the impact of crowding on QoC. Patient and ED factors were adjusted. **Results:** A total of 369 AIR patients were drawn from the 5 sites for which 354 (96%) were matched to the administrative data. Patient factors (demographics, previous number ED visits and hospitalizations) were similar across sites. Among the indices of crowding examined, only ED occupancy within 1 hour of asthma patients arrival was found to be positively associated with DMA (multiplier; 95% CI 1.7; 1.3–2.3) and DT (multiplier; 95% CI 1.7; 1.2–2.3), but not with R14. For example, an increase in occupancy from 100% to 150% would contribute to an increase of 30% both in DMA and in DT. Other factors associated with longer delays were lower acuity, previous hospitalizations, older age, presentation during weekday and day shifts; while being a female and lower acuity were associated with increased R14. **Conclusion:** Patients with asthma who presented to the ED when occupancy was higher experienced modest delays to medical assessment and treatment. Other factors associated with a reduced QoC delivered to asthma patients were age, acuity level, previous hospitalization and arrival time. **Keywords:** asthma, ED crowding, quality of care

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PROSPECTIVE evaluation of a revised preschool respiratory assessment measure in children with acute asthma

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Introduction: Adequate evaluation of the severity of asthma exacerbations is important. A promising clinical severity score is the Preschool Respiratory Assessment Measure (PRAM); however, it was described as cumbersome to use. The aim of our study is to compare the accuracy and responsiveness of the PRAM (5 variables) and a revised PRAM (rPRAM) (4 variables) during an asthma exacerbation in children. **Methods:** A prospective cohort study was conducted in an academic pediatric ED from February 2006 to October 2007. All patients between the ages of 18 months to 7 years who presented to the ED for an asthma exacerbation while one of the research assistants was available were approached. The outcomes of interest were the length of stay greater than 6 hours in the ED or admission and the physicians' judgment of severity. Clinical findings were assessed by respiratory therapists at the start of the visit and after 90 minutes of treatment. **Results:** During the study period, 3788 patients were seen in the ED for an asthma exacerbation. Of these patients, 291 were approached and 8 refused to participate. The mean age was 3.4 years (SD 1.5) and 63.6% were boys. There was a high correlation between the physicians judgment of severity and PRAM (r = 0.45) and rPRAM (r = 0.42). PRAM and rPRAM were moderate predictors of length of stay greater than 6 hours (AUC= 0.67 and 0.64, respectively) but better predictors of admission (AUC = 0.85 and 0.80, respectively) when calculated at the start of the ED visit. When the scores were recalculated after 90 minutes of treatment, the predictive abilities for length of stay greater than 6 hours and admission were higher for both PRAM (AUC = 0.77 and 0.90) and rPRAM (AUC = 0.75 and 0.90). The scores were shown to be responsive, with a 50% relative improvement in score from start to 90 minutes of treatment for both the PRAM and rPRAM. **Conclusion:** The rPRAM, which is a simplified version of the PRAM, is a valid measure of asthma severity in children and shows similar discriminative and responsive properties. **Keywords:** pediatric asthma, clinical severity scores, clinical prediction guide

Neurosciences and diagnostic modalities

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DO statins improve outcomes and reduce the incidence of vasospasm following aneurysmal subarachnoid hemorrhage a meta-analysis

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Introduction: Vasospasm following subarachnoid hemorrhage (SAH) causes significant morbidity and mortality. Statins are believed to reduce vasospasm by effects on inflammation, endothelial nitric oxide synthase activity and thrombogenesis. This meta-analysis attempts to determine if statins reduce vasospasm and mortality following aneurysmal SAH. **Methods:** For this systematic review and meta-analysis, we searched MEDLINE (1950–2007), EMBASE (1980–2007) and the Cochrane Central Register of Controlled Trials (second quarter 2007) for randomized controlled trials (RCTs) relating to statins and patients with SAH. We included foreign language and abstract articles. Two independent reviewers assessed studies for eligibility, data extraction and quality. We assessed study quality and allocation concealment. We calculated interrater agreement for study selection and quality using κ statistics. The primary outcome was radiographically-confirmed clinical vasospasm; secondary outcomes were delayed clinical ischemic deficits and morality. We combined eligible studies using Review Manager 4.2.10 to determine relative risk (RR). **Results:** Our search identified 160 titles. From these, we reviewed 26 abstracts. We exclusdd 23 (duplicates, reviews, letters or were not RCTs). Three studies were analyzed (n = 158). The κ for included studies was 1.0. Therapy was started within 96 hours of SAH with simvastatin 80 mg/day or pravastatin 40 mg/day. Most patients were treated for 14 days or until hospital discharge. There was significant reduction in incidence of radiographic vasospasm (RR 0.73, 95% CI 0.54–0.99), delayed clinical ischemic deficits (RR 0.38, 95% CI 0.17–0.83), and mortality (RR 0.22, 95% CI 0.06–0.82) in the statin group. There was no significant heterogeneity. **Conclusion:** The initiation of statin therapy following aneurysmal SAH significantly reduces vasospasm, delayed ischemic deficits and mortality. This supports the routine use of

statins for patients with aneurysmal SAH. **Keywords:** subarachnoid hemorrhage (SAH), statins, vasospasm

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WHAT is a clinically significant nontraumatic subarachnoid hemorrhage?

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Introduction: There is a relatively new phenomenon in EDs where patients with nonaneurismal, nontraumatic subarachnoid hemorrhage (SAH) are discharged home from the ED. This study's objective was to define what a significant SAH is. **Methods:** We surveyed all neurosurgeons listed in the Canadian Medical Directory (lists > 92% of practicing physicians). We used a modified Dillman technique with up to 3 mailed surveys plus a prenotification letter. Neurosurgeons were asked to answer 22 questions including a series of 13 clinical scenarios of SAH. Scenarios involved typical aneurismal SAH to SAH with a normal CT and only positive xanthochromia in cerebrospinal fluid (CSF) analysis. Each scenario was assessed regarding its clinical significance with a 5 point Likert scale (1 = always, 2 = most often, 3 = sometimes, 4 = almost never, 5 = never). Analysis included calculating means and medians as descriptive results. **Results:** We received 112 responses from 241 surveys. Mean age was 49 years (SD 11), mean years of clinical practice was 16 (SD 11) and 97% were male. All scenarios with an aneurysm requiring an intervention, arteriovenous malformation, death or any surgical intervention all had a median responses of 1 (IQR 1, 1). Scenarios having a negative CT with xanthochromia and few red blood cells in CSF with a negative angiography had a median response of 3 (IQR 1, 4). Scenario with perimesencephalic pattern on CT with negative angiography had median 3 (IQR 2, 4). Scenario where any patient with nontraumatic SAH is discharged directly from the ED had median response of 4 (IQR 3, 5). **Conclusion:** This study found that neurosurgeons consider SAH cases discharged from the ED after full investigation with CT +/– CSF analysis and cerebral angiography, are not clinically significant SAHs. Emergency physicians need to recognize that not all nontraumatic SAH are clinically significant. Future study should identify a classification to distinguish clinically significant from nonsignificant SAH. **Keywords:** subarachnoid hemorrhage, survey, angiography negative SAH

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AN international survey for the management of high risk transient ischemic attacks in the emergency department

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Introduction: Up to 10% of patients with transient ischemic attack (TIA) suffer a stroke or die within 1 week of their initial TIA. Our study objectives were to assess for patients with TIA: 1) current emergency department (ED) practice; 2) need for a clinical decision rule (CDR) to identify those at high risk of an impending stroke or death; and 3) the required sensitivity for such a CDR. **Methods:** We administered a mail survey with 31 questions to a random sample of members of 3 national emergency physician associations, ACEM (Australia), CAEP (Canada) and ACEP (USA), using a modified Dillman technique. A prenotification letter and up to 3 surveys were sent. Descriptive statistics were calculated. **Results:** Overall, 801 responses from 1493 surveys were received with individual country response rates of 55%, 60% and 46% for Australia, Canada and the United States, respectively. Of physicians, 76% were male with a mean age of 41.5 years of age, with 12 years of clinical practice and 75% of physicians had formal emergency medicine credentials. Ninety percent of respondents have 24-hour on-site access to CT scanners. Ninety-one percent of physicians indicated that they always or most often investigate TIA patients with a CT Head and 95% routinely order an ECG. Twenty-nine percent reported that most or all of their patients are admitted. Thirty-five percent of ED physicians reported having a dedicated stroke prevention clinic to follow their patients; however, only 17% estimated that most patients are seen within 7 days from referral. A CDR to identify high-risk TIA patients would be used by 97% of ED physicians surveyed. The median required sensitivity of a CDR for stroke or death within 7 days was 97% (IQR 99%, 95%) (98% for both Canada and US, and 97% for Australia). **Conclusion:** Most TIA patients are treated as outpatients, which is often neither expedited nor in a dedicated stroke prevention clinic. ED physicians support the need for a highly sensitive CDR to identify TIA patients at a high risk for impending stroke or death within 7 days of TIA diagnosis. **Keywords:** transient ischemic attack, survey, clinical prediction guide

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DEFINING normal jugular venous pressure on bedside ultrasound: an anatomic survey

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Introduction: Elevated jugular venous pressure (JVP) may be useful diagnostically in dyspneic patients. Unfortunately, physical examination for JVP (E-JVP) is unreliable. JVP measurement with ultrasound (U-JVP) is easy, but normal values have not been defined. The study objective was to define normal U-JVP. **Methods:** This was a prospective anatomic survey conducted on a convenience sample of voluntary ED patients over 35 years old. Exclusion criteria were presenting complaints, physical exam findings, past medical history or medications which would possibly lead to an alteration of JVP. With the head of bed at 45 degrees and the legs parallel to the ground, the point at which the diameter of the internal jugular vein (IJV) began to decrease on ultrasound (the taper) was marked. U-JVP was measured in two ways on all participants: 1) the vertical height (cm) of the taper above the sternal angle plus 5 cm; and 2) the IJVs path from the clavicle to the angle of the jaw was divided into four quadrants. The quadrant in which the taper was located was recorded. The measurements were conducted by three medical students trained by the principal investigator. A subset of participants had U-JVP measured by 2 students to determine interrater reliability. **Results:** U-JVP could be determined in all 38 male and 39 female participants. Mean U-JVP was 6.35 cm (95% CI 6.00–6.59). In 76 patients (98.8%), the taper was located in the first quadrant. Fifteen patients had their U-JVP measured by two students. $\kappa = 1.0$ for method (1). $\kappa = 0.87$ for method (2). **Conclusion:** Normal U-JVP is 6.35 cm consistent with published normal E-JVP. U-JVP can be determined in all patients. Interrater reliability is excellent. The top of the IJV column is located less than 25% of the way from the clavicle to the angle of the jaw in the vast majority. **Keywords:** bedside ultrasound, jugular venous pressure, shock

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PREVALENCE of chest x-ray findings requiring intervention in emergency department patients with possible acute coronary syndrome

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Introduction: Chest x-rays (CXRs) are routinely performed in patients with chest pain to rule out a non-cardiac etiology. We sought to determine the prevalence of CXR findings requiring intervention in patients with chest pain and possible acute coronary syndrome (ACS). **Methods:** This prospective study conducted in an academic

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tertiary care emergency department enrolled consecutive patients ≥ 25 years of age with a primary complaint of chest pain and possible ACS over 5 months. Exclusion criteria were: acute ST-segment elevation, hemodynamic instability, cocaine use, terminal illness, or pregnancy. Thirty-six clinical variables were collected on a standardized data collection form prior to radiography. All CXRs were interpreted by attending radiologists blinded to the data collection forms. Two investigators independently classified CXRs as normal, abnormal requiring intervention or abnormal not requiring intervention based on review of the radiology report and the medical record. Analyses included descriptive statistics and inter-rater reliability (κ). **Results:** There were 541 patients enrolled. Patient characteristics included: mean age 59.6 years, 40.3% female, 50.5% hypertension, 19.0% diabetes, 3.0% congestive heart failure and 35.5% ischemic heart disease. Of patients, 40.7% reported shortness of breath, 9.6% had an abnormal lung examination (crackles, rales or wheezes) and 6.8% pitting edema; 11.6% experienced MI, revascularization or death within 30 days. CXRs were obtained in 83.4% of patients, 2.7% (1.5–4.7) of which had an abnormality requiring intervention (κ for CXR classification = 0.78, 95% CI 0.61–0.96). **Conclusion:** The prevalence of CXR findings requiring intervention was low. These data suggest that a clinical decision rule for CXR in patients with possible ACS is feasible and has potential to decrease costs, radiation exposure, and length of stay in our busy EDs. **Keywords:** chest radiograph, acute coronary syndromes, clinical prediction guide

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PERCEIVED barriers to emergency medicine ultrasonography by emergency physicians

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Introduction: Emergency Medicine Ultrasonography (EMUS) has been identified as a part of current EM practice, but it has not been universally adopted. We set out to identify potential barriers to the use of EMUS by emergency physicians. **Methods:** As part of the ETUDE study, we conducted a web-based survey of a sample of the Canadian Association of Emergency Physicians membership database using a modified Dillman technique. The 24-item instrument assessed demographics, current and potential EMUS use, and barriers to EMUS use. Barriers were identified from the literature and a pilot study. Ethics approval was obtained. Pediatric emergency physicians, residents, and medical students were excluded from analysis. Descriptive and chi-square statistics were used to analyze the data. **Results:** The response rate was 36.4% (296/814). 72.5% were male with a median age of 40. 51.9% of respondents graduated after 1995. Certification of respondents was CCFP(EM) (52.3%) and FRCP(EM) (29.3%). Three items were not considered barriers to EMUS use: consultant attitudes lack of impact on patient management, and ease of getting a formal ultrasound. Respondents practicing in inner city/urban/suburban settings were more likely to endorse heavy clinical workload as a barrier to using EMUS vs. small town/rural/remote EDs ($p < 0.05$). Female respondents felt that not enough training was a barrier ($p < 0.05$). Respondents born before 1965 compared with those born after 1965 felt that easy access to CT scans was a barrier ($p < 0.05$). Part-time physicians reported more barriers compared to full-time physicians ($p < 0.05$) including clinical workload, difficulty recording scans, inadequate access to formal training, supervision and review of findings with credentialed staff, and inability to complete 200 scans in a timely manner. **Conclusion:** This is the first national survey to characterize the barriers to adopting EMUS into practice. Leaders in EMUS will need to address these issues in order to enhance care in this domain. **Keywords:** bedside ultrasound, implementation barriers, survey

Critical care, resuscitation and quality of care

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SOCIOECONOMIC status influences bystander CPR and survival rates for out-of-hospital cardiac arrest victims

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Introduction: While lower socioeconomic status is associated with lower level of education and increased incidence of cardiovascular diseases, the impact of socioeconomic status on out-of-hospital cardiac arrest outcomes is unclear. We used residential property values as a proxy for socioeconomic status to determine if there was an association with 1) bystander CPR rates; and 2) survival to hospital discharge for out-of hospital cardiac arrest. **Methods:** We performed a secondary data analysis of cardiac arrest cases prospectively collected as part of the Ontario Prehospital Advanced Life Support study which was conducted in 20 cities with ALS and BLS-D paramedics. We measured patient and system characteristics for cardiac arrests of cardiac origin, not witnessed by EMS, occurring in a single residential dwelling. We obtained property values from the Municipal Property Assessment Corporation. Analyses included descriptive statistics with 95% CIs and stepwise logistic regression. **Results:** 3600 of 7707 (46.7%) cardiac arrest cases met our inclusion criteria between Jan. 1, 1995, and Dec. 31, 1999. Patient characteristics were: mean age 69.2 years, male 67.8%, witnessed 44.7%, bystander CPR 13.2%, VF/VT 33.8%, time to vehicle stop 5:36 min:sec, return of spontaneous circulation 12.7% and survival 2.7%. Median property value was $184 000 (range $25 500 – $2 494 000). Patient and system characteristics were similar across property values. For each $100 000 increment in property value, the likelihood of receiving bystander CPR increased (OR 1.07, 95% CI 1.01–1.14; $p = 0.03$) and survival decreased (OR 0.77, 95% CI 0.61–0.97; $p = 0.03$). **Conclusion:** This is the first study to show an association between socioeconomic status and bystander CPR and survival rates for out-of-hospital cardiac arrest victims. Future studies should determine the nature and quality of the bystander CPR being performed in residential dwellings. Our findings might be used to target CPR training among lower socioeconomic groups. **Keywords:** socioeconomic status, cardiopulmonary resuscitation, advanced life support

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CAEP Critical Care Committee Sepsis Position Statement

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Introduction: Optimal management of severe sepsis in the ED has evolved rapidly. The purpose of this guideline is to review key management principles for Canadian emergency physicians, utilizing an evidence based grading system. **Methods:** Key areas in the management of septic patents were determined by members of the CAEP Critical Care Committee (C4). Members of C4 were assigned a question to be answered after literature review, based on the Oxford grading system. After completing, each section underwent a secondary review by another member of C4. A tertiary review was conducted by C4 as a group, and modifications were determined by consensus. Grading was based on peer reviewed publications only, and where evidence was insufficient to address an important topic, a practice point was provided based on group opinion. **Results:** The project was initiated in 2005, and completed in December 2007. Key areas which area reviewed include the definition of sepsis, the use of invasive procedures, fluid resuscitation, vasopressor/ inotrope use, the importance of cultures in the ED, antimicrobial therapy, and source control.

Other areas reviewed included the use of corticosteroids, activated protein C, transfusions and mechanical ventilation. **Conclusion:** Early sepsis management in the ED is paramount for optimal patient outcomes. The CAEP Critical Care Committee Sepsis Position Statement provides a framework to improve the ED care of this patient population. **Keywords:** sepsis, clinical practice guideline, CAEP

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A universal termination of resuscitation clinical prediction rule for both advanced and basic life support providers

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Introduction: Different termination of resuscitation (TOR) rules have been retrospectively derived for advanced life support (ALS) providers and prospectively validated for basic life support (BLS) providers. To determine whether either of these rules could stand as a universal pre-hospital TOR rule, we validated each on a prospectively collected cohort of out of hospital cardiac arrest (OHCA) patients attended by both levels of providers. **Methods:** We performed a secondary cohort analysis of data prospectively collected for the Resuscitation Outcomes Consortium Epistry trial from Apr. 1, 2006, to Mar. 31, 2007. The BLS and ALS TOR rules were applied and the diagnostic test characteristics as well as the predicted transport rate for each rule were calculated. **Results:** Both TOR rules were applied against 2410 patients with presumed cardiac etiology OHCA. The ALS TOR rule recommended TOR for 744 patients and none of these patients survived. The ALS TOR rule had a specificity of 100% for recommending transport of potential survivors and had a positive predictive value of 100% for death when TOR was recommended. Implementation of the ALS TOR rule would result in a transport rate of 69%. The BLS TOR rule recommended TOR for 1306 patients and none survived. The BLS TOR rule had a specificity of 100% for recommending transport of potential survivors and had a positive predictive value of 100% for death when TOR was recommended. Implementation of the BLS rule would result in a transport rate of 46%. **Conclusion:** Both TOR rules have high specificity and positive predictive values when TOR was recommended. Implementing the BLS TOR rule for all providers would result in a lower overall transport rate without missing any survivors. These findings may be useful for EMS systems that wish to implement TOR procedures for OHCA patients attended by ALS or BLS providers. **Keywords:** termination of resuscitation, advanced life support, basic life support, clinical prediction guide

Winner of the CAEP Resident Research Abstract Award

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UTILITY of impedance cardiography in the early diagnosis and management of emergency department shock patients

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Introduction: Impedance cardiography (ICG) is a noninvasive technology that measures hemodynamic parameters. We sought to determine the utility of ICG in the early diagnosis and treatment of emergency department (ED) patients with shock. **Methods:** This study was conducted at a tertiary care academic emergency department (90 000 visits/yr). ED patients with shock were prospectively enrolled over 2 years. Inclusion criteria were: SBP < 90 mm Hg or a drop > 40 mm Hg from baseline, shock index (HR/SBP) > 1, or lactate > 3 without evidence of liver disease. Patients < 16 years of age and trauma patients were excluded. Thirty-five clinical and ICG variables were collected on a standardized data collection form. Treating physicians were interviewed to determine the predominant shock type (distributive, hypovolemic, cardiogenic/obstructive) and initial treatment plan before and after viewing the ICG data. Critical care experts blinded to the collected data determined the reference standard shock type and therapeutic plan by review of the entire electronic medical record. **Results:** Seventy-five patients were enrolled. Patients mean age was 67.7 years, 56% male, mean BMI 26.9. According to the reference standard shock type 52% of patients had distributive, 39% hypovolemic, 4% cardiogenic/obstructive and 5% no shock. ICG resulted in a change in the emergency physicians diagnosis in 20% of cases and intervention in at least one of the 4 categories (volume resuscitation, antibiotic, inotropic support and vasopressors) in 17.3%. Pre-ICG and post-ICG agreements of ED physicians with expert were 58.7%; $\kappa = 0.30$ (95% CI 0.12–0.47) and 66.7%; $\kappa = 0.46$ (95% CI 0.29–0.62). ICG did not significantly improve the accuracy of the ED Physician diagnosis ($p = 0.083$). **Conclusion:** 1) A nonsignificant trend toward increased agreement in the diagnosis of shock type and management was observed. 2) ICG is a simple, noninvasive tool that may improve risk stratification of ED patients presenting with shock.3) Further studies are needed to determine ICG role more clearly. **Keywords:** impedance cardiography, hemodynamics, shock

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PATIENTS who are discharged from the ED with referral to outpatient specialty clinics, but do not complete the referral: demographics, reasons for nonattendance, and barriers to care

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Introduction: To characterize patients who are referred from the ED to specialty clinics but do not complete the referral, and to identify reasons for failure to follow-up. **Methods:** Retrospective cohort study over three months of patients who were discharged from the ED of a teaching hospital with referral to internal medicine, cardiology or neurology clinics but did not complete follow-up. A standardized telephone interview assessed demographics, barriers to care and reasons for not completing the consultation. **Results:** Of 171 ED referrals, 42 (24.6%) were not completed. Interviews were completed for 71.4% ($n = 30$). Nonattenders were functional in English (80%) and educated (73.1% were high school graduates, 60.7% university graduate); 93% of interviewees could get to hospital by themselves or have someone take them. Only 42.9% ($n = 12$) understood why the emergency physician (EP) requested consultation, and 42.9% ($n = 12$) described EP instructions as poor or fair. Most followed up with another physician (72.4%, $n = 21$), generally family doctor (51.7%, $n = 15$) or another specialist (17.2% $n = 5$). Primary reasons for noncompletion of consult were patient choice (46.7%), physical or social barriers (13.3%), communication failure (20%) and consultants' refusal of the consultation (20%). All clinic refusals were from one internal medicine clinic, representing 42% (8/19) of EP referrals to that clinic. No interviewed patient (6/6) who was declined consultation was aware of his/her status. **Conclusion:** Clinic follow-up requested by the EP is often not completed. Approximately one-half of consult noncompletion was attributable to communication and system failures, rather than patient choice. **Keywords:** outpatient referral, continuity of care, ED follow-up

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PATIENTS who leave prior to the completion of acute care: further evidence of overcrowding in emergency departments

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Introduction: Patients who leave without being seen (LWBS) or

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against medical advice (LAMA) constitute potential problems for emergency departments (ED) owing to patient dissatisfaction and potential morbidity. Few jurisdictions can accurately evaluate the pattern of LWBS/LAMA for a large population; this study examines this ED phenomenon over a 6-year period in 1 Canadian province. **Methods:** All patients presenting to Alberta EDs were eligible for inclusion. Data were derived from a sample of ED patients treated in 17 health regions over 6 years (1998/99–2004/05) with a disposition code of LWBS or LAMA. Data were extracted from the Ambulatory Care Classification System (ACCS) database, a computerized abstract system coded similarly across all regions. All data elements are recorded by medical record nosologists and LWBS can be differentiated from LAMA by the absence of a treating ED physician code. Descriptive statistics and crude presentation rates are reported. **Results:** Between 1999/2000 and 2004/05, ED visits increased from 1.49 to 1.8 million. Over the study period LWBS rates were orders of magnitude higher (30/1000 compared to LAMA (~ 4/1000). The annual rates of LAMA and LWBS both increased; the average increase in rates was 10.8% and 12.6% per year, respectively ($p = 0.64$). A larger proportion of LAMA patients were classified as CTAS one-half than LWBS cases ($p < 0.001$). Death at follow-up following LWBS and LAMA did not differ ($p = 0.581$); however, LAMA patients were more likely to be admitted to an ED ($p < 0.001$) and were hospitalized more rapidly following ED discharge than LWBS ($p = 0.029$) patients. **Conclusion:** These results indicate that LWBS and LAMA cases across a large population are increasing annually. LWBS cases are orders of magnitude higher than LAMA and can be considered a proxy marker for ED overcrowding. LAMA is a less common problem overall; however, readmissions for LAMA are higher than LWBS cases. Interventions to reduce LWBS and LAMA in EDs appear warranted. **Keywords:** left without being seen, left against medical advice, ED crowding

Academics and clinical prediction rules

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STATE of the nation: a profile of Canadian EM clerkships 2007

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Introduction: It is a marker of the growth of emergency medicine (EM) as a specialty that EM content is rated as essential in the curricula of Canadian medical schools. However, no national profile of EM teaching in MD programs exists. We set out to characterize the current state of EM undergraduate medical education in Canada. **Methods:** We conducted a cross-sectional online survey of EM clerkship directors (CDs) or their equivalent at Canada's 17 medical schools. We used Dillman methods with up to 6 contacts. Ethics approval was obtained. We used descriptive statistics to analyze the data. **Results:** Two schools confirmed they had no EM clerkship or equivalent. Of 15 schools, 12 responded (80%). Of these 12, 10 (83.3%) schools had a mandatory clinical rotation in EM, with 60% of these occurring in third year of training. EM rotations varied in length from 4 weeks (50%) to 2 weeks (40%). The number of teaching sites per school varied from 1 to 6. Clerkship features included clinical shifts (100%), seminars (90%), procedure skills (70%), lectures, simulations, ACLS (all 60%), web modules, EMS (40%), student presentations (30%) and journal club (20%). Student assessment methods varied, but included written tests (22%), daily encounter cards (22%), clinical evaluations (20%), OSCEs (11%), observed procedures (9%), simulations (6%) and assignments (3%). Most EM clerkship faculty were not directly compensated for clinical teaching (80%), and were evaluated only at the end of the clerkship (41%) or at the end of each teaching activity (36%). Senior residents taught in 9/10 clerkships. Clerkship budgets varied from $10 000 to $350 000. Ten of 12 EM undergraduate directors had salary support and dedicated a mean 1.6 days/week (range 0.25–2.5). Schools took a mean of 42 elective students per year (range 4–150). **Conclusion:** This is the first national profile of the state of EM teaching in medical schools in Canada. In 2007, EM teaching was extremely heterogeneous. National standards for quality EM UGME are needed. **Keywords:** undergraduate medical education, clerkships, undergraduate curriculum

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METHODOLOGIC quality of the American Board of Emergency Medicine Life-Long Self Assessment reading lists

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Introduction: The American Board of Emergency Medicine (ABEM) uses an annual reading list of articles as the basis of the annual online examination for its Lifelong Self-Assessment (LLSA) program. This study aimed to examine the methodologic quality of listed articles, using accepted standard hierarchies of evidence. **Methods:** The Oxford Centre for Evidence-based Medicine Levels of Evidence scales of evidence hierarchy in multiple study categories was adapted to 10-point Likert scales (1 = highest level of evidence, 10 = lowest). Articles in each LLSA year (2004–2007) were rated using these scales. Articles were also rated using the McMaster Online Rating of Evidence (MORE) Likert scales (7 points) for relevance and newsworthiness. Descriptive statistics for each year's ratings were obtained as well as reliability measures. The Oxford scales were selected on the basis of widest representation of study designs, and the MORE scales based on proven reliability for content assessment. **Results:** A total of 79 articles were independently reviewed by 3 blinded raters. The interrater reliability for overall ratings across 3 scales was 0.83 (95% CI 0.77–0.81). Average relevance and newsworthiness scores were high over 4 years (6.0 and 5.0, respectively). Average quality ratings were poor over 4 years (7.5 out of 10). A small trend towards higher quality scores were noted in later years. **Conclusion:** Articles included on the LLSA reading lists from 2004 to 2007 are relevant and newsworthy to the practice of emergency medicine, but represent a low standard of evidence. Readers should be cautious in using such information to guide clinical practice. Certifying bodies should re-examine their article screening and selection processes to ensure that high quality articles are disseminated for recertification purposes and to optimize patient care. **Keywords:** American Board of Emergency Medicine, critical appraisal, Lifelong Self-Assessment

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OLD dogs and new tricks — formalizing feedback around the CanMEDS Roles

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Introduction: In-training evaluations often contain halo and leniency bias yet must address all seven CanMEDS competencies. Our previous work has shown that teachers evaluate some roles much more than others using an emergency medicine daily encounter card model. We sought to explain the reasons why this might be true and explore options for improvement. **Methods:** Semistructured focus groups at 2 large academic teaching hospitals were completed by a third-party moderator until the data was saturated. A dual reviewer grounded theory analysis generated themes. **Results:** Sixteen faculty participated in 4 focus groups; data saturation was achieved. Teachers felt that the Medical Expert, Commu-

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nicator and Professional roles were easy to assess, applicable to EM rotations and important, while Health Advocate, Scholar, Collaborator and Manager had less obvious applicability and objectivity. Barriers to assessment included lack of "buy-in" from trainees, time constraints and lack of observable behaviours for each role. Participants did, however, appreciate the structure that the CanMEDS roles provided for feedback sessions. A follow-up workshop demonstrated that education about the Roles can improve understanding and create insight into the practical assessable behaviours associated with each Role. **Conclusion:** The CanMEDS roles are abstract for many teaching faculty in our centre. Teachers felt the roles were useful as a framework but had difficulty providing feedback on objective behaviours for each role. Opportunity exists to improve use of the CanMEDS roles in resident assessment through education about the operational aspects of each role. **Keywords:** CanMEDS, trainee assessment, focus group

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PROSPECTIVE validation of the Ottawa Ankle Rule and the Malleolar Zones Algorithm for children with ankle trauma

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Introduction: The Ottawa Ankle Rule (OAR) and the Malleolar Zone Algorithm (MZA) have been developed to identify children needing a radiography following an ankle trauma. **Objective:** To determine the criterion validity of the 2 rules for predicting significant ankle fractures in children. **Methods:** This was a prospective cohort study performed in a university-affiliated pediatric emergency department (ED). Children younger than 16 years suffering from an acute ankle trauma were eligible. A priori, physicians were instructed in how to assess patients according to the rules. The ED physician implemented each rule with the aid of a standardized diagram. Ankle radiography and referral to orthopedics were left at the physicians' discretion. Final diagnosis was made at follow-up at the orthopedic clinic. A phone follow-up was made for those who needed no orthopedics follow-up. All fractures other than a nondisplaced Salter I fracture of the fibula were considered significant. The primary outcome was the presence of a significant fracture as confirmed in the orthopedic follow-up. The criterion validity was calculated for each rule. **Results:** Radiography was performed in 245 (90%) of the 272 participants. All patients with no radiograph were reached by phone. Eighty patients had an ankle fracture including 33 with a Salter I fracture of the fibula and 47 with a significant fracture. The sensitivity and specificity for a significant fracture were 1.00 (95% CI 0.94–1.00) and 0.27 (95% CI 0.24–0.30) for the OAR, and 0.87 (95% CI 0.84–1.00) and 0.24 (95% CI 0.21–0.27) for the MZA. **Conclusion:** The OAR identified all children with a significant fracture, whereas the MZA showed a lower sensitivity. The use of the OAR would decrease by 10% the number of requested ankle radiography in our setting whereas the use of the MZA would not decrease it. **Keywords:** Ottawa Ankle Rule, Malleolar Zone Algorithm, clinical prediction guide

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LONG-TERM outcomes of a cluster randomized knowledge transfer trial in the ED

Stiell IG, Clement C, Grimshaw J, Brison R, Rowe BH, Schull MJ, Lee JS, Brehaut J, McKnight RD, Dreyer J, Eisenhauer M, MacPhail I, Rutledge T, Letovsky E, Shah A, Clarke A, Ross S, Perry JJ, Wells GA; for the CCC Study Group. University of Ottawa, Ottawa, ON

Introduction: We previously conducted a randomized trial in which implementation of the Canadian C-Spine Rule (CCR) by physicians led to significantly lower ED use of c-spine imaging (CSI) without missed injuries. We sought to evaluate the long-term impact of the CCR and conducted a prospective 12-month follow-up at the same EDs. **Methods:** The original trial had a matched–pair cluster design that compared outcomes during two 12-month before and after periods at 6 intervention and 6 control EDs, stratified by teaching or community hospital. We randomly allocated sites to intervention or control groups and enrolled alert, stable adult trauma patients. During the intervention-site after-period, active strategies were employed to implement the CCR. During the follow-up period, all intervention strategies were removed and sites were unaware that we continued to collect data. We used univariate analyses, appropriate for a cluster design. **Results:** The 11 947 patients were similar, comparing after (n = 6144) to follow-up (n = 5803) periods, and control (n = 4339) to intervention (n = 7608) sites, with mean age 38.7 years, female 50.1%, MVC 69.7%, important c-spine injury 0.9%. At the 6 intervention sites, CSI rates dropped from before to after periods (61.7% v. 53.8%; $p < 0.01$, RR 12.8%) and remained low in the follow-up period (53.1%). At the 6 control sites, CSI rates increased from before to after (53.8% v. 60.5%; $p < 0.05$, RI 12.5%) and remained higher in the follow-up period (61.7%). There was variation in CSI rates among intervention (40.9%–61.4%; $p < 0.05$) and control sites (50.2%–67.3%; $p < 0.05$). There were no missed c-spine injuries. **Conclusion:** This trial demonstrated that actively implementing the CCR led to significantly lower CSI use by physicians without missed injuries and that this effect was sustained for at least 12 more months without interventions. Widespread implementation of the CCR could reduce health care costs and improve patient flow in busy EDs over a long term period. **Keywords:** knowledge translation, implementation, long-term outcomes

Winner of the CAEP Resident Research Abstract Award

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OTTAWA Ankle Rules to exclude fractures in the pediatric population: a systematic review and meta-analysis

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Introduction: Although the role of the Ottawa Ankle Rules (OAR) is routinely accepted in adults, the accuracy of the OAR in children is less well established. The primary objective of this report was to conduct a quantitative systematic review to determine the diagnostic accuracy of the OAR to exclude fractures of the ankle and midfoot in children. **Methods:** We searched electronic databases (i.e. MEDLINE, EMBASE and CINAHL) for published and gray literature and hand searched reference lists. Two reviewers independently applied inclusion/exclusion criteria (children [< 18 yr] presenting to the ED with an acute blunt ankle or midfoot injury, x-ray or proxy measure to confirm/exclude a fracture and sufficient data to create a 2×2 table). Data were extracted by one reviewer using a standard form and verified by a second reviewer. The data was then pooled using an approximation of the inverse variance approach; 95% confidence intervals were calculated using the exact method. **Results:** We included 12 studies, which enrolled 3226 patients with 552 fractures (prevalence 17.1%). The pooled sensitivity was 98.2% (95% CI 96.7–99.1) and specificity was 29.5% (95% CI 27.8–31.3). The pooled negative and positive predictive value were 98.8% (95% CI 97.7–99.4) and 22.3% (95% CI 20.7–24.1), respectively. Of the 10 missed fractures, only 4 were characterized; 1 was a Salter-Harris (SH) I fracture, 1 was a SH-IV fracture and 2o were insignificant (either SH-I or avulsion fractures < 3 mm). Pooled estimate for x-ray reduction rates was 24.8% (95% CI 23.3–26.3). There was evidence of funnel plot asymmetry ($p = 0.002$), suggesting that there may be missing studies with smaller sample sizes but more significant re-

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sults. **Conclusion:** Based on the findings from our study, the OAR appears to be a reliable tool to exclude fractures in children presenting with ankle and midfoot injuries. The usage of the OAR in children would significantly decrease radiography usage with a very low likelihood of missing a fracture. **Keywords:** Ottawa Ankle Rule, pediatric ankle injury, systematic review

Pediatrics

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PASSIVE versus active distraction for intravenous catheterization in the pediatric emergency department

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Introduction: Children visiting the ED experience anxiety and pain during procedures. In order to ameliorate the effects of pain and anxiety, many hospitals have Child Life Specialist programs. The objective of this study was to compare the efficacy of active versus passive forms of distraction in decreasing anxiety and pain in children 5–18 years old undergoing IV insertion, the most common procedure in the pediatric ED. **Methods:** This was a prospective, randomized trial comparing anxiety and pain response among children being active (experimental) or passive (control) during intravenous catheter insertion in the ED and while being supported by a Child Life Specialist. Outcome measures were recorded by a research assistant (RA) and included Observational Scale of Behavioral distress-Revised (OSBD-r) at baseline, immediately before IV insertion(s), immediately after IV insertion attempt(s) and every 2 minutes in between. The RA also recorded the Faces Pain Scale-Revised (FPS-r) for each angiocath insertion attempt. The number of IV attempts and the length of the procedure were also recorded. **Results:** A total of 79 (89%) children completed the study. Children were 10 (SD 3) years old (range 5–18). Thirty-nine and 40 were randomized to the active and passive groups, respectively. Ten (13%) children that were allocated to the passive group were subsequently offered active forms of distraction to accommodate their perceived needs. There was no significant difference in mean OSBD-r and FPS-r between the groups. More children in the active group had a successful first attempt to insert an IV compared to the active group (89% v. 63%, respectively, $p = 0.01$) and the mean length of procedure was faster in the active group (1.2 v. 1.8 min, respectively, $p = 0.02$). **Conclusion:** Active child participation in the distraction procedure by a Child Life Specialist during angiocath insertion appears to be more effective than passive forms of distraction, particularly as they relate to fewer attempts for successful cannulation. **Keywords:** distraction, IV catheter insertion, randomized trial

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DOES the Broselow Tape accurately estimate the weight of Canadian children?

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Introduction: The Broselow Tape (BT) has been used for more than 20 years as a length-based estimate of body weight for children during resuscitation. Increasing childhood obesity has raised concern that the BT no longer accurately estimates weight. The purpose of this study was to validate the BT in Canadian children. **Methods:** A convenient sample of children attending their community pediatrician's office between October and December 2007 was used. Their actual weight was compared with their BT weight estimates using the Bland–Altman method. The correlation coefficient and percentage error (PE) was also calculated. **Results:** A total of 499 children were included in the study. The mean age was 2.58 years (95% CI 2.31–2.85), mean height was 88.42 cm (95% CI 86.15–90.70), mean weight was 14.4 kg (95% CI 13.61–15.20) and mean BT weight was 13.31 kg (95% CI 12.62–14.00). Bland–Altman difference was 1.1 kg (–3.9 to 6.1). The correlation coefficient (r) was 0.9645 ($p < 0.001$, 95% CI 0.958–0.970). The BT had a PE > 10% one-third of the time and > 20% error 8.6% of the time. **Conclusion:** The BT was often not accurate and tended to underestimates the weight of Canadian children. **Keywords:** Broselow Tape, pediatric resuscitation, weight measurements

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PROSPECTIVE evaluation of the ability of the Low-Risk Exam to identify children who do not need radiography for an ankle trauma

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Background: The Low-Risk Exam (LRE) aims to identify children with an ankle injury for which a radiograph is not necessary because it would not modify the treatment. **Objective:** To determine the criterion validity of the LRE for predicting significant ankle fractures in children. **Methods:** A prospective cohort study was conducted to evaluate children younger than 16 years suffering from an acute ankle trauma in a university affiliated pediatric emergency department (ED). All participants were evaluated by the treating ED physician using a standardized datasheet. Physicians were instructed in how to use the LRE a priori. The ED physician evaluated the need for radiography according to the LRE. Radiograph and referral to orthopedics were left at the physicians' discretion. The follow-up was made either by phone or at the orthopedics clinic depending on the presumptive diagnosis. All fractures other than a nondisplaced Salter I fracture of the fibula were considered significant. The primary outcome was the presence of a significant fracture as confirmed in the orthopedic follow-up. A secondary analysis was performed to evaluate all fractures. **Results:** Among the 272 patients recruited, 47 had a significant fracture and 33 had a Salter I fracture of the fibula. The LRE permitted to identify 41 of the 47 patients with a significant fracture (sensitivity 0.87, SD 0.05). The use of the LRE would have decreased the number of radiograph from 245 (90%) to 145 (53%). Significant fractures not identified by the LRE were 2 Salter II fractures of the fibula, 1 small avulsion, 1 metaphysis of the fibula, 1 metaphysis of the tibia and 1 Salter II of the tibia. **Conclusion:** The use of the LRE would have permitted to decrease the number of radiograph performed for children with ankle trauma but almost 15% of the significant injury would have been missed. **Keywords:** Low-Risk Exam, ankle radiography, clinical prediction guide

Poster Presentations

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THE use of the Ottawa Ankle Rules in children: a survey of physicians' practice patterns

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Introduction: Despite a number of recent studies assessing the diagnostic accuracy of the Ottawa Ankle Rules (OAR) in children, we are unaware of any studies that have examined physicians practice patterns in this setting. The primary purpose of this survey was to

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assess whether Canadian pediatric emergency physicians (PEPs) reported using the OAR in their clinical practice. Secondary outcomes included PEPs management and diagnosis of Salter-Harris I ankle fractures. **Methods:** A self-administered piloted mail survey was distributed to 215 Canadian PEPs using a modified Dillman technique (maximum of 3 mailings for nonresponders). All physician members of Pediatric Emergency Research Canada (PERC), a national organization of PEPs, were surveyed. Outcomes were analyzed using descriptive statistics. **Results:** The survey response rate was 68.9% (144/209). Six respondents were excluded based on a priori exclusion criteria. The respondents were primarily full-time PEPs (73.2%) and 38.9% had completed a pediatric emergency medicine fellowship. Of those physicians surveyed, 87.5% (126/144) reported applying the OAR in children to determine whether to order radiographs for acute ankle or midfoot injuries. Of these physicians, 65.1% reported using the OAR always/usually. Sixty-five percent of physicians surveyed felt that all ankle fractures are clinically significant. Although the physicians most commonly order the radiographs (63.1%), 34.8% of the time, x-rays are requisitioned by triage nurses or the orthopedic technicians. Management of SH-I fractures the included immobilization by 85.1% of emergency physicians, with the majority arranging follow-up with the orthopedic surgeons. **Conclusion:** Although there are limitations with self-reported surveys, it appears that the majority of Canadian PEPs are applying the OAR when assessing children with acute ankle and midfoot injuries. Future studies should assess how well the self-reported usage correlates with actual clinical usage of the OAR in the clinical setting. **Keywords:** Ottawa Ankle Rule, pediatric ankle injury, survey

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EMERGENCY medicine observerships for preclerkship students: a structured experience

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Introduction: Medical students are expected to make residency and career decisions early in their undergraduate medical education. In medical school curricula there is limited exposure to emergency medicine (EM) in the preclerkship years. The purpose of this study was to develop a formalized EM observer ship program for preclerks and to survey the students following their participation. **Methods:** A structured EM observership program was developed at the University of Toronto Medical School in 2007. All first- and second-year students were eligible to participate. Nine ED teaching sites were recruited with each site recruiting interested preceptors. The observership consisted of two 4-hour shifts with 1 preceptor at 1 site. Specific expectations of the students were outlined. A convenience sample was used for the period Feb. 26 to Nov. 4, 2007, to conduct an anonymous online survey of the students experience following the observership. **Results:** During the study period, 82 students completed 99 observerships at 9 sites with 54 preceptors. Seventy-one (71) students completed the survey (response rate 86.6%). Only 22 (31%) students participated in prior informal EM observerships. Most students (94.4%) found the process of setting up the observership easy. Overall, most students (98.6%) found the experience to be worthwhile. Most students (95.8%) viewed the preceptors as good role models and thought the patients were accepting of the students' presence as observers (98.6%). As a result of the observership, 47 (66.2%) students reported that their attitudes/interest to EM has changed and most (83.1%) plan on exploring other opportunities in EM (such as electives). As a result of the observership, most students (78.6%) would like to find a mentor in EM and 57 (80.3%) students feel they have the opportunity to contact the preceptor for further discussion (mentoring). **Conclusion:** Formal EM observerships are viewed by students to be worthwhile and have the potential to impact positively on students' career choices. **Keywords:** undergraduate medical education, observerships, curriculum

Winner of the CAEP Resident Research Abstract Award

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WHAT do emergency medicine workers think and know about crisis resource management? Results from a needs assessment survey

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Introduction: Emergency department (ED) resuscitation requires the coordinated efforts of an interdisciplinary team. Human errors are common and have a negative impact on patient safety. Although Crisis Resource Management (CRM) skills are utilized in other clinical domains, emergency medicine (EM) caregivers currently receive no formal team training education. **Objective:** To assess and compare attitudes towards CRM training among EM staff physicians, nurses and residents at two Canadian academic teaching hospitals. **Methods:** EM staff physicians, residents and experienced nurses were asked to complete a web survey, which included Likert scales and short-answer questions. Focus groups and pilot testing informed survey development. Thematic analysis was performed on the qualitative data set and compared to quantitative results. Descriptive and inferential statistics were calculated to summarize the findings. **Results:** The response rate was 75.7%. There was strong consensus regarding the importance of core CRM principles (effective communication, team leadership, resource utilization, problem solving and situational awareness) in ED resuscitation. Problems with coordinating team actions (58.8%), communication (69.6%) and establishing priorities (41.3%) were among factors implicated in adverse events. Interdisciplinary collaboration (95.1%), efficiency of patient care (83.9%) and decreased medical error (82.6%) were proposed benefits of CRM training. Communication between disciplines is a barrier to effective ED resuscitation for 94.4% of nurses and 59.7% of physicians ($p = 0.008$). Residents reported a lack of exposure to (64.3%) yet had interest in (96.4%) formal CRM education using human patient simulation. **Conclusion:** Nurses rate communication as a barrier to teamwork more frequently than physicians. EM residents are keen to learn CRM skills. An opportunity exists to create and novel interdisciplinary CRM curriculum to improve EM team performance and mitigate human error. **Keywords:** crisis resource management, team training, needs assessment survey

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PREDICTING the development of severe bronchiolitis among an emergency department cohort: a multicentre study

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Introduction: Bronchiolitis is the most common lower respiratory tract infection of young children. While many studies have described risk factors for admission, no study has prospectively examined the risk factors for developing severe bronchiolitis among emergency department (ED) patients. The objectives of this study were 1) to describe the occurrence of severe disease among children with bronchiolitis presenting to the emergency department; and 2) to predict which infants with bronchiolitis are at risk for developing severe bronchiolitis. **Methods:** Prospective cohort study at 8 Canadian

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pediatric EDs in which children < 12 months of age presenting with bronchiolitis were assessed for 22 standardized demographic, historical, environmental and physical exam variables. Main outcome measure was severe bronchiolitis defined as need for intubation, apnea, death and admission to a pediatric ICU. **Results:** There were 1554 patients enrolled. Among the study sample, 482 (31%) of infants were admitted. Thirty-eight infants (2.4%) developed severe bronchiolitis with 36 (2.3%) admitted to ICU, 11 intubated (0.7%) and 7 (0.5%) developed apnea. No infants in the cohort died. Mean age was 22 weeks (SD 13), 39% of the cohort was female, 13% were born at < 37 weeks gestation, 3% had chronic cardiopulmonary disease and 37% were exposed to second-hand smoke. In the univariate analysis age, gestational age, heart rate, respiratory rate, respiratory distress assessment instrument score, oxygen saturation on room air were significantly associated ($p < 0.05$) with the development of severe bronchiolitis. Variables found to be strongly associated with the outcome of severe bronchiolitis will be further analyzed by multivariate partitioning techniques. **Conclusion:** This large emergency department cohort of infants with bronchiolitis is the first study to prospectively follow ED patients with bronchiolitis to determine the risk of developing severe bronchiolitis and to examine a wide range of predictor variables. **Keywords:** bronchiolitis, clinical prediction guide, respiratory emergencies

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MEASURING tissue oxygen saturation (StO_2) via spectrometer in healthy children

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Background: Near-infrared spectroscopy (NIRS) offers a noninvasive monitoring method for quantifying the percent of tissue oxygen saturation (%StO_2) in cases where pulse oximetry (SpO_2) is less reliable or not measured, such as in cases of shock or trauma. StO_2 in adults is measured in the thenar area but in children, owing to small size, this location may not be suitable for measurement. **Objective:** The aim of this study was to evaluate a new NIRS system in children and to determine the best area to measure StO_2. **Methods:** Prospective study in children 0–17 years arriving at the emergency department (ED) at the Hospital for Sick Children in Toronto, Ontario. StO_2 on several areas including shoulder (deltoid muscle), palm (thenar eminence), forearm, calf and mid-triceps was measured with a 25-mm probe and SpO_2 documented. We included patients in the 3 lower triage categories (urgent, semiurgent and nonurgent), with no respiratory distress or any presenting symptom related to a chronic respiratory or cardiovascular disorder. **Results:** We recruited a total of 316 patients and conducted 983 measurements of StO_2. The mean age was 6.8 (SD 4.4) years (range 0.1–17) and 53% were males. Average StO_2 was in the normal range on the bicep (82.7, SD 10.1%) and deltoid (82.2, SD 12.8%) muscles and significantly ($p < 0.05$) lower on other areas. While significantly more children moved their limbs (77 [25%] v. 46 [15%], $p < 0.001$) or struggled (31 [10%)] v. 20 [6.4%], $p = 0.02$) during the StO_2 measurements, less than 5% in the StO_2 group reported any type of pain or cried which did not differ from SpO_2. **Conclusion:** Bicep and deltoid muscles are the most appropriate areas to measure StO_2 using the 25-mm transducer in children of different ages. Monitoring peripheral tissue oxygenation using noninvasive NIRS that allows very early application in the pediatric ED, could become a regular part of ED care of critically ill patients to institute prompt therapy and guide resuscitation, avoiding organ damage. **Keywords:** oxygen saturation, spectrophotometry, pediatrics

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PHYSICIANS' clinical interpretation of the Ottawa Ankle Rule for children

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Background: The Ottawa Ankle Rule (OAR) is a clinical decision rule developed to identify, based on a short physical exam, the need for radiography for patients with an ankle trauma. **Objective:** Determine the appropriateness of interpretation of the OAR by physicians evaluating children with ankle trauma. **Methods:** This was a prospective cohort study performed in a university-affiliated pediatric emergency department (ED). Participants were children less than 16 years with an acute ankle trauma. Before study recruitment, all physicians were formally instructed in the use of the OAR. For each participant, the ED physician completed a standardized datasheet that described thoroughly the physical exam. He then interpreted the need for radiography according to the OAR rule with the aid of a standardized diagram. Ankle radiography was left at the physicians' discretion. All standardized datasheet were reviewed by a single reviewer to assess for the need for radiography based on the described physical exam and the OAR guidelines. The primary outcome was the correlation between the physicians interpretation of the OAR (x-ray or not) and the need of radiography according to the description of the physical exam. This correlation was evaluated using a κ score. **Results:** There were 272 participants included in the study with a total of 80 ankle fractures. All patients had a completed standardized datasheet with no missing data. Physicians evaluated that 227 (0.83) patients needed radiography according to the OAR while the description of the physical exam suggested that 213 (0.78) would need it. There was a good correlation between the physicians interpretation and the physical exam has demonstrated by a κ score of 0.66 (95% CI 0.60–0.72). Discordance in the interpretation was not associated with a missed diagnosis of fracture **Conclusion:** Pediatric emergency physicians use the Ottawa Ankle Rule appropriately in children with ankle trauma. **Keywords:** Ottawa Ankle Rule, pediatrics, interobserver agreement

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HYPERGLYCEMIA at presentation predicts functional outcome in nonlacunar infarctions

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Introduction: Assess the functional outcome in patients presenting with and without hyperglycemia in lacunar and nonlacunar stroke subtypes. **Methods:** A consecutive cohort of 1013 patients presented to an academic emergency department with an acute ischemic stroke from December 2001 to December 2005 was included. All patients had serum glycemia levels measured in the emergency department. The variables collected were age, gender, stroke severity at presentation (National Institutes of Health Stroke Scale [NIHSS] from 0 to 42 points), functional outcome at hospital dismissal (modified Rankin score, from 0 to 6 points) and stroke subtype categorized in lacunar versus nonlacunar. Glycemia followed a normal distribution and was analyzed as continuous variable with parametric tests. All p values were 2-sided. **Results:** A total of 1013 patients were included. The mean and standard deviation age was 72.3 (SD 14.5) years; 53% were male. The median NIHSS at admission was 5 (interquartile range 3–11), with a mean of 8. The mean functional outcome was 3.0 (SD 1.6). A total of 27% of the cohort had diabetes and 74% hypertension. Overall, 152 (15%) had lacunar strokes. In nonlacunar strokes glycemia was a strong predictor of functional outcome at hospital dismissal ($p <$

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0.001); the higher the glycemia level the worse the functional outcome. However, in lacunar strokes, glycemia was not a predictor of functional outcome at hospital dismissal (p = 0.98). **Conclusion:** Hyperglycemia at presentation predicts functional outcome in non-lacunar infarctions; however, does not predict the outcome of patients presenting lacunar infarctions. Hyperglycemia at emergency department presentation does not confer a worse prognosis in patients with lacunar strokes. **Keywords:** stroke, hyperglycemia, functional outcome

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MANAGEMENT of transient ischemic attack and stroke in British Columbia emergency departments: the Current Practice Indicator project

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Introduction: Stroke is the third leading cause of death and the leading cause of adult disability in Canada. We sought to measure the performance of BC EDs in the management of patients with TIA and stroke, when measured by evidence-based clinical indicators. **Methods:** This was a retrospective medical records review study performed in adherence to published guidelines. Charts were randomly sampled from selected EDs in all 6 health regions (HRs) in BC, with an ED discharge diagnosis of TIA or stroke. Where available, ED administrative databases were utilized; otherwise, medical records were hand searched. Fourteen data abstractors were given standardized training and were blinded to study hypotheses. Adherence to 19 performance indicators was measured using standardized data collection forms. Ethical approval was obtained prior to study inception. Interrater reliability was calculated. **Results:** There were 1352 charts audited from 48 emergency departments in BC. Of these, 685 (50.1%) charts were stroke patients; 503 (37.2%) and 164 (12.1%) were TIA and, query TIA patients, respectively. Percent agreement ranged from 61% to 91% between HRs. Of charts, 430/1352 (31.8%) arrived within 2.5 hours of symptom onset, 23/685 (3.4%) received tPA, and of those, 7/23 (30.4%) received tPA within 1 hour of arriving to the ED. Only 618/1352 (45.7%) had a blood glucose checked on arrival and 1137/352 (84.1%) had an electrocardiogram performed in the ED. Of patients, 547/1352 (40.5%) were mobilized within 24 hours and only 133/1352 (9.8%) had a swallowing screen in the ED. Upon discharge, 509/1262 (40.3%) were prescribed an antiplatelet and 177/381 (46.5%) patients with atrial fibrillation were prescribed anticoagulants. Only 51/1352 (3.8%) patients or caregivers were given stroke education on discharge. **Conclusion:** The care for patients with TIA and stroke in emergency departments in BC could be optimized. Various knowledge translation implementation strategies may be employed to improve care for stroke and TIA patients in the emergency department. **Keywords:** transient ischemic attack, performance indicators, medical records review

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PHYSICIAN attitudes towards clinical decision rules for acute respiratory disorders for patients > 50 years old in the ED: an international survey

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Introduction: There are no widely used guidelines to determine which older patients with acute respiratory conditions require admission. This survey assessed the need for clinical decision rules (CDR) to determine the need for hospital admission for patients > 50 years for 3 respiratory conditions: chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF) and community acquired pneumonia (CAP). **Methods:** We surveyed ED physicians from 3 countries (the United States, Canada and Australia) by a random sample of their respective ED physician associations (ACEP, CAEP and ACEM). We used a modified Dillman technique with up to 3 mailed surveys plus a prenotification letter. Physicians were asked a series of questions regarding the need for CDRs for ED patients > 50 years to direct the need for admission for COPD, CHF or CAP, and the required sensitivity of each rule for death within 14 days. The current use of some form of walk test in the ED to assess for possible discharge was also assessed. **Results:** There were 801 responses from 1493 surveys received with rates of 55%, 60% and 46% for Australia, Canada and the United States, respectively. The median years in clinical practice was 11 (IQR: 7, 17) and 69% were male.

Table 1, Abstract 52. The percentage of physicians who support the need for a rule and who would use such a rule stratified by disease and country

	% support needed for rule; % would use rule		
Country	CHF	CAP	COPD
Overall	65; 93	69; 92	63; 92
Australia	65; 92	73; 92	64; 91
Canada	77; 94	75; 93	75; 93
United States	48; 91	55; 92	45; 90

The median sensitivity for death within 14 days was 97%–98% for all conditions. A walk test is used by 45%, 60% and 64% of Australian, Canadian and US physicians. **Conclusion:** This international survey determined that ED physicians would adopt highly sensitive CDRs for all 3 conditions. This survey supports the development of CDRs to determine the need for hospital admission for ED patients > 50 years with COPD, CHF or CAP. **Keywords:** clinical prediction guide, acute respiratory disorder, survey research

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USE of personal protective equipment in Canadian pediatric emergency departments

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Introduction: This study examined the attitudes, knowledge, self-reported behaviors and perceived barriers to compliance with infection control practices and the use of personal protective equipment (PPE) in Canadian pediatric emergency departments (EDs). **Methods:** A self-administered survey tool consisting of 21 questions was developed and validated de novo for this study. The survey was mailed to all individuals listed on the Pediatric Emergency Research Canada Database of physicians practising pediatric emergency medicine in Canada. **Results:** There were 187 physicians surveyed and 125 (67%) responded. Respondents had a median 9 years of experience (range 0–32 yr) and 50 respondents (41%) had completed a pediatric emergency medicine fellowship. Fifty-four percent reported that they had either never received PPE training or had not been trained in the previous 2 years. Respondents scored a mean of 4.92 out of 11 questions correct (SD 1.66) on knowledge-based questions although 53% reported being very or somewhat comfortable with their knowledge of transmission-based isolation practices. Only 11% reported always or usually wearing a mask when assessing febrile respiratory patients. For scenarios assessing self-reported use of PPE, respondents reported correct PPE use in a mean of 1.01 out of 6 scenarios (SD 0.95). There was no statistically significant correlation between

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knowledge and reported use of PPE ($p = 0.08$). Respondents report they would be more likely to use PPE appropriately if patients were clearly identified prior to physician assessment, equipment was easily accessible, and PPE was made a priority in their ED. **Conclusion:** Knowledge and self reported adherence to recommended infection control practices among Canadian pediatric emergency physicians is suboptimal. Early identification of patients requiring PPE, more convenient access to PPE, and improved education regarding isolation and PPE practices may improve adherence to these important guidelines. **Keywords:** personal protective equipment, infection control, pediatrics

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OCCURRENCE of override among nurses using the Canadian Canadian Triage and Acuity Scale Paediatric Guidelines

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Background: The Canadian Triage and Acuity Scale Paediatric Guidelines (PaedCTAS) is a triage tool that suggests triage level to children visiting an emergency department (ED) based on a brief clinical assessment. Guidelines of the PaedCTAS stipulate that nurses can override the suggested triage level with caution based on clinical judgment. **Objective:** To measure the frequency and reproducibility of override for nurses using a computerized version of the PaedCTAS in a pediatric ED. **Methods:** This was a prospective cohort study among a children visiting a single tertiary care pediatric ED. Recruitment occurred during 40 shifts of 8 hours from June to September 2007. To be included, children had to be initially triaged from level II (emergent) to V (non urgent) on the PaedCTAS by a regular triage nurse using a computerized version of the PaedCTAS (Staturg from Statdev). All participants were triaged a second time by a research nurse immediately after their first triage using the same tool. Both triages were performed blinded to each other. Research nurses were regular ED nurses performing extra hours for research. Final triage levels assigned by the triage and research nurses and those suggested by Staturg were recorded. The two primary outcome measures were the percentage of override and the interrater agreement for these overrides measured by the κ score. **Results:** There were 499 patients recruited to participate in the study. The percentages of overrides were 23.2% (116/499) for the regular triage nurses and 21.8% (109/499) for the research nurses. These overrides were equally distributed among increase and decrease in triage level assigned. The interrater agreement between the nurses for overrides was poor (κ score of 0.319 SD 0.098). **Conclusion:** There was a high prevalence of override among nurses using a computerized version of the PaedCTAS. The interrater agreement between nurses for these overrides was poor. **Keywords:** PaedCTAS, overrides, interobserver agreement

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CHARACTERIZING wheelchair-related falls — identifying risk factors and targets for future intervention

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Introduction: Wheelchair-related falls are an avoidable cause of injury. This study assessed the characteristics of patients injured owing to a fall from a wheelchair, the incidence of significant injuries and need for hospitalization. **Methods:** A formal health records review was performed from January 2002 to March 2006 in a tertiary referral centre. Research ethics approval was obtained. We included patients presenting to the emergency department with a complaint related to a fall from a wheelchair. A single reviewer identified cases and abstracted data into a standardized database. The primary outcome was risk of serious injury (fracture, dislocation, intracranial bleed, death, other life-threatening injury). The secondary outcome was need for hospital admission. Analysis included χ^2 and t tests. **Results:** The analysis included 194 patients; 228 patients were identified using ICD codes. Eighteen patients did not meet inclusion criteria and 16 charts were not found. Patients had a mean age of 64.6 years (range 18–104) and 62.9% were female. Of falls, 31.4% occurred during a wheelchair transfer and 37.6% occurred in a supervised residence. The most common location of injury involved the hip and lower limb (43.3%), and head (34.0%). The most common injury was fractures (38.7%) and soft tissue injuries (30.4%). Seven patients (3.6%) suffered an intracranial bleed and 1 patient (0.5%) died. Overall, 44.3% of patients sustained a serious injury; 24.2% were admitted for a mean hospital length of stay of 23.6 days (range 0–460). There was an increased risk of admission in patients with coronary artery disease ($p = 0.01$), diabetes ($p = 0.03$) and peripheral vascular disease ($p = 0.02$). **Conclusion:** There is a significant risk of serious injury resulting from wheelchair-related falls. Further study and intervention strategies are required in this patient population. **Keywords:** wheelchair-related falls, injury, risk factors

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DIAGNOSTIC accuracy of clinical prediction rules to exclude acute coronary syndrome in the emergency department

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Introduction: To determine the diagnostic accuracy of clinical prediction rules (CPRs) to exclude acute coronary syndrome (ACS) in the ED setting. **Methods:** MEDLINE, EMBASE, Web of Science and the Cochrane Database of Systematic Reviews were searched with the assistance of an expert librarian. Additional studies were identified by searching reference lists and contacting content experts. Articles were selected for review based on the following criteria: 1) enrolment of consecutive ED patients; 2) incorporation of variables from the history or physical examination, electrocardiogram and cardiac biomarkers; 3) stress testing or coronary angiography not incorporated as part of prediction rule; 4) based on original research; 5) prospectively derived or validated; 6) does not require use of a computer; and 7) data available to construct a 2×2 contingency table. Quality assessment and data extraction were performed using a standardized data extraction form. Analyses included descriptive statistics and calculation of diagnostic test performance characteristics with 95% CIs using MetaDiSc software. **Results:** Eight studies met inclusion criteria, encompassing 7937 patients. None of the studies verified the results of the CPR by using a reference standard on all or a random sample of patients. Data were not pooled owing to between-study heterogeneity. Sensitivities and specificities ranged from 94% to 100% and 13% to 57%, and positive and negative LRs from 1.1 to 2.2 and 0.01 to 0.17, respectively. Of the 2 CPRs with reported sensitivities of 100%, the sensitivity of 1 has not been consistently reproduced in the literature, and the other incorporated variables not available in all patients. The upper bound of the 95% CI of the negative LR included 0.1 in all studies. **Conclusion:** Current prediction rules for ACS have substantial methodologic limitations and do not exclude ACS with sufficient certainty to be clinically useful. Future methodologically-sound studies are needed to guide clinical practice. **Keywords:** clinical prediction guide, acute coronary syndromes, systematic review

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COMPARING the predictive validity of memory based triage to a computerized emergency triage tool

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Introduction: Emergency department (ED) triage prioritizes pa-

tients based on urgency of care. A web-based triage tool (eTRIAGE) has been developed using the 5-level Canadian Emergency Department Triage and Acuity Scale (CTAS) templates. Despite research on triage reliability, limited triage validation research has been published. This study examined 2 cohorts: patients triaged with CTAS using a memory-based tool and those triaged with the eTRIAGE program. The predictive validity of the triage scores based on patient outcomes of acuity and resource utilization were examined. **Methods:** In both cohorts, dedicated triage nurses assessed each patient on ED presentation and both were unaware of the study. Each patients triage score, resource utilization (need for specialist consultation, computerized tomography and ED length of stay [LOS]) and acuity (admission to hospital or death in the ED) were collected over two 6-month study periods: January–June 2003 (memory-based triage cohort) and January–June 2004 (eTRIAGE cohort). Using a regional database, the association between the triage scores and each categorical outcome were analyzed through univariate logistic regression models. A univariate ANOVA was used to evaluate the significance of ED LOS variation according to each CTAS score. **Results:** The memory (n = 30 078) and eTRIAGE cohorts (n = 29 447) involved patients with similar ages, sex ratios, mode of arrival and triage score distribution. Compared with CTAS I, the odds ratios for specialist consultation, CT scan, admission to hospital and death were significantly lower in CTAS II, III, IV and V ($p < 0.001$) in both cohorts. The ED LOS showed a significant variation among CTAS scores ($p < 0.001$) in both cohorts. **Conclusion:** Both memory-based triage and eTRIAGE demonstrated excellent predictive validity for resource utilization and patient acuity. CTAS scoring appears to be a valid and consistent method of estimating resource use in EDs and should be included in future ED health economic studies. **Keywords:** computerized triage, memory based triage, CTAS

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USE of prehospital strategies to reduce time to reperfusion for STEMI patients varies widely among Canadian EMS operators

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Introduction: Timely reperfusion therapy for ST-elevation myocardial infarction (STEMI) is an important determinant of outcome, yet time to treatment targets are widely unmet in North America. Prehospital strategies can reduce time to reperfusion; we sought to determine the extent emergency medical services' (EMS) use these strategies in Canada. **Methods:** A cross-sectional survey in 2007 of land EMS operators in British Columbia (BC), Alberta (AB), Ontario (ON), Quebec (QC) and Nova Scotia (NS) focused on the use of 4 prehospital strategies: 1) 12-lead electrocardiogram (ECG), 2) routine expedited emergency department (ED) transfer of STEMI patients (from a referring ED to a percutaneous coronary intervention (PCI) centre), 3) ED bypass (bypass of local EDs to transport directly to a PCI centre); and 4) prehospital fibrinolysis. **Results:** We surveyed 99 ambulance operators (provincial response rate varied from 87.5% in AB to 100% in all others), representing 15 681 paramedics and serving 97% of the combined provincial populations. Of operators, 68% (95% CI 59%–77%) had ambulances equipped with 12-lead ECGs, ranging from 40% in QC to 100% in AB and NS. Overall, 47% (95% CI 46%–48%) of paramedics were trained in ECG acquisition and 40% (95% CI 39%–41%) were trained in ECG interpretation. Only 18% (95% CI 10%–25%) of operators had ED bypass protocols; 45% (95% CI 35%–55%) had protocols for expedited ED transfer. Prehospital fibrinolysis occurred only in AB (50% of respondents). All EMS operators in BC, AB and NS had at least 1 of the 4 prehospital strategies, while one-third of operators in ON and QC had 0 of 4. In major urban centres, at least 1 of 12-lead ECG acquisition, bypass and expedited transfer was available, but there was considerable urban variation in and across provinces. **Conclusion:** There is substantial variation in prehospital STEMI strategies across these provinces. The key role of EMS providers in STEMI care is increasingly recognized, yet access to widely recommended protocols and technologies is not uniform. **Keywords:** prehospital, door-to-balloon times, door-to-needle times

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THE state of EM ultrasonography adoption: a national survey using a novel evaluation tool (ETUDE)

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Introduction: Emergency Medicine Ultrasonography (EMUS) first appeared in the 1980s in North America but the extent of its adoption is unknown. We developed a tool to characterize EMUS adoption and applied it to a national survey of emergency physicians (EPs). **Methods:** We used Rogers Diffusion of Innovations theory to develop a novel Evaluation Tool for Ultrasound skills Development and Education (ETUDE), which assessed level of training, past, current and potential use of EMUS. ETUDE content and weighting was validated by 3 independent experts in EMUS. We defined a series of patterns to categorize respondents into innovators, early adopters, majority and those not interested in EMUS. We applied the tool to a web-based survey of a sample of the Canadian Association of Emergency Physicians membership database using a modified Dillman technique. We used descriptive statistics and correlations to analyze the data. **Results:** The 296 respondents (36.4% of 814 surveyed) had a median age of 40 years and were 72.5% male. EMUS was available to 53.5% of respondents after 2004. EPs adoption scores using ETUDE followed a normal distribution of innovators (18.0%), early adopters (34.5%), majority (28.7%), and those not interested (18.8%). Respondents varied in their level of training in EMUS: 21.0% had no training, 51.3% had introductory training, 21.4% were credentialed and 6.3% had advanced training. Respondents endorsed always using EMUS currently and in the future for FAST (current 41.8%/future 88.4%), first trimester pregnancy (current 23.3%/future 73.7%), suspected AAA (current 32.7%/future 92.6%), cardiac (current 30.7%/future 87.5%) and central venous catheterization (current 17.0%/future 80.3%). **Conclusion:** We developed a novel validated Evaluation Tool for Ultrasound skills Development and Education (ETUDE) and used it to characterize the current state of adoption of EMUS in Canada. ETUDE can be used to evaluate uptake of EMUS over time and to compare adoption in different countries. **Keywords:** ultrasound, educational instruments, survey research

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PREVALENCE and characterization of community-acquired methicillin resistant *Staphylococcus aureus* colonization in high-risk individuals in Toronto

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Introduction: Community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) has emerged as a common pathogen causing skin and soft tissue infections (SSTIs). In many parts of North America CA-MRSA has now replaced methicillin-susceptible *S. aureus* (MSSA) as the primary cause of SSTIs. There are several commonly cited risks for CA-MRSA infection, yet little is known about colonization rates in high-risk individuals. **Methods:** Between Jul. 10 and Aug. 18, 2007, 295 consenting male residents of a Toronto community shelter provided information regarding risk fac-

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tors for MRSA colonization and swabs from their nares, axilla and any visibly open sores. Swabs were enriched and selectively cultured for MRSA and MSSA, which were identified using standard methods. MRSA were typed by SmaI PFGE and SCCmec type and presence of PVL was determined by PCR. **Results:** Overall, 110 (37%) and 12 (4.1%) of residents screened positive for MSSA and MRSA, respectively. MRSA were of 5 distinct types, the largest cluster included 7 residents positive from 11 sites, including a postfrostbite foot infection. This unusually resistant (R; R to clindamycin and fucidin) cluster was closely related to the PVL-positive epidemic community strain, CMRSA-10 (USA-300). Two other residents carried the typical CMRSA-10/USA-300 strain responsible for the surge of CA-MRSA in North America. The remaining 4 MRSA (all PVL-neg) included 2 CMRSA-2 (USA-800) with community-acquired SCCmec-IVa (R to blactams only), 1 CMRSA-2 (USA-100) with SCCmec-II (the common nosocomial strain) and 1 CMRSA-1 (USA-600) also carrying the community SCCmec-IVa cassette. **Conclusion:** The most common isolate of CA-MRSA found in high-risk individuals was an unusually drug resistant variant of the most common strain of CA-MRSA. The implications of colonization with this strain are yet to be determined. **Keywords:** CA-MRSA, SSTIs, colonization rates

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PROLONGED TASER drive stun exposure in humans does not cause worrisome biomarker changes

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Introduction: The TASER (TASER International Inc., Scottsdale, Arizona) electronic control device (ECD) is used to control dangerous behaviour in 2 ways. The primary method is probe deployment. The secondary method is the Drive Stun (DS). This is the first study of the human effects of the DS. ECDs are scrutinized since occasional deaths occur unexpectedly following their use. Some deaths have followed a DS. Cases of custodial sudden deaths occur when no ECD has been used, but a causal relationship is hypothesized. **Methods:** Volunteers underwent 24 hour monitoring. After informed consent, a health history and baseline bloodwork was obtained. Subjects then received either a 15-second or 2 consecutive 5-second DS applications. Applications were to the upper trapezius region using a TASER X-26 ECD. Bloodwork was obtained after exposure and again at 8 and 24 hours after exposure. Samples were analyzed for BUN/creatinine ratio, potassium, CK–MB, lactate and troponin I. **Results:** There were 21 subjects enrolled (98.5% male, mean age 40.3 years, SD 6.8, range 29–55; mean body mass index 28.4, SD 3.5, range 21.1–36.8). Eleven had the single continuous exposure and 10 had the 2 shorter exposures. Repeated measure ANOVA showed no significant change from baseline at the 4 time points or between exposure types for BUN/creatinine ratio (mean value 14.8 µg/L, SD 3.7, range 6.6–23, $p = 0.40$), serum potassium (mean value 4.0 mmol/L, SD 0.4, range 3.0–5.1, $p = 0.26$), or serum CK–MB (mean baseline value 2.45 µg/L, SD 2.89, range 0–20.9, $p = 0.32$). A significant decrease in serum lactate occurred from baseline at the 8-hour time point ($p = 0.005$; baseline mean 1.87 mmol/L 95% CI 1.39–2.35; immediate postexposure mean 1.35 mmol/L 95% CI 1.04–1.65; 8 hour mean 1.06 mmol/L 95% CI 0.92–1.2; 24 hour 1.22 mmol/L 95% CI 1.1–1.4). All troponins were < 0.2 µg/L. **Conclusion:** There were no worrisome changes in the measured serum biomarkers. There was a significant decrease in serum lactate after exposure. This data does not support a causal relationship between ECD DS exposure and worsening physiology. **Keywords:** TASER, electronic control devices, serum biomarkers

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COMPLIANCE with infection control guidelines for central venous catheter insertion in the emergency department

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Introduction: Central venous catheter (CVC) related bloodstream infections are a major cause of morbidity and mortality. This study determined the compliance rate with infection control guidelines for CVC insertion in the ED. **Methods:** A prospective observational cohort study was performed between November 2006 and March 2007 in a tertiary ED referral centre. Ethics approval was obtained. A standardized data collection form was completed by nurses assisting with the procedure. The primary outcome was the rate of compliance with current best practice infection control guidelines for CVC insertion. Analysis included descriptive statistics and χ^2 tests. **Results:** There were 33 CVC insertions performed on 29 patients. CVC insertions were performed by staff physicians (30.3%) or residents (69.7%) from emergency medicine (45.5%), intensive care (45.5%) or medicine (9.0%). Of insertions, 42.4% were emergent and 54.5% of insertions were urgent. Ultrasound was used 42.4% of the time. The femoral vein, internal jugular vein and the subclavian vein were used in 45.5%, 33.3% and 21.2% of the cases, respectively. The femoral vein was more likely to be used in emergent insertions (71.4%; $p = 0.01$). All recommended infection control measures were used only 29.0% of the time, but only 15.4% of the time by emergency medicine personnel ($p = 0.05$). The most common breaches were failure to cover the patient with a sterile gown (36%), to maintain a sterile field (15%), to use a sterile drape (12.1%) or to wear a cap (12.1%). Hand hygiene was performed before the procedure by 58% of operators and 57% of assistants. A mask was not worn in 6% of cases. There were no statistical differences in compliance with infection control between staff and residents, urgency of the procedure or time of day. **Conclusion:** There is poor compliance with infection control guidelines for CVC insertion in the ED. Further educational strategies are required to improve compliance with guidelines. **Keywords:** infection control, central venous catheter, compliance

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IS the combination of vasopressin and epinephrine superior to epinephrine alone in the treatment of cardiac arrest? A systematic review

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Introduction: No evidence supports vasopressin (VASO) over epinephrine (EPI) in cardiac arrest; however, animal and some clinical studies support the concurrent use of VASO and EPI together. This systematic review compares the efficacy of VASO and EPI used together versus repeated doses of EPI alone in cardiac arrest. **Methods:** For this systematic review, we searched MEDLINE, EMBASE and Cochrane Central Register of Controlled Trials. We included randomized controlled trials (RCTs) where VASO and EPI were administered concurrently to cardiac arrest patients within the half life of VASO (6 min). Two reviewers assessed studies for eligibility, data extraction and quality. κ statistics measured interrater agreement. Appropriateness of studies for meta-analysis was assessed. The primary outcome was return of spontaneous circulation (ROSC) and the secondary outcome was survival to hospital discharge. Relative risk was obtained of each outcome. **Results:** From 235 titles identified, we reviewed 29 abstracts. Twenty-three were excluded (wrong outcomes, not RCTs, not both EPI and VASO, or unobtainable data). Three cardiac arrest studies were included. Study 1 randomized VASO versus EPI then subsequent EPI. Study 2 randomized

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2 doses of VASO versus EPI. Study 3 randomized VASO versus placebo, administered a mean 4.6 minutes following initial EPI. κ for included studies and quality were both 1.0. All studies favored combination treatment for ROSC, but only study 2 was statistically significant: RR 1.1, 95% CI 0.82–1.46, RR 1.42, 95% CI 1.14–1.77, and RR 1.02, 95% CI 0.74–1.42, respectively. Studies 1 and 2 reported survival to discharge, with RRs of 0.88, 95% CI 0.26–2.92, and 3.69, 95% CI 1.52–8.95, respectively. The methods for the 3 studies were too dissimilar to allow pooling of results. **Conclusion:** This systematic review of the combination of VASO and EPI found trends towards better ROSC but equivocal effects on survival. There is a need for RCTs to evaluate the simultaneous use of VASO and EPI in cardiac arrest. **Keywords:** vasopressors, cardiac arrest, systematic review

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RESOURCE utilization by the very elderly in the emergency department

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Introduction: Several tools for measuring patient load in emergency departments have defined age as a key determinant of resource utilization (RU). However, the elderly are not a homogenous group and those over the age of 85 might represent a subgroup of patients that require even greater resource utilization. The objective of this study is to compare RU in the younger seniors (YS 65–84) and the very elderly (VE greater and equal to 85). **Methods:** The data from an Oracle database from April 2003 to December 2007 of a university teaching, tertiary adult emergency department was analyzed using Excel. The age cohorts for this analysis were patients from 65 to 84 years old (YS) and those above 85 years old (VE). Indices of RU included length of stay, admission rate, consultation requests, imaging and the need for isolation. **Results:** Of the 304 599 visits analyzed retrospectively, the VE accounted for 7% of all visits while the YS accounted for 22%. RU by the VE is consistently higher than that of YS in the following ways: triaged as a code 1; RR of 1.81 (with 95% CI 1.66–1.96), LOS 18.6 verus 12.8; $p < 0.001$, accounting for 14% and 33% of all patient hours, and the rates of hospitalizations was 37% and 25% of each cohort. The RU is also reflected by the patients with a LOS over 48 hours: RR of 2.12 (with 95% CI 2.06–2.18); LOS over 60 hours: RR of 2.31 (with 95% CI 2.23–2.39), requiring consultation; RR of 1.32 (with 95% CI 1.30–1.34), requiring advanced imaging; RR of 1.20 (with 95% CI 1.17–1.23), preventive isolation; RR of 1.98 (with 95% CI 1.90-2.06) and the admission rate of 37% versus 25%; $p < 0.001$, with hospitalization from the ED; RR of 1.49 (with 95% CI 1.47–1.51). **Conclusion:** We report that the very elderly above the age of 85 year old are a clear distinct group within the elderly cohort in patient load and resource utilization in an adult tertiary emergency department. This could be reflected in increased resource allocation and physician billing agreements. **Keywords:** resource utilization, ED crowding, very elderly

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IMPROVING care of subacute patients in the emergency department: the Kaizen approach

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Introduction: Kaizan (Japanese for continuous improvement) is a methodology used in the workplace for applying rapid process improvement. A Kaizen was held to address the care of patients triaged to the subacute area of the emergency department (ED). The purpose of this study was to evaluate if the implementation of a new process in the subacute area decreases length of stay for these patients. **Methods:** Members of North York General Hospital ED participated in a 1-week Kaizen event to address care of patients triaged to the subacute area. The process involved analyzing all aspects of care for these patients from registration to discharge. As a result, a rapid assessment zone was created utilizing 5 existing rooms in the subacute zone of the ED and an adjacent waiting area. Patients were placed in rooms only for assessments or specific treatments by the physician and/or nurses. A treatment area with reclining chairs was established for patients requiring ongoing treatments. Utilizing the ED information system, we prospectively evaluated all patients triaged to the subacute area for 120 days after implementation comparing this retrospectively to patients triaged to the subacute area in the 120 days prior. Primary endpoints included length of stay (LOS) of patients, time to be seen by a physician (time to MD) and patients leaving without being seen by a physician (LWBS). **Results:** Prior to the implementation, 5203 patients were seen in the subacute area with an average LOS of 9.3 hours, compared with 7102 patients (36.5% increase) after implementation with an average LOS of 6.1 hours (34.4% decrease). The time to MD was 2.9 hours before and 2.6 hours (10.3% decrease) after with 1333 patients LWBS before and 1237 patients LWBS (7.2% decrease) after implementation of the rapid assessment zone. **Conclusion:** Implementing a rapid assessment zone in the subacute area of the ED using Kaizen methodology has significantly decreased LOS of these patients. **Keywords:** rapid assessment zone, quality improvement, fast track

Winner of the CAEP Resident Research Abstract Award

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CEREBRAL infarct volumes on diffusion weighted imaging are related with cardiac biomarkers, stroke subtypes and functional outcome in patients with acute ischemic stroke.

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Objective: To determine whether cerebral infarct volumes on diffusion weighted imaging are related with cardiac biomarkers, stroke subtypes and functional outcomes in patients with acute ischemic stroke (AIS). **Methods:** This was a cohort study done in a tertiary care academic center with patients presenting with AIS within 24 hours of symptoms and brain MRI within index hospitalization (December 2001 to March 2004). We measure total volume of the infarct by an algorithmic approach incorporating and adding effective mapped out areas on all MR slices depicting the infarct. Stroke subtype was categorized with TOAST. Serum troponin was measured at admission. Stroke severity was determined using the National Institutes of Health Stroke Scale (NIHSS). Functional outcome was assessed with modified Rankin score (mRs) at hospital discharge (good 0–3 and poor outcome 4–6). **Results:** Of 217 patients, the mean age was 70.8 (SD 13.9) years and 116 (53.5%) were males. A total of 58 had large vessel disease, 61 cardioembolic, 30 small vessel, 11 other causes, 16 multiple causes, 32 no cause, 9 insufficient information. The mean NIHSS was 5.8 (median 4, SD 5.2). Patients with large vessel disease or cardioembolic cause had a significantly larger MRI volume than patients with small vessel (both $p < 0.001$), or no cause identified ($p = 0.029$ and 0.064). Patients with an elevated troponin were more likely to have a larger volume of infarct. In a regression model the association between elevated troponin (yes/no) and MRI volume yielded an OR 1.2 (95% CI 1.03–1.5, $p = 0.025$). After adjusting for age and NIHSS, larger MRI volume was a predictor of poor Rankin (OR 1.3, 95% CI 1.1–1.6, $p = 0.013$).

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This represents a 30% increase in risk of poor outcome per a doubling in MRI volume. **Conclusion:** Stroke subtype predicts ultimate volume of infarct on MRI. An elevated troponin appears to be associated with a larger volume of infarct. Larger infarct volume on initial MRI scan is associated with a poor functional outcome at hospital discharge. **Keywords:** cerebral infarct volumes, acute ischemic stroke, troponin

Winner of the CAEP Resident Research Abstract Award

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OUTCOME of children treated with prochlorperazine for migraines in a pediatric emergency department

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Introduction: In an RCT, prochlorperazine has been demonstrated to relieve pain in children with migraines. However, the International Headache Society Clinical Trial Subcommittee also suggests evaluating other outcomes that are meaningful to patients, such as the need for further rescue medication or symptoms recurrence. **Objective:** To evaluate the rate of treatment failure associated with intravenous prochlorperazine used in the treatment of children with severe migraines in a pediatric emergency department. **Methods:** This study was a retrospective chart review of patients less than 18 years of age that visited the ED of a tertiary care pediatric hospital between November 2005 and June 2007. All patients diagnosed with a migraine by the emergency physicians were included in the study. All charts were evaluated by a data abstractor blinded to the study hypothesis using a standardized datasheet. Interrater agreement was measured between the data abstractor and the primary investigator after formal training. Prochlorperazine treatment failure was defined as either an administration of further rescue therapy, a hospitalization or a return visit to the ED within 48 hours for either symptoms recurrence or side effects from the medication. **Results:** There were 286 episodes of migraine in patients who presented to the ED during the 20 month period. Prochlorperazine was administered in 99 episodes of migraine at a mean dose of 0.14 mg/kg (SD 0.02) all received diphenhydramine in adjunction in order to prevent akathisia. A total of 15 (15%) of these patients had a treatment failure according to our definition: 8 patients received further rescue therapy after the administration of prochlorperazine, 6 patients were hospitalized, including 3 who received further rescue therapy, and 4 patients returned to the ED within 48 hours owing to symptom recurrence. **Conclusion:** There appears to be a treatment failure rate of 15% with the use of prochlorperazine for severe migraines in children seen in a pediatric ED. **Keywords:** prochlorperazine, pediatric migraine, treatment failure

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PRACTICE variation over 10 years in the treatment of migraines in children seen in a pediatric emergency department

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Introduction: Several important recommendations on the management of migraine in children were published in the past 10 years. The integration of this new knowledge into clinical practice in a pediatric emergency department (ED) is not known. **Objective:** To analyze changes that occurred in the management of migraines in children treated in a pediatric ED from 1996/97 to 2006/07. **Methods:** This study was a comparative retrospective chart review of children diagnosed with migraine in the ED of a tertiary care pediatric hospital. Patients that had a final diagnosis of migraine were eligible. The 2 study periods were from April 1996 to March 1997 and from April 2006 to March 2007. All identified charts were evaluated by a data abstractor blinded to the study hypothesis using a standardized datasheet. Interrater agreement was measured between the data abstractor and 1 of the investigators. Medications used at home, in the ED and upon discharge were evaluated. **Results:** There were 144 visits to the ED for migraine in the first study period compared to 182 visits in the second one. The absence of treatment at home before the ED visit was more frequent in 1996/97 compared to 2006/07: 69/144 (48%) v. 45/182 (25%) D; 23% (95% CI 12–33), respectively. More patients were not treated in the ED in 1996–97 compared to 10 years later: 101/144 (70%) v. 91/182 (50%), D; 20% (95% CI 9–30). Patient pain was less documented in the charts in 1996/97 compared to 2006/07: 2/144 (1%) v. 131/182 (72%), D; –71% (95% CI –77 to –63). Finally, more patients were sent home without a prescription in 1996–97 compared to 10 years later: 67/144 (46%) v. 29/182 (16%), D; 30% (95% CI 20–40). The type of medications used at home, in the ED and upon discharge also differed. **Conclusion:** Many changes occurred in the management of migraine headaches from 1996–97 to 2006–07 in our pediatric ED. It appears that changes in management reflect the evolution of recommendations published in the literature as well as the protocol for migraine treatment proposed in our ED. **Keywords:** pediatric migraine, practice variation, medical records review

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MARKERS of overcrowding in a pediatric emergency department

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Introduction: Research on the possible effects of emergency department (ED) overcrowding in childrens hospitals is hampered by the lack of a standardized definition or measure of overcrowding in this setting. The objective of this study was to identify possible markers of overcrowding according to expert opinion and to use statistical methods to extract the more relevant measures. **Methods:** A survey of all pediatric ED directors (12) and fellowship program directors (10) across Canada was conducted to elicit expert opinion on relevant markers. The list of markers was reduced to those specific to the ED for which data could be collected using a computerized patient tracking system. Data representing 2190 consecutive shifts and 138 361 patient visits between April 2005 and March 2007 were collected retrospectively from one tertiary care pediatric ED. An analytic procedure (Principal Component Analysis [PCA]) was then used to reduce the data and determine the linear combination of markers that best represented the complete data set. **Results:** The survey had a response rate of 95% and provided measures of patient volume (35%), ED operational processes (46%) and delays in transferring admitted patients to inpatient beds (12%). After discarding redundant markers (correlation coefficient > 0.80), data collected on 29 markers was retained for the PCA. The results of the PCA indicated that the largest portion of variation in the data (25%) was accounted for by markers describing patient flow through the ED. The maximum remaining variability (12%) was explained by patient volume measures. Measures of admission delays only accounted for a relatively small proportion of variability (4%). **Conclusion:** The results suggest that for pediatric EDs, markers of ED operational processes and patient volume may be more relevant than measures reflecting delays in transferring patients to inpatient beds. This study provides a foundation for further research on measures of overcrowding specific to the pediatric setting. **Keywords:** ED crowding, pediatric emergency department, survey research

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A qualitative study of barriers and supports to implementation of metered-dose inhaler (MDI)/spacer use in Canadian pediatric emergency departments

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Introduction: We aim to determine the barriers and supports to implementing MDI/spacer instead of nebulizers for the provision of β-agonist medications to treat mild-to-moderate acute asthma, and to identify factors associated with early and late adoption of MDI/spacers in Canadian pediatric EDs. **Methods:** A case study design was used. Sites were classified as late adopters, adopting or early adopters (3 sites each) according to their stage of implementation based on the results of a recent survey. Data at each site were collected using focus group interviews with physicians, nurses and respiratory therapists, and individual interviews with both patient care and medical directors. Data collection and analysis proceeded concurrently using the constant comparative approach, with initial coding being based on the Ottawa Model of Research Use categories of elements known to influence the uptake of innovations. **Results:** Key facilitators to adoption of MDI/spacer were the presence of a research champion, nurse buy in, and a well-coordinated roll-out of the practice change. Frequently mentioned barriers to MDI/spacer adoption included a perceived cost increase associated with MDI/spacer use, lack of a research champion, perceived increase in workload and little perceived benefit compared to the use of a nebulizer. Late adopter sites were more likely to lack someone willing to champion the adoption of MDI/spacer use and were more likely to cite the higher costs of MDI/spacer use as a reason for not adopting this practice. Early adopter sites were more likely to have participated in research involving MDI/spacer use and more likely to have the MDI/spacer included in a protocol/pathway. **Conclusion:** Lack of leadership in the form of a research champion along with perceived increased cost associated with MDI/spacer use were the biggest barriers to the adoption of the MDI/spacer. Future interventions intended to increase MDI/spacer use in pediatric EDs will need to address these barriers. **Keywords:** metered dose inhalers, implementation barriers, qualitative research

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DISTRIBUTION of chief complaints using the Canadian emergency department information systems chief complaint list

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Introduction: The Canadian Emergency Department Information System (CEDIS) chief complaint (CC) codes were introduced in 2002 and linked to the updated Canadian Emergency Department Triage and Acuity Scale (CTAS) in 2005. The CC list was developed with the aim of balancing granularity (detail) with practicality, however, its performance in the emergency department (ED) has not been examined. This study's objective was to examine the distribution of CCs, which could assist in guiding further refinement of the list. **Methods:** Retrospective analysis of the ED administrative database of CC codes was performed. Data was entered by triage nurses during the triage process. The study population consisted of adult patients presenting to a tertiary care, level 3 trauma hospital ED. **Results:** The CCs of 111 143 visits from April 2006 until December 2007 were analyzed. Of the 170 CCs in the list, 168 CCs were used at least once. The CCs Abdominal Pain, Chest pain with cardiac features, Shortness of breath and Lower extremity pain were used in 24% of the visits. There were 156 CCs with less than 2% of the visits and 142 CCs with less than 1%. Overall, 33% ($n = 57$) of CCs covered together less than 1% of all the visits. Furthermore, 39 different CCs (23% of all CCs) were used in 80% of the visits. **Conclusion:** Our results indicate that the majority of ED patients visits could be classified using a reduced number of CCs since about one-third of the CCs remained largely unused. Further analysis of this list in multiple settings (including pediatric and trauma) should be performed to determine if the list can be modified to simplify its usage while maintaining the quality of the information gathered. **Keywords:** chief complaint list, CEDIS, administrative database

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EMERGENCY medicine residency competency assessment — a national survey

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Introduction: The Canadian College of Family Physicians offers a 1-year fellowship in emergency medicine (EM) that certifies physicians to practice EM in Canada. Currently, no method exists to confirm that CCFP(EM) residents graduate with the clinical skills and confidence required for the challenges of EM practice. This study aimed to assess the effectiveness of current CCFP(EM) programs by assessing the confidence and self-perceived competence of residents. **Methods:** In July 2007, 160 surveys were distributed to CCFP(EM) programs using a modified Dillman methodology. The 20-question survey employed 5-point Likert scales to assess self-perception of knowledge and confidence in 2 key educational domains: clinical skills and nonclinical, managerial skills. Survey questions were based on national residency Core Competency Guidelines. The responses were calculated and compared with parametric (Student's t test) and nonparametric (Mann–Whitney) tests. **Results:** A representative sample was obtained: 52 of 72 (72.2%) outgoing residents, and 68 of 88 (77.3%) incoming residents. Statistically significant ($p < 0.05$) improvements was noted in virtually all clinical and nonclinical domains across all CCFP(EM) programs. However, outgoing residents showed no significant improvement in ability to manage paediatric dermatology cases or management of ethical problems. As well, there was a statistically significant difference in residents comfort level with clinical skills as compared to nonclinical, managerial skills. **Conclusion:** This is the first study to demonstrate that CCFP(EM) residency programs successfully teach virtually all clinical domains outlined in the Core Competency Guidelines. Confidence and perceived competence is lower in paediatric dermatology and ethics. As well, residents are graduating with only an average level of comfort in higher-level, nonclinical managerial skills. These areas constitute important components of EM practice where educational tools can be developed to improve training in these areas. **Keywords:** competency assessment, postgraduate training, survey research

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WHAT are the professional development priorities of emergency physicians: a pilot survey

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Introduction: This study sought to determine the professional development priorities (PDPs) of emergency physicians (EPs) using a competency-based framework. **Methods:** After obtaining institutional ethics approval and informed consent, an electronic survey was distributed to all practicing EPs at 2 university academic centres

using a modified Dillman method. Three representative topics addressing each of the CanMEDS Roles (Medical Expert, Communicator, Collaborator, Manager, Health Advocate, Scholar, and Professional) were assessed using a 7-point Likert scale. **Results:** Of 54 EPs, 37 (68.5%) responded. All were board certified (59.5% CCFP[EM]). The representative topics for Medical Expert, Manager and Scholar were identified by more than 40% of EPs as high, very high or top PDPs. Topics selected as high, very high or top PDPs included keeping up to date with the literature (94.2%), interpretation of diagnostic tests (65.7%), procedural skills (40%), billing strategies (40.0%), new information technology tools (51.4%), bedside teaching of learners (45.7%), and feedback and assessment of learners (47.1%). When asked to select their top 3 PDPs, topics not selected or only selected by a single respondent included communication skills with patients and families, charting, teamwork skills, conflict resolution skills, advocacy skills for patients, health promotion in emergency populations and ability to handle ethical conflicts. **Conclusion:** To maintain clinical competence, the self-reported PDPs of EPs are focused upon the Medical Expert, Manager and Scholar roles. Faculty development and continuing medical education initiatives may benefit from addressing these needs. However, further research is required to determine why the Communicator, Collaborator, Health Advocate and Professional roles were poorly self-identified. The data does not infer whether these non-PDP topics were rated poorly because of presumed competence in the role or because these roles are not acknowledge by EPs as important for competent clinical practice. **Keywords:** CME, continuing professional development, needs assessment, CanMEDS

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DOES the ability of ED clinicians to speak limited Portuguese enhance communication with the Portuguese-speaking patient? The design and pilot of a translation aid

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Introduction: To design and pilot an instrument to facilitate history taking with Portuguese-speaking patients in the ED. **Methods:** An instrument was designed to facilitate history taking with Portuguese-speaking patients (PSPs). A pocket-sized document incorporated bilingual, problem-oriented, closed-ended questions for common ED presentations as well as numbers, measurements of time and anatomy. An accompanying audio CD demonstrated correct pronunciation of each phrase. A 3-month pilot was undertaken in a downtown teaching hospital on a convenience sample of PSPs who indicated the need for a translator at triage. A trained Portuguese-speaking observer monitored clinician–patient pairs using the instrument and scored differential patient comprehension in a standardized manner. Qualitative patient and clinician impressions were assessed. A follow-up survey assessed EP impressions of the instrument. **Results:** Eight of the 9 eligible clinician–patient pairs were enrolled. The average proportions of questions answered appropriately in English and then using the instrument were 16.7% and 85.5% respectively ($p = 0.001$), with mean improvement of 68.8% (95% CI 45.6–92.1). 87.5% ($n = 7$) agreed that the instrument had helped in communication. Fifty percent of clinicians ($n = 4$) indicated that the tool had helped them communicate, and 87.5% ($n = 7$) indicated that they would use the instrument in the future. Only 12% (2/17) of physicians utilized the audio guide. Suggested modifications included incorporation of phonetics. **Conclusion:** Pilot of the instrument was well received by patients and resulted in improved communication. Physician adoption of the audio CD was suboptimal and likely limited usefulness of the instrument. **Keywords:** multiculturalism, language translation, translation aid

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DOES duration of fever affect the likelihood of a positive urinalysis in febrile children age 3–36 months?

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Introduction: The optimal time to screen for a UTI in children with fever without source (FWS) is unknown. **Objective:** To determine the proportion of children with a positive bag urinalysis with duration of fever of < 1, 2, 3, 4 and > 5 days. **Methods:** Prospective cohort study of infants and children 3–36 months of age presenting to a tertiary care emergency department with FWS. Patients with antibiotic use in the past 2 weeks, a history of renal pathology, recurrent UTI, immunocompromised state or proceeding directly to catheterization were excluded. Bag specimens were collected for urinalysis after perineal cleaning. A positive urinalysis was defined as a dipstick positive for leukocyte esterase or nitrites or > 5 white blood cells per high power field on a centrifuged urine. The primary outcome was the proportion of positive urinalyses on each day of fever. We also determined the proportion of positive catheter urine cultures on those infants with a positive bag urinalysis. **Results:** Eight hundred eighteen infants and children were enrolled in the study. The proportion of children with a positive bag urinalysis if the fever was < 2 days was 14.6% versus 23.2% if the fever was > 3 days, $p = 0.002$ (RR 1.59, 95% CI 1.2–2.1). Results were not affected by age, sex, white race or circumcision status. Temperatures on each day were similar with a median temperature varying between 39.0°C and 39.3°C. The proportion of positive catheter cultures done on infants with a positive bag urinalysis increased nonsignificantly over time: lowest on day 1 (44%, $n = 11/25$) and highest on day 4 (62.5%, 10/16). **Conclusion:** The proportion of positive bag urinalyses increased significantly with longer duration of fever in children 3–36 months of age. In order to increase the usefulness of the screening urinalysis in nontoxic appearing infants consideration of duration of fever (> 3 d of fever) may significantly increase detection of a true UTI. Early testing (< 2 d) may have the potential to miss a significant number of urinary tract infections. **Keywords:** fever, urinalysis, pediatrics

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MANAGEMENT of acute exacerbations of chronic obstructive pulmonary disease (COPD) in emergency departments in British Columbia

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Objective: Exacerbation of COPD is a common reason for emergency department (ED) visits in Canada and there is considerable practice variability. The objective of this study was to describe specific performance measures in the management of COPD in 48 EDs across British Columbia. **Methods:** Twenty-two performance indicators for COPD emergency department care were identified by a panel of experts. Four broad areas were included patient history (e.g., number of COPD-related ED visits in past 2 years), patient physical exam (e.g., oxygen saturation level at triage), process measures (e.g., proportion of patients prescribed oral corticosteroids on discharge) and outcome measures (e.g., referred for COPD education). Fourteen data abstractors were given standardized training and were blinded to study hypotheses. Adherence to 22 performance indicators was measured using standardized data abstraction forms. Random sampling of hospitals (stratified by health region) lead to 1452 patient charts from 48 hospitals being assessed. **Results:** Of 1452 patient visits audited, the median ED length of stay was 3 hours and 18 minutes (interquartile range [IQR] 1 hour

51 minutes to 5 hours 3 minutes). Oxygen saturation was documented for 97.6% of patient visits (95% CI 96.8%–98.4%) and respiratory rate was documented for 98% of patient visits (95% CI 97.3%–98.7%). When stratified by number of ED visits per year, prescription for oral corticosteroids ranged from 55% to 100% of patient visits ($p < 0.01$) and for antibiotics in 54% to 86% of patient visits ($p < 0.05$). **Conclusion:** There is considerable variability in the care of patients with acute exacerbations of COPD in emergency departments in British Columbia. Various knowledge translation and implementation strategies should be utilized to improve care for COPD patients in the emergency department. **Keywords:** COPD exacerbations, performance indicators, knowledge translation

Winner of the CAEP Resident Research Abstract Award

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SAFETY of prehospital nitroglycerin use in suspected ischemic chest pain

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Introduction: Current guidelines from the American Heart Association recommend that sublingual nitroglycerin (NTG) should not be administered to patients with ischemic chest pain and pulse rates > 100 beats/min. We sought to determine if patients treated according to our regional prehospital ischemic chest pain protocol with pulse rates > 100 beats/min were at greater risk of adverse events than patients with pulse rates ≤ 100 beats/min. **Methods:** A retrospective analysis of data abstracted from ambulance call records from Jan. 1, 2005, to Apr. 30, 2005, was performed. All patients experiencing suspected ischemic chest pain who were treated with NTG were included in the study. The primary outcome of interest was the difference in systolic blood pressure (SBP) drops experienced by tachycardic (> 100 beats/min) and nontachycardic patients after NTG administration. Secondary outcomes included the rate of significant drops in SBP (> 25% drop from the initial value) and the rate of significant hypotension (SBP < 90 mm Hg). **Results:** There were 467 patients identified who met the inclusion criteria during the study period; 94 (20%) of these were tachycardic (HR > 100 beats/min). The mean drop in SBP after NTG was 6.9 mm Hg greater in the tachycardic group than in the nontachycardic group ($p < 0.01$). Tachycardic patients were more likely to experience a significant drop in SBP (RR 2.27 95% CI 1.28–4.01). Tachycardic patients were also more likely to experience significant hypotension, but this relationship failed to reach statistical significance (RR 2.65, 95% CI 0.45–15.60). No occurrences of serious adverse cardiac events (e.g., death, dysrhythmia) were noted in either group. **Conclusion:** Caution is warranted when administering NTG in a prehospital setting for suspected ischemic chest pain in patients with heart rates > 100 beats/min due to a higher risk of significant drops in systolic blood pressure. Further study is needed to determine if this risk is associated with adverse clinical outcomes. **Keywords:** prehospital, nitroglycerin, patient safety

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FREQUENCY and outcomes of syncope in the emergency department

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Introduction: Syncope is a common presenting complaint in the ED, consumes substantial health care resources and has little evidence to guide optimal care. The aim of this study was to evaluate the frequency, management and outcomes of ED syncope patients. **Methods:** In this health records review we screened consecutive patient visits to a large tertiary care ED over a 13-month period. We included adults with a primary complaint of syncope (sudden transient loss of consciousness with complete recovery). We excluded patients with ongoing altered mental status, alcohol/illicit drug use, seizure, head and severe trauma. We extracted characteristics, ED management, disposition and serious outcomes. A 30-day follow-up at all local adult hospitals and chief coroner's office for outcomes was done. We conducted descriptive analyses with 95% CIs. **Results:** Of the 721 visits screened, 357 patients (361 visits) were included with these characteristics: mean age 58.9 years (range 17–96), 50.9% males, past syncope 41%, heart disease 32.1% and arrival by ambulance 68.4%. 96.1% were investigated (EKG 93.1%, CT head 24.9%) and 13% (95%CI 9.5%–16.5%) were admitted. Most common final diagnoses were syncope NYD 57.6%, vasovagal syncope 25.2% and cardiac syncope 4.9%. Of patients, 4.7% had return ED visits within 30 days. Overall 9.9% had 1 of the composite outcomes, including death 0.5%, myocardial infarction 0.3%, arrhythmia 4.7%, pulmonary embolism 0.6%, major bleeding 1.4%, procedural intervention to treat cause of syncope 5.5% (mostly pacer insertion 3.9%) condition causing/likely to cause return ED visit 0.6% and hospitalization for a related event 0.3%. Of the outcomes, 38.9% occurred after discharge from ED. **Conclusion:** This is the first study to evaluate ED syncope in Canada. Admission rates were much lower than in US studies. A significant proportion of patients suffer adverse outcomes after discharge and there is a need for an accurate clinical decision rule to guide admission for syncope patients. **Keywords:** syncope, admission rates, prognosis

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EXTERNAL validation of the San Francisco Syncope Rule (SFSR) in the Canadian setting

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Introduction: Syncope is a common presenting complaint in the ED and poses a large challenge to emergency physicians (EPs). The aim of this study was to evaluate the performance of the SFSR in Canadian setting. **Methods:** Over an 18-month period, consecutive patient visits to a large tertiary care ED were screened in a health records review. Adults with syncope (sudden transient loss of consciousness with complete recovery) as primary complaint were included. We excluded patients with ongoing altered mental status, alcohol/illicit drug use, seizure, head and severe trauma. Patient characteristics, SFSR variables and outcomes were extracted. A 30-day follow-up for outcomes was done at all local adult hospitals and coroner's office. All outcomes were confirmed by another EP. We calculated predictive parameters for the rule with 95% CIs. **Results:** Of 907 visits screened, 436 patients were included (50.8% males, mean age 58.2 years, range 16–101). Of patients, 62.4% had at least 1 abnormal SFSR variable (congestive heart failure 6.0%, shortness of breath 10.2%, triage systolic BP < 90 4.9%, hematocrit < 0.3 2.7%, abnormal EKG 55.3%); 9.8% sustained adverse outcomes (death 0.4%, myocardial infarction 0.2%, arrhythmia 4.0%, pulmonary embolism 0.4%, significant bleeding 1.3%, procedural intervention to treat etiology of syncope 4.4%, condition causing return ED visit 0.7% and hospitalization for related event 0.7%); 12.7% were admitted; 43.1% had outcomes after ED discharge. Sensitivity and specificity of the SFSR were 90.5% and 40.2% (95% CI 78.5%–96.2% and 39%–40.8%). Missed cases were 1 pneumothorax and 3 cases needing pacers with normal EKG but ED monitor abnormalities. Inclusion of monitor abnormalities in SFSR EKG variable would improve sensitivity to 97.6% (95% CI 88%–99.6%). **Conclusion:** This is the first Canadian study to evaluate the SFSR and found the sensitivity and specificity lower than previously reported. Further research should attempt to refine the SFSR to improve sensitivity and specificity. **Keywords:** San Francisco Syncope Rule, validation, clinical prediction guide

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INTERRATER agreement of CTAS triage scores assigned by base hospital and ED nurses

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Introduction: Chaudière-Appalaches is the first regional healthcare system in the province of Quebec where a base hospital has been set up. One of its intended uses is to streamline processes and assign an ED stretcher in advance to patients coming in by ambulance. This study aimed at measuring the agreement between the triage score attributed by base hospital nurses and the scoring of ED nurses triaging the same patient on arrival, both using the Canadian Emergency Department Triage and Acuity Scale (CTAS). **Methods:** A prospective study design was used in our academic urban emergency department with a census of 50 000 visits annually. A CTAS score was assigned by the base hospital nurse from the data transmitted by EMS ($n = 100$). On arrival, the same patient got triaged again by the ED triage nurse, blinded to the first score. The agreement between base hospital and ED nurses triage was measured using the κ statistic. **Results:** The weighted agreement between base hospital and ED nurses triage was poor, the κ being 0.3564 (95% CI 0.243–0.470). The score assigned on arrival to the ED was the same in 49% of the cases, lower in 39% and higher in 12%. **Conclusion:** The low interrater agreement obtained supports our own previous data showing poor agreement between experienced nurses triaging from standardized written scenarios. These results might reflect the dynamic condition of the patient, differences in users or differences in application of CTAS among users. These results might even question the validity of the CTAS scale, which has not been supported by high-quality evidence and they warrant caution before implementing triage by base hospital nurses. Further exploration and research are also warranted to determine if computerized triage can allow better treatment of signs and symptoms of presenting patients and more reliable CTAS scores. **Keywords:** CTAS, interobserver agreement, computerized triage

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DROWNING and the influence of hot weather: a case-crossover analysis

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Introduction: Drowning is the leading cause of death through injury for recreational activities. Public perception often regards cold, stormy weather as a risk factor. We analyzed how weather was a risk factor for drowning deaths. **Methods:** We reviewed all drowning deaths in Ontario from 1999 to 2004 (6 years) by linking Coroner records with National Climate Archives. We excluded intentional deaths (e.g., suicide and homicide). A case-crossover analysis used a self-matching design to control for multiple confounders including public safety campaigns, seasonal recreational activities, local alcohol sales and population demographics. The interval period was 1 week prior to the time of death. Indoor drowning deaths were separated from outdoor drowning deaths to serve as a control group for the effect of weather. **Results:** There were 717 drowning deaths. Linked records were possible for 635 cases, which were then analyzed. The average age was 38.7 years (range 0.5–97 years, SD 22.6). Males accounted for 82% of drowning deaths. Alcohol consumption was considered to be a factor in 45.7% of cases. Personal flotation devices were worn in only 3.9% of cases; in 13.6% of cases they were present but not worn. Cardiac disease was a contributing factor in 7.9% of cases, epilepsy in 6.8% of cases. Of drowning deaths, 87.8% occurred outdoors. The risk of drowning death tripled on days when the maximum temperature exceeded 30°C (86°F) (OR 3.04, 95%CI 1.48–6.24, $p = 0.004$). For indoor drowning deaths, there was no significant association with hot weather ($p = 0.157$). **Conclusion:** Hot weather is associated with three times the risk of death by drowning outdoors. Many drowning deaths are associated with alcohol consumption and lack of protective equipment. An awareness of these findings might promote future injury prevention strategies. **Keywords:** drowning, environmental emergencies, injury prevention

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BACTERIAL infection and drug resistant patterns in sputum of ambulatory COPD patients

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Objective: There are debates regarding the utility of sputum samples for patients with COPD exacerbations. This study examined the sputum cultures collected from COPD patients enrolled in a clinical trial and describes the microbiological profile of these samples, the sensitivities and the effect of culture on outcomes. **Methods:** A sputum collection protocol was followed by research staff in 159 enrolled subjects with acute COPD who were discharged from the ED. All patients received corticosteroids and antibiotics at discharge. Sputum cultures were sent for microscopic examination including gram stain and routine bacterial culture with susceptibility testing. Data were extracted from sputum collection forms completed by dedicated research nurses at each site and laboratory reports using a standardized data extraction form. The success and culture results were compared to clinical characteristics and outcomes. A survey on sputum handling was also administered to study sites across Canada. **Results:** From 156 COPD patients, 60 patients (38.5%) expectorated a sample that could be submitted for analyses. Subjects did not expectorate primarily because of failure to generate sufficient sputum or refusal. From the 60 patients whose samples were processed, 44 patients (28.2% of total sample; 73.3% of those who expectorated) produced a sufficiently high-quality sputum sample to be sent for culture. Of the 44 adequate sputum samples cultured, 25 samples (56.8%) isolated mixed oropharyngeal flora and 19 samples (43.2%) grew identifiable bacterial pathogens. From the susceptibility test, only 1 sample of the 19 identified a resistant pathogen and these results neither influenced management nor impacted outcomes. Survey results from enrolling sites suggest that sputum collection across Canada is variably performed and analyses of samples are not standardized. **Conclusion:** This study confirms that sputum collection should not be routinely performed on outpatients with exacerbations of COPD. **Keywords:** COPD, acute exacerbations of chronic bronchitis, bacteriology

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CHARACTERISTICS associated with admission and longer length of stay due to painful vaso-occlusive crisis in children with sickle cell disease

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Background: Sickle cell disease (SCD), characterized by chronic hemolysis and vaso-occlusive crises (VOC) carries a significant risk of morbidity and mortality in children. The objective of the study was to identify demographic, clinical and laboratory characteristics associated with admission and a longer length of stay (LOS) due to VOC in children with sickle cell disease. **Methods:** Retrospective

chart review at a large tertiary pediatric center. All patients under 18 years with VOC due to SCD presenting to the emergency department (ED) were included. We performed univariate and multivariate regression analyses to predict characteristics associated with admission and LOS 4 days. **Results:** A total of 428 visits for VOC were documented in 2005/06. Children with fever, higher systolic blood pressure, higher leukocyte and monocyte count, and combined extremity and nonextremity location of pain were more likely to be admitted; homozygous genotype, fever, higher mean cell hemoglobin, increased leucocytes, platelets and percentage of reticulocytes were associated with a longer LOS for admitted patients. Higher pain score at triage ($p < 0.001$), older age ($p = 0.04$) and increased systolic blood pressure ($p = 0.02$) were predictors of admission in a multivariate regression analysis. Higher pain score at triage ($p = 0.046$), older age ($p = 0.002$), increased polymorphonuclear count ($p = 0.02$) and homozygous SCD type ($p = 0.03$) were associated with prolonged hospital LOS in a multivariate analysis. **Conclusion:** A higher pain score at triage and older age predict both admission and a longer LOS for children with painful VOC. Furthermore, increased systolic blood pressure is associated with admission and increased polymorphonuclear count and homozygous SCD type predict longer LOS. These parameters will help healthcare providers predict and plan admission and management of these children. **Keywords:** sickle cell disease, vaso-occlusive crises, pediatrics

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DOES gender influence the risk for subsequent events following an acute ischemic stroke?

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Introduction: To assess whether gender influences the likelihood of a subsequent vascular events acute ischemic stroke (AIS), transient ischemic attack (TIA) and myocardial infarction (MI) in the year following an acute ischemic stroke. **Methods:** The study was conducted in the emergency department (ED) of a tertiary academic medical center with an annual ED census of 79 000. The study population consisted of 1038 consecutive consenting patients who presented to the ED or were admitted directly to the stroke inpatient service between December 2001 and December 2005. Patients were contacted via telephone at 3, 6 and 12 months to capture all subsequent events that may have occurred following their first admission for stroke. Follow-up was updated using the date of the last service or dismissal available from registration databases. This data was collected in our institutions prospective observational acute brain ischemia registry. **Results:** There were 547 men (52.7%). The mean age for women was 74.4 (SD 15.0) years and 70.2 (SD 14.2) years for men. A total of 83 subsequent events were seen: 38 strokes, 20 TIAs, 25 MIs. Using a logistic regression model after adjusting for age, there was no statistical difference ($p = 0.168$) between men and women in the frequency of and time to subsequent event after stroke; the subsequent events occur in a similar median time from the initial stroke presentation in both genders. In the univariate analysis we found that age was a predictor of subsequent MI in women but not in men. The mean age of women having subsequent MI was 82.7 (7.7) years, versus 74 (SD 15.5) years in those not having MI ($p = 0.020$). Age was not a predictor of subsequent TIA or stroke after stratification by gender. **Conclusion:** Both women and men have an equal likelihood of having a subsequent event following a stroke; this is despite women on average being older than men at the time of their initial presentation. Gender does not play a protective role in subsequent event following stroke. **Keywords:** acute ischemic stroke, transient ischemic attack, gender imbalances

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INTERRATER agreement of CTAS triage scores assigned by experienced nurses

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Introduction: The reproducibility of Canadian Emergency Department Triage and Acuity Scale (CTAS) scores has only been studied in newly trained nurses. At our institution, triage has been performed according to CTAS standards for the last 10 years by all regular nursing staff. Scores are being attributed according to initial training to the use of CTAS and to nurses' experience and judgment. We aimed at measuring interrater agreement between experienced nurses triaging written scenarios based on real ED cases. **Methods:** A prospective study design was used in our academic urban emergency department (ED) with a census of 50 000 visits. One hundred patients were selected and triage data collected using ED software and medical records. Five experienced nurses were recruited to blindly assign a triage level to 100 ED written case summaries presenting, in a standardized fashion, initial complaint, vital signs, past medical history and current illness. The agreement among nurses was measured using the κ and AC2 statistics. **Results:** The κ was 0.16 (95% CI 0.12–0.21) and the AC2 was 0.20 (95% CI 0.03–0.36). The agreement between experienced nurses was very poor. The agreement for any specific score or any subgroup of nurses remained poor and a retest done 6 weeks later with two nurses gave similar results. **Conclusion:** A low interrater agreement has important implications for ED triage. It suggests that CTAS scores vary greatly among experienced nurses, even when triaging from written standardized scenarios. It suggests also that triage on a daily basis might rely on other factors than the information provided in scenarios, like some more subjective patient characteristics or even actual ED crowding. Further research is required to ascertain if triage scoring would be more consistent if signs and symptoms were analyzed with the help of computerized systems. **Keywords:** CTAS, triage, interrater reliability

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OUTCOMES of a regional implementation of a multidisciplinary asthma protocol in emergency departments in British Columbia

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Introduction: Considerable variation exists in management of patients with acute asthma in the emergency department (ED). The British Columbia Provincial Emergency Services Project has introduced a province-wide Acute Asthma Management Protocol in early 2006. The protocol, with algorithms for pediatric and adult patients, adjusted for acuity, allowed nurses or respiratory therapists to initiate bronchodilator treatment at triage, continue bronchodilator treatments and administer corticosteroids to patients before being seen by a physician. The objective of the study was to measure the impact of this protocol in the 12 EDs in the Fraser Health Authority (FHA) of British Columbia. **Methods:** We reviewed consecutive medical records of patients over the age of 2 years presenting with asthma in EDs in the FHA just prior to and 2 months following the implementation. **Results:** Medical records of 433 patients seen before and 493 patients seen after the implementation were reviewed. Use of an asthma protocol increased in the post period (4% v. 22%, $p = 0.005$). The average time to first bronchodilator decreased post implementation (66 min v. 46 min, $p = 0.04$); however, peak flow measurements (43% v. 46%, $p = 0.56$), mean length of stay in the ED (2 h 36 min v. 2 h 25 min, $p = 0.79$), use of oral corticosteroids in the ED (35% v. 37%, $p = 0.41$) and prescription of oral (35% v. 41%, $p = 0.2$) and inhaled corticosteroids (35% v. 27%, $p = 0.12$) at

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discharge remained similar pre and post. ED visits within 7 days following the index visit were 8% and hospitalization within 7 days following the index visit was 2% in the postimplementation group. **Conclusion:** The study provides evidence that a regional multidisciplinary protocol for evaluation and treatment of patients with acute asthma significantly decreased the time to initiation of treatment with inhaled bronchodilators. However, the use of corticosteroids in the ED and prescription of them at discharge did not change. More research is required to evaluate strategies to improve asthma care by physicians. **Keywords:** asthma, knowledge translation, care pathways

Winner of the CAEP Resident Research Abstract Award

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TELEHEALTH Ontario detection of gastrointestinal illness: an early warning system for bioterrorism

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Introduction: Prompt detection of bioterrorism and rapid introduction of mitigation strategies is a primary concern for public health, emergency and security management organizations. Traditional surveillance methods rely on astute clinical detection and reporting of disease or laboratory confirmation of a pathogen. Although effective these methods are slow, dependent on physician compliance and delay timely effective intervention. To address these issues, syndromic surveillance programs have been integrated into the health care system at the earliest points of access; in Ontario these points are primary care providers, emergency departments and Telehealth Ontario. This study explores the role of Telehealth Ontario, a telephone helpline, as an early warning system for detection of gastrointestinal illness. **Methods:** Retrospective time-series analysis of the National Ambulatory Care Reporting System (NACRS) emergency department discharge and Telehealth Ontario data for gastrointestinal illness from June 1, 2004, to Mar. 31, 2006. **Results:** Telehealth Ontario recorded 184 904 calls and the NACRS registered 34 499 emergency department visits for gastrointestinal illness. The Spearman rank correlation coefficient was calculated to be 0.90 ($p < 0.001$). Time-series analysis resulted in significant correlation at lag (weekly) 0 indicating that increases in Telehealth Ontario call volume correlate with increases in NACRS data for gastrointestinal illness. **Conclusion:** Telehealth Ontario call volume fluctuation reflects directly on emergency department gastrointestinal visit data on a provincial basis. Telehealth Ontario gastrointestinal call complaints are a timely, novel and representative data stream that show promise for integration into a real-time syndromic surveillance system for detection of bioterrorism events. **Keywords:** Telehealth, syndromic surveillance, bioterrorism

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FACILITATION of the management of suspected deep vein thrombosis (DVT) by emergency department based paramedics

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Introduction: The management of patients referred to the ED with suspicion of DVT can be conducted according to an evidence-based algorithm, with each step in the process dictated by the result of the previous step. We describe a process whereby DVT investigation and initial treatment is facilitated by an advanced care paramedic (ACP) in the ED without the patient needing to wait for an ED bed. **Methods:** Patients referred to the ED by their family physician (FP) with suspected DVT were met in the waiting room by an ACP, who calculated their clinical probability of DVT, using Wells criterion, and ordered tests and treatment according to a standard algorithm. Patients and the care plan were reviewed by an emergency physician (EP) before discharge. Consented patients were followed up at 3 months. Satisfaction of ACPs, FPs and EPs was evaluated. **Results:** ED length of stay for patients unlikely to have DVT according to Wells score decreased by 94.57 min (from 379.31 min before pathway introduction, $n = 68$, to 284.74 min after introduction, $n = 73$). There was no change in the percentage of ultrasounds positive for DVT (14.0% v. 13.9%). Of 55 consented patients, 38 were contacted. Of these, anticoagulation to treat DVT had been prescribed in 9 (24%). Regarding the efficiency of the process, 30 (79%) felt that it was efficient, 4 inefficient and 6 no opinion. Regarding their satisfaction with the process, 36 (95%) reported being very satisfied or satisfied. A telephone survey of 30 FPs showed that 70% had used the process. The average satisfaction rating on a 10-point scale was 8.99 (range 8.75–10). Of 23 EPs surveyed, 22 (96%) had used the pathway, 21/22 (95%) felt that the process had improved patient care and was worthwhile. Of 9 ACPs, 7 (78%) felt that the process improved patient care and 8 (89%) that it was worthwhile. **Conclusion:** DVT investigation and management can effectively be conducted by ACPs resulting in decreased length of stay and satisfaction of patients and the approval of FPs EPs and ACPs. **Keywords:** DVT, prehospital, clinical prediction guide

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IMPACT of a homeless curriculum on the attitudes of medical trainees towards homeless people who present for care in the emergency department

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Background: Many homeless people (HP) use emergency departments (EDs) for care owing to barriers to access. Negative attitudes of health care workers have been identified as a major theme when HP are asked about difficult aspects of being homeless. Exposure alone to homeless patients may negatively impact attitudes of medical trainees (MTs). **Objective:** To describe the attitudes of MTs towards HPs pre- and postcompletion of an ED rotation before (Study Yr1) and after (Study Yr2) the inclusion of a formal curriculum on homelessness. **Methods:** The study was conducted in an urban Canadian ED (55 000 visits/yr; 15% HP). MTs were surveyed using a validated 11-question survey about attitudes towards homelessness. Included were 4 additional questions regarding comfort level providing care. **Results:** Overall, 228 MTs responded: 113 in Study Yr1 and 115 in Study Yr2. Mean age was 27 years ($p = 0.2$) and 40% were male. Prerotation data (Yr1 & Yr2): most were comfortable with HP — 96% working, 86% socially. Cutbacks in housing assistance, low minimum wage and welfare were identified as social causes by 91%, 50% and 74%, respectively. Substance abuse was identified with homelessness by 68%. Seventy-seven percent were comfortable dealing with homeless mental health patients. However, 55% felt overwhelmed by problem complexity. Overall scores did not change before or after curriculum implementation. Study Yr1 differences were found for comfort meeting HP (67% v. 74%; $p = 0.05$), and the impact of low wages on homelessness (49% v. 39%; $p = 0.01$). Study YR2 differences were found for impact on low wages (63% v. 77%; $p = 0.01$), little can be done (89% v. 97%; $p = 0.01$), ability for normal lifestyle (84% v. 93%; $p = 0.02$) and comfort providing care/mental health care (76% v. 84%; $p = 0.03$) **Conclusion:** MTs were comfortable with HP. Exposure to HP alone during an ED rotation did not impact overall scores. Addition of a curriculum improved understanding of causes and solutions for homelessness. **Keywords:** homelessness, EM curriculum, survey

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NURSE practitioners in Canadian pediatric emergency departments: current roles and physician attitudes towards those roles

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Introduction: The Canadian Association of Emergency Physicians and the National Emergency Nurses Affiliation suggested the use of nurse practitioners (NPs) as a strategy to address emergency department (ED) overcrowding. The objectives of this study were to determine the utilization of NPs among Canadian PEDs and to examine pediatric emergency medicine (PEM) physicians' views in NPs assuming traditional physician duties. **Methods:** Self-administered, mailed survey of PEM physicians at 10 of the 12 Canadian PEDs. The 10 PEDs are members of a collaborative research group. Directors were surveyed regarding PED demographics. PEM physicians were surveyed on attitudes towards NPs assuming traditional physician duties. **Results:** There were 164 physicians surveyed; 68% of general surveys and 90% of director surveys were returned. Only 1 PED currently employs NPs and they manage minor illness and follow up lab and x-ray reports. Overall, 66% of physicians saw barriers to NPs. This belief varied by site ($p < 0.001$) and was associated with whether NPs were working at the respondent's institution ($p < 0.001$) but not with length of practice ($p = 0.95$) or way of physician remuneration ($p = 0.34$). Among respondents who saw barriers, 67% reported financial, 40% credentialing and 26% hospital policy barriers. The majority of physicians (76%) were comfortable with NPs managing nonurgent patients without supervision but a small minority (6%) were not comfortable with NP managing any class of patient with or without supervision. Overall, physicians were comfortable with NPs ordering investigations such as EKG and x-rays without review but were not comfortable with them ordering more complex/invasive investigations without review. The 3 top procedures that physicians were comfortable with NPs performing were suture removal (91%), splinting (64%) and use of tissue adhesive (55%). **Conclusion:** NPs are not utilized in most Canadian PEDs despite physician comfort with NPs managing nonurgent patients, ordering some investigations and performing several procedures. **Keywords:** nurse practitioners, pediatrics, survey

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DERIVATION of a prediction model for diagnosing acute heart failure based on the application of Bayesian Theorem to multiple NT-ProBNP cut points

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Introduction: Acute heart failure (aHF) is often challenging to diagnose. N-terminal prohormone brain-type natriuretic peptide (NT-ProBNP) is a biomarker of modest specificity for aHF which national guidelines suggest can be clinically helpful. Bayesian Theorem is a statistical concept that correlates posttest probability with pretest probability and likelihood ratios (LRs). This study analyzed data from a blinded clinical trial to assess the performance of NT-ProBNP at multiple cut points applying Bayesian Theorem, using this to derive a prediction model for diagnosing aHF. **Methods:** A prospective study of 485 patients presenting to one of 7 Canadian emergency departments with undifferentiated shortness of breath were enrolled. The emergency physician estimated the probability of aHF (1%–99%) without knowledge of the drawn NT-ProBNP value; blinded adjudication for aHF was subsequently determined. The performance characteristics of NT-ProBNP were analyzed by applying Bayesian Theorem to its ranges of less than 300 ng/L to greater than 8000 ng/L after calculating LRs. Multiple logistic regression analysis of clinical variables revealed significant correlates for aHF; these were incorporated into a post test probability model for aHF by expressing the regression model on the probability scale by the inverse logit transformation. Bootsrap analysis and calibration were performed for internal validation. **Results:** The LRs for aHF with NT-ProBNP ranged from 0.11 (95% CI.06–0.19) for values < 300 ng/L to 13.03 (95% CI 5.31–32.01) for values > 8000 ng/L. Significant variables for aHF were age, pretest probability and the logNT-ProBNP value. A posttest probability prediction model was then created with a c statistic of 0.905, being validated internally. **Conclusion:** A model using NT-ProBNP, age and pretest probability has been derived which appears to be useful in improving the clinical diagnosis of aHF in the ED. External validation of the model will help to establish its clinical utility. **Keywords:** NT-ProBNP, heart failure, diagnosis

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METHODOLOGIC quality of American College of Emergency Physicians Clinical Practice Guidelines for emergency medicine

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Introduction: Clinical practice guidelines (CPGs) represent a higher order of clinical evidence, combining literature reviews and expert stakeholder assessments to formulate recommendations for practicing clinicians treating numerous conditions. It is important that CPGs meet high methodologic standards in order to provide reliable information to consumers. This study examined the methodological quality of the American College of Emergency Physicians (ACEP) CPGs using an accepted critical appraisal instrument. **Methods:** Currently active CPGs ($n = 20$) were obtained from the ACEP website list and reviewed using the previously validated Appraisal of Guidelines for Research and Evaluation (AGREE) instrument. CPGs were scored using multiple AGREE domains: scope and purpose, stakeholder involvement, creation methodology, clarity of presentation, applicability, bias and overall assessment. CPGs were reviewed in a chronologically random fashion by 4 blinded reviewers, and aggregate scores descriptively summarized. Aggregate methodological scores for domains were ranked as strong, moderate, weak or undetermined. **Results:** CPG scores were summarized as follows: strong for scope and purpose, creation methodology and presentation clarity domains, moderate for stakeholder involvement and bias domains, and weak for applicability domains. Overall assessments also yielded mixed recommendations, although there was a trend to favorable endorsement with more recent CPGs. Recurrent flaws noted were the lack of patient involvement in creation, lack of pilot testing, identifying organizational barriers and costs to use, supplying monitoring and audit tools, and potential conflicts of interest. **Conclusion:** ACEP CPGs are methodologically strong in domains of scope and purpose, creation methodology and clarity of presentation. They are weaker in areas of stakeholder involvement, bias and application. CPG creators should consider strengthening these particular domains, so as to make their use more generalizable. **Keywords:** AGREE, ACEP, clinical practice guidelines

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THE impact of emergency department targeted ultrasound on management of patients with early pregnancy complaints

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Introduction: Emergency department (ED) targeted ultrasound (EDTU) is a useful clinical tool in the management of the patient with early pregnancy bleeding or pain. EDTU has recently been

introduced at our institution and approximately half the emergency physicians in our group currently use EDTU in the management of patients with early pregnancy complaints. The objective of this study was to describe the impact of EDTU on patient outcomes and ED length of stay (LOS). **Methods:** A convenience sample of 123 (n = 60 EDTU, n = 63 non-EDTU) adult female patients (age > 17 yr) less than 20 weeks pregnant complaining of pelvic/abdominal pain, vaginal bleeding, syncope or shock were included in this prospective, cohort study. Data was gathered from 2 tertiary care EDs with a combined annual census of 95 000 during a 3-month period (July–September 2007). **Results:** Mean age was 28.3 (SD 6.2) years old and average LOS was 4.1 (SD 2.2) hours. LOS times were significantly less (p = 0.05) in the EDTU group (3.7 hr) compared to the non-EDTU group (4.5 hr). Referral rates for obstetrical follow-up care were also similar in the EDTU (51.7%) and the non-EDTU (60.3%) groups. There was no difference in the proportion of patients sent for formal radiologic ultrasound in the EDTU and non-EDTU groups (53.3% v. 66.7%, respectively). **Conclusion:** ED LOS was reduced when EDTU was used to manage patients with early pregnancy complaints. A trend to lower rates in both obstetrical follow-up and formal radiologic ultrasound was noted, but a significant difference was not detected between the EDTU and non-EDTU groups. EDTU is a valuable clinical tool that may impact patient outcome and improve patient flow in the ED. **Keywords:** EDTU, first trimester emergencies, length of stay

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THE effectiveness of an innovative EM curriculum for off-service junior residents

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Objectives: Hundreds of non-EM residents rotate through teaching EDs each year, but their experience has been shown to be variable. We evaluated the effectiveness of an innovative EM curriculum for off-service junior residents. **Methods:** Using data from a previous systematic needs assessment of non-EM residents and their program directors (Wolpert 2007), we implemented a new PGY1 curriculum that included: 1) decreased shift length from 10 to 9 hours; 2) EM skills day involving simulation and ED orientation; 3) ACLS, ATLS, suturing, central line and airway workshops; and 4) an updated tutorial series. We then conducted a cross-sectional online survey using Dillman methods of all junior non-EM residents in the first 10 EM rotations at 2 teaching hospitals in 2007. We obtained ethics approval and used descriptive statistics and t tests to analyze the data versus those obtained by Wolpert et al the year before (n = 86). **Results:** There were 100 eligible residents and 61% completed the survey. Respondents were 53% male and 97% in PGY1. Their specialties were 47% family medicine, 22% medicine, 6% surgical and 22% other. On a 5-point Likert scale residents in the new curriculum reported greater confidence with the skills of suturing (3.7 v. 3.0, $p < 0.001$), casting (2.8 v. 2.1, $p < 0.001$), central line insertion (2.0 v. 1.8, $p = 0.35$), defibrillation (2.9 v. 2.3, $p < 0.001$), intubation (2.4 v. 2.2, $p = 0.180$) and trauma management (2.7 v. 2.1, $p = 0.002$). This cohort was more satisfied with shift length (3.5 v. 2.3, $p < 0.001$) and orientation to the ED (4.2 v. 3.8, $p < 0.05$). Ratings of shift number, teaching, supervision, exposure to procedures, trauma, and resuscitation were all similar before and after the new curriculum. All seminars were positively rated (mean scores 3.6–4.0/5.0). **Conclusion:** This innovative EM rotation for off-service junior residents effectively addressed the needs of PGY1s and their program directors. Others should consider adopting these features to enhance education and learner satisfaction. **Keywords:** EM curriculum, graduate medical education, off-service residents

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IMPACT of a province-wide head injury guideline on outcomes and process of care

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Introduction: A head injury (HI) management guideline (HIG) including specific treatment, imaging and transport recommendations for moderate-to-severe head injury was implemented on a province-wide basis in Nova Scotia (NS) on July, 1 2002. The guideline includes suggestions for intubation, spine immobilization, 2-minute neurological assessment and accessing the provincial trauma hotline for potential transport. The HIG was implemented owing to the regionalization of tertiary trauma services with a single provincial neurosurgical/adult tertiary trauma centre (TTC). It was hypothesized this guideline would significantly decrease the time from injury and arrival at first hospital to reaching the TTC and that improved outcomes would follow. **Methods:** All major HI patients (GCS < 12) (> 15 y/o) in NS with at least 1 intermediate hospital before TTC transfer, from July 2001 until December 2003 were included in this study and categorized into 3 time periods: pre-HI guidelines implementation (July 1, 2001–June 30, 2002), implementation period/maturation phase (July 1, 2002–Dec. 31, 2002) and post-implementation (Jan. 1, 2003–Dec. 31, 2003). Time to TTC (TTTC) was measured and descriptive statistics were generated with 95% CIs. **Results:** There were 214 patients that met inclusion criteria: 71 pre-implementation, 44 implementation and 69 postimplementation major HI patients. Overall, there was a 41 minute ($p < 0.05$) decrease in TTTC from the pre- to postimplementation periods. Final outcomes analysis using mortality and Glasgow Outcomes Scores are pending at this time. **Conclusion:** We have demonstrated a statistical decrease in TTC for moderate-to-severe HIs for the province of NS following implementation of a specific HIG. This process of care effect was demonstrable in the major HI category where rapid transport within a regionalized trauma system with a single tertiary care neurosurgical site could be of considerable importance to patient care and outcomes. Final analysis on patient outcomes is pending. **Keywords:** head injury, clinical practice guideline, implementation research

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ARE triage criteria for prioritizing ICU admission feasible and useful during an influenza pandemic?

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Introduction: Future pandemics will likely overwhelm the resources available in emergency departments (EDs), particularly for those patients requiring intensive care. Triage guidelines were developed by expert consensus in Ontario (2006) to determine who would benefit most from intensive care unit (ICU) admission during a pandemic. However, these criteria have not been tested clinically. During a large mock pandemic exercise, we piloted the use of these guidelines to assess their feasibility and ease of use during a simulated crisis. **Methods:** The triage criteria were used during a mock pandemic exercise involving over 100 simulated patients and including both a full-scale ED and ICU. Use of the guidelines during the exercise was optional, at the discretion of the multidisciplinary team. All health care workers (HCWs) participating in the exercise were asked to complete a voluntary pre- and post-survey regarding the triage criteria. **Results:** Sixty-five HCWs completed at least 1 of the surveys. None of the participants had used these guidelines previously, and most (99%) could not name all of the triage criteria prior to the exercise itself, despite the information being precirculated electronically. Of respondents, 93% thought that triage criteria to guide ICU admission would be useful during a pandemic. During the exercise, 90% of the respondents chose to use the criteria to triage

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ICU patients. Of the HCWs, 79% reported that they would use the criteria during a real pandemic to guide patient care. **Conclusion:** During a large pandemic exercise, most HCWs chose to use triage guidelines to assess patients for appropriateness of ICU admission and ongoing care. Despite very little knowledge of the criteria before the exercise, physicians and nurses were able to rapidly learn and apply the criteria. Further training could maximize the efficacy of these guidelines and ensure that they were applied fairly and consistently. **Keywords:** influenza pandemic, ICU, disaster plan

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WHAT are the resources emergency physicians use to maintain clinical competence? A pilot study

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Introduction: This study sought to determine the resources that practising emergency physicians utilize to maintain clinical competence. **Methods:** After obtaining institutional Research Ethics Board approval and informed consent, an electronic survey was distributed to all practising emergency physicians at 2 university academic centres using a modified Dillman method. **Results:** Of 54 emergency physicians, 37 (68.5%) responded. All were board certified (59.5% CCFP[EM]). Only 38.9% attended grand rounds 3 or more times per year. The top reasons for nonattendance were conflicting clinical responsibilities (80.6%), conflicting personal/family responsibilities (38.9%) and conflicting nonclinical professional responsibilities (25.0%). Of respondents, 89.2% read journals at least monthly; 61.1% regularly read review synopses of original articles with 63.9% receiving these updates by email; 61.1% used websites to receive updates on clinical practice; 31.4% subscribed to an audio journal or podcast that provided review lectures. Although 91.7% attended a medical conference at least once per year, only 34.3% regularly attended the original research tracks. **Conclusion:** This survey reveals 3 themes about the resources used to maintain clinical competence by practising emergency physicians. First, traditional group learning is used by a minority with clinical/professional and family scheduling conflicts preventing attendance. Second, most access the medical literature to maintain competence, with the majority using electronic media. Finally, only a minority of respondents is routinely accessing original research. Most practising emergency physicians are relying on review synopses of original findings in order to maintain clinical competence. Further research is required to determine the generalizability of these findings. **Keywords:** continuing professional development, clinical competence, survey

Winner of the CAEP Resident Research Abstract Award

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EFFECTS of an emergency department sepsis protocol on time to antibiotics in severe sepsis

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Introduction: Our objective was to evaluate the time to antibiotics in our emergency department (ED) in patients meeting criteria for severe sepsis pre- and postimplementation of an ED sepsis protocol. Compliance with published guidelines for time to antibiotics and initial empiric therapy in sepsis was also assessed. **Methods:** A retrospective chart review of ED encounters with ICD codes related to severe infections were screened over a 3-month period pre- and postimplementation of a sepsis protocol. Encounters meeting criteria for severe sepsis were further assessed. The time to initiation of antibiotics was determined as well as the initial choice of antimicrobial therapy based on the presumed source of infection. **Results:** Two hundred and twelve unique ED patient encounters meeting criteria for severe sepsis were reviewed. Initial analysis showed a median time from meeting severe sepsis criteria to delivery of antibiotics of 163 minutes. Subsequent analysis postimplementation of the protocol revealed a median time of 79 minutes, representing an overall reduction of 52% ($p < 0.05$). Initially only 23% of patients meeting criteria for severe sepsis received antibiotics within 1 hour of recognition as recommended by the Surviving Sepsis Campaign Guidelines for management of severe sepsis and septic shock. Postimplementation this number improved to 39%. Prior to the protocol, 47% of patients received correct antibiotic coverage for the presumed source of infection in compliance with locally published guidelines. After initiating the protocol, 73% received appropriate initial antibiotics, an overall improvement of 26%. **Conclusion:** Prompt initiation of appropriate antibiotic therapy in severe sepsis and septic shock has been shown to be a very important predictor of outcome. Our data reveals that a guideline based ED sepsis protocol for the evaluation and treatment of the septic patient appears to improve the time to administration of antibiotics as well as the appropriateness of initial antibiotic therapy in patients with severe sepsis. **Keywords:** sepsis, time to antibiotics, implementation research

Winner of the CAEP Resident Research Abstract Award

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AMBULATORY visits to a Canadian emergency department

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Introduction: According to the Canadian Institute for Health Information, between 2003 and 2004, 57% of patient visits to Canadian EDs were for nonurgent conditions. In 1996, Burnett et al. published a survey, characterizing 200 nonurgent patients presenting to a Montréal ED, during regular business hours. Afilalo, in 2004, compared characteristics of nonurgent with urgent and semi-urgent patients, who visited 5 Quebec tertiary hospitals. To date, there has been no Ontario study done on this topic. The purpose of this survey is to determine the reasons why patients choose the ED as their health care facility, for nonurgent medical care. We hypothesized that these factors are affected by recent changes in provincial health care, namely the introduction of Telehealth and the shortage of primary care physicians in Canada. **Methods:** A written survey was administered to CTAS IV and V patients presenting to the St. Joseph Healthcare Emergency Department in Hamilton, Ontario. The survey was comprised of questions on patients' baseline characteristics, accessibility to primary care, perceptions of the urgency of their medical problems, and satisfaction with care received in the ED. **Results:** We collected 245 completed surveys. Musculoskeletal complaints were the most common reason for low-acuity ED visits. Of patients surveyed, 11% had no GP. Among those who did have GPs, 1e in every 3 patients was unable to access their doctor; 26% did not know of any alternative health care options (e.g. urgent care centres, walk-in clinics, etc.). More than one-half of patients felt their problem required immediate medical attention, while 9% were advised by Telehealth to go to the ED. **Conclusion:** Although most patients do have GPs, accessibility to primary care remains a major factor in nonurgent ED visits. There is a need to educate the public on alternative health care options for low acuity problems. We hope to repeat this study in other EDs across Ontario and to use this information to improve the efficiency of emergency care in the province. **Keywords:** nonurgent users, access to care, Telehealth

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PATIENT safety event reporting and response in British Columbia emergency departments

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Introduction: The primary purpose of reporting patient safety events (PSEs) is to learn from experience to guide changes to prevent similar

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future events. Hence, reporting, analysis, feedback and system change are required for learning to occur. **Methods:** We interviewed ED nurse managers (EDNM) from urban and rural EDs in BC to describe the current content, structure and process of ED PSE reporting. Fifty-nine semistructured telephone interviews were conducted between September and December 2007. Data were iteratively analyzed for emergent patterns and themes. **Results:** Five broad themes emerged with open coding: 1) Off the side of the desk: EDNMs reported that they did not have sufficient time, resources or specific training to conduct system level analyses of PSEs. Yet, despite these limitations, few wanted to give the task of analyzing reports to an outsider. 2) Into the void: Many EDNMs neither uniformly gave nor received feedback on PSE reports. Some received summary statistics on PSEs from their site, whereas others did not even know where to send reports. 3) Stats or stories: In many cases the purpose of PSE reporting was not clear. At sites receiving statistical summaries, reports were often viewed as statistics to be monitored rather than stories to be learned from. 4) Threshold of harm: Incidents resulting in significant harm were usually reported, but near misses and Prehospital incidents were generally not reported. 5) Lack of physician involvement: EDNMs reported that physicians rarely filled out reports, but might verbally report to the EDNM or ask a nurse to report for them. **Conclusion:** Learning from patient safety events in urban and rural EDs in BC is limited by underreporting, lack of system level analysis and scant feedback. Patient safety stories are left untold,and physicians are rarely involved in the process. PSE reports are managed off the side of the desk and often go into the void. **Keywords:** patient safety, root cause analysis, qualitative research

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DEMOGRAPHIC characteristics of emergency department patients with suspected renal colic

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Introduction: Southwestern Ontario is a known stone belt with a high incidence of renal colic, and our centre is somewhat unusual in its high use of renal ultrasound (US) in the diagnosis of renal colic. The purpose of this study was to describe the demographic characteristics, imaging results and outcomes of patients who had a renal US for suspected renal colic over a 1-year period. **Methods:** A retrospective chart review was completed for all adult patients who had an emergency department (ED)-ordered US for suspected renal colic. Data was gathered from 2 tertiary care EDs with a combined annual census of 95 000 during a 1-year period (Jan. 1 to Dec. 31, 2006). Independent, double data extraction was performed for all imaging reports and results were categorized as normal, suggestive, stone seen or nonrenal disease. **Results:** Of the 857 renal US ordered during the study period, 373 (43.5%) were classified as normal, 182 (21.2%) were classified as suggestive, 241 (28.2%) were classified as stone seen and 61 (7.1%) were classified as nonrenal disease. Of the 857 renal US, 160 (18.7) patients had a computed tomography scan and 29 patients (3.4%) required urologic intervention. Mean age of all patients was 44 (SD 16) years and 53% were male. The mean length of stay in the ED was 5.5 (SD 3.4) hours, and 6.4% of patients were brought to the ED by ambulance. There was no seasonal variation in ED visits, and 4.2% of patients were admitted. **Conclusion:** To our knowledge, this is the largest Canadian renal colic research study. Although patients presenting to the ED with suspected renal colic frequently will be shown to have urolithiasis, there is a relatively low need for intervention or admission in this population. Future research to define low-risk patient characteristics may help decrease the need for imaging in these patients. **Keywords:** renal colic, ultrasound, utility

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PATIENT safety event reporting forms used in British Columbia emergency departments

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Introduction: Patient Safety Event (PSE) reporting forms should be easy to use. Reporters need space to tell what happened, why it happened, and how they think it could have been prevented, whereas managers need to make sense of system level factors that contribute to events. **Methods:** We obtained 14 PSE reporting forms used in 61 BC EDs. Forms were analyzed to describe their length, layout, content, and specificity for ED events. **Results:** One form was used in 32 EDs, another in 11 and the remainder in 1 to 4. Several patterns were noted: 1) None of the forms were specific to the ED. 2) Most forms were also not specific to PSEs and also allowed reporting of events involving staff, visitors or property. Some EDs had multiple separate forms for occupational health events, blood and body fluid exposure, medication incidents, falls and good catches. 3) Forms ranged in length from 1 to 3 pages, but had limited space for a narrative description of the events. Most were highly structured with tick boxes to classify events and identify risk factors. 4) All forms had large sections focused on falls and medication events. 5) All but one form asked about injury severity, and usually focused on physical injuries sustained in a fall. 6) The reporters name was always requested and most forms asked for a witness. 7) All but 2 forms asked if a physician had been notified, but only 3 forms had a physicians section. 8) All but 2 forms included a section for the manager investigating the report, which ranged from half a page of free text to highly structured tick boxes with specific follow-up options. **Conclusion:** PSE reporting forms used in BC EDs are highly structured with a focus on falls and medication events, and are neither anonymous nor specific for ED events. Tick boxes may facilitate monitoring of PSE statistics, but scant narrative space limits understanding of the context of PSEs, as well as those events that do not fit the tick box classification. Multiple forms further complicate reporting in some organizations. **Keywords:** patient safety, error reporting, reporting forms

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MALARIA in the Ottawa Hospital emergency department

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Introduction: Malaria is a very common and potentially fatal tropical disease. In Canada, malaria has proven to be a diagnostic challenge over the years. The majority of cases first present through the emergency room. Its sporadic and nonspecific presentation, however, has lead to misdiagnosis and delays in treatment. This study sought to review the diagnosis and treatment of malaria cases presenting to the Ottawa Hospital emergency department (ED). It examined the time from initial presentation to diagnosis and time to treatment in the Ottawa Hospital. **Methods:** The study was conducted using a retrospective chart analysis. All cases of malaria smear positive patients evaluated by the ED at the Ottawa Hospital from January 2000 to December 2006 were included. Cases were excluded if diagnosis or treatment were initiated at another centre, if records were not available or if the cases were referred directly to a consultant service. Charts were reviewed and data entered into a chart review form. **Results:** Thirty-five cases were reviewed. A majority of the cases were travelers from endemic regions in Africa (57.1%). No chemoprophylaxis was used in 71.4% of cases. Falciparum malaria accounted for 57.1% of cases. The average time in the ED until diagnosis was 4.53 hours, with the average time from diagnosis to treatment being 2.54 hours. The ED initiated treatment in 20.1% of cases. There were no deaths among the 35 cases, with 1 ICU admission in a patient discharged on oral treatment. **Conclusion:** Although there was no mor-

tality amongst the cases reviewed, changes need to be made in the diagnosis and treatment of malaria. Firstly, patients must not be sent home with malaria smear results pending. Secondly, initial treatment should be observed in the ED to ensure tolerance for those being discharged. Lastly, the use of a malaria treatment protocol may help ED physicians to initiate treatment earlier to avoid wait times for consultant services. **Keywords:** malaria, tropical diseases, chart review

Winner of the CAEP Resident Research Abstract Award

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A review in management of minor thoracic injuries (MTIs) in the emergency department

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Introduction: MTIs with or without ribs fractures are a very common presentation in ED. About 75% of MTIs are treated on an ambulatory setting. Recently, it has been demonstrated that nearly 10% of the patients with MTIs may develop important delayed complications, such as hemothoraces and pneumothoraces. Our objective was to review the management and follow-up of patient with MTIs. **Methods:** A multicenter retrospective cohort study in 3 university-affiliated Canadian EDs was conducted from January 2004 to January 2006. Patients older than 16 years with a suspected or proven rib fracture following a traumatic event were included. Chart of patient with any intra or extrathoracic complication at initial visit in ED were excluded. Univariate analyses were used to compare patient management profiles between hospitals. **Results:** There were 447 charts analyzed; only 21 (4.6%) patients were admitted during the study period. The proportion of admissions was significantly different between the three hospitals. No follow-up recommendations were identified in the majority (53.5%) of charts and there were no differences after stratifying for hospital. A planned follow-up visit was schedule for 5.7%. Neither age greater than 65 years nor the number of ribs fractured influenced the follow-up recommendations. Inadequate pain relief was the primary reason for an unplanned follow-up visit in ED in 23.7% of patients. There was not difference after stratifying for age and type of analgesia. **Conclusion:** Admission proportions are lower than expected from previous publications and varies across surveyed hospitals. The follow-up offer to patients with MTI seems insufficient in view of possible delayed complications and disabilities. Further study is suggested to derive predictors of delayed complication of MTI and orient appropriate use of follow-up resources. **Keywords:** minor thoracic injury, rib fractures, admission criteria

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DO rate control drugs increase the likelihood of successful cardioversion in acute atrial fibrillation?

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Introduction: In the context of an ED protocol of acute rhythm control for acute atrial fibrillation (AAF), some clinicians believe that pretreatment with IV rate control (RC) drugs enhances safety and the chance of successful cardioversion. We sought to test this belief. **Methods:** We conducted a health records review of consecutive patient visits over a 5-year period for adults who presented to a university hospital ED with acute-onset AAF (< 48 hr) and were managed with rhythm control. All patients received IV procainamide followed by electrical cardioversion if necessary. At the discretion of the attending ED physician, some patients were pretreated with IV RC drugs, usually 1 or 2 doses of IV metoprolol (5 mg) or diltiazem (15–25 mg) given over 5–10 minutes. Outcomes included conversion, adverse events and length of stay. We conducted Student *t* test, χ^2 and odds ratio analyses. **Results:** We enrolled 628 patients, of whom 96.8% were discharged home from the ED in sinus rhythm. Patients who received RC drugs (39.2%) were similar to those who did not (60.8%) but had higher arrival heart rates (HR) (mean 129.5 v. 101.8 beats/min). RC drugs had no effect on HR (129.5 beats/min before v. 133.1 beats/min after) despite being given a median 30 minutes prior to rhythm control. Patients receiving RC drugs were less likely to convert to sinus rhythm after procainamide than those who did not (53.3% v. 64.1%, $p < 0.01$, OR 0.64, 95% CI 0.46–0.88). This lower conversion rate was also observed in the subgroups with HR >120 beats/min ($n = 278$; 58.6% v. 71.6%, $p < 0.05$) and HR >140 beats/min ($n = 135$; 59.6% v. 70.7%, $p = 0.22$). Metoprolol and diltiazem were followed by similar conversion rates (51.2% v. 57.1%, $p =$ NS). RC patients had similar have adverse event rates (7.7% v. 7.1%, $p =$ NS) but had longer times in the ED prior to discharge (mean 377.0 v. 308.7 min, $p < 0.01$). **Conclusion:** We found no benefit from use of RC drugs prior to ED rhythm control for AAF and that their use was associated with lower conversion rates and longer lengths of stay. **Keywords:** atrial fibrillation, rate control, cardioversion

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ALCOHOL-related visits in youth: pediatric emergency department resource utilization

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Introduction: The incidence of binge drinking is increasing in Canadian youth. Its impact on emergency department resource utilization is unknown. This study characterizes the demographics, clinical features and management of youth who present to the pediatric emergency department (PED) with alcohol ingestion. **Methods:** A retrospective study in an academic, urban, tertiary care PED with an annual census of 38 000 visits was conducted. We reviewed the emergency records of all patients aged 10–17 presenting to the PED between Jan. 1 and Dec. 31, 2006. Youth with a documented history of alcohol ingestion and/or a positive blood alcohol level were included. Demographics, clinical presentation, management and disposition were collected using a standardized data collection form. **Results:** A total of 8290 visits were made by youth aged 10 to 17 years. There were 119 visits (1.4%) by 100 youth for alcohol ingestion. The average patient age was 14.8 years (SD 1.1 yr). The majority was female (58%). Most patients arrived by ambulance (79%). The average GCS on arrival was 12.6 (range 5–15). Ten (9%) patients had a GCS of less than 8. The average blood alcohol level was 46.4 mmol/L. Twenty-one (19%) patients had body temperatures less than 35°C. No patients were hypoglycemic. Injuries were reported in 47 visits (40%). One patient required intubation and 3 required ICU admission. Health care personnel were assaulted during 7 visits. Most patients were discharged directly from the PED (94%). The average length of stay was 7.2 hours. **Conclusion:** Although binge drinking may be considered a common adolescent risk taking behaviour, it is associated with high prehospital and emergency department resource utilization. There is a need to develop protocols to standardize management of this population and ensure health care provider safety. **Keywords:** alcohol ingestion, pediatrics, chart review

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HIGH effectiveness of a new developed miniaturized extracorporeal assist device for mobile cardiopulmonary bypass in emergency medical services

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Introduction: Severe cardiopulmonary failure resistant to advanced

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treatment is a major reason for exceedingly high mortality of patients located in outlying medical facilities. We retrospectively reviewed our experiences with a new developed miniaturized extracorporeal assist device for mobile closed chest cardiopulmonary bypass support in patients with severe cardiopulmonary or pulmonary failure. **Methods:** Between March 2006 and October 2007, the authors used mobile cardiopulmonary bypass support in 10 adult patients with severe cardiopulmonary failure ($n = 7$) and pulmonary failure ($n = 3$). We started closed chest cardiopulmonary bypass in the outlying medical facility using percutaneous femoro–femoral veno–arterial ($n = 7$) and femoro–jugular veno–venous ($n = 3$) vessel access. The new developed cardiopulmonary bypass system is a closed-loop extracorporeal circulation system, consisting of a centrifugal pump and a membrane oxygenator. The total weight is 27 kg. The system is capable for hand-held use and suitable for storing on a standard gurney for additional emergency medical service. **Results:** Bedside cannulation procedure was uneventful. After start of the circulatory support, pharmacological support could be marked down and systemic blood flow and gas exchange were restored. During extracorporeal assistance, including air ($n = 8$) and ground ($n = 2$) ambulance transport, no technical complication occurred. Limb ischemia was observed in 2 cases. Hospital survival rate was 70%. **Conclusion:** The use of this new miniaturized extracorporeal assist device is safe and highly effective in management of cardiopulmonary failure. Extracorporeal assistance for patients in need of emergency medical service is first time possible without extended technical or personnel support. **Keywords:** extracorporeal assist device, cardiopulmonary bypass, EMS

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NORMAL renal ultrasound predicts low risk of urologic intervention for emergency department patients with suspected renal colic

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Introduction: Renal colic is a common emergency department (ED) diagnosis. Computed tomography (CT) is a frequently employed imaging modality for patients with suspected renal colic because of its high diagnostic accuracy. However, there is increasing concern about the lifetime cumulative radiation exposure attributed to CT. Ultrasound (US) is an alternative imaging modality that may also be used to diagnose renal colic without exposing the patient to radiation. The objective of this study was to determine the ability of US to identify renal colic patients with a low risk of requiring urologic intervention within 90 days of their initial ED visit. **Methods:** A retrospective chart review was completed for all adult patients who had an ED-ordered US for suspected renal colic. Data was gathered from 2 tertiary care EDs with a combined annual census of 95 000 during a 1-year period (Jan. 1 to Dec. 31, 2006). Independent, double data extraction was performed for all imaging reports and results were categorized as normal, suggestive, stone seen or nonrenal disease. The charts of all patients with a normal US were reviewed to determine if they required any urologic intervention within 90 days after their initial ED visit. **Results:** There were 857 ED-ordered renal US during the study period. The study patients had a mean age of 44 years (range 18–95 yr) and 53% were male. Of the 857 renal US ordered during the study period, 373 (43.5%) were classified as normal. Of these, 49 (13%) underwent additional imaging identifying 6 (1.6%) stones, only 2 (< 1%) of which required urologic intervention with lithotripsy. **Conclusion:** A normal renal US predicts a very low likelihood for urologic intervention within 90 days for adult ED patients with suspected renal colic. The use of US may avoid the risks of radiation for many patients with suspected renal colic without adversely affecting their clinical outcomes. Further prospective research is needed to better define the role of US in the emergency management of renal colic. **Keywords:** renal ultrasound, urologic intervention, clinical prediction guide

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BUILDING a student-run medical quiz website for medical students using Ruby on Rails an open-source programming framework

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Introduction: Rapidly developing Internet technologies allow development of websites that contain functionality previously only seen in desktop applications. A website created by a medical student called QuizMD (http://quiz.md) takes advantage of these so-called Web 2.0 technologies to allow students and teachers to publish quiz questions instantly online. QuizMD allows users to sort and refine the questions based on relevance and quality through discussion, voting, and automatically recorded statistics. Quizzes are generated on demand, containing randomly selected questions on desired topics. **Methods:** Using the Ruby on Rails (RoR) web-development framework, QuizMD was developed over a 6-month period based on user feedback and an iterative design approach. The flexibility of RoR allowed for multiple revisions to be created in a relatively short time period. **Results:** At the end of the 6-month period there were a total of 242 users in 7 Canadian provinces. 87% were students enrolled in the University of Alberta where the website was created. There were a total of 713 questions in 15 subject collections. Use of the highly flexible RoR framework allowed the website to quickly grow and adapt to the needs of its users. Efforts to establish an emergency medicine component are underway, and will be demonstrated at the exhibit. **Conclusion:** RoR is a robust and flexible web-development framework that is well suited to database-backed applications. It fully incorporates modern web techniques such as AJAX (Asynchronous JavaScript and XML) that enable a better user experience. Its use enabled rapid development and deployment of a medical quiz website for medical students by a single developer. More iterative feedback is needed to examine the potential for such a site to affect the learning behaviors of medical students and residents (especially in Emergency Medicine) and to explore the feasibility of using the RoR framework for development of future medical applications. **Keywords:** Internet, Ruby on Rails, online quiz

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CEFTRIAXONE for persistent acute otitis media: impact of a clinical practice guideline

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Introduction: IV ceftriaxone (CEF) is recommended as second-line treatment for persistent acute otitis media (AOM). We aim to determine the effect of a clinical practice guideline (CPG) on the use of CEF for persistent AOM. **Methods:** Charts of all patients aged 3–60 months referred from a pediatric ED to a day treatment center (DTC) for persistent AOM for IV CEF were reviewed. Data were collected for two 18-months periods before (September 2002 to February 2004) and after (May 2004 to October 2005) implementation of a CPG. CEF was indicated for children with AOM who remained symptomatic despite 48 hours of high-dose amoxicillin or amoxicillin–clavulanate, or in whom symptomatic AOM recurred despite treatment with 1 of these 2 antibiotics over the previous month. Therapy was considered adequate if patients met

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these indications for CEF, if at least 3 daily doses had been prescribed and if all doses were of 40–60 mg/kg range. **Results:** Thirty-two ED physicians referred 127 patients to the DTC for treatment of persistent AOM with CEF. In the pre-CPG group (n = 60), patients had received a median of 2 (range 0–5) different antibiotics over the previous month, including amoxicillin or amoxicillin–clavulanate in 53% of cases. In the post-CPG group (n = 67), patients had received a median of 1 (range 0–5) different antibiotics, including amoxicillin or amoxicillin–clavulanate in 60% of cases. Indications for prescription of CEF were adequate in 17% of the pre- and 22% of the post-CPG groups (p = 0.4). Dose of CEF was adequate in 45% and 82% of the pre- and post-CPG groups, respectively ($p < 0.001$). Number of doses was sufficient in 62% and 58% of the pre- and post-CPG groups (p = 0.7). Before implementation of the CPG, overall treatment was considered adequate in 3 patients (5%); it was adequate in 7 patients (10%) after CPG implementation (p = 0.3). **Conclusion:** Implementation of a CPG for the treatment of persistent AOM with CEF has significantly improved prescription of adequate doses of CEF, but has not led to better indications for its use. **Keywords:** acute otitis media, ceftriaxone, clinical practice guideline

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BARN door-to-needle time: thrombolysis in rural emergency departments

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Introduction: The American Heart Association (AHA) has established a benchmark for the administration of thrombolytic therapy for acute myocardial infarction (AMI) patients as a door-to-needle (DTN) time of less than or equal to 30 minutes. Previous research at the national, provincial and rural levels suggests that this goal was not being achieved. The purpose of this study is to determine if the AHA benchmark of a DTN time of < 30 minutes for thrombolysis could be met in 2 rural emergency departments. **Methods:** A retrospective chart review was conducted at 2 rural hospitals in Southwestern Ontario. Descriptive data was obtained for each patient, including demographic information, Canadian Emergency Department Triage and Acuity Scale (CTAS) score and disposition. Visit timeline data was also collected and included the time the patient first experienced pain, was triaged, saw the emergency physician, had an ECG, received thrombolytic therapy and was discharged. Visit time intervals such as the median DTN times were then calculated. Summary descriptive statistics were calculated for each of these data points. **Results:** A total of 454 charts with a diagnosis of acute myocardial infarction (AMI) were pulled and checked for the administration of thrombolytic therapy. The final data pool consisted of 101 patients. The median age was 67, CTAS score level II (emergent), 63% male, 83% admitted to hospital, median door-to-ECG (DTE) time was 6 minutes, door-to-physician assessment (DTP) time was 8 minutes, DTN time 27 minutes, 58% of patients received thrombolysis in < 30 minutes and length of stay 2:20. **Conclusion:** A median DTN time of < 30 minutes is possible in a rural ED and suggests high quality care of AMI patients in these two rural hospitals. **Keywords:** door-to-needle time, thrombolysis, chart review

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CARDIAC resuscitation skills of first-year internal medicine residents

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Introduction: New physicians often provide the initial response to in-hospital cardiac emergencies and should be proficient at resuscitation skills. Several studies have raised concerns that undergraduate medical programs may not be adequately preparing graduates in this respect. We conducted a descriptive study to evaluate the hypothesis that new medical graduates lack the skills required to effectively manage cardiac emergencies. **Methods:** Using an objective structured clinical examination format, we assessed the cardiac resuscitation skills of 16 first-year internal medicine residents at our tertiary hospital-based center. All participants had completed an Advanced Cardiac Life Support course. The study was conducted in our patient simulation lab. Residents attended four skills stations that evaluated for proficiency at 1) basic airway management; 2) operation of a cardiac defibrillator/monitor; 3) cardiopulmonary resuscitation (CPR) and directing a team to manage a cardiac arrest; and 4) external cardiac pacing. Performance was assessed objectively using checklists of items and timed events, and subjectively via a global proficiency rating. **Results:** Performance varied widely within and across stations. Mean checklist scores ranged from 44% (3.1/7.0) for external cardiac pacing to 83% (5.0/6.0) for operation of the cardiac defibrillator/monitor. Mean global proficiency scores ranged from 2.1/5.0 for external cardiac pacing to 3.2/5.0 for CPR and leadership. The mean time to begin bag–mask ventilation of an apneic patient was 57 seconds (range 30–95). The mean time to demonstrate a cardiac rhythm on the monitor of a patient in cardiac arrest was 84 seconds (range 29–169). A total of 31 errors (mean 1.9/resident, range 0–4) that jeopardized the health of the patient or safety of health care staff were committed. **Conclusion:** New internal medicine residents at out center lack proficiency with cardiac resuscitation skills, resulting in delays in patient assessment and proper management during critical events. **Keywords:** ACLS, medical students, resuscitation skills

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POTENTIAL vitamin interactions in children

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Introduction: Significant growth in vitamin use has been documented in the literature in recent years both in children and adults. All vitamins have significant pharmacological activity and can interact with prescribed or over-the-counter medications. The objective of the study was to determine the frequency and types of potential interactions between vitamins and conventional medications in children arriving at the pediatric emergency department. **Methods:** A survey of parents and/or patients 0–18 years arriving at a large tertiary pediatric ED in Canada in the preceding three months. **Results:** A total of 1804 families were interviewed in this study. A considerable number of patients (11% of our cohort) had possible vitamin-medication interactions in the preceding 3 months which could theoretically result in adverse events, and over one-third of these children had more than one interaction. Patients with potential interactions and their parents were significantly older ($p < 0.001$ for the child and mother, p = 0.02 for father), they were much more likely to have a chronic illness ($p < 0.001$) and concurrently receive prescribed or over-the-counter medication ($p < 0.001$), and more children with interactions were completely immunized (p = 0.02). Child's sex, parental education, employment status, family income and primary language spoken at home were not associated with interactions. **Conclusion:** Taking into account the high rate of potential vitamin–drug interactions, especially among older children and patients with chronic illness, parents and health care providers need to balance the potential benefit of concurrent vitamin–medication use with its potential harms. **Keywords:** vitamins, drug interactions, pediatrics

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BILL 110: an evaluation of the impact of Canada's first mandatory gunshot wound reporting law

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Introduction: On Sept. 1, 2005, Ontario proclaimed into law Bill 110, Canada's first law mandating GSW reporting. We assessed awareness and impact of the law through surveys of emergency physicians, police and the public. **Methods:** Electronic surveys were sent to 1080 members of the OMA Section on Emergency Medicine in June 2007. The public survey of 1000 Ontario residents was conducted by Ipsos–Reid in July 2007. The Ontario Government assisted in obtaining opinions by email from selected members/chiefs of police forces in Ontario. **Results:** The physician response rate was 24%; respondents were representative of the EM community. The great majority (89% and 93%, respectively) was aware of the law and willing to comply. Eighty percent reported no problems with either the police or the bill, and 86% perceived no change in relations with patients. Six incidents of patients delaying care were reported. Two-thirds of the public respondents were aware of the law; after being informed almost all (96%) expressed support, the majority (80%) felt it would not affect relations with physicians. The Ontario Association of Chiefs of Police informed us that there was strong consensus among the police leaders that Bill 110 has been beneficial. All 47 Bureau Commanders of the Ontario Provincial Police who received our survey replied. All felt Bill 110 was helpful to investigations, 70% felt it had improved public safety and 60% felt it had improved relations with health care workers. Eight (17%) reported being personally involved in an investigation initiated by a report under the Bill; leading to between 6 and 14 incidents of charges being laid and/or guns confiscated. Data on actual reports and results of investigations are not available. **Conclusion:** Bill 110 has been broadly accepted in Ontario. Anecdotes of patients delaying care to avoid reporting and of investigations based on reports leading to charges/gun confiscations were identified. Actual impact on injury prevention and safety cannot be assessed. **Keywords:** mandatory reporting, gunshot wound, Bill 110

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EXPERIENCE, training not a predictor of high, average or low admitting in emergency physicians

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Introduction: Empirical evidence for emergency physician admission rate variability is sparse to nonexistent. The few occasions this phenomenon is mentioned in the literature are in the context of anecdotal evidence or physicians' adherence to some protocol or guideline. To the authors knowledge this is the first independent study of physician admission rate variability. **Methods:** A survey measuring attitudes and demographics was distributed to all emergency physicians ($n = 30$) at a large regional hospital (ED census ~ 90 000 patients/yr). Admissions data from the previous year, including CTAS scores, was drawn from existing hospital databases and matched to individual physician survey results. The resultant dataset was analyzed for correlations and trends. Researchers were blinded to physician identity at all stages of the study. **Results:** Survey response rate was 97% ($n = 29$). Overall admission rates ranged from 8.69% to 17.00%, (mean 12.53, SD 2.21). Admissions data showed the greatest variability in the CTAS I (highest acuity) category, contrary to the researchers expectations, with an admission rate range of 69.23, (mean 70.63%, SD 13.78). More years of EM experience was significantly correlated with more admissions in the CTAS 2 category, $r = 0.4$, $p < 0.05$; however, in all other CTAS categories the correlation was negative, though not significant. Whether a physician worked full time, part time, less than part time or as a locum did not predict a pattern of high or low admitting, nor did having any particular post graduate certification (CCFP, CCFP[EM], FRCP). **Conclusion:** The absence of a significant relationship between rates of admission and educational factors or years of emergency medicine experience is notable and suggests that the variability measured is due principally to inherent physician characteristics. This study should be replicated to test generalizability of results. Broad variability in admitting practices in the ED might be lessened with treatment guidelines specifically targeting higher-acuity patients. **Keywords:** admission thresholds, practice variation, training

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A comparison of survival probabilities according to the transfer status of trauma victims

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Introduction: Little is known about the injury profiles of patients transferred from a lower to a higher level of care hospital compared to patients that are not transferred. Our objectives were to compare injury profiles and survival probabilities of transferred and nontransferred adult trauma victims in a regionalized system including 4 levels of care. **Methods:** The study population was based on the provincial Trauma Registry, which contains data observations from all trauma centres between 1998 and 2005. The population comprised 36 118 adults trauma patients, of these 9281 (25.7%) were transferred to a higher level of care. Deaths on arrival and in less than 2 hours after arrival at the initial hospital were excluded. Multiple logistic regression was used to compare the mortality experience of patients according to their transfer status and level of trauma care, while adjusting for injury severity (ISS), body region of the worst injury and age. **Results:** Comparison of adjusted mortality of patients transported directly to a trauma centre and not transferred revealed decreasing mortality for increasing expertise (odds ratios [OR] of 1.00, 1.08, 1.23 and 1.41 for levels I to IV, respectively). However, adjusted mortality of patients transferred to a level I centre was lower than that of patients sent directly to a level I trauma center: level IV OR 0.84, level III OR 0.907 and level II OR 0.48. Adding a transfer factor to the regression analysis model also revealed a protective effect of being transferred compared to direct transport (OR 0.86, 95% confidence interval 0.76–0.97). **Conclusion:** Lower mortality for patients transferred to a level I centre over patients arriving directly is illogical. This could be caused by the fact only patients with a higher survival probability according to clinical judgment are in fact transferred. Our results suggest that the results of studies evaluating the benefits of transferring trauma patients to higher levels of care could be misleading. **Keywords:** trauma, survival analysis, inter-institution transfer

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SUGGESTIVE renal ultrasound is associated with significant rates of urologic intervention in emergency department patients with suspected renal colic

Sedran RJ, Yan JW, McLeod SL, Theakston KD, Edmonds ML. Division of Emergency Medicine, Faculty of Medicine, University of Western Ontario, London, ON

Introduction: Computed tomography (CT) is a common imaging modality for suspected renal colic because of its diagnostic accuracy; however, ultrasound (US) is an alternative that does not expose the patient to radiation. Clinical decisions are straightforward when the US is normal or demonstrates a ureteric stone. Frequently the US fails to visualize a ureteric stone but does demonstrate sonographic features suggestive of renal colic (hydronephrosis, perinephric fluid,

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absent urinary jets or intrarenal stones). The purpose of this study was to determine the urologic outcome of patients with a suggestive renal US. **Methods:** A retrospective chart review was completed for all adult patients who had an emergency department (ED)–ordered US for suspected renal colic. Data was gathered from 2 tertiary care EDs with a combined annual census of 95 000 during a 1-year period (Jan. 1 to Dec. 31, 2006). Independent, double data extraction was performed for all imaging reports and results were categorized as normal, suggestive, stone seen or nonrenal disease. Charts of patients who had suggestive US were reviewed to determine if a stone was documented on further imaging, and if urologic intervention was required within 90 days. **Results:** Of 857 renal US ordered during the study period, 182 (21.2%) were classified as suggestive. Fifty-two (28.6%) of these patients underwent additional imaging where 21 (11.5%) stones were identified. All but 1 of these stones was less than 7 mm (mean 4.8 mm, SD 1.7 mm). However, 13 (7.1%) patients required urologic intervention. **Conclusion:** There is a significant rate of urologic intervention within 90 days for patients with renal US suggestive of urolithiasis. Close clinical follow-up or use of CT may be warranted in this population. Future prospective research is needed to better define the role of US in the ED management of renal colic. **Keywords:** renal ultrasound, renal colic, urologic intervention

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PREDICTIVE value of xanthochormia by spectophotometry in suspected subarachnoid hemorrhage (SAH) in the emergency department (ED)

Emond M, Perry JJ, Rachid A, Baril P, Nadeau L. Laval University, Québec City, QC

Introduction: The usual investigation tools of acute headache in the ED include CT scan and lumbar puncture. The absence of xanthochromia is used to exclude SAH when the initial CT scan is normal. Few studies have evaluated the diagnostic ability of xanthochromia by spectophotometry in the ED. Our objective was to establish the predictive value and change in angiography rate of different method of xanthochromia detection. **Methods:** A retrospective cohort study of patient with suspected SAH was realized from 2003 to 2006. Charts were reviewed if patients were more than 14 years of age, had a GCS of 15 and had a chief complaint of nontraumatic acute headache and an initial normal CT scan. Charts were identified using laboratory databases. Extraction of patient data permitted the evaluation of different xanthochromia detection. The definition of positive SAH was a positive angiography investigation and a positive visual xanthochromia or more than 5 × 106 red blood cells/L in the last LP tube. Sensitivity, specificity, predictive values and change in angiography rate were calculated. **Results:** There were 363 patients included, 5 (1.3%) had a positive SAH. There were no differences in baseline characteristics. Predictive values of different xanthochromia detection were as they appear in Table 1. **Conclusion:** Predictive values of xanthochromia by spectophotometry revealed low sensitivity with high specificity. A higher sensitivity goal will increase projected angiography rate and use of resources. **Keywords:** xanthochromia, spectrophotometry, subarachnoid hemorrhage

Table 1, Abstract 118.

	Sensitivity (95% CI)	Specificity (95% CI)	Projected angiography rate	% change in angiography rate
Visual	40 (5–85)	98.3 (96.4–99.4)	2.2	–71
Hendrik	80 (28–99)	87.4 (83.4–90.6)	13.6	+181
Chalmers	40 (5–85)	97.5 (95.3–98.8)	3	–60
Chalmers revised	40 (5–85)	98 (96–99)	2.5	–67
UK NEQAS	40 (5–85)	94.9 (92.1–96.9)	5.5	–26

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VALIDITY of the Canadian Emergency Department Triage an Acuity Scale at a tertiary care center in Saudi Arabia

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Introduction: The Canadian Emergency Department Triage and Acuity Scale (CTAS) is a 5-level triage tool, with I being the most acute. It has been shown to be a reliable and valid triage tool in Canada. In 2002, CTAS was first instituted at our tertiary care center in Saudi Arabia. However, it has never been evaluated in our population. We sought to evaluate the validity of CTAS in predicting hospital admission at our tertiary care center in Saudi Arabia. **Methods:** Our emergency department (ED) sees 45 000 visits per year with an overall admission rate of 9%. A retrospective study of all patients presenting to our ED from Sept. 1 to Sept. 30, 2007, was performed. The CTAS category and ultimate disposition for each patient was recorded. For this study, ED death and hospital transfer were considered as admissions. **Results:** During the study period, 4108 patients visited the ED and 3636 were included in the final data analysis. Four hundred seventy two patients were excluded due to missing or incomplete data. The total number in each triage category was 18 (CTAS I), 150 (CTAS II), 896 (CTAS III), 2098 (CTAS IV), 474 (CTAS V). Hospital admission rates were 67% (CTAS I), 47% (CTAS II), 18% (CTAS III), 3% (CTAS IV), 1% (CTAS V). **Conclusion:** At our tertiary care center in Saudi Arabia, CTAS appears to be a valid triage tool that predicts patient's disposition from the ED. **Keywords:** CTAS, triage, Saudi Arabia

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PREDICTIVE factors of delayed complications of acute minor thoracic injuries (MTI).

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Introduction: MTI with or without ribs fractures are associated to delayed significant complication (DC) in nearly 10% of patients. It has been suggested that age more than 65 years and the number of fractures could predict those DC. According to a previous study there is an important lack in standardized recommendation for follow-up of these injuries. Our objective was to derive predictive factors of DC. **Methods:** A multicentre retrospective cohort study was performed in three university-affiliated Canadian EDs from 2004 to 2006. Patients older than 16 years old with an MTI, including suspected or proven rib fracture with a normal chest radiograph, were included. Charts of patient with any intra- or extrathoracic complication at initial visit in ED were excluded. Main outcome was the presence of hemothoraces/pneumothoraces at any follow-up visit. Any other significant complications (e.g., lung contusion, pneumonia) composed the secondary outcomes. Univariate and multiple regression analyses were used to compare profiles of patients with or without delayed complications. **Results:** There were 588 charts analyzed; the most frequent DC was hemo-

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thorax (3.57%). Consultation delay of less than 24 hours from trauma was significantly associated with delayed hemothoraces (OR 4.5, 95% CI 1.3–15.3). Age greater than 65 and the number of rib fractures were not statistically associated with delayed hemothorax. However, those older than 65 (OR 2.3, 95% CI 1.1–4.8) or taking antiplatelets medications (OR 2.2, 95% CI 1.1–4.4) were associated with the presence of at least 1 DC. **Conclusion:** The incidence of delayed hemothoraces is lower than expected. Age and the number of fracture failed to predict delayed hemothoraces. Surprisingly, delay in consultation and use of antiplatelets agents were predictive factors of any DC. A larger prospective study with systematic follow-up is needed to confirm those results. **Keywords:** minor thoracic injury, hemothorax, chart review

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A review of gastrointestinal decontamination for overdose patients at the Ottawa Hospital

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Introduction: The risks and benefits of gastrointestinal decontamination are considered in the emergency department for all poisoned patients. Recently we experienced several potentially avoidable serious adverse events related to gastrointestinal decontamination that necessitated the creation and implementation of institutional guidelines at our hospital based on published recommendations for the use of activated charcoal. The purpose of this study was to evaluate our adherence to our institutional guidelines for the use of activated charcoal in poisoned patients. **Methods:** We performed a retrospective chart review of consecutive poisoned patients presenting to our emergency department between Jan. 1 and Dec. 31, 2006. Patients transferred from other institutions and those with noningested poisonings were excluded. Data describing patient demographics, overdose characteristics, gastrointestinal decontamination use and eligibility, and outcomes were collected. Eligibility and use of gastrointestinal decontamination was independently reviewed and adjudicated by 3 separate reviewers using predefined criteria from institutional and published guidelines. **Results:** Data was collected from 192 consecutive cases of poisonings during the study period. Activated charcoal was administered in eight of 33 eligible cases (24%) and in 8 other cases where patients did not meet institutional eligibility criteria. Three of the 16 patients who received activated charcoal had an adverse event. **Conclusion:** The majority of patients deemed to be eligible for gastric decontamination with activated charcoal did not receive therapy for their ingestion. Half of the patients who received charcoal did not meet institutional eligibility criteria. Further educational efforts to raise awareness of institutional guidelines and earlier recognition of eligible patients are warranted to ensure appropriate use of activated charcoal and minimize avoidable adverse events. **Keywords:** gastrointestinal decontamination, overdose, chart review

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THE potential of web-based graphical user interface design to contribute to medical error in clinical decision support systems

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Introduction: Emergency physicians (EPs) are expected to adhere to complicated treatment algorithms and decision support rules. The University of Alberta hosts eCPG, an intranet-based Clinical Decision Support System (CDSS) that contains a variety of electronic clinical tools that include patient handouts, order sets, assessment tools, clinical practice guidelines with varying degrees of interactivity and other clinical updates. Two CDSS pertaining to community acquired pneumonia (CAP) and neutropenic fever (NF) had second-generation prototypes developed as part of a project to add extra functionality to the eCPG site. Inherent in the development process was a detailed analysis of the usability of the existing and prototype CAP and NF applications. **Methods:** Seven volunteer EPs were observed performing tasks based on standardized mock patient encounters. Screen graphical user interface (GUI) interaction was recorded with automated screen capture software along with audio recording. Audio recording of EPs using the tools were transcribed verbatim, analyzed and correlated with events in the automated screen capture videos to identify relevant incidents. **Results:** A total of 422 events were recorded in the 56 sessions. Seven main categories of events emerged: 1) negative comments; 2) positive comments; 3) neutral comments; 4) events (e.g., subject ignores drug dosing recommendation); 5) problems; 6) slips (corrected mistakes); and 7) mistakes. In total, there were 169 negative comments, 55 positive comments, 130 neutral comments, 21 events, 34 problems, 6 slips and 5 mistakes identified. Of the 5 mistakes, 2 could have potentially led to adverse events. **Conclusion:** Previous studies have shown that technology-induced error can lead to adverse medical outcomes. Direct observation of clinical users showed that GUI issues can lead directly to mistakes that could potentially lead to adverse events. Performing usability testing early in design phases of CDSS could identify and mitigate such problems. **Keywords:** clinical decision support system, graphical interface, medical error

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ULTRASOUND versus CT scans for estimation of stone size in renal colic

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Introduction: Although computed tomography (CT) is a frequently employed imaging modality for suspected renal colic because of its diagnostic accuracy, ultrasound (US) is an alternative that does not expose the patient to radiation. It has been suggested that US overestimates the size of stones. As part of a review of the utility of US in the management of emergency department (ED) patients with possible renal colic, we compared the reported stone sizes for patients who had stones seen on both US and CT. **Methods:** A retrospective chart review was completed for all adult patients who had an ED-ordered US for suspected renal colic. Data was gathered from 2 tertiary care EDs with a combined annual census of 95 000 during a 1-year period (Jan. 1 to Dec. 31, 2006). Reported stone sizes were compared in patients who underwent renal CT within 90 days of ED-ordered US and had a stone seen on both tests. **Results:** There were 857 ED-ordered renal US during the study period. Of the 241 renal US where a stone was seen and measured, 44 had a CT done in follow-up and there were 30 stones seen on CT which could be compared. There was significant correlation between the stone size reported on US versus CT ($r = 0.53$, $p < 0.01$). US overestimated the size of the stone in 19 (63.3%) cases, with the mean overestimate being 1.7 mm (range 0.3–9.0 mm, $p = 0.046$). However, in 17 (56.7%) cases, the size reported on CT and US differed by 2 mm or less. **Conclusion:** Although there was significant correlation between the sizes of stones seen on US versus CT, on average US overestimated the stone size. Stone size is often used to predict the need for urologic intervention; therefore, this may affect the utility of US in determining the need for urologic follow-up and treatment. **Keywords:** ultrasound, computerized tomography, stone size

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BEST better early stroke treatment: implementation of nursing questionnaire aids in triage of acute ischemic stroke patients

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Introduction: As part of the recommendations of the current guidelines for the management of acute stroke, hospitals must create efficient pathways to rapidly identify and evaluate stroke patients. To minimize delays in triage, we developed an organized protocol to speed the clinical assessment, the performance of diagnostic studies, and decisions for early management. **Methods:** A random cohort of 43 patients was collected after implementation of the Better Early Stroke Treatment (BEST) Nursing Questionnaire in the setting of a tertiary care ED. BEST Nursing Questionnaire includes:

- Patients name
- Location of referring ED
- Time of symptom onset
- Consideration of t-PA by outside physician
- t-PA administration
- Estimated time of arrival

Data collected included symptom onset to ED presentation, consideration of t-PA, t-PA administration, and ED length of stay (LOS). Descriptive statistics and Wilcoxon/Kruskal–Wallis tests were performed in JMP software (SAS institute, Version 6.0). **Results:** The BEST Nursing Questionnaire was completed in all 43 patients prior to arrival at the tertiary care ED. Only 16 of the 43 patients were considered to be candidates for t-PA by the outside facilities. Of those 16, a total of 4 received t-PA prior to their arrival at the tertiary care ED. All patients were triaged to the specialized area of the ED upon arrival and managed by a standardized acute stroke protocol. The ED LOS was available in 35 of 43 patients. The median ED LOS was 2.83 hours (interquartile range 2.08–5.25 hr). This time is significantly lower than the recorded times during the previous 12 months, with a median of 3.55 hours (interquartile range 2.63–4.70 hr), $p = 0.046$. **Conclusion:** Implementation of the BEST Nursing Questionnaire aids in management of AIS patients by triaging patients to a specialized area of the ED and decreasing ED LOS. The questionnaire enhanced ED throughput by shortening the median ED LOS by approximately 1 hour which is of paramount importance given the current overcapacity trends. **Keywords:** acute ischemic stroke, triage, length of stay

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IMAGING modalities for the assessment of acute appendicitis in the emergency department

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Introduction: Appendicitis is routinely on the differential for patients that present to the emergency department (ED) with an acute abdomen. Clinical diagnosis can be inaccurate with a reported negative appendectomy rate (NAR) of 16%–40%. Several studies have indicated that despite the increased use of diagnostic imaging, NARs have remained relatively unchanged. The objective of this study was to review the utilization of imaging modalities, factors associated with choice of imaging modality and the NAR at our institution. **Methods:** A retrospective chart review was completed for all adult patients with an ED diagnosis of appendicitis. Data was gathered from 2 tertiary care EDs (combined annual volume 95 000) during a 1-year period (Apr. 1, 2006, to Mar. 31, 2007). **Results:** Of 250 patients with a diagnosis of appendicitis, 30 were managed without imaging. One hundred and twelve patients had an ultrasound (US), 128 had a computed tomography (CT) scan and 15 had both. Younger patients (< 45 yr) were less likely to have a CT scan (26.6% v. 71.7%, $p < 0.001$) compared to older patients (> 44 yr), with no difference found between males and females (44.4% v. 42.1%). Younger patients were more likely to have an US compared to older patients (49.4% v. 15.2%, $p < 0.001$), with young females receiving more US than males (45.2% v. 28.2%, $p = 0.005$). The NAR was similar in those patients managed with US (6.5%) and CT (4.7%); however, the NAR was statistically higher for those patients that did not have imaging (20.0%, $p < 0.05$). **Conclusion:** There was a high rate of imaging overall with 51.2% of patients receiving a CT scan prior to appendectomy. Although the rate of misdiagnosis was lower in those who received imaging, the most appropriate use of these diagnostic tests warrants further study owing to costs, time in the ED and concerns regarding the lifetime cumulative radiation exposure attributed to CT. **Keywords:** appendicitis, imaging, radiation exposure

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ASTHMA presentations by children to emergency departments in a Canadian province: a need for better follow-up

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Introduction: Asthma has a high prevalence among North American children and presentations for exacerbations to the emergency department (ED) are common. In this study, the epidemiology of acute asthma presentations by children in the province of Alberta is described. **Methods:** ED visits were identified in the Ambulatory Care Classification System databases and linked to other provincial administrative databases to obtain all ED and follow-up encounters for asthma made by children less than 18 years of age during 6 fiscal years (April 1999 to March 2005). Information extracted included demographics, ED visit timing and subsequent visits to physicians; all data were coded by trained medical records nosologists. Data analysis included descriptive summaries and directly standardized visit rates (DSR). **Results:** During the study period, 94 187 ED visits for asthma were made by 45 385 distinct children, averaging of 2.1 visits per child. The rates were 21/1000 in 99/00 and 19.8/1000 in April 2005. Annual visits for Aboriginal children were higher (124/1000) than any other group. Until age 14, more male than female children presented; a noticeable spike reaching 47.6/1000 visits for boys aged 1 to 4 years old compared to 26.9/1000 for girls; these rates decline and reverse in adolescent ages. Daily, weekly, and monthly trends were also seen. While 89.2% of these ED visits resulted in discharge, these encounters were followed by infrequent physician follow-up (29%) within 1 week of discharge. Repeat ED visits within 1 week (5.4%) and 180 days (23.8%) were identified. **Conclusion:** Asthma is a relatively common presenting problem in Alberta EDs. These results suggest that the rates have remained relatively constant; however, disparities exist based on age, sex and socio-economic/cultural status. Follow-up reassessments with physicians within a week are lower than expected and may explain the repeat ED presentations. Interventions to reduce asthma-related ED visits by children are needed. **Keywords:** asthma, pediatrics, continuity of care

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LOW-IMPACT pelvic fractures presenting to the emergency department

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Introduction: Elderly patients with low-impact pelvic fractures present a challenge of appropriate disposition for emergency depart-

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ment (ED) physicians. Few studies describe patterns of occurrence, ED-based clinical care and outcomes for these patients. **Methods:** Patients treated for a pelvic fracture in a tertiary care ED in Kingston, Ontario, in 2005/06 were identified in emergency discharge databases using ICD-10 codes. A retrospective chart review of ED and hospital records collected information on the injury event, clinical care provided and outcomes at 1 year on those with low-impact pelvic fractures. **Results:** Of 132 pelvic fractures captured, 77 were identified as low-impact pelvic fractures. Patients were predominantly female (82%), with an average age of 81 years and all but 3 reporting comorbidity. Common presentation was by ambulance (74%) following a fall (94%) with 82% the result of simple falls from standing. Fractures involved the pubic rami (86%), sacrum (25%), acetabulum (21%), ilium (4%) and ischium (1%) with multiple sites in 35%. The median length of stay in the ED was 9.4 hours. Consults included orthopedics (43%), medicine (8%), social work/homecare (33%). Twenty-five (32%) were admitted (orthopedics 20, medicine 5). Median length of stay in hospital was 13 days. Ten patients had surgical stabilization, most of the acetabulum. Five patients died in hospital, 4 precipitated by pneumonia and 1 by myocardial infarction. Eight additional patients died within 1 year of discharge from ED or hospital. Postinjury, 18% lived independently and 16% walked without aids versus 42% and 38%, respectively, before the injury. **Conclusion:** Low-impact pelvic fractures affect an elderly patient population with substantial pre-existing comorbidity. They are important injuries that affect independence and seem associated with an increased risk of death. Additional research is needed to develop appropriate and safe disposition plans for rehabilitating these persons postinjury. **Keywords:** low-impact pelvic fracture, geriatrics, prognosis

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FACTORS associated with troponin I elevation in middle-aged adults presenting to the emergency department

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Introduction: Chest pain (CP) is a frequent and potentially ominous complaint in the emergency department (ED). Despite low incidence of acute myocardial infarction (AMI), many troponins (cTnI) are drawn in middle-aged adults representing significant resource utilization. Strategies aimed at risk stratification to guide ED assessment could aid in optimizing cTnI assessment in this cohort. **Methods:** Subjects included all men aged 40–55, and women aged 40–65 who had cTnIs drawn in the Moncton Hospital ED, Moncton, NB, in 2005. Over 100 variables were assessed. The main outcome measure was cTnI elevation (> 99% upper limit normal). **Results:** There were 1593 charts reviewed (627 men, mean age 51.2 yr). Of these, 91 (5.7%) patients had a positive cTnI. There were 29 factors significantly associated with cTnI elevation identified. Male sex ($p < 0.001$), smoking ($p = 0.007$), dyslipidemia ($p = 0.005$), and obesity ($p = 0.01$) were associated with positive cTnI. Diabetes, hypertension, and family history were not. Pain radiation to both arms ($p < 0.001$), diaphoresis ($p < 0.001$) and retrosternal location ($p = 0.002$) were also associated with cTnI elevation. Any ECG change, including nonspecific ST changes ($p = 0.005$), was associated with positive cTnI, as was leukocytosis ($p < 0.001$) and random glucose ($p = 0.01$). Factors negatively associated with cTnI elevation were prior number of ED visits ($p < 0.001$), pain reproduced by palpation ($p = 0.02$), sharp CP ($p = 0.023$), brief duration ($p = 0.04$). **Conclusion:** Although evaluation of CP in middle-aged adults represents significant ED resource utilization, no studies have identified factors associated with cTnI elevation in this population. We identified aspects of patient history, physical and ECG findings that might be used to better identify those patients at greater risk of AMI. Future studies should target strategies for risk stratification of this patient population and methods to optimize cTnI use. **Keywords:** troponin, chest pain, chart review

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EMERGENCY department troponin I assessment in middle-aged adults: patterns of use

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Introduction: Chest pain (CP) is a frequent and potentially ominous complaint in the emergency department (ED). Despite low incidence of acute myocardial infarction, many troponins (cTnI) are drawn in middle-aged adults representing significant resource utilization. Understanding patterns of utilization can aide in planning/resource allocation for the ED. **Methods:** Subjects included all men aged 40–55 and women aged 40–65 who had cTnIs drawn in the ED at the Moncton Hospital, Moncton, NB, in 2005. The aim was to identify factors associated with cTnI elevation; a subanalysis was performed to describe the patient population and utilization patterns of cTnI in middle-aged adults. **Results:** There were 1593 charts rreviewed (627 men, mean age 51.2 years). There were 2529 cTnIs performed in study subjects. Of patients, 1157 (72.6%) had chest pain, 165 (10.4%) had pre-existing coronary artery disease and 243 (15.3%) had diabetes. Ninety-one (5.7%) patients had a positive cTnI. Smoking ($p = 0.007$), dyslipidemia ($p = 0.005$), and obesity ($p = 0.01$) were associated with positive cTnI. Diabetes, hypertension and family history were not. Most patients had 1 ($n = 860$) or 3 ($n = 599$) cTnIs drawn. Of pateints, 684 (42.9%) were discharged after 1 cTnI. Mean previous number of ED visits for CP was 1.12 (SD 2.53); 490 (30.8%) patients had an ED diagnosis of CP not yet diagnosed (NYD). There were 618 (38.8%) patients admitted, 172 (10.8%) were assessed in the rapid chest pain assessment clinic. **Conclusion:** Despite a relatively low incidence of AMI, a large number of middle-aged adults have cTnI evaluation and are admitted to hospital. A significant proportion of patients were diagnosed with CP NYD. CP in middle-aged adults poses a significant diagnostic challenge and resource utilization in the ED. Future research should target strategies of risk stratification for optimal cTnI assessment in this cohort. **Keywords:** troponin, chest pain, utility

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ADHERENCE of emergency physicians to Canadian Cardiovascular Society Guidelines in the treatment of patients with acute decompensated heart failure

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Introduction: The recently published 2007 update of Canadian Cardiovascular Society (CCS) Guidelines recommend the use of intravenous diuretics and vasodilators for treatment of acute decompensated heart failure (adHF). Previously published data from a single regional study (Edmonton, AB) found these agents to be used in a relatively small proportion of patients presenting to the emergency department (ED). We extended the analysis to include both eastern and western Canadian centres to determine the ED practice pattern and also compared our findings to US data. **Methods:** Medications given in the ED were determined by retrospective chart reviews in consecutive patients presenting to 2 Canadian EDs: Foothills Medical Centre (FMC), Calgary, Alberta (Oct. 1, 2004, to Mar. 31, 2005; $n = 223$) and St. Michaels Hospital (SMH), Toronto, Ontario (Apr. 1, 2005, to Sept. 30, 2005; $n = 123$). ICD-10 codes (FMC) and Emergency Department Information System-EDIS (SMH) for adHF admission were used to screen patients. This was compared with US ADHERE Registry data. **Results:** More patients received antihypertensive medication in the western Canadian centre; neither center

utilized vasodilator therapy to any significant extent comparable with ADHERE registry data. **Conclusion:** Based on new CCS guidelines, treatment patterns before guideline inception show suboptimal therapy for the treatment of adHF in 2 major academic centres in Canada. This study advocates the need to apply these practice guidelines and establish treatment algorithms to guide future treatment of adHF. **Keywords:** acute decompensated heart failure, clinical practice guideline, guideline adherence

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ASSESSMENT of medical adventure racing as a tool for teaching acute care skills

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Introduction: Simulation through moulage (representations of clinical scenarios using actors, props and make-up) is often used to teach acute care skills, particularly related to trauma. Medical Wilderness Adventure Race (MedWARs), a series of educational events held around North America since 2001, is a novel method of moulage teaching in an outdoors setting. The objective of the study was to assess the effectiveness of MedWAR participation in increasing the participants' sense of mastery of acute care topics. **Methods:** The study consisted of 2 questionnaires, given before and after the event to all willing participants of the MedWAR North race, held near Toronto in March 2006. The race included scenarios on mass trauma, near drowning, exposure, burns, etc. The participants were asked to rate themselves on 14 areas of acute care knowledge and 5 areas of acute care processes on a 5-point Likert scale. Pre- and postrace self-ratings on each item were compared using Wilcoxon matched-pairs nonparametric test. **Results:** Of 42 participants, 25 filled out the questionnaires. The majority (56%) were medical students, the rest being residents, practising MDs and paramedics. Eleven out of 14 categories were found to be significantly ($p < 0.05$) increased postrace (Scene assessment, Triage, Secondary survey, C spine, Neuro, Chest, Abdo, MSK and Exposure injury, Shock and Evacuation). Primary Survey, CPR and Airways were not improved. Process questions improved in Teamwork, Calmness and Comfort with acute scenarios ($p < 0.05$). Organization was not improved. Majority of participants (96%) thought MedWAR was a good learning method, transferable to hospital setting and preferable to didactic teaching. **Conclusion:** MedWAR participation increased self-reported sense of knowledge and comfort with acute care in the majority of subject areas sampled by the survey. **Keywords:** Medical Wilderness Adventure Race, moulage, simulation