quantitative prediction of future events to develop initial plans. Through research, these predictions can be focused and refined. The results suggest that many hospitals will experience increased demand for services and will have to do resource allocation planning accordingly to ensure patient demand is met appropriately.
Keywords: patient flow, health human resources, admission

P116

An analysis of pediatric visits to a tertiary care centre in Northern Ontario, Canada

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Introduction: The Thunder Bay Regional Health Sciences Centre (TBRHSC) Emergency Department (ED) has experienced an all patient increase in visits ranging from 1.5 to 6% per year since 2004. As a regional referral centre with no dedicated pediatric ED, TBRHSC is the sole emergency provider. Given the rising visits, we have investigated the pattern of pediatric visits, rates of admission to hospital and for a subset of years the investigations completed. **Methods:** Pediatric visits from 2004 to 2014 were summarized for the TBRHSC ED. The pattern of visits was examined along with the rate of admission to hospital. We also investigated the trend in acuity over the study period. Laboratory and imaging data are purged 1 year after each visit and were not available prior to 2011 but were summarized for the remainder of the years to identify the rates of all investigations completed. **Results:** From 2004 to 2014 there was a total increase in visits of 7.5% with the average annual admission rate ranging from 5 to 6.3%. The month to month variability in visits over the study period was high with a minimum of 1292 in August 2004 and a maximum of 2488 in October 2009. Nearly all patients were either CTAS II, III or IV, with level III having the highest occurrence. The mean investigation rate was approximately 16, 0.8, 24, and 2.3% of patients having laboratory, CT, x-ray and ultra-sound completed, respectively. **Conclusion:** Pediatric patients are an important subset of all patients visiting the ED. They often require special resources and at the TBRHSC use specific treatment spaces. In addition, there is a limited number of pediatric inpatient hospital beds. Managers could use the timing of visits, number of visits and admission rates to examine resource use and the probability of exceeding capacity. This study also provides baseline information on the rates of investigations, especially imaging such as CT which can have long-term radiological consequences.
Keywords: pediatrics, patient flow, diagnostic investigations

P117

Does an age-adjusted D-dimer threshold provide adequate sensitivity in ED patients investigated for pulmonary embolism?

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Introduction: The D-dimer assay is a high sensitivity, low specificity test used to rule out pulmonary embolism (PE) in low risk ED patients. Patients with a positive D-dimer result will likely undergo CT imaging to confirm the diagnosis. Given the time, cost, and radiation exposure associated with CT, and the higher false-positive rate in older patients, an age-adjusted D-dimer threshold may be preferred. Our objective was to evaluate the sensitivity and specificity of an age-adjusted D-dimer and approximate the downstream effect on CT imaging utilization. **Methods:** This was a retrospective cohort study conducted using administrative data from Calgary emergency departments between July 2013 and January 2015. Eligible patients were individuals aged 50 and older who were undergoing PE workup including D-dimer testing. Outcomes were ascertained using CT imaging reports and by searching the regional administrative database for subsequent diagnosis of PE within 30 days of the index visit. These data were used to calculate the sensitivity, specificity, positive predictive value, and negative predictive value of the D-dimer test using the standard threshold (500 ng/mL) and an age-adjusted threshold (10 ng/mL x patient age as an integer). From this, the potential reduction in CT imaging use and missed PE diagnoses were modeled. **Results:** Of 6669 patients aged 50 or older who had D-dimer testing for possible PE, 1504 (22.6%) underwent a CT scan, and 217 (14.4% of CT) received a discharge diagnosis of pulmonary embolism, which was confirmed on chart review. When test results were re-interpreted using an age-adjusted threshold, D-dimer specificity increased from 63.9% to 75.4%, while sensitivity decreased from 96.5% to 89.9%. This translates to 888 new true negatives, representing CT scans potentially avoided (a 59% reduction in CT utilization), but with 18 new missed PE diagnoses. **Conclusion:** The age-adjusted threshold may reduce use of CT imaging among older patients suspected of PE, but at the cost of more missed PE diagnoses.
Keywords: pulmonary embolism, D-dimer, diagnostic imaging

P118

The utility of serum markers for diagnosing septic arthritis in the emergency department: do rigid cut-offs improve diagnostic characteristics?

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Introduction: Septic arthritis represents one of the most severe diagnoses for a presentation of an acutely swollen joint, with a high level of morbidity and mortality associated with delayed management. There is continued interest in the utility of serum markers of inflammation in diagnosing this dangerous condition, however there is a lack of clear consensus for cut-offs that optimize diagnostic performance for these tests. The objective of this study was to perform a systematic search of the literature to identify optimal cut-offs for commonly ordered serum markers and to assess how these cut-offs perform in a cohort of patients with a diagnosis of septic arthritis. **Methods:** We performed a systematic literature search aimed at identifying optimal cut-offs for serum makers (white blood cell count (WBC), erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP)) used for diagnosing septic arthritis. We assessed the use of these markers within a retrospective cohort (n = 87) of patients diagnosed with septic arthritis (based on positive gram stain, culture, or treatment with a prolonged antibiotic course and/or surgical intervention) that presented to one of four emergency departments in Calgary over a two-year period. We then compared published values to local data. **Results:** We identified 10 articles that evaluated diagnostic characteristics for serum markers. Although there was variability for cut-offs reported in the literature, classically WBC >11 x 10^9/L, ESR >30 mm/h, and CRP >100 mg/L were reported to modestly increase the likelihood ratio of diagnosing septic arthritis. In our cohort, a complete blood count was ordered in the emergency department in 97% (n = 84) subjects. ESR and CRP were ordered in 66% (n = 57) and 85% (n = 74) of patients, respectively. When comparing the classic literature based cut-offs to our population group, a WBC <11 x 10^9/L was found in 38% (n = 32), ESR <30 mm/h in 51% (n = 38), and CRP <100 mg/L in 30% (n = 17). Sensitivity was found to be poor (61% for WBC >11 x 10^9/L; 70% for ESR >30 mm/h; 48% for CRP >100 mg/L). **Conclusion:** Data collected from the Calgary Emergency Department supports the published literature suggesting that serum tests are not helpful in the

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diagnosis of septic arthritis. Future work should evaluate these diagnostic characteristics in relation to patients with non-infectious monoarticular joint pain.
Keywords: septic arthritis, serum markers, diagnosis

P119

B-mode point-of-care ultrasound without doppler may help include or exclude significant carotid stenosis in stroke and transient ischemic attack patients - a prospective pilot study

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Introduction: Emergency physicians can use B-mode Point-of-Care Ultrasound (POCUS) to identify a patient's carotid vasculature including the common carotid artery (CCA), and carotid bulb (CB) as well as carotid bifurcation into the internal carotid artery (ICA) and external carotid artery (ECA). Radiology performed carotid ultrasound (RPCU) is performed using both B-mode and spectral Doppler ultrasound, a combination termed "duplex" ultrasound where first arteries are evaluated for stenosis using B-mode ultrasound, which is followed by flow measurements using Doppler. Performing flow measurements using Doppler may add a significant amount of time to the ultrasound, which makes it impractical for an emergency physician in a busy emergency department. Some institutional practices include arranging for outpatient RPCU to assess patients with Transient Ischemic Attack (TIA) and have them follow up in an outpatient TIA clinic. This study explored whether B-mode POCUS without Doppler may help identify Stroke or TIA patients in the emergency department with significant carotid stenosis (CS) by measuring the CCA, CB, and ICA lumen. **Methods:** Adult patients with an emergency physician diagnosis of stroke or TIA who were sent for RPCU were included in this study. An emergency medicine resident in their POCUS fellowship training performed a B-mode POCUS of the patient's right and left CCA, CB and ICA with the patient sitting 90 degrees. Three measurements of each of the 3 sections were obtained and the mean calculated. This was then compared to the results from the RPCU as CS $>50\%$ or CS $<50\%$. **Results:** 38 patients were included in the study between February and June 2013. We observed a correlation between absolute differences in comparing the right side of the carotid vasculature to the left side of the carotid vasculature with CS $>50\%$. Also, in one case, the absolute lumen diameter with B-mode POCUS without Doppler predicted near complete CS which was confirmed on the RPCU. **Conclusion:** B-mode POCUS without Doppler may be useful in identifying patients with CS above and below 50% and may help identify patients who need expedited referrals for CS. However, further research is required before this method can be recommended.
Keywords: point-of-care ultrasound (PoCUS), carotid stenosis

P120

Exploring the utility of the Hamilton early warning score at triage: pilot study in a Canadian emergency department

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Introduction: Early warning scores (EWS) use vital signs to identify patients at risk of critical events as defined by unplanned intensive care unit (ICU) admission, cardiopulmonary resuscitation (CPR), or death. Systems that combine an EWS with a ICU outreach team can improve hospital survival and cardiac arrest rates. Although initially developed for use in ward patients, evidence suggests that EWS are useful in emergency department (ED) patients and may aid in the earlier identification of sepsis. The Hamilton Early Warning Score (HEWS) was recently developed as part of quality improvement process in our health system. The current study examined HEWS at ED triage among a cohort of patients who experienced a critical event during their hospitalization. HEWS were also evaluated as a predictor of sepsis. **Methods:** Patient were selected from a database of patients admitted to a medical or surgical ward at two tertiary care hospitals over a six-month period. Cases were patients who experienced a critical event during admission and were admitted via the ED. Controls were randomly selected from the database in a two-to-one ratio using an algorithm to match cases based upon burden of comorbid illness. Receiver operator curves (ROC) and likelihood ratios were used to evaluate HEWS at ED triage as a predictor of likelihood of critical deterioration and sepsis. **Results:** The sample included 845 patients of whom 267 experienced a critical event. The median time to occurrence of critical event from admission was 124 hours. ROC analysis indicated that HEWS at ED triage had poor discriminative ability for predicting likelihood of experiencing a critical event 0.63 [95%CI: 0.58-0.67]. HEWS had fair discriminative ability for predicting likelihood of meeting criteria for sepsis 0.75 [95%CI: 0.71-0.80], and good discriminative ability for predicting likelihood of experiencing a critical event among patients meeting criteria for sepsis 0.80 [95%CI: 0.74-0.86]. **Conclusion:** This retrospective study indicates that HEWS at ED triage has limited utility for identifying patients at risk of experiencing a critical event. This may be because deterioration commonly occurred days after admission. However, HEWS may have utility as tool for aiding earlier identification of critically ill septic patients. Prospective studies are needed to further delineate the utility of the HEWS in the ED.
Keywords: triage, early warning scores, sepsis

P121

Does test-enhanced learning improve success rates of ultrasound-guided peripheral intravenous insertion? A randomized-controlled trial

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Introduction: Optimising teaching techniques when introducing learners to new skills such as ultrasound guided peripheral IV insertion (UGPIV) is essential due to the time and resource intense nature of skills learning. The testing effect has been demonstrated to be effective in improving learner retention, however there is little research evaluating the testing effect on the acquisition of technical skills in medicine. This study aims to determine whether test-enhanced learning improves learner performance of UGPIV. **Methods:** A prospective randomized control trial is ongoing with medical students on rotation at Sunnybrook Health Sciences Centre. Participants are randomized to one of two study groups, the control group (CG) and the test-enhanced learning group (TEG). Each group receives a teaching session lasting 1.5 hours surrounding ultrasound guidance for peripheral IV insertion. The TEG receives a formal evaluation of the skill during the last 15 minutes of that session, whereas the CG has continued practice time. Subjects in both groups are being evaluated two weeks later to compare skill performance using an objective structured assessment of technical skills. **Results:** Data collection is ongoing and is expected to be completed with an recruitment of 40 by March 31st. **Conclusion:** Given the importance and resource intensive nature of technical skill training it is important to have an understanding of the most efficient ways to teach new techniques. The results from this study will help provide evidence on the testing effect as a method of improving competency and retention for ultrasound guided procedures.