

physicians (MD). An ACP requesting DI at the time of first assessment would likely improve patient flow. We investigated whether ACPs can safely and cost-effectively request DI for extremity injuries without increasing cost or exposing patients to unnecessary radiation. **Methods:** A prospective evaluation of a convenience sample of patients presenting with an extremity injury sustained within 48 hours of presentation. At time of initial assessment, the ACP, following specific guidelines, recorded whether or not they believed an x-ray was indicated, and if so, what DI views they felt appropriate. Their opinion was blinded from the physician subsequently assessing the patient. An ACP opinion of the need for DI was compared with the subsequent test ordered by the MD. The MD decision to order DI was considered 'gold standard'. Opinions were considered "matched" if the MD ordered DI of the same body part that the ACP believed was indicated. Sensitivity, specificity, positive predictive and negative predictive values (PPV, NPV) were calculated. Using data from our ED information system, we estimated the time that would have been saved by allowing ACPs to order DI. **Results:** Of 199 patients 192 images were ordered and 89 fractures were diagnosed. ACPs and MDs agreed that DI was necessary 94.70% of the time (95% CI: {90.6%, 97.4%}). There were 8 x-rays the ACP did not order that the MD did order, of which one showed a fracture. Twice, the ACP would have ordered an x-ray that the MD did not. In terms of identifying the need for DI, ACPs were 95.8% sensitive and 71.4% specific. The PPV was 98.9% (95% CI: {95.8%, 99.8%}), and the NPV was 38.5% (95% CI: {15.1%, 67.7%}). On average, ACP opinion of DI indication was made 54.1 minutes (95% CI: {48.0, 60.2}) earlier than that of the MD. **Conclusion:** The overall agreement between MDs and ACPs was almost 95%. ACPs are more likely to under-order x-rays than to over-order them, lowering the risk of increasing radiation exposure and cost. ACP DI ordering may decrease the time of processing of patients with extremity injuries by almost an hour.

Keywords: paramedic, diagnostic imaging, emergency department

LO009

Impact of physician navigators on measures of emergency department efficiency

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Introduction: The Physician Navigator (PN) is a novel position created to manage patient flow in real-time at a very-high volume emergency department (ED). When paired with an emergency physician, PNs actively track patient wait times, and direct the physician to see and re-assess patients in a particular order to improve measures of emergency department efficiency, and maximize patient flow. Anecdotal evidence has shown that PNs decrease length-of-stay times for non-resuscitative patients in the setting of increased patient volumes, and without additional nursing or physician hours. The objective was to study the operational impact of PN on emergency department patient flow. **Methods:** A 48-month pre-/post-intervention retrospective chart review at an urban community emergency department from September 2011 to September 2015. The PN program started on March 1, 2013. The main outcome is emergency department length-of-stay (LOS). Secondary outcomes include time to physician-initial-assessment (PIA), left-without-being-seen rates (LWBS), left-against-medical-advice (LAMA), and physician satisfaction rates. Autoregressive integrated moving average models were generated for Canadian Triage and Acuity Scale (CTAS) 2 to 5 patients to quantify the immediate impact of the intervention on the outcome levels, and whether the impact was sustained over time. **Results:** Interim results are provided. 399,958 patients attended the ED during the study period. Daily patient volumes

increased 11.2% during the post-intervention period. There were no significant increases in the number of physicians shifts/day, and physician hours/day during the post-intervention period. Post-intervention, for CTAS 2-5 patients, there was a reduction in average LOS by 0.04 hours/PN ($p < 0.05$), and 90th-percentile LOS by 0.14 hours/PN ($p < 0.05$). For secondary outcomes, there was a decrease in overall average PIA by 6.37 minutes/PN ($p < 0.05$), and 90th-percentile PIA by 8.29 minutes/PN ($p < 0.05$). LWBS rates decreased by 40.8% ($p < 0.05$). There were no significant changes in LAMA rates. **Conclusion:** The implementation of Physician Navigators is associated with significant reductions in LOS, PIA, and LWBS rates for non-resuscitative patients at a very-high volume emergency department.

Keywords: patient flow, efficiency

LO010

Clinical assessment of transient ischemic attack patients for symptomatic carotid disease in the emergency department

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Introduction: TIAs precede about 30% of strokes, with 4-10% having a stroke within 90 days of their TIA. In patients with a TIA due to symptomatic carotid disease, diagnosis and treatment within 2 weeks has been shown to have much better outcomes, while delay beyond 12 weeks no longer reduces subsequent stroke risk. The objective of this study was to determine the clinical findings associated with symptomatic carotid disease following an ED visit for TIA to indicate patients requiring prompt carotid imaging. **Methods:** We performed a prospective Canadian multicenter cohort study, at 13 academic sites, of ED patients with TIA or non-disabling stroke from 2006-2014. Treating ED physicians indicate clinical features on standardized data collection forms. Symptomatic carotid disease was carotid stenosis 50-99%, or carotid dissection, adjudicated by stroke neurology to be the etiology of the index event. Patients were followed by medical review and telephone up to 90 days. Univariate analysis was conducted for clinical features associated with patients who were eventually found to have symptomatic carotid disease as a cause for their TIA. **Results:** The cohort included 305 patients with and 5,277 without symptomatic carotid disease. Positive predictors of symptomatic carotid disease included older age (74.0 yrs vs 68.0 yrs $p < 0.0001$), male sex (62.9% vs 47.9%; $p < 0.0001$), history of weakness (63.3% vs 41.4%; $p < 0.0001$), language disturbance (52.1% vs 40.0%; $p < 0.0001$), weakness on physical exam (25.5% vs 17.1%; $p = 0.0002$), history of hypertension (74.8% vs 59.5%; $p < 0.0001$), and known history of carotid stenosis (18.9% vs 3.1%; $p < 0.0001$). Negative predictors of symptomatic carotid disease included first ever TIA (56.8% vs 68.8%; $p < 0.0001$), history of altered sensation (39.4% vs 45.8%; $p = 0.0322$), lightheadedness (13.0% vs 22.4%; $p = 0.0002$), and vertigo (3.6% vs 12.7%; $p < 0.0001$). **Conclusion:** TIA patients with older age, male sex, weakness, language disturbance or history of carotid stenosis need to be promptly imaged to assess for symptomatic carotid disease.

Keywords: diagnostic imaging, clinical assessment, transient ischemic attack (TIA)

LO011

Identification of mild acute cerebrovascular syndrome (ACVS) in the emergency department: validation of an ACVS clinical classifier to help distinguish mimics

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Introduction: National guidelines (NICE, AHA) for management of Acute Cerebrovascular Syndrome (ACVS) in the Emergency Department (ED) recommend the use of ABCD2 score to risk stratify patients despite its poor specificity and low diagnostic accuracy. The SpecTRA project previously developed a clinical classifier for ACVS vs. Mimic derived from historical clinical data collected during a 5-year period at an outpatient stroke clinic (Victoria, BC). Here we present a prospective evaluation of the performance of our clinical classifier on prospectively collected ED patient data compared to the industry-standard ABCD2. **Methods:** The prospective cohort consisted of ED patients (N = 555, Male = 54%, Mean (SD) Age = 68.7(15.5), ACVS = 70%) enrolled between Jan 2014 and May 2015 at Victoria General Hospital (BC) and Foothills Medical Centre (Calgary, AB). ABCD2 and clinical classifier scores were calculated from clinical data from the ED. We compared the performance of the two classifiers using DeLong's test of Dependent Receiver Operating Curves (ROC). In keeping with national guidelines, we used a score of 4 or more to assess sensitivity, specificity and accuracy (sens/spec and acc) of the ABCD2; for our clinical classifier, we used the cut point previously determined to maximize agreement between predictions and true class labels in the historical data. **Results:** Our new clinical classifier significantly outperformed the ABCD2 ($z = 2.44$, $p = 0.015$) with an AUC of 0.72, (95% CI: 0.68, 0.77) vs. 0.66 (0.61, 0.71). In terms of sens/spec and acc, our classifier achieved 0.78/0.55 with acc 71% compared to 0.75/0.46 with acc 66% for the ABCD2 (using the previously specified cut points). **Conclusion:** Our ACVS clinical classifier showed better performance than the ABCD2 score on a prospective sample of ED patients. The improved specificity of the clinical classifier relative to existing prognostic tools would reduce the number of non-ACVS patients referred for early treatment as well as conserve medical resources. Our ongoing multi-site study will evaluate the utility of the ACVS classifier embedded in a logic-enabled e-fillable form. This form will also provide risk-based thresholds guiding timely ordering of CTA as well as links to clinical treatment guidelines. Longer-term, the e-form and classifiers will be further enhanced to include plasma-based protein biomarker data.

Keywords: acute cerebrovascular syndrome, clinical decision rule, transient ischemic attack (TIA)

LO012

High-risk investigation findings for symptomatic carotid disease in ED TIA patients

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Introduction: About 20% of TIAs are due to large vessel disease. Carotid stenosis >50% which is causing a TIA or stroke needs to be definitely managed quickly in order to benefit. Alternatively, dual antiplatelet therapy may be considered. The objective of this study was to determine high-risk diagnostic findings associated with symptomatic carotid disease in ED patients with TIA to indicate patients requiring urgent carotid imaging. **Methods:** We performed a prospective Canadian multicenter cohort study, at 13 academic sites, of ED patients with TIA or non-disabling stroke from 2006-2014. Study research nurses recorded imaging findings on standardized data collection forms from the final reports of all imaging tests ordered in the ED on prospectively enrolled patients by treating emergency physicians. Symptomatic carotid disease was defined as carotid stenosis 50-99% or carotid dissection and was adjudicated by stroke neurology to be the etiology of the index event. Patients were followed by medical review and telephone up to 90 days. Univariate analysis was conducted for

investigation results with our primary outcome. **Results:** The cohort included 305 patients with and 5,277 without symptomatic carotid disease. Positive predictors of symptomatic carotid disease included platelet count over $400 \times 10^9/L$ (15.3% vs 7.6%; $p = 0.0095$), blood glucose >15 mmol/L (11.4% vs 4.4%; $p < 0.0001$), CT evidence of acute infarction (9.8% vs 4.1%; $p < 0.0001$), CT evidence of old infarction (35.7% vs 24.1%; $p < 0.0001$), and CT evidence of any infarct (43.3% vs 26.7%; $p < 0.0001$). There were no negative predictors of symptomatic carotid disease. **Conclusion:** High-risk investigation findings suggestive of symptomatic carotid disease in ED TIA patients include platelet count over $400 \times 10^9/L$, blood glucose >15 mmol/L, CT evidence of any infarction. Patients with any of these findings should be considered for rapid carotid imaging.

Keywords: transient ischemic attack (TIA), diagnostic imaging, carotid stenosis

LO013

Can you trust administrative data? Accuracy of ICD-10 codes for diagnosis of pulmonary embolism

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Introduction: Administrative data is a useful tool for research and quality improvement; however, the validity of research findings based on these data depends on their reliability. Diagnoses are recorded using diagnostic codes, as defined by the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10). Several groups have reported coding errors associated with ICD-10 assignments to patient diagnoses; these errors have serious implications for research, quality improvement, and policymaking. As part of a quality improvement project targeting emergency department (ED) diagnostic appropriateness for pulmonary embolism (PE), we sought to validate the accuracy of ICD-10 codes for studying ED patients diagnosed with PE. **Methods:** Hospital administrative data for adult patients (age ≥ 18 years) with an ICD-10 code for PE (I26.0 and I26.9) were obtained from the records of four urban EDs between July 2013 to January 2015. A review of medical records and imaging reports was used to confirm the diagnosis of PE. In the case of discrepancy between ICD-10 coding and chart review, the diagnosis obtained from chart review was considered correct. The physicians' discharge notes in the administrative database were also searched using 'pulmonary embolism' and 'PE', and patients who were diagnosed with PE but not coded as PE were identified. Coding discrepancies were quantified and described. **Results:** 1,453 ED patients had a PE ICD-10 code during our study period. 257 (17.7%) of these patients' diagnoses were improperly coded. 211 patients assigned an ICD-10 PE code had ED discharge diagnoses of 'rule-out PE' or 'query PE'. 64 other patients were miscoded as having a PE and should have been assigned an alternate code, such as chest pain, hypoxia, or dyspnea. The physician did not include a discharge diagnosis in 4 of the 64 miscoded patients; however, triage and physician assessment notes indicated no suspicion of PE. Furthermore, 117 patients who had an ED discharge diagnosis of PE were not assigned a PE code, meaning that 8.91% of true PEs were missed by using ICD-10 codes alone. Thus, 1,313 ED patients truly had a PE. **Conclusion:** Our work suggests the need for more accuracy in ICD-10 coding of ED diagnoses of PE. Caution should be exercised when using administrative data for studying PE, and validation of the accuracy of ICD-10 coding prior to research use is recommended.

Keywords: pulmonary embolism, ICD-10