

approach to performing triage assessments increased consistency in CTAS scores across many, but not all, high-volume CEDIS complaints. This does not reflect triage accuracy, as there are no known benchmarks for triage accuracy. Improvements in consistency were greatest for sentinel presenting complaints with a minimum allowable CTAS score.

Keywords: consistency, electronic Canadian Triage and Acuity Scale, triage

LO22

Risk-stratification of emergency department syncope by artificial intelligence using machine learning: human, statistics or machine

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Introduction: The Canadian Syncope Risk Score (CSRS) is a validated risk tool developed using the best practices of conventional biostatistics, for predicting 30-day serious adverse events (SAE) after an Emergency Department (ED) visit for syncope. We sought to improve on the prediction ability of the CSRS and compared it to physician judgement using artificial intelligence (AI) research with modern machine learning (ML) methods. **Methods:** We used the prospective multicenter cohort data collected for the CSRS derivation and validation at 11 EDs across Canada over an 8-year period. The same 43 candidate variables considered for CSRS development were used to train and validate the four classes of ML models to predict 30-day SAE (death, arrhythmias, MI, structural heart disease, pulmonary embolism, hemorrhage) after ED disposition. Physician judgement was modeled using the two variables, referral for consultation and hospitalization. We compared the area under the curve (AUC) for the three models. **Results:** The proportion of patients who suffered 30-day SAE in the derivation cohort (N = 4030) was 3.6% and in validation phase (N = 2290) was 3.4%. Characteristics of the both cohorts were similar with no shift. The best performing ML model, a gradient boosting tree-based model used all 43 variables as predictors as opposed to the 9 final CSRS predictors. The AUC for the three models on the validation data were: best ML model 0.91 (95% CI 0.87–0.93), CSRS 0.87 (95% CI 0.83–0.90) and physician judgment 0.79 (95% CI 0.74 - 0.84). The most important predictors in the ML model were the same as the CSRS predictors. **Conclusion:** A ML model developed using AI method for risk-stratification of ED syncope performed with slightly better discrimination ability though not significantly different when compared to the CSRS. Both the ML model and the CSRS were better predictors of poor outcomes after syncope than physician judgement. ML models can perform with similar discrimination abilities when compared to traditional statistical models and outperform physician judgement given their ability to use all candidate variables.

Keywords: artificial intelligence, risk-stratification, syncope

LO23

Do point of care ultrasound findings of left ventricular dysfunction predict cardiogenic shock in undifferentiated hypotensive patients?

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Introduction: Patients presenting to the emergency department (ED) with hypotension have a high mortality rate and require careful yet rapid resuscitation. The use of cardiac point of care ultrasound (PoCUS) in the ED has progressed beyond the basic indications of detecting pericardial fluid and activity in cardiac arrest. We examine if finding left ventricular dysfunction (LVD) on emergency physician performed PoCUS reliably predicts the presence of cardiogenic shock in hypotensive ED patients. **Methods:** We prospectively collected PoCUS findings performed in 135 ED patients with undifferentiated hypotension as part of an international study. Patients with clearly identified etiologies for hypotension were excluded, along with other specific presumptive diagnoses. LVD was defined as identification of a generally hypodynamic LV in the setting of shock. PoCUS findings were collected using a standardized protocol and data collection form. All scans were performed by PoCUS-trained emergency physicians. Final shock type was defined as cardiogenic or non-cardiogenic by independent specialist blinded chart review. **Results:** All 135 patients had complete follow up. Median age was 56 years, 53% of patients were male. Disease prevalence for cardiogenic shock was 12% and the mortality rate was 24%. The presence of LVD on PoCUS had a sensitivity of 62.50% (95%CI 35.43% to 84.80%), specificity of 94.12% (88.26% to 97.60%), positive-LR 10.62 (4.71 to 23.95), negative-LR 0.40 (0.21 to 0.75) and accuracy of 90.37% (84.10% to 94.77%) for detecting cardiogenic shock. **Conclusion:** Detecting left ventricular dysfunction on PoCUS in the ED may be useful in confirming the underlying shock type as cardiogenic in otherwise undifferentiated hypotensive patients.

Keywords: echocardiography, hypotension, point of care ultrasound

LO24

Implementing emergency department take-home naloxone programs: a systematic scoping review

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Introduction: Distributing take-home naloxone (THN) kits from Emergency Departments (EDs) is an important strategy for preventing opioid overdose deaths. However, there is a lack of clear operational guidance for implementing ED-based THN programs. This scoping review had two objectives: 1) identify key strategies for THN distribution in EDs, and 2) develop a theory-informed implementation model that can be used to optimize the effectiveness of ED-based THN programs. **Methods:** We systematically searched health science databases through April 18, 2019. The search strategy combined terms representing the ED, naloxone, and take-home kits/bystander administration. Two reviewers independently screened the search results. We included all peer-reviewed articles that described THN distribution within EDs. A standardized form was used for data extraction. Included studies were coded by two reviewers and mapped to domains of the Consolidated Framework for Implementation Research (CFIR). A third reviewer with content expertise adjudicated disagreements in record screening and data coding. **Results:** Database searching retrieved 717 records after duplicates were removed. 87 full-text studies were assessed for eligibility. Two studies were added through other sources, resulting in a total of 21 studies included in the final review. Of note, 14 studies evaluated existing ED-based THN programs. We synthesized themes that emerged within each CFIR domain and identified four key implementation strategies: 1) develop ED policies on opioid harm reduction; 2)

collaborate with community and government partners to ensure programs meet patient needs; 3) address provider attitudes and knowledge gaps through dedicated training; and 4) establish guidelines to identify patients who are at risk of opioid overdose, and engage at-risk patients to maximize THN acceptance. **Conclusion:** ED-based THN programs must be tailored to local community needs and available hospital resources. Innovative implementation strategies are needed to promote ED provider engagement, and reduce barriers to patient acceptance of THN in the ED. This scoping review highlights key considerations for ED-THN implementation that can guide EDs to establish new programs, or refine existing programs to maximize their effectiveness.

Keywords: naloxone, opioid overdose, scoping review

LO25

Characteristics of frequent users of emergency departments in Alberta and Ontario, Canada: an administrative data study

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Introduction: Frequent users to emergency departments (EDs) are a diverse group of patients with a disproportionate number of ED presentations. This study aimed to compare sociodemographic and clinical characteristics of adult high system users (HSUs) and control groups in two provinces. **Methods:** Cohorts of HSUs were created for Alberta and Ontario by identifying the patients with the top 10% of ED presentations in the National Ambulatory Care Reporting System during April 2015 to March 2016. Random samples of patients not in the HSU groups were selected in each province as controls (4:1 ratio). Sociodemographic and presentation data (e.g., Canadian Triage and Acuity Scale [CTAS], disposition) were extracted and compared using separate logistic regression models. **Results:** In Alberta, 101,250 HSU patients made 686,918 ED presentations (median [med] = 5 interquartile range [IQR] 4,7 presentations per patient), compared with 401,923 controls who made 560,765 ED presentations (med = 1 IQR 1,2 per patient). HSUs were more likely to be female (odds ratio (OR) = 1.20 95% confidence interval (CI) 1.18,1.22), older (OR = 1.03 per 5y 95%CI 1.03,1.03), live closer to hospital (OR = 1.02 per 100km 95%CI 1.00,1.03), and be from the lowest income quintile (OR = 1.39 95%CI 1.37,1.42) than controls. In Ontario, 478,424 HSUs made 2,222,487 ED presentations (med = 4 IQR 3,5 per patient) and 1,714,037 controls made 2,114,070 ED presentations (med = 1 IQR 1,1 per patient). Ontario HSUs were also more likely to be female (OR = 1.13 95%CI 1.12,1.14), older (OR = 1.03 per 5y 95%CI 1.03,1.03), and from the lowest income quintile (OR = 1.41 95%CI 1.40,1.42) than controls, but were less likely to live closer to hospital (OR = 0.93 per 100km 95%CI 0.92, 0.93). Higher acuity was seen in Ontario (CTAS 1/2 vs. others OR = 1.05 95%CI 1.04,1.06) but not for Alberta (CTAS 1/2 vs others OR = 0.75, 95%CI 0.74,0.76). Discharges were less likely in the HSUs compared to controls (Alberta OR = 0.89 95%CI 0.88,0.90; Ontario OR = 0.65 95%CI 0.65,0.66). HSUs were more likely to leave without being seen (Alberta OR = 1.10 95%CI 1.07,1.13; Ontario OR = 1.37 95%CI 1.35,1.40) and against medical advice (Alberta OR = 1.47 95%CI 1.41,1.53; Ontario OR = 1.67 95%CI 1.63,1.71). **Conclusion:** HSUs were more likely to be female, older, and poorer than controls. Ontario HSUs had higher acuity than the other groups. Disposition

differed for HSUs and controls. Further study is required to identify ways to safely reduce ED utilization by HSUs.

Keywords: administrative data, frequent users

LO26

The mean abnormal response rates of laboratory tests ordered in the emergency department: shooting percentage insights from a multicentre study

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Introduction: There is ongoing concern about the burden placed on healthcare systems by lab tests. Although these concerns are widespread, it is difficult to quantify the extent of the problem. One approach involves use of a metric known as the Mean Abnormal Response Rate (MARR), which is the proportion of tests ordered that return an abnormal result; a higher MARR value indicates higher yield. The primary objective of this study was to calculate MARRs for tests ordered between April 2014 and March 2019 at the four adult emergency departments (EDs) covering a metropolitan population of 1.3 million. Secondary objectives included identifying tests with highest and lowest MARRs; comparison of MARRs for nurse- and physician-initiated orders; correlation of the number of tests per order requisition to MARR; and correlation of physician experience to MARR. **Methods:** In total, 40 laboratory tests met inclusion criteria for this study. Administrative data on these tests as ordered at the four EDs were obtained and analyzed. Multi-component test results, such as from CBC, were consolidated such that an abnormal result for any component was coded as an abnormal result for the entire test. Repeat tests ordered within a single patient visit were excluded. Physician experience was quantified for 209 ED physicians as number of years since licensure. Analyses were descriptive where appropriate for whole-population data. Risk of bias was attenuated by the focus on administrative data. **Results:** The population dataset comprised 33,757,004 test results on 415,665 unique patients. Of these results, 30.3% were the outcomes of nurse-initiated orders. The 5-year MARRs for the four hospitals were 38.3%, 40.0%, 40.7% and 40.9%. The highest per-test MARRs were for BNP (80.5%) and CBC (62.6%), while the lowest were for glucose (7.9%) and sodium (11.6%). MARRs were higher for nurse-initiated orders than for physician-initiated orders (44.7% vs. 38.1%), likely due to the greater order frequency of high-yield CBC in nurse-initiated orders (38.6% vs. 18.1%). The number of tests per order requisition was inversely associated with MARR ($r = -0.90$, $p < 0.001$). Finally, the number of years since licensure was modestly but significantly associated with MARR ($r = 0.28$, $p < 0.001$). **Conclusion:** This is the first and largest study to apply the MARR in an ED setting. As a metric, MARR effectively identifies differences in test ordering practices on per-test and per-hospital bases, which could be useful for data-informed practice optimization.

Keywords: informatics, laboratory test, mean abnormal response rate

LO27

Relevance of Choosing Wisely Canada non-emergency medicine specialty lists to emergency medicine practice

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Introduction: The Choosing Wisely Canada (CWC) initiative is dedicated towards optimizing patient care and reduce unnecessary