routine ED care. Machine learning tools may potentially be used to help ED physicians to make faster and more appropriate disposition decisions, to decrease unnecessary testing and alleviate ED crowding.
Keywords: artificial intelligence, emergency department crowding, emergency department disposition

LO33

Sharing and teaching electrocardiograms to minimize infarction

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Background: Every 30-minute delay to ST-Elevation Myocardial Infarction (STEMI) reperfusion increases one-year mortality by 7.5%. A local audit found that the third of patient electrocardiograms (ECGs) not initially meeting classic STEMI criteria had an ECG-to-Activation (ETA) time of over 90 minutes, more than five times that of classic STEMIs. However, three quarters of "STEMI negative" ECGs met STEMI-equivalent patterns or rules for subtle occlusion, uncovering an opportunity for improvement. **Aim Statement:** We aimed to reduce ETA time, from initial emergency department (ED) ECG to activation of the cath lab, for patients whose ECGs did not meet classic STEMI criteria, by 30 minutes within one year (i.e. by Dec 2019). **Measures & Design**: We reviewed all ED Code STEMIs over a 35-month pre-intervention period. Root Cause analyses, including Ishikawa diagram and Pareto chart, led to our Plan-Do-Study-Act cycles: 1) a survey to engage our team; 2) a Grand Rounds presentation as an educational strategy; and 3) weekly web-based feedback to all ED physicians on STEMI-equivalents and subtle occlusions, using recent local cases. Our outcome measures were ETA times, stratified by ECGs not initially meeting STEMI criteria (primary) and those that did (secondary). Our process measures were the number of website visits and page views. Our balancing measure was the proportion of Code STEMIs without culprit lesion. We used Statistical Process Control (SPC) charts with usual special cause variation rules. **Evaluation/Results**: ETA time for the 37.5% of 56 ECGs that did not meet classic STEMI criteria decreased from 97.5 to 53.7 minutes (min), a 43.8-min absolute decrease ($p = 0.037$), while those meeting STEMI criteria remained the same (16.5 to 18.2min, $p = 0.75$). SPC charts did not show special cause variation. There were 2,634 page views (65.9/week) and 1,092 visits (27.3/week), in a group of 80 physicians—i.e. a third of the group each week. There was no change in Code STEMIs without culprit lesions (28.0 % to 23.3%, $p = 0.41$). **Discussion/Impact**: We reduced ETA time by 43.8min for the one third of patients with culprit lesions not initially meeting classic STEMI criteria, a magnitude associated with mortality impact. To do so, we used a multi-modal educational strategy including a novel web-based feedback approach to all ED physicians. Local feedback and education on this challenging-to-diagnose subgroup, guided by ETA time as a quality metric, could be replicated in other centres.
Keywords: electrocardiogram, quality improvement and patient safety, ST elevation myocardial infarction

LO35

A province-wide quality improvement collaborative for treatment of children's pain in Alberta's emergency departments

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Background: Pediatric pain is often under-treated in emergency departments (EDs), causing short and long-term harm. In Alberta EDs, children's pain outcomes were unknown. A recent quality improvement collaborative (QIC) led by our team improved children's pain care in 4 urban EDs. We then spread to all EDs in Alberta using the Institute for Healthcare Improvement Framework for Going to Full Scale. **Aim Statement:** To increase the proportion of children <12 years who receive topical anesthetic before needle procedures from 11% to 50%; and for children <17 years with fractures: to 1) increase the proportion receiving analgesia from 31% to 50%; 2) increase the proportion with pain score documentation from 24% to 50%, and 3) reduce time to analgesia from 60 to 30 minutes, within 1 year. **Measures & Design:** All 97 EDs in Alberta that treat children were invited. Each was asked to form a project team, attend webinars, develop key driver diagrams and perform PDSA tests of change. Sites were given a monthly list of randomly selected charts for audit and entered data in REDCap for upload to a provincial run chart dashboard. Baseline performance measurement informed aims. Measures included proportion of children <12 years undergoing a lab test who received topical anesthetic, and for children <17 years with fracture, the proportion with a pain score, proportion receiving analgesia and median minutes to analgesia. Length of stay and use of opioids were balancing measures. Control charts were used to detect special cause. Interrupted time series (ITS) was performed to assess significance and trends. **Evaluation/Results:** 36 sites (37%) participated, including rural and urban sites from all regions. 8417 visits were audited. 23/36 sites completed audits before and after tests of change and were analyzed. Special cause occurred for all aims. The proportion receiving topical anesthetic increased from 11% to 30% (ITS $p < 0.001$). For children with fractures, the proportion with pain scores increased from 24% to 34% (ITS $p = 0.21$, underlying trend present), proportion receiving analgesic medication increased from 31% to 39% (ITS $p = 0.41$, underlying trend present) and minutes to analgesia decreased from 60 to 28 (ITS $p < 0.01$). There was no increase in length of stay or use of opioid medications. **Discussion/Impact:** A pragmatic approach encouraging locally led change was well-received and key to success. The QIC method shows promise for improving outcomes in diverse EDs across large geographic areas. Next steps include further spread and sustainability measurement.
Keywords: pain, pediatric, quality improvement and patient safety

LO36

Reducing emergency department bloodwork and eliminating waste

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Background: Patients presenting to the Emergency Department (ED) may be subjected to unnecessary bloodwork. This leads to excessive work for front-line nurses, physicians and laboratory staff, contributing to increased ED length of stay (LOS), patient discomfort, and health care costs. **Aim Statement:** By January 1, 2020, we will reduce the number of targeted blood tests (AST, GGT, aPTT and CK) by 40% in the Mount Sinai ED, as measured by the percent per 1000 ED visits of AST to ALT, GGT to ALT, aPTT to INR and CK to troponin. **Measures & Design:** This was a prospective time series quality improvement study. Using the Model for Improvement, we engaged front-line ED staff, as well as stakeholders from

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Consultant, Laboratory and Information Services. Data was analyzed using run chart rules. Intervention: a) Removed rarely used tests from electronic nursing order sets b) Uncoupled order panels c) Developed six presentation-based medical directives with appropriate blood testing. d) Staff education Family of measures Outcomes: percent of targeted uncoupled test per 1000 ED visits for each of AST to ALT, GGT to ALT, aPTT to INR, and CK to troponin; Total number of blood tests ordered per 1000 ED visits Process: number of "separate and hold" tubes; number of blood tubes used in the ED; proportion of staff attending education Balancing: volume of blood drawn; LOS **Evaluation/Results:** Outcome: Estimated relative reduction in proportion of all uncoupled tests per 1000 ED visits by: • 33% AST/ALT • 52% GGT/ALT • 50% CK/troponin •18% aPTT/INR Total number of lab tests per 1000 ED visits decreased by 7.7% (5742 to 5331). Evidence of special cause variation on all outcomes. Process measures: 1. 100% reduction in weekly "Separate and Hold" tubes (56 to 0). 2. Monthly total of blood tubes used in the ED decreased by 2.8% (11620 to 11300) 3. Attendance pending. Balancing measures: Monthly average volume of blood drawn decreased by 1.4L(2%) from 50.4L to 49.0L; LOS pending **Discussion/Impact:** A multi-pronged intervention resulted in a decrease in blood testing in the ED. We achieved the sub-aim of reducing targeted blood tests and are on track to achieve the overall aim of total lab reduction in the ED by April 2020. Final interventions to be implemented in the coming months include changes to the ED paper record and replacement of the paper add-on order process with an electronic ordering tool. Complete data will be available by April 2020. This intervention is scalable and has the potential to reduce costs and preventable harm to patients.

Keywords: choosing wisely, laboratory testing, quality improvement and patient safety

LO37

Reducing hemolysis of coagulation blood samples in the emergency department

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Background: Hemolysis of blood samples is the leading cause of specimen rejection from hospital laboratories. It contributes to delays in patient care and disposition decisions. Coagulation tests (prothrombin time/international normalized ratio [PT/INR] and activated partial thromboplastin time [aPTT]) are especially problematic for hemolysis in our academic hospital, with at least one sample rejected daily from the emergency department (ED). **Aim Statement:** We aimed to decrease the monthly rate of hemolyzed coagulation blood samples sent from the ED from a rate of 2.9% (53/1,857) to the best practice benchmark of less than 2% by September 1st, 2019. **Measures & Design:** Our outcome measure was the rate of hemolyzed coagulation blood samples. Our process measure was the rate of coagulation blood tests sent per 100 ED visits. Our balancing measure was the number of incident reports by clinicians when expected coagulation testing did not occur. We used monthly data for our Statistical Process Control (SPC) charts, as well as Chi square and Mann-Whitney U tests for our before-and-after evaluation. Using the Model for Improvement to develop our project's framework, we used direct observation, broad stakeholder engagement, and process mapping to identify root causes. We enlisted nursing champions to develop our Plan-Do-Study-Act (PDSA) cycles/interventions: 1) educating nurses on hemolysis and coagulation testing; 2) redesigning the peripheral intravenous and blood work supply carts to encourage best practice; and 3) removing PT/INR and aPTT from automatic inclusion in our electronic chest pain bloodwork panel. **Evaluation/Results:** The average rate of hemolysis remained unchanged from baseline (2.9%, $p = 0.83$). The average rate of coagulation testing sent per 100 ED visits decreased from 41.5 to 28.8 (absolute decrease 12.7 per 100, $p < 0.05$), avoiding $4,277 in monthly laboratory costs. The SPC chart of our process measure showed special cause variation with greater than eight points below the centerline. **Discussion/Impact:** Our project reduced coagulation testing, without changing hemolysis rates. Buy-in from frontline nurses was integral to the project's early success, prior to implementing our electronic approach – a solution ranked higher on the hierarchy of intervention effectiveness – to help sustainability. This resource stewardship project will now be spread to a nearby institution by utilizing similar approaches.

Keywords: laboratory testing, quality improvement and patient safety, resource stewardship

LO38

Reducing inappropriate urine culture testing in the emergency department

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Background: Urinary tract infections (UTI) are a common emergency department (ED) presentation. Urine cultures (UC) are frequently ordered to confirm the diagnosis, however, it can be challenging to differentiate between a true infection and asymptomatic bacteriuria (ASB) which does not generally benefit from antibiotics. This over-treatment of ASB leads to serious adverse side effects, growing antimicrobial resistance and increased healthcare costs. By reducing inappropriate ED urine culture testing, we can concomitantly avoid the false positives that contribute to this large-scale problem. **Aim Statement:** We aimed to reduce ED urine culture testing at Credit Valley Hospital, a large community hospital based in Mississauga, Ontario by 30%, from a baseline average of 97 cultures per 1000 ED visits in 2017, to 68 cultures per 1000 ED visits by year end 2019. **Measures & Design:** Multiple PDSA cycles were ran with our multi-disciplinary ED team. Our interventions to encourage rational urine culture testing are three-fold, including (1) medical directive optimization (removal of routine sending of UC), (2) individualized physician feedback and (3) physician education with introduction of a clinical decision aid. Our outcome measure is rate of UC per 1000 ED patient visits with a balance measure of rate of 30-day ED return visit of hospital admission for patients with a UTI. **Evaluation/Results:** Despite a parallel surge in ED volumes, we observed a significant decrease in urine culture testing, from an annual average of 97 cultures per 1000 ED visits to 60 cultures per 1000 ED visits in 2019 year-to-date. There was no increase in the rate of ED 30-day return visit or admission for UTI or a diagnostic equivalent. **Discussion/Impact:** Our multipronged approach effectively decreased the rate of UC testing during the study period. ED physicians provide higher quality care with judicious use of resources to guide diagnosis and management. Active ongoing interventions include our transition to a 2-step UC order protocol (uncoupling urinalysis with culture) using BD vacutainer urine collection products, which will allow for 48 hour storage of uncompromised urine. Further work will leverage our knowledge and experience with optimizing urine culture testing to other culture specimens.

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