within 24 hours Process Measure Time from availability of culture results from lab to completion of patient follow-up Balancing Measure Number of positive culture results not displayed in ED server Change Idea Electronically push positive culture results to an ED server that is periodically checked daily and acted upon. An electronic interface was created to capture positive results from the microbiology lab in real time. **Results:** There was a 45 hour reduction in the mean time to complete a patients follow-up of culture results (59 hours pre vs. 14 hours post, $p = 0.03$). We surpassed our aim of >80% follow-up within 24 hours. **Conclusion:** A significant reduction to completing a patients follow-up of microbiology culture results was achieved by automating the availability of results and eliminating the manual process previously used in relaying results from the microbiology lab to ED. This new process has the following benefits: 1) Improves timely reporting of culture results to patients, that may require initiation or change in antibiotics 2) Enhanced patient safety due to elimination of human error 3) Decreased workload due to elimination of batching of results and data entry 4) Entire process is streamlined, since only positive culture results are transmitted for follow-up.

Keywords: quality improvement and patient safety, microbiology culture results, follow-up

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Using electronic health record data to assess emergency medicine trainees independent and interdependent performance: a qualitative perspective on measuring what matters

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Introduction: Competency-based medical education (CBME) affirms that trainees will receive timely assessments and effective feedback about their clinical performance, which has inevitably raised concerns about assessment burden. Therefore, we need ways of generating assessments that do not rely exclusively on faculty-produced reports. The main object of this research is to investigate how data already collected in the electronic health record (EHR) might be meaningfully and appropriately used for assessing emergency medicine (EM) trainees independent and interdependent clinical performance. This study represents the first step in exploring what EHR data might be utilized to monitor and assess trainees clinical performance **Methods:** Following constructivist grounded theory, individual semi-structured interviews were conducted with 10 EM faculty and 11 EM trainees, across all postgraduate years, to identify EHR performance indicators that represent EM trainees independent and interdependent clinical actions and decisions. Participants were presented with a list of performance indicators and asked to comment on how valuable each would be in assessing trainee performance. Data analysis employed constant comparative inductive methods and occured throughout data collection. **Results:** Participants created, refined, and eliminated performance indicators. Our main result is a catalogue of clinical performance indicators, described by our participants, as reflecting independent and/or interdependent EM trainee performance that are believed to be captured within the EHR. Such independent indicators include: number of patients seen (according to CTAS levels), turnaround time between when a patient is signed up for and first orders are made, number of narcotics prescribed. Meanwhile, interdependent indicators include, but are not limited to, length of stay, bounce-back rates, ordering practices, and time to fluids. **Conclusion:** Our findings document a process for developing EM trainee report cards that incorporate the perspectives of clinical faculty and trainees. Our work has important implications for distinguishing between independent and interdependent clinical performance indicators.

Keywords: electronic health records, postgraduate education, performance indicators

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How available is availability bias? Examining factors that influence diagnostic error

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Introduction: Cognitive bias is often cited as an explanation for diagnostic errors. Of the numerous cognitive biases currently discussed in the literature, availability bias, defined as the current case reminds you of a recent similar example is most well-known. Despite the ubiquity of cognitive biases in medical and popular literature, there is surprisingly little evidence to substantiate these claims. The present study sought to measure the influence of availability bias and identify contributing factors that may increase susceptibility to the influence of a recent similar case. **Methods:** To investigate the role of prior examples and category priming on diagnostic error at different levels of expertise, we devised a 2 phase experiment. The experimental intervention was in a validation phase preceding the test, where participants were asked to verify a diagnosis which was either i) representative of Diagnosis A, and similar to a test case, ii) representative of Diagnosis A and dissimilar to a test case, iii) representative of Diagnosis B and similar to a test case. The test phase consisted of 8 written cases, each with two approximately equally likely diagnoses (A or B). Each participant verified 2 cases from each condition, for a total of 6. They then diagnosed all 8 test cases; the remaining 2 test cases had no prior example. All cases were counterbalanced across conditions. Comparison between Condition i) and ii) and no prior showed effect of prior exemplar; comparison between iii) and no prior showed effect of category priming. Because cases were designed so that both Diagnosis A and B were likely, overall accuracy was measured as the sum of proportion of cases in which either was selected. Subjects were emergency medicine staff ($n = 40$), residents ($n = 39$) and medical students ($n = 32$) from McMaster University, University of Washington, and Harvard Medical School. **Results:** Overall, staff had an accuracy (A + B) of 98%, residents 98% and students 85% ($F = 35.6$, $p < 0.0001$). For residents and staff there was no effect of condition (all mean accuracies 97% to 100%); for students there was a clear effect of category priming, with accuracy of 84% for i), 87% for ii) and 94% for iii) but only 73% for the no prime condition (Interaction $F = 3.54$, $p < 0.002$) **Conclusion:** Although prior research has shown substantial biasing effects of availability, primarily in cases requiring visual diagnosis, the present study has shown such effects only for novices (medical students). Possible explanations need to be explored. Nevertheless, our study shows that with increasing expertise, availability may not be a source of error.

Keywords: diagnosis, availability bias

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Risk factors for adverse outcomes in hyperglycemic patients presenting to the emergency department: a systematic review

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Introduction: Hyperglycemia is a significant cause of morbidity and mortality, often resulting in adverse outcomes such as recurrent ED

visits, hospitalization or death. The objective of this study was to perform a systematic review to identify predictors of these adverse outcomes among patients who present to the ED with hyperglycemia. **Methods:** Electronic searches of Medline and EMBASE were conducted for studies published in English between the years 1946 and June 2017. Studies with patients presenting to the ED with hyperglycemia were eligible for inclusion. Both adult and pediatric populations were included, as were diabetic and non-diabetic patients. Two reviewers independently screened all titles and abstracts for relevance to the research question. If consensus could not be reached, full-length manuscripts were reviewed. For any discrepancy, a third reviewer was consulted, and disagreement was resolved through discussion. Study quality was assessed using the Newcastle-Ottawa Quality Assessment Scale. Study- and patient-specific data were then extracted and presented descriptively in the systematic review. **Results:** Thirteen observational studies were included, with a combined total of 664,829 patients. The studies scored between 5 to 8 on the Quality Assessment Scale out of a possible total of 8. Predictors of adverse outcomes included patients in both older and younger (<25) age groups, history of diabetes, multiple comorbidities, patients requiring insulin, sepsis and hyperlactatemia, access to a family physician, a sentinel hyperglycemia visit in the past month, and triage glucose level >20 mmol/L. Protective factors included no admissions in the past year, care from a diabetes team while in hospital, systolic blood pressure between 90-150 mmHg and heart rate >110 bpm. **Conclusion:** This systematic review found eight predictors and four protective factors for adverse outcomes in patients presenting to the ED with hyperglycemia. These factors should be considered for easier identification of higher-risk patients for adverse outcomes in order to guide management and follow-up.

Keywords: hyperglycemia, emergency department, risk factors

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Predictive validity of the Regional Paramedic Program for Eastern Ontario (RPPEO) prehospital sepsis notification tool

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Introduction: Early recognition of sepsis can improve patient outcomes yet recognition by paramedics is poor and research evaluating the use of prehospital screening tools is limited. Our objective was to evaluate the predictive validity of the Regional Paramedic Program for Eastern Ontario (RPPEO) prehospital sepsis notification tool to identify patients with sepsis and to describe and compare the characteristics of patients with an emergency department (ED) diagnosis of sepsis that are transported by paramedics. The RPPEO prehospital sepsis notification tool is comprised of 3 criteria: current infection, fever &/or history of fever and 2 or more signs of hypoperfusion (eg. SBP <90, HR 100, RR24, altered LOA). **Methods:** We performed a review of ambulance call records and in-hospital records over two 5-month periods between November 2014 February 2016. We enrolled a convenience sample of patients, assessed by primary and advanced care paramedics (ACPs), with a documented history of fever &/or documented fever of 38.3°C (101°F) that were transported to hospital. In-hospital management and outcomes were obtained and descriptive, t-tests, and chi-square analyses performed where appropriate. The RPPEO prehospital sepsis notification tool was compared to an ED diagnosis of sepsis. The predictive validity of the RPPEO tool was calculated (sensitivity, specificity, NPV, PPV). **Results:** 236 adult patients met the inclusion criteria with the following characteristics: mean age 65.2 yrs [range 18-101], male 48.7%, history of sepsis 2.1%, on antibiotics 23.3%, lowest mean systolic BP 125.9, treated by ACP 58.9%, prehospital temperature documented 32.6%. 34 (14.4%) had an ED diagnosis of sepsis. Patients with an ED diagnosis of sepsis, compared to those that did not, had a lower prehospital systolic BP (114.9 vs. 127.8, $p = 0.003$) and were more likely to have a prehospital shock index >1 (50.0% vs. 21.4%, $p = 0.001$). 44 (18.6%) patients met the RPPEO sepsis notification tool and of these, 27.3% (12/44) had an ED diagnosis of sepsis. We calculated the following predictive values of the RPPEO tool: sensitivity 35.3%, specificity 84.2%, NPV 88.5%, PPV 27.3%. **Conclusion:** The RPPEO prehospital sepsis notification tool demonstrated modest diagnostic accuracy. Further research is needed to improve accuracy and evaluate the impact on patient outcomes.

Keywords: paramedicine, sepsis notification, prehospital

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Diagnosis of pulmonary embolism in the Canadian context: clinical review findings from a health technology assessment

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Introduction: Pulmonary embolism (PE) is a diagnostic challenge, since it shares symptoms with other conditions. Missed diagnosis puts patients at a risk of a potentially fatal outcome, while false positive results leave them at risk of side effects (bleeding) from unnecessary treatment. Diagnosis involves a multi-step pathway consisting of clinical prediction rules (CPRs), laboratory testing, and diagnostic imaging, but the best strategy in the Canadian context is unclear. **Methods:** We carried out a systematic review of the diagnostic accuracy, clinical utility, and safety of diagnostic pathways, CPRs, and diagnostic imaging for the diagnosis of PE. Clinical prediction rules were studied by an overview of systematic reviews, and pathways and diagnostic imaging by a primary systematic review. Where feasible, a diagnostic test meta-analysis was conducted, with statistical adjustment for the use of variable and imperfect reference standards across studies. **Results:** The Wells CPR rule showed greater specificity than the Geneva, but the relative sensitivities were undetermined. Application of a CPR followed by with D-dimer laboratory testing can safely rule out PE. In diagnostic test accuracy meta-analysis, computed tomography (CT) (sensitivity 0.973, 95% CrI 0.921 to 1.00) and ventilation/perfusion single-photon emission CT (VQ-SPECT) (sensitivity 0.974, 95% CrI 0.898 to 1.00) had the highest sensitivity) and CT the highest specificity (0.987, 95% CrI 0.958 to 1.00). VQ and VQ-SPECT had a higher proportion of indeterminate studies, while VQ and VQ-SPECT involved lower radiation exposure than CT. **Conclusion:** CPR and D-dimer testing can be used to avoid unnecessary imaging. CT is the most accurate single modality, but radiation risk must be assessed. These findings, in conjunction with a recent health technology assessment, may help to inform clinical practice and guidelines.

Keywords: diagnostic imaging, pulmonary embolism, systematic review

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An exploratory study to understand relationship between gameplay experience and observed actions

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Introduction: The GridlockED game is a serious game aimed at teaching junior learners about flow and organization in the emergency

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