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Introduction: Utilization of CT pulmonary angiography (CTPA) to rule out pulmonary embolism (PE) has risen dramatically but diagnostic yield has fallen over the past several decades, suggesting that lower risk patients are being tested. Given little evidence to suggest improved patient outcomes with higher CTPA utilization, and increasing evidence of harm, evidence-based guidelines have been developed to reduce unnecessary CTPA use. The objective of this study was to assess the impact of an electronic clinical decision support (CDS) intervention to reduce unnecessary CTPA utilization for emergency department (ED) patients with suspected PE. **Methods:** This was a cluster-randomized, controlled trial with physicians as the unit of randomization. All emergency physicians (EPs) at 4 urban adult EDs and 1 urgent care center were randomly assigned to receive either evidence-based imaging CDS for patients with suspected PE (intervention) or no CDS (control) over a 1-year study period. CDS was launched in an external web browser whenever an intervention EP ordered a CTPA from the computerized physician order entry software for ED patients CTAS 2-5; however, physician interaction with CDS was voluntary. The CDS tool enabled calculation of patient-specific information, including the patients Wells score, PERC score, and age-adjusted D-dimer, as well as prediction of each patients pre-test risk of PE along with an imaging/no imaging recommendation. CDS recommendations could be printed for the medical record as could educational patient handouts to support physician decision-making. The primary outcome was CTPA utilization for patients with CEDIS chief complaints of shortness of breath or chest pain on the index visit. Secondary outcomes included index visit length of stay (LOS), and CTPA use or VTE diagnosis within 90-days. This study was REB approved. **Results:** Demographics were similar among intervention and control EPs; however, during a 2-year pre-intervention period control EPs had a higher baseline CTPA rate (8.5% vs. 7.7%, $p < 0.001$). In the first 8-months following CDS implementation, 94 intervention EPs saw 9,609 patients and voluntarily interacted with the CDS tool on 43.2% of eligible encounters while 91 control EPs saw 9,498 patients. CTPA utilization was higher among intervention EPs than control (9.6% vs. 8.3%, $p < 0.001$) as was ED LOS (302 vs. 287 minutes, $p < 0.001$). There was no difference in 90-day CTPA use or VTE diagnoses. **Conclusion:** In one of the largest RCTs of CDS to date, exposure to CDS was associated with higher rates of CTPA utilization and longer ED LOS on the index visit, and no difference in 90-day CT use or VTE diagnoses. These results differ from a concurrent study of CDS for patients with mild traumatic brain injury in the same physician population and may relate to the implementation of the CDS intervention and/or complexity of the underlying evidence-based algorithms.
Keywords: clinical decision support, pulmonary embolism, diagnostic imaging

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Cost-effectiveness of pathways for diagnosing pulmonary embolism in Canada

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Introduction: Pulmonary embolism (PE) is a common cardiovascular condition with high mortality rates if left untreated. Given the non-specific and varied symptoms of PE, its diagnosis remains challenging and approaches can lend themselves to inefficiencies through over-testing and over-diagnosis. Clinicians rely on a multi-component and sequential approach, including clinical risk assessment, rule-out biomarkers, and diagnostic imaging. This study assessed the potential cost-effectiveness of different diagnostic algorithms. **Methods:** A cost-utility model was developed with an upfront decision tree capturing the diagnostic accuracy and a Markov cohort model reflecting the lifetime disease progression and clinical utility of each diagnostic strategy. 57 diagnostic strategies were evaluated that were permutations of various clinical risk assessment, rule-out biomarkers and diagnostic imaging modalities. Diagnostic test accuracy was informed by systematic reviews and meta-analyses, and costs (2016 CAD) were obtained from Canadian costing databases to reflect a health-care payer perspective. Separate scenario analyses were conducted on patients contra-indicated for computed tomography (CT) or who are pregnant as this entails a comparison of a different set of diagnostic strategies. **Results:** Six diagnostic strategies formed the efficiency frontier. Diagnosing patients with PE was generally cost-effective if willingness-to-pay was greater than $1,481 per quality-adjusted-life year (QALY). CT dominated other imaging modality given its greater diagnostic accuracy, lower rates of non-diagnostic findings and lowest overall costs. The use of clinical prediction rules to determine clinical pre-test probability of PE and the application of rule-out test for patients with low-to-moderate risk of PE may be cost-effective while reducing the proportion of patients requiring CT and lowering radiation exposure. At a willingness-to-pay of $50,000 per QALY, the strategy of Wells (2 tier) –> d-dimer –> CT –> CT was the most likely cost-effective diagnostic strategy. However, different diagnostic strategies were considered cost-effective for pregnant patients and those contra-indicated for CT. **Conclusion:** This study highlighted the value of economic modelling to inform judicious use of resources in achieving a diagnosis for PE. These findings, in conjunction with a recent health technology assessment, may help to inform clinical practice and guidelines. Which strategy would be considered cost-effective reflected ones willingness to trade-off between misdiagnosis and over-diagnosis.
Keywords: health economics, methodology, diagnostic technologies

LO75
Utility of red flags to identify serious spinal pathology in patients with low back pain: a retrospective analysis

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Introduction: Practice guidelines discourage routine imaging for low back pain and recommend selective use when serious underlying conditions are suspected. Evidence about prevalence of serious pathologies and accuracy of red flags for decision-making is limited. We describe rates of serious low back pathology, assess the accuracy of three red flags and model the utility of combining administratively available red flags to reduce imaging. **Methods:** A seven-year retrospective study of patients presenting with low back pain to four emergency departments in Nova Scotia, Canada. Patient characteristics were available from administrative data. We test sensitivity, specificity, positive and negative predictive values, and likelihood ratios of individual and combinations of red flags. We use decision curve analyses to assess the clinical utility of three red flags to inform imaging. **Results:** We included data from 38,714 patients presenting with low back pain. Serious low back pathology was diagnosed in 1,196 (3.09%): 847 (2.19%) were vertebral fractures, 184 (0.48%) unstable fracture, 262 (0.68%) cancer, 57 (0.15%) cauda equina syndrome, and 30 (0.08%) spinal infection. Value of combining three red flags (age >65, female sex, and trauma) was found: positive likelihood ratios of 4.36 and 9.74 for vertebral fracture and unstable fracture, respectively. Imaging for