



Resident Journal Review: July-August 2009

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This is a continuing column providing journal articles pertinent to EM residents. It is not meant to be an extensive review of the articles, nor is it wholly comprehensive of all the literature published. Rather, it is a short list of potentially useful literature that the busy EM resident may have missed. Residents should read the articles themselves to draw their own conclusions. This edition will include articles published over a two month period. These selections are from papers published in March and April 2009.

Rizkallah, J, S. F. Man, et al. (2009). "Prevalence of pulmonary embolism in acute exacerbations of COPD: a systematic review and meta-analysis." Chest 135(3):786-93.

The purpose of this review was to determine the reported prevalence of pulmonary embolism in patients experiencing a COPD exacerbation. The authors conducted a structured search of the literature, along with a hand search of bibliographies to identify additional titles. The authors' selection criteria excluded studies containing another obvious cause of respiratory deterioration (e.g., sepsis, bacteremia, malignancy, pneumothorax, myocardial infarction). From the 2,407 articles identified, five articles (comprised of 550 total patients) were included in their final analysis.

Overall, the prevalence of PE was 19.9%; in studies limited to patients hospitalized for COPD exacerbations, the prevalence was 25.5%. In one study that evaluated emergency department patients who were not admitted to the hospital, the prevalence of PE was 3.3%. Overall, the prevalence of deep venous thrombosis was lower than PE. For hospitalized patients, the prevalence of DVT was 16.6%. The physical exam, EKG and chest radiograph of patients with and without pulmonary embolism were similar. In two out of three identified studies, there was no difference in the occurrence of dyspnea, chest pain, cough, hemoptysis or palpitations between groups.

The authors identified a high prevalence of pulmonary embolism among patients with COPD exacerbations that were admitted to the hospital. With COPD patients having nearly double the mortality from PE, a careful consideration of this diagnosis should be entertained when there is not a clear cause for their exacerbation. Complicating matters further, no clinical decision rules for pulmonary embolism have been validated in this population. Further studies are needed to more clearly define the features of PE in the COPD population, as well as to help develop rational management strategies for this challenging disease. Until then, emergency department physicians should stay on the lookout for this common, deadly and protean condition.

Dowling S, Spooner CH, Liang Y, et al. Accuracy of Ottawa Ankle Rules to exclude fractures of the ankle and midfoot in children: a meta-analysis. Acad Emerg Med. Apr 2009;16(4):277-287.

Ankle and midfoot injuries are common presenting complaints to the emergency department. Radiographs are a mainstay of the emergency department evaluation to determine the presence of fracture. The Ottawa Ankle Rules (OAR) are a set of clinical decision rules developed and validated in adults to guide the use of x-rays in this evaluation. Subsequently, several studies have applied these rules to children with similar injuries. The authors in this study reviewed the literature and data for the use of the Ottawa Ankle Rules in children.

The authors conducted a structured search of the literature, along with a hand search of bibliographies to identify additional titles. Standard inclusion and exclusion criteria were applied. Among other criteria, studies with patients <18 years old, in which the criterion standard diagnostic test was ankle and/or foot x-ray were included. From the 451 articles identified, 12 articles (comprised of 3,130 total patients) were included in their final analysis.

Study quality was assessed via QUADAS. The pooled sensitivity for identifying fracture was 98.5%. Specificities ranged from 7.9-50%. The pooled negative likelihood ratio was 0.11 (0.05-0.26 95%CI). There were ten missed fractures – one Salter Harris-I, one SH-IV, two "insignificant" (SH-I or <3mm avulsion), six unreported. Based on the 21.4% prevalence of fractures and the pooled negative LR, the posterior probability of fracture after a negative OAR assessment was 2.9%. Applying the OAR to the included population would result in a missed fracture rate of 1.2%. The pooled estimate of x-ray reduction after applying the decision rules was 24.8%.

Based on this review, the OAR appears to be a valuable clinical decision rule to help reduce unnecessary x-rays while maintaining a high sensitivity for identifying fracture. However, there were several important limitations to the analysis. In eight included studies, the OAR were applied retrospectively to data collected at time of assessment. Furthermore, of the ten missed fractures, six were not completely described (five from one single study). Also, most included patients were over the age of five. Despite these limitations, the review provides compelling evidence for the use of Ottawa Ankle Rules in children over five.

Liteplo AS, Marill KA, Villen T, et al. Emergency thoracic ultrasound in the differentiation of the etiology of shortness of breath (ETUDES): sonographic B-lines and N-terminal pro-brain-type natriuretic peptide in diagnosing congestive heart failure. Acad Emerg Med. Mar 2009;16(3):201-210.

Thoracic sonography has been increasingly used in the diagnosis of undifferentiated cardiorespiratory complaints. B-Lines (vertical "comet tail" artifacts) are sonographic signs of lung edema (interstitial/alveolar) and/or fluid-filled lung – findings commonly found in CHF. The authors in this study examined the diagnostic value of two- and eight-zone lung sonography as compared to and combined with NT-ProBNP, for predicting CHF.

This prospective, observational study enrolled a convenience sample of 100 adult patients who presented to the emergency department with shortness of breath. Patients who had NT-ProBNP levels sent as part of the diagnostic work-up were selected for thoracic lung zone ultrasound. Comprehensive medical charts were independently reviewed after hospital courses were completed to

continued on page 18



Resident Journal Review - continued from page 17

determine final diagnoses. This was used as the criterion standard. Technicians/RDMS ultrasound reviewers and physician chart reviewers were blinded to NT-ProBNP levels and ultrasound results, respectively.

A positive eight zone ultrasound, defined as at least two positive zones (presence of three B-lines per zone) on each side, had a positive likelihood ratio of 3.88 (1.55-9.73 99% CI) and negative likelihood ratio of 0.5 (0.3-0.82 95% CI) for the diagnosis of CHF. NT-ProBNP had a LR+ of 2.3 (1.41-3.76 95% CI) and LR- of 0.24 (0.09-0.66 95% CI). For two-zone US, interval LRs were 4.73 (95% CI = 2.10 to 10.63) when inferior lateral zones were positive bilaterally and 0.3 (95% CI = 0.13 to 0.71) when these were negative. These changed to 8.04 (95% CI = 1.76 to 37.33) and 0.11 (95% CI = 0.02 to 0.69), respectively, when congruent with NT-ProBNP.

This study provided support for the value of thoracic sonography in the diagnosis of CHF. The results show lung sonography to be comparable to NT-ProBNP for the diagnosis of CHF. Combined, the two represent a powerful diagnostic tool. Despite a relatively small convenience sample size and observational nature, the study suggests a promising role for lung sonography and demonstrates the need for a larger, randomized evaluation.

Hollander JE, Chang AM, Shofer FS, McCusker CM, Baxt WG, Litt HI. Coronary computed tomographic angiography for rapid discharge of low-risk patients with potential acute coronary syndromes. Ann Emerg Med. Mar 2009;53(3):295-304.

Evaluating low-risk patients who present to the emergency department with chest pain has been the subject of much discussion in recent years, as the tools available to clinicians in the ED have expanded. Coronary computed tomographic angiography (CTA) is a diagnostic technique examined by a number of authors for the evaluation of this group.

In their prospective, observational study, Hollander et al. looked at 568 adult patients who presented to their emergency department and who were determined to be low-risk patients. Low-risk patients were defined as patients with a TIMI risk score of 0-2. In these low-risk patients, 285 underwent coronary CTA during hours when it was immediately available; the remaining 283 who presented at other times of the day had serial cardiac enzymes measured followed by coronary CTA. Patients who had findings of <50% maximal stenosis and calcium scores of less than 100 on CTA were considered to have negative results and were discharged home. Cardiac stress testing and coronary catheterization were considered the criterion standard in patients who had such testing.

Overall, 214 patients in the immediate CTA group (75%) and 262 patients in the delayed CTA group (93%) had negative results and were discharged without further evaluation. At 30-day follow-up, none of these patients suffered cardiovascular death or non-fatal myocardial infarction. Using a cutoff of a 50% coronary lesion, the diagnostic accuracy of coronary CTA had a sensitivity of 100% and specificity of 91.5%.

The results of this paper seem to indicate that low-risk patients presenting with chest pain, who have a negative coronary CTA, are

safe for discharge to home without the need for further diagnostic testing. However, there are a few caveats to bear in mind with this study. First, these results were from a subset of patients who were already at very low risk for adverse events at 30 days. Additionally, this study was observational and offered no comparison group as a diagnostic control. As such, it is difficult to make practice-changing conclusions from this single paper. Nevertheless, coronary CTA appears to be a highly sensitive diagnostic study that is available in the ED and may allow for further risk stratification with reduced admissions for patients with low cardiac risk chest pain. Larger, prospective, controlled, trials are still needed to work out the role of coronary CTA in the evaluation of low-risk patients in the emergency department.

Friedman BW, Bender B, Davitt M, et al. A randomized trial of diphenhydramine as prophylaxis against metoclopramide-induced akathisia in nauseated emergency department patients. Ann Emerg Med. Mar 2009;53(3):379-385.

Metoclopramide is a commonly used medication in the emergency department for the treatment of nausea, acute migraine and gastroparesis. An adverse side effect of this medication is akathisia – a complex of signs of symptoms characterized by restlessness and agitation. Various methods have been used to prevent or treat akathisia including anticholinergics, benzodiazepines and slower delivery of medication. To date, no clear consensus on which agent should be used as prophylaxis has been reached.

This randomized, double-blinded study investigated whether co-administration of diphenhydramine along with metoclopramide would decrease the incidence of akathisia. 289 patients were enrolled from a single emergency department. Exclusion criteria included patients with extrapyramidal illnesses or movement disorders, pregnancy, and use of antiemetics, antihistamines or antipsychotics within three days of presentation. Patients were randomized to receive either 10mg or 20mg of metoclopramide IV along with 25mg of diphenhydramine IV or placebo. Development of akathisia was evaluated by a Short Akathisia Instrument (SAI), a version of the Prince Henry Hospital Rating Scale of Akathisia modified for use in the ED setting. Akathisia was present if SAI scores were increased at either assessment at 30 minutes or 60 minutes or if rescue medications such as benzodiazepine were given by the primary physician.

34 patients developed akathisia and the incidence did not vary significantly among the different arms of the study. There was a trend towards akathisia in those patients who received 20mg vs. 10 mg of metoclopramide (OR 1.7) but this was not statistically significant (CI 0.8 -3.6). Only 3 of the 14 patients who developed akathisia and were not treated with rescue medications still had symptoms at 60 minutes.

Akathisia can be an adverse effect of metoclopramide administration and is often not evaluated for in the emergency department. This study showed that administration of diphenhydramine did not decrease the rate of akathisia and is not recommended for prophylactic use in this setting.

continued on page 19



Resident Journal Review - continued from page 18

Pedrosa I, Laforanara M, Pandharipande PV, Goldsmith JD, Rofsky NM. Pregnant patients suspected of having acute appendicitis: effect of MR imaging on negative laparotomy rate and appendiceal perforation rate. Radiology. Mar 2009;250(3):749-757.

Acute appendicitis (AA) is the most common cause of abdominal pain requiring surgical treatment in the pregnant patient. Timely and accurate diagnosis is very important as delayed treatment can lead to significant morbidity to the mother and fetus. Negative laparotomy rate (NLR) and perforation rate (PR) are important clinical outcomes in patients with suspected AA. In pregnant patients, a higher NLR (20%) is generally accepted in order to avoid a high PR. At the same time, high NLR is concerning due to the increased risks associated surgery in the pregnant patient. Computed tomography (CT) has become the standard in assessing AA in non-pregnant patients. However, due to the radiation exposure involved with CT, other diagnostic tests such as ultrasonography (US) and magnetic resonance (MR) imaging have been considered.

This retrospective cohort study assessed the effects of MR imaging in the examination of AA using NLR and PR as objective measures of outcome. 148 patients from a single hospital were found to have MR imaging in their evaluation for suspected AA. Reference standards for the final diagnosis were surgical pathology after laparotomy or laparoscopy, confirmatory CT (for one of the patients) or clinical follow-up (median follow-up time of seven days).

Of the 148 patients, 14 were found to have AA confirmed by either pathology or CT and all were identified by MR imaging (fluid filled appendix >7mm diameter or non-visualized appendix with peri-appendiceal fat stranding or abscess). Of the 134 patients who were negative for AA by criterion standard, 2 had false-positive findings with MRI. The authors contend that if the decision for laparotomy or laparoscopy was based on these MR findings, only 2 of the 27 total patients who underwent surgery would have negative findings, for a NLR of 7% while the PR in this study would remain at 21%.

Limitations to this study include the low prevalence of AA, the 24 hour availability of MRI in this facility and the potential bias inherent to any retrospective study. Despite this, the findings suggest that the use of MRI in the evaluation of AA in pregnant patients results in clinically favorable negative laparotomy and perforation rates while avoiding the radiation exposure related with CT examinations.

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