Pulmonary Embolic Disease in the ED and the PCTA a Retrospective Study at Hennepin County Medical Center
Christopher A. Smith D.O.
Hennepin County Medical Center, Minneapolis, Minnesota

Background: 120 Million patients present each year to US emergency departments (EDs), of whom 1.5% undergo computed tomography (CT) of the pulmonary arteries (CTPA) to evaluate for pulmonary embolism (PE).

Concepts to Consider:
• The NQF measure states that CTA is avoidable in patients who are 1) hemodynamically stable and, 2) who have a low clinical probability of PE and 3) have either a negative or never drawn d-dimer level
• A large multi-center study based on the NQF measure found that 32% of all patients who get a CTA are avoidable studies (Figure)
• Sufficient risk factors based on several studies for PE are few: 1) Major Trauma, 2) Neurological trauma, surgery or tumor, 3) Major surgery, 4) Active malignancy 5) Hypercoagulable state
• Studies on pregnancy and prolonged immobilization show that an underlying VTE risk factor is present in nearly all cases
• PE fatality is exaggerated: The commonly quoted figure of 18-35% was based on studies done in 1939-1961 that had no controls, inpatient based, and used no imaging
• Studies show 2.3/10⁵ deaths are due to PE (vs 193/10⁵ in heart disease)
• The risk for mortality is significant in 1) cancer, 2) CHF, 3) increased age
• Increased RV/LV ratio is the greatest risk factor for 30 day mortality (OR 12, P<0.001). In two years, HCMC had 11 total such studies. 8 never had a D-dimer
• The few studies with controls that exist to study treatment of PE show that it is not effective

Methods: We reviewed a total of 1060 CT angiograms obtained to evaluate for PE at a large level 1 trauma teaching hospital from Jan. 2013 through Dec. 2014 in the ED. We excluded repeated CTA, as well as CTA results that were inconclusive or incomplete. D-dimer values, when obtained, also were reviewed. The diagnosis of PE was based on final CTA reports. A review of the literature was used in the interpretation and production of further questions from the results.

Results:
PE was diagnosed in 7.74% of 1060 patients who had a CTA. A D-dimer assay was performed for 603 (57%) of the 1060 patients. 519 patients had an abnormal D-dimer assay, of which 41 (8%) had a positive PE. 84 had a normal D-dimer assay, of which only 1 patient had a positive PE (and was later over-read as likely chronic). 457 patients never had a D-dimer performed, of which 40 (9%) had a positive PE found on CTA. Of the 80 total patients who were found to have a PE, 40 (50%) had a positive D-dimer assay. The number of CTA examinations ordered for patients with normal D-dimer results, and in whom a D-dimer assay was never drawn totaled 541 (51% of the 1060 CTA studies). Of the 84 patients who had a negative D-dimer assay, 14 (17%) of those were deterred from getting a CTA.

Conclusions: Our data showed subjective overestimation of the probability of PE before ordering of CTA. Although a definitive acceptable PE positivity rate for CTA has not been established, the 7.74% yield represents overuse of CTA as a screening rather than a diagnostic examination. Following the NQF measure, with other supporting data, it is likely that about 49% of all CTPA exams in the ED are avoidable at HCMC.