POINT OF CARE ULTRASOUND IN PREDICTING ADVERSE OUTCOMES IN ACUTE PULMONARY EMBOLISM PATIENTS

Paul Ranta and Rohan Bhilegaonkar
Emergency Medicine Research Associates Program
University of California, Irvine Emergency Department

Paul Ranta, BS; Rohan Bhilegaonkar; Vikram Muller, MD; Andy Hsueh, MD; Edmund Hsu, MD; Tanvi Shirke, DO; Kristen Wilhelm, MS; Matthew Vitale, MD; Daniel Singer, MD; Alyssa Nguyen-Phuoc, MD; Megan Guy, MD; John Fox, MD; Michael Secko, DO; Brent Becker, MD

Emergency department (ED) physicians risk stratify patients with pulmonary embolism (PE) to determine disposition. The pulmonary embolism severity index (PESI) is a validated prediction tool for mortality based on clinical parameters. Point-of-care ultrasound (POCUS) can assess for signs of right ventricular dysfunction (RVD). Our primary objective was to evaluate the accuracy of POCUS in predicting short-term clinical outcomes in patients with acute PE compared to PESI.

We conducted a prospective, multi-center, observational study of adult ED patients with acute PE diagnosed by computed tomography. Each subject had a PESI score calculated and underwent POCUS to assess for RVD. Subjects received standard treatment and were followed via chart review and telephone calls at 7 and 30 days. The primary outcome was a composite of death, major bleeding, subsequent hospitalization, and need for cardiovascular or respiratory interventions within 5 days. Secondary outcomes included the composite outcome at 30 days and mortality at 5 and 30 days. Sensitivity, specificity, and likelihood ratios (LR) were calculated for PESI and POCUS, both separately and in combination.

We enrolled 214 patients across three sites. Patients were 46.9% female, mean age of 64.5 years (SD 16.1, range 20-99). 5-day mortality was 2.3% with a composite outcome incidence of 16.4%. For the 5-day primary composite outcome, PESI >2 demonstrated a sensitivity of 0.69 [95% CI, 0.51-0.83], specificity of 0.41 [0.34-0.48], +LR 1.2 [0.90-1.5] and -LR 0.77 [0.46-1.3]. POCUS with gross RVD demonstrated a sensitivity of 0.71 [0.54-0.85], specificity of 0.56 [0.49-0.64], +LR 1.6 [1.3-2.1] and -LR 0.51 [0.30-0.87]. PESI >2 and POCUS in combination yielded a sensitivity of 0.89 [0.73-0.97], specificity of 0.27 [0.20-0.34], +LR 1.2 [1.0-1.4] and -LR 0.43 [0.16-1.1]. For 5-day mortality, PESI >2 yielded a sensitivity of 0.80 [0.28-0.99], specificity of 0.40 [0.33-0.47], +LR 1.3 [0.84-2.1] and -LR 0.50 [0.09-2.9]. For 5-day mortality, POCUS with gross RVD had a sensitivity of 1.00 [0.48-1.0], specificity of 0.53 [0.46-0.60], +LR 2.1 [1.9-2.5] and -LR 0.0. Combined, PESI >2 and POCUS yielded a sensitivity of 1.00 [0.48-1.0], specificity of 0.25 [0.19-0.31], +LR 1.3 [1.2-1.4] and -LR 0.0.

POCUS outperformed PESI in predicting adverse outcomes for ED patients with PE at 5 days. The combination of POCUS and PESI yielded improved sensitivity, but with reduced specificity.