

C-Reactive Protein Test to Diagnose Pneumonia in Adults

Flanders SA, Stein J, Shochat G, et al. Performance of a bedside C-reactive protein test in the diagnosis of community-acquired pneumonia in adults with acute cough. *Am J Med* 2004;116:529–35.

Study Overview

Objective. To determine the test characteristics of the bedside C-reactive protein (CRP) test for the diagnosis of pneumonia.

Design. Prospective evaluation of consecutive patients evaluated for a cough.

Setting and participants. Adults with acute cough (duration ≤ 3 weeks) presenting to the emergency department or an urgent care clinic at a tertiary care hospital between January and April 2002.

Main outcome measures. Main outcome measure was the diagnosis of pneumonia. Pneumonia was defined as the presence of infiltrate or consolidation on a chest radiograph as interpreted by an attending radiologist. A clinical prediction rule for pneumonia was calculated for each patient and compared with CRP levels.

Main results. Of the 168 patients evaluated for an acute cough, 20 (12%) had radiographic evidence of pneumonia. Median CRP levels were significantly higher for patients with pneumonia than those in the remaining population (60 mg/L versus 9 mg/L; $P < 0.001$). The area under the receiver operating characteristic (ROC) curve was 0.83. However, a simple clinical prediction rule performed at least as well (area under the ROC curve, 0.88). Combined, the clinical prediction rule and the CRP test had an area under the ROC curve of 0.92.

Conclusion. Among patients presenting to an outpatient urgent care clinic or ED with an acute cough, the CRP test was satisfactory at differentiating patients with and without pneumonia.

Commentary

When patients present to the emergency department or urgent care with an acute cough, physicians must rule out several critical and potentially fatal diagnoses, including pneumonia, heart failure, asthma, and upper airway obstruction. Usually, upper airway obstruction and congestive

heart failure have different enough symptom complexes that they can be distinguished from pneumonia. The bigger clinical challenge is differentiating pneumonia from asthma or upper respiratory viral syndrome. It is in this clinical setting that the investigation by Flanders and colleagues is meant to be useful.

What is a good way to judge the value of a diagnostic test? In general, we determine its sensitivity and specificity. When a diagnostic test has a linear result (such as CRP level), it is possible to use different cutoffs and create an ROC curve. The area under the ROC curve indicates how useful a test is in differentiating those with the condition from those without the condition. Usually, any value greater than 0.8 is considered good. The authors found that the area under the ROC curve for CRP was 0.83, which generally would be considered good to very good. However, this interpretation may be overstating the value of the CRP test. The clinical prediction rule examined in this study, the Heckerling score, actually performed better than the CRP, with an area under the ROC curve of 0.88. Given that all the variables involved in the Heckerling score (temperature, heart rate, lung examination findings, and absence of asthma) are readily available at any clinical encounter, the score usually can be calculated easily by physicians. More importantly, these are the clinical variables that clinicians use to decide whether to obtain a chest radiograph or to treat empirically. Therefore, the real value of the CRP might be in helping to distinguish those with pneumonia from those without pneumonia when the clinical scores are equivocal. Unfortunately, the authors did not study this specifically, though it seems that the CRP would add little to the clinical findings.

Applications for Clinical Practice

While the CRP test effectively distinguished patients with pneumonia from patients without pneumonia, the clinical utility of the CRP test remains in doubt, as it failed to perform better than a simple clinical evaluation. Further studies that evaluate the added benefit in patients with equivocal clinical findings may be useful.

—Review by Ashish K. Jha, MD