Clinical Preview
Serum procalcitonin and the admission decision in CAP

Michael Donne/Science Photo Library

For the **study by Self and colleagues** see *Chest* 2016; **150:** 819–28

The site of care decision is one of the most important in the management of community acquired pneumonia (CAP). Mortality is typically 10–12% for those admitted to the hospital, but can exceed 30% in those admitted to the intensive care unit (ICU). However, patients who are admitted first to the medical ward, and then deteriorate and need ICU care, have a mortality rate that is twice as high as for those admitted directly to the ICU. Thus, we could improve patient outcomes if we could better identify which patients are likely to deteriorate after admission. The criteria for ICU admission vary from hospital to hospital, and while this decision might not be fully objective, one approach has been to develop prediction tools for those who will need intensive respiratory and vasopressor support (IRVS) during their hospital stay.

In the October issue of *Chest*, Self and colleagues used the multicentre EPIC database to examine the best way to identify, on admission, those CAP patients who will require IRVS (intubation for respiratory failure or vasopressors for septic shock) in the first 72 h. Of 1770 CAP patients, 115 (6·5%) required IRVS, and the admission serum level of the inflammatory biomarker procalcitonin (PCT), correlated well with the need for IRVS. Those patients with low PCT levels (<0·05 ng/ml) had a 4% risk of IRVS, while those with the highest levels (>10 ng/ml) had a 22·4% risk. When biomarker levels were added to clinical data, the predictive value increased further. If the patient had three minor criteria for severe CAP, using the 2007 ATS/IDSA guidelines, and a high PCT level, the risk for IRVS was 36·2%, whereas those patients with the same three minor criteria and a low PCT level had only a 13·2% risk. The investigators also developed a logistic regression model associating the risk of IRVS with any PCT value. They identified 370 patients as high risk (using a PCT cutoff value of ≥0·83 ng/ml), who were not identified by clinical criteria, and 33 of these patients needed IRVS. These findings suggest that an elevated PCT level might make it necessary to carefully consider the site of care decision, and to consider ICU monitoring, even when the clinical need for ICU admission is uncertain. This observation is extremely important, because underestimation of severity of illness in a patient who will need IRVS would be a serious error. In this study, unlike other studies in which a low score was almost always a sign of good prognosis, it was unclear whether a patient with a high clinical severity of illness could be safely observed out of the ICU, if the PCT value is low.

The findings in this study support observations from other investigations. PCT was initially recognised as an inflammatory biomarker, mostly produced by the liver as an acute phase reactant, with levels rising in the presence of bacterial, but not viral infection. Early studies showed its value in defining which patients with respiratory tract infection (particularly CAP and bronchitis) could benefit from antibiotic therapy. Then research showed that serial measurements of PCT could be used to guide the duration of antibiotic therapy for patients with CAP, as well as for those with sepsis from multiple sources. A number of investigators have also correlated PCT measurements with prognosis in CAP.Some studies found that using either the Pneumonia Severity Index or the CURB-65 score, that the risk of death was low if the PCT values were low, regardless of the severity score. Additionally, some data suggest that patients who are admitted to the ICU after hospital admission have a higher initial PCT value than those who are safely managed on the ward. Not only is PCT elevated in those with more severe illness, but serial measurements also have prognostic value, and rising levels correlate with a greater likelihood of mortality or pneumonia complications.

Should PCT levels become a routine part of the site of care decision in CAP? The current study in *Chest* shows the potential value of this information, but more discriminating values might have come from repeat measurements during the first 72 h, because not every patient with a single elevated level needed IRVS. Additionally, some patients need hospital admission but are clinically well enough that they are unlikely to need ICU care, and in this population, it might not be valuable to measure PCT to guide the site of care decision. The greatest value could come for those with a borderline need for ICU care, where high initial PCT values, or rising serial values might help guide management and indicate a need for ICU observation, while low initial values might reassure the clinician about the safety of continued care outside of the ICU.

Michael S Niederman
Division of Pulmonary and Critical Care Medicine, New York Presbyterian/Weill Cornell Medical Center, 425 East 61st Street, New York, NY 10065, USA
msn9004@med.cornell.edu

MSN has received honorarium and research support from Thermo Fisher Scientific for the role of biomarkers in the management of CAP and sepsis. MSN has consulted for Paratek and Cempra on CAP.