

C-Reactive Protein in Community Acquired Pneumonia: Can it be used to determine treatment outcome?

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Introduction: CRP and CAP

The Burden of CAP:

Between 22% and 42% of people presenting to GPs with community acquired pneumonia (CAP) are hospitalised; the mean length of stay is 6 days¹. In 2014, CAP led to 25000 deaths and a significant financial cost of around £734 million in the UK and €10.1 billion across Europe².

Only 26% of sputum samples isolate a bacterial cause of CAP³. Therefore ensuring patients are on the most appropriate antibiotic regime and are responding to their treatment must be based on other markers.

What is CRP?

C-reactive protein is an acute phase protein released in response to inflammatory stimuli. It is a non-specific marker of inflammation and is released to a number of conditions, including infection⁴.

CRP has been shown to be useful for diagnosing and stratifying the severity of CAP.

The aim of this study is to investigate the relationship between CRP, CAP outcomes and other markers such as white cell count (WCC), early warning score (EWS) and temperature.

Methods

A retrospective service evaluation of adult patients admitted to University Hospital of South Manchester with a diagnosis of CAP between June and August 2017 was performed.

Patient demographics, diagnosis, complications, CRP, WCC, EWS and temperature were recorded, as were microbiology results and antimicrobial prescriptions. Patients were included if 18 years or older, and met the BTS definition of CAP. Patients were excluded if they were discharged before 72 hours, or after 10 days of follow up had an alternate diagnosis for their symptoms.

The primary outcomes for the study was either treatment success of treatment failure of their CAP. Treatment failure was defined as the presence or development of: increased oxygenation needs, CXR deterioration, antibiotic escalation, transfer to critical care, empyema development, hospital acquired pneumonia. Treatment success was the absence of any of these features.

Statistical Analysis

IBM SPSS was used to perform an independent T test on the decline in markers from day 1 to 4, a binary logistic regression was performed to assess the predictive ability for treatment failure/success of the decline in markers from day 1 to 4. A generalised estimating equation was used to assess whether the trajectory in markers from day 1 to 4 associated with treatment failure or success. A value was significant if the p value was <0.05.

Results

Data on 50 consecutive patients was reviewed; 6 were discharged early and were excluded, 5 patients were excluded due to alternative diagnoses, leaving 39 patients. The baseline characteristics of the population are shown in table 1.

Characteristic	Patients Included in Study:
Age (Median)	76.5
Male Gender (Percent)	17 (43.5)
CURB-65 Median:	2

Table 1: Patient Demographics

Treatment Outcomes

11 patients failed treatment and 28 had successful treatment of CAP, the reason for failure is recorded in table 2.

Table 2: Treatment Failure Reasons

Reasons for Treatment Failure:	Antibiotic Escalation: 6 (54.5%)	Empyema: 1 (9.1%)
HAP Development: 2 (18.2%)	CXR Deterioration: 1 (9.1%)	Critical Care: 1 (9.1%)

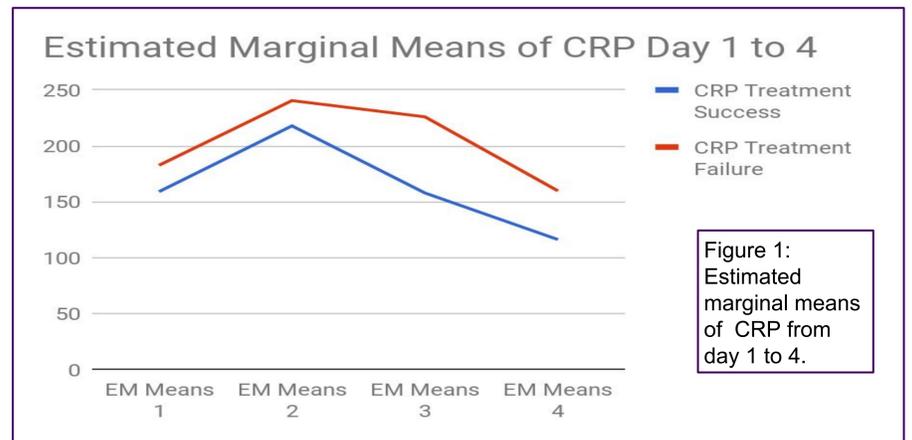
Results: Biomarkers

Early Warning Scores and Temperature

Patient temperature and early warning score changes between day 1 and did not significantly differ between treatment failure and treatment success groups, nor did they predict treatment outcome.

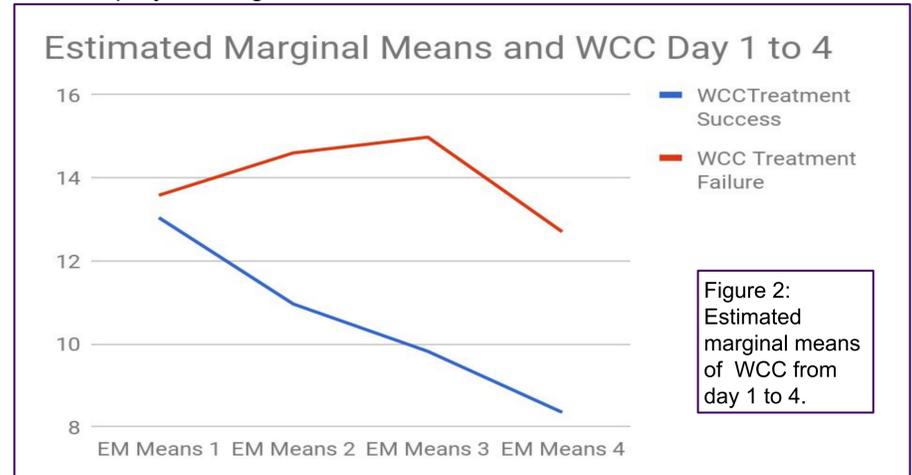
CRP

Increase in CRP between day 1 to 4 did not differ significantly between treatment outcome groups (p=0.106) and CRP change from day 1 to 4 had no predictive ability (p=0.140). This is displayed in figure 1.



Total white cell count

The change in WCC between day 1 and 4 neither associated with or predicted treatment outcomes in CAP. However, the trajectory of WCC between day 1 and 4 did differ significantly between treatment outcomes (p=0.038). In patients whose treatment failed, WCC increased up to day 3 whereas with treatment success WCC decreased consistently from day 2. This is displayed in figure 2.



Discussion

In our study we concluded that CRP cannot be used to determine treatment outcomes of CAP, and should not be used to make decisions about escalation or altering antimicrobial therapy.

WCC trajectory did associate with treatment outcomes, particularly the trajectories between day 1 and 2.

Our study sample size was small, and the retrospective approach limits generalisability, however further study is warranted to ensure that CRP is not being used inappropriately to escalate or alter antimicrobials in patients admitted with CAP.

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