

Critical Review Form

Diagnostic Test

The Impact of Blood Cultures on Antibiotic Therapy in
Pneumococcal Pneumonia, *Chest* 1999; 116: 1278-1281

Objective: To review the impact of blood cultures positive for pneumococcus on community acquired pneumonia (CAP) in one hospital. (p 1279)

Methods: Retrospective chart review without clearly stated methods of all patients admitted to Methodist Healthcare Central Hospital in Memphis, TN between January 1996 and December 1998 with a diagnosis of CAP and at least one BCx positive for *S. pneumoniae*. Information obtained included demographics, initial antibiotics, and any subsequent change in antibiotics with a documented reason. Two Pulmonary specialists independently reviewed the data and determined if a change was due to culture results.

Guide		Comments
I.	Are the results valid?	Answer questions IA, IB, & IC below
A.	<p>Did clinicians face diagnostic uncertainty?</p> <p><i>“Clinicians” can represent the original treating physicians and/or the research investigators.</i></p>	Yes, treating physicians did not know pre-culture which patients had bacteremia or drug-resistant organisms. Whether research investigators were blinded to the culture results when abstracting other variables from their chart review is not stated, so a potential bias does exist.
B.	<p>Was there a blind comparison with an independent gold standard applied similarly to the treatment group and to the control group?</p>	No control groups or independent Gold standard. The positive BCx were not being compared to another diagnostic test, but rather the clinical impact of the information provided by culture results was being assessed.
C.	<p>Did the results of the test being evaluated influence the decision to perform the gold standard?</p>	Presumably no -- if the hospital was following JCAHO standards, all admitted CAP patients had two BCx sent. The current study only included those with documented S. pneumonia bacteremia. Excluded by design are non-S. pneumonia bacteremia, pre-treated patients with false-negative cultures, and non-bacteremic CAP patients. An interesting comparison could have been made about frequency of treatment change based on lack of clinical improvement among these alternative subsets.



II.	What are the results?	Answer questions IIA below.
A.	What likelihood ratios were associated with the range of possible test results?	<p>Unable to calculate sensitivity, specificity, Likelihood Ratios, or construct 2x2 tables with the information provided. The authors would need to include data on all 1805 with CAP to do so. Assuming that all 1805 had 2 sets of BCx, however, one can calculate the following:</p> <ul style="list-style-type: none"> • 118/1805 (6.5%) had + BCx • 31/1805 (1.7%) had change in management based upon a positive culture representing 25% of the positives. Unfortunately, only 2/31 (6%) of those who had a change in antibiotics represented a narrowing of the spectrum based upon sensitivity results. • Therapy was narrowed to penicillin in 22% and atypical coverage was eliminated in 37% (p 1280).
III.	How can I apply the results to patient care?	Answer questions III A-D below.
A.	Will the reproducibility of the test result and its interpretation be satisfactory in my clinical setting?	Uncertain because culture results are available only after the patient leaves the ED when therapeutic options are out of our hands. If admitting teams utilize data to narrow antimicrobial coverage and reduce costs while controlling evolving resistance patterns, maybe.
B.	Are the results applicable to the patients in my practice?	Uncertain since no demographic information is provided. Age-range? Nursing home residents included? Who drew the BCx and when (on average) were they drawn? What proportion of cultures were false-positives? How many subjects had pre-culture antimicrobial exposure as outpatients?



C.	Will the results change my management strategy?	No, I still believe BCx are of little utility in vast majority of ED CAP patients.
D.	Will patients be better off as a result of the test?	Yes, if JCAHO and IDSA recognize burgeoning body of literature opposing their guidelines and fund prospective trials to address these valid concerns.

Limitations

1. **Retrospective review without clearly stated methods:**
 - a. **Who identified the charts?**
 - b. **Kappa analysis of chart identification or data abstraction?**
 - c. **Standardized data abstraction forms?**
 - d. **Data abstractors blinded to the study hypothesis?**
2. **Retrospective design reliance on documentation of antibiotic change reasoning likely missed cases where alterations indeed made because of culture results (but not documented in the chart). Hence, the need for a prospective trial.**
3. **Exclusion of BCx-negative and non-S. pneumonia cohorts limits external validity.**
4. **No information about hospital length-of-stay provided.**

Bottom Line

In CAP patients admitted to one hospital with subsequent S. pneumonia bacteremia, BCx are rarely positive and even more rarely alter antimicrobial management. The Pneumonia Severity Index should not be viewed as a predictor of PCN-resistance or bacteremia since 45% of culture-positive subjects had PSI Grades I-III. Prospective studies should assess the cost-effectiveness and utility of BCx in CAP.

