Critical Review Form

Diagnostic Test

Do Emergency Department Blood Cultures Change Practice in Patients with Pneumonia? *Annals EM* 2005; 46: 393-400

<u>Objectives:</u> To determine the impact of ED blood cultures on antimicrobial therapy for patients with pneumonia. (p 393)

<u>Methods:</u> Prospective chart review between 2000-2001 on consecutive adult patients treated at Beth Israel Hospital (Boston, MA) with clinical and radiographic evidence of pneumonia and blood cultures (BCx) obtained in the ED or within 3 hours of arrival to inpatient floor. <u>Excellent data abstraction methods were used</u> including blinded abstractors, well-referenced definitions of true-positives, contaminants, and non-susceptible organisms, as well as conflict resolution of inconclusive BCx results. An additional strength of this paper is the use of a sensitivity analysis with reasonable approximations (see pp 396-397) to assess the potential impact of those not enrolled because BCx were not obtained. No other exclusion criteria are noted and a CONSORT diagram is provided on p. 395.

Guide		Comments
I.	**Are the results valid?**	Answer questions IA, IB, & IC below
A.	**Did clinicians face diagnostic uncertainty?**	*Treating clinicians* certainly did face diagnostic uncertainty in a population of patients with clinical and radiographic evidence of pneumonia in whom JCAHO requires antibiotics within 4-hours and BCx prior to antibiotics on all admitted patients. Additionally, the *data abstractors* also faced diagnostic uncertainty because they were blinded to the culture results, thus removing the potential of *ascertainment bias*.
B.	**Was there a blind comparison with an independent gold standard applied similarly to the treatment group and to the control group?**	No, the gold standard was and is BCx. No alternative diagnostic study (lung biopsy) was performed.
C.	**Did the results of the test being evaluated influence the decision to perform the gold standard?**	No – all had BCx by inclusion criteria.

II.	What are the results?	Answer questions IIA below.
A.	**What likelihood ratios were associated with the range of possible test results?**	Unable to derive 2x2 tables, sensitivity or LR with information provided. However, here are the results: • 29/414 (7%, 95% CI 4.5-9.5%) true positives with three patients who died before BCx available so not included in the analysis. • 25/414 (6%, 3.7-8.3%) false-positives. • 15/29 (3.6%, 1.8-5.4%) had treatment altered as a result of the BCx results with 11 narrowed and 4 broadened. Of the 4 who had antimicrobial coverage expanded, three were geriatric nursing-home residents and two of these had coverage expanded *before* the culture results were available due to clinical deterioration. • S. pneumonia represented 50% of positives, followed by S. aureus (23%) and E. coli (10%). • 9.6% (3.6-15.6%, 95% CI) of NH residents were bacteremic. • Sensitivity analysis resulted in revised estimates of all ED patients with pneumonia with true-positive BCx 6.2% (4.2-8.2%), resistant infections (0.8%), and BCx used to narrow antibiotic coverage 2.4% (1.1-3.7%) with the <u>number needed to culture to identify one resistant organism 1 ÷ 0.008 = 125.</u>

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?**	Yes, the mix of pneumonia patients and diagnostic uncertainty in conjunction with the reticence regarding universal BCx between Boston and St. Louis are likely identical.
B.	**Are the results applicable to the patients in my practice?**	Yes, as noted above.
C.	**Will the results change my management strategy?**	No, I did not believe BCx were universally indicated before and I still do not.
D.	**Will patients be better off as a result of the test?**	Yes, if we can subsequently study subgroups more likely to benefit from routine BCx and then amend JCAHO non-scientific, unsubstantiated "quality indicators" and divert funds from expensive, unused BCx towards proven disease prevention measures like the pneumococcal vaccine and smoking cessation.

Limitations:

1. **Limited external validity because one hospital's results may not be generally applicable to others with different patient populations, spectrum of organism, and resistance patterns, along with variable ED structures and waiting times.**
2. **Subjects included a mix of CAP and NH-acquired pneumonia which probably represent a heterogeneous pneumonia group better studied separately.**
3. **No assessment of Pneumonia Severity Index was reported leaving one to wonder about disease severity spectrum and the utility of PSI as a predictor of bacteremia.**

Bottom Line:

In the year 2000 routine BCx of one urban ED's pneumonia patients rarely revealed bacteremia (7%) and just as often yielded false-positive results (6%). While half of true-positives do suggest a change in antimicrobial coverage, these findings are often (42%) ignored and unused. CMS and JCAHO's BCx in pneumonia quality indicator is unsubstantiated, of low yield, potentially misleading, and a substantial waste of valuable resources. Future research should assess subsets of pneumonia patients likely to benefit from routine BCx such as nursing home residents, immunocompromised patients, and the recently hospitalized, as well as in settings of high-level local resistance or with a clinical suspicion of atypical pathogens.