

Adherence to use of Blood Cultures According to Current National Guidelines and their Impact on Patients with Community Acquired Pneumonia: A Retrospective Cohort

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Background

Community acquired pneumonia (CAP) is the most frequent cause of mortality secondary to infectious etiologies. Recommendations about the use of blood cultures in the diagnosis and treatment of CAP has been a contentious topic of debate and ever-changing recommendations. Current guidelines specify the situations when blood cultures should be ordered.

Table 1. Sociodemographic and clinical characteristics. Bivariate analysis for mortality

Characteristics	Alive N=641 (89%)	Deceased N=80 (11%)	Total N=721	Odds ratio	P-value	Confidence intervals 95%
Age	67 (56, 79)	76 (64, 87)	68 (57, 80)	1.04	<0.00001	1.02 - 1.05
ICU admission						
No	531(83%)	39(49%)	570(59%)	Reference		
Yes	110(17%)	41(51%)	151(21%)	5.07	<0.00001	3.13 – 8.24
CURB 65 grouped						
Mild	629 (98%)	64 (80%)	693 (86%)	Reference	<0.00001	
Severe	12(1.9%)	16(20%)	28(3.9%)	13.1		5.99-29.5
PSI	95 (68, 121)	136 (112, 163)	101 (74, 127)	1.03	<0.00001	1.02 - 1.04
ATS	1 (1, 3)	4 (2, 6)	2 (1, 4)	1.52	<0.00001	1.38 - 1.68
Appropriate BC					<0.00001	
Not Appropriate	459(72%)	15(19%)	474(66%)	Reference		
Appropriate	182(28%)	65(81%)	247(34%)	10.93		6.07-19.68
Positive blood culture						
No	573(89%)	52(65%)	625(87%)	Reference		
Yes	68(11%)	28(35%)	96(13%)	4.54	<0.00001	2.67-7.67

ATS: American Thoracic Society, ICU: Intensive care unit, PSI: Pneumonia severity index

Methodology

- Retrospective cohort study between January - December 2019 including patients with the International Disease Classification 10 (ICD-10) codes for CAP.
- Sociodemographic factors and clinical factors were obtained, as well as appropriateness of blood cultures as per current Infectious Disease Society of America (IDSA) guidelines.
- An initial bivariate analysis was performed for mortality and length of stay with pertinent variables like blood culture positivity, blood culture appropriateness, intensive care admission and clinical comorbidities.

Results

- 721 patients had CAP and were included in the study. Median age was 68 years and almost 50% of the patients were male (n= 293). Most of the patients presented from home (84%) and the most common comorbidities were hypertension and diabetes (68% and 31 % respectively).
- 96 patients had positive blood culture and 34% (n= 247) of all the blood cultures were adequately ordered as per current IDSA guidelines. 80 patients died or went to hospice and the median length of hospital stay in our cohort was 7 days (Table 1).
- The multivariate model showed that mortality was associated with positive blood cultures (OR= 3.1 95%CI 1.63-5.87) and appropriateness of blood cultures (OR=2.96 95% CI 1.2-5.7). Length of hospital stay did not show any association with positive blood cultures, but it was associated with blood culture appropriateness (OR= 1.63 95%CI 1-2.65).

Table 2. Multivariate logistic regression to assess the association with mortality

Factor	Estimate	Standard error	Odds ratio	P-value	95% CI
Intercept	-6.7	0.85	Reference	<0.00001	0.001 - 0.006
Culture positivity	1.15	0.32	3.1	<0.0001	1.63 - 5.87
Age	0.02	0.01	1.02	0.05	1.00 - 1.04
Dementia	1.26	0.36	3.50	<0.001	1.67 - 7.30
Active cancer	0.78	0.43	2.18	0.07	0.93 – 5.10
History of cancer	-1.49	0.80	0.22	0.06	0.04 – 1.09
PSI	0.02	0.005	1.01	0.02	1.01 - 1.03
ATS	0.16	0.08	1.26	0.01	1.05- 1.50
Blood culture appropriateness	1.20	0.43	2.96	0.01	1.25 – 7.00

ATS: American Thoracic Society, PSI: Pneumonia severity index

Conclusion

Adherence to current recommendations of blood cultures use in CAP at our institution was low. There may be some association with patient outcomes and appropriate use of blood cultures in patients diagnosed with CAP. However, a prospective study evaluating the utility of this test following current IDSA recommendations is needed to understand their impact in mortality and morbidity of CAP.

Table 3. Relationship between appropriateness of blood cultures and final disposition according to the positivity of the blood cultures

Blood culture use	Positivity of the blood culture	Final Disposition	
		Home	Death or Hospice
Appropriate	No	154 (78.2%)	43 (21.8%)
	Yes	28 (56.0%)	22 (44.0%)
Not Appropriate	No	419 (97.9%)	9 (2.1%)
	Yes	40 (87.0%)	6 (13.0%)

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