

The Impact of Molecular Testing on Antibiotic Utilization in Community-Acquired Pneumonia

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BACKGROUND

Diagnostic testing for respiratory viruses can guide antimicrobial therapy and improve patient care. The study objective was to evaluate antibiotic therapy in patients with community-acquired pneumonia (CAP) who were tested for respiratory viruses via a respiratory virus PCR panel (RVP). Additionally the study evaluated patient characteristics and outcomes associated with viral pneumonia.

METHODS

Patients hospitalized at TriHealth with a diagnosis of CAP and who underwent molecular testing for respiratory viruses were included in the study. Patients with CAP who tested positive for viral pathogens on the RVP were compared to patients who tested negative to identify any differences in antibiotic days, patient characteristics, and patient outcomes.

RESULTS

The study included 190 subjects of which 108 (57%) tested positive and 82 (43%) tested negative for viral pathogens. Patients who tested positive were younger ($p=0.04$), had a lower WBC count ($p=0.003$) and a lower creatinine level ($p=0.01$) (Table 1). Clinical findings were similar between RVP positive and negative patients (Table 2). Although significantly fewer patients who tested positive took antibiotics for more than 2 days when compared to negative patients ($p=0.002$), substantial antibiotic overuse was still demonstrated as the vast majority of patients who test positive on the RVP (72%) continued on antibiotic treatment for more than 2 days. There was not a significant difference in cumulative antibiotic days between patients who tested positive for viral pneumonia (3.0 median days) versus patients who tested negative for viral pneumonia (4.0 median days) ($p=0.56$). Patient outcomes were similar between the two groups (Table 3).

CONCLUSIONS

1. RVP testing alone has a minimal impact in decreasing antibiotic utilization in CAP.
2. Viral pneumonia is associated with a lower prevalence in the elderly population and is less likely to be associated with leukocytosis or an elevated creatinine.
3. Additional biomarkers such as procalcitonin may need to be combined with molecular testing for respiratory viruses in order to assist physicians in the decision to discontinue antibiotic therapy in CAP.

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Table 1. Patient Characteristics between RVP Positive and Negative Inpatients with CAP

Characteristics n, %	RVP Negative n = 82		RVP Positive n = 108		p-value
	n	%	n	%	
Male gender	36	43.9%	37	34.3%	0.18
Age 65+	46	56.1%	44	40.7%	0.04
Caucasian	64	78.0%	82	75.9%	0.73
Comorbidities n, %					
Leukocytosis	48	63.2%	40	38.8%	0.001
Acute Kidney Injury	15	18.3%	16	14.8%	0.52
Acute Respiratory Failure	14	17.1%	17	15.7%	0.81
Hypokalemia	9	11.0%	20	18.5%	0.15
Anemia	13	15.9%	11	10.2%	0.24
Hypoxia	6	7.3%	16	14.8%	0.11
COPD	7	8.5%	14	13.0%	0.34
Sepsis	8	9.8%	10	9.3%	0.91
Steroid Use	30	36.6%	47	43.5%	0.34
Lab values median, IQR	Median	IQR	Median	IQR	p-value
WBC	12.0	8.8, 16.3	9.7	6.8, 13.7	0.003
Creatinine	1.2	1.0, 1.5	1.0	0.8, 1.3	0.01
AST	24	20, 44	32	22, 45	0.34

Table 2. Clinical Findings between RVP Positive and Negative Inpatients with CAP

	RVP Negative n = 82		RVP Positive n = 108		p-value
	n	%	n	%	
Chest X-ray n, %					0.89
Unilateral	39	52.7%	48	50.5%	
Bilateral	23	31.1%	33	34.7%	
Interstitial	6	8.1%	6	6.3%	
Not Clear	5	6.8%	5	5.3%	
Lab values mean, SD	Mean	SD	Mean	SD	p-value
O2 Sat	89.3	12.1	92.0	6.9	0.08
Temp Max	100.2	1.6	100.3	1.7	0.80

Table 3. Patient Treatment and Outcomes between RVP Positive and Negative Inpatients with CAP

	RVP Negative n = 82		RVP Positive n = 108		p-value
	n	%	n	%	
Treatment n, %					
Antibiotic	81	98.8%	103	95.4%	0.24
Abx 2 days or more	74	90.2%	78	72.2%	0.002
Duration of antibiotic tx, median, IQR	4.0	3.0, 5.0	3.0	2.0, 6.0	0.56
Outcomes n, %					
ICU Transfer	6	7.3%	9	8.3%	0.80
Ventilator	29	35.4%	34	31.5%	0.57
Mortality	3	3.7%	2	1.9%	0.65
LOS median, IQR	5.0	3.0, 9.0	5.0	3.0, 9.0	0.80