

# Clinical Impact of a Multiplex Rapid Diagnostic Pneumonia Panel in Critically Ill Patients

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## BACKGROUND

- The BioFire FilmArray® Pneumonia Panel® (PNA panel) is a rapid multiplex PCR test that detects certain bacterial and viral organisms and resistance genes from respiratory samples within 75 minutes of testing.
- In November 2021, our institution, an 885-bed academic medical center, initiated automatic PNA panel testing of all quantitative cultures obtained by bronchoalveolar lavage (BAL) or tracheal aspirate (TA) from adult ICU patients who did not have a previous PNA panel result in the preceding 72 hours.

## METHODS

- Single-center, retrospective cohort study
- Patients with a quantitative BAL or TA culture obtained January - March 2021 (PRE) or January - March 2022 (POST) randomly screened until 25 patients per study month (75 in each cohort) meeting inclusion criteria identified
- Patients included only once per admission

Inclusion Criteria	Exclusion Criteria
<ol style="list-style-type: none"> <li>Age ≥ 18 years</li> <li>Admitted to an adult ICU at Atrium Health Wake Forest Baptist</li> <li>Quantitative culture obtained by BAL or TA</li> </ol>	<ol style="list-style-type: none"> <li>Another infection requiring antibiotics (other than bacteremia with the same causative pathogen) in the 14 days prior to through 5 days after specimen collection</li> <li>Death within 5 days after specimen collection</li> <li>Another quantitative culture obtained by BAL or TA within the previous 72 hours</li> </ol>

### Primary Outcome

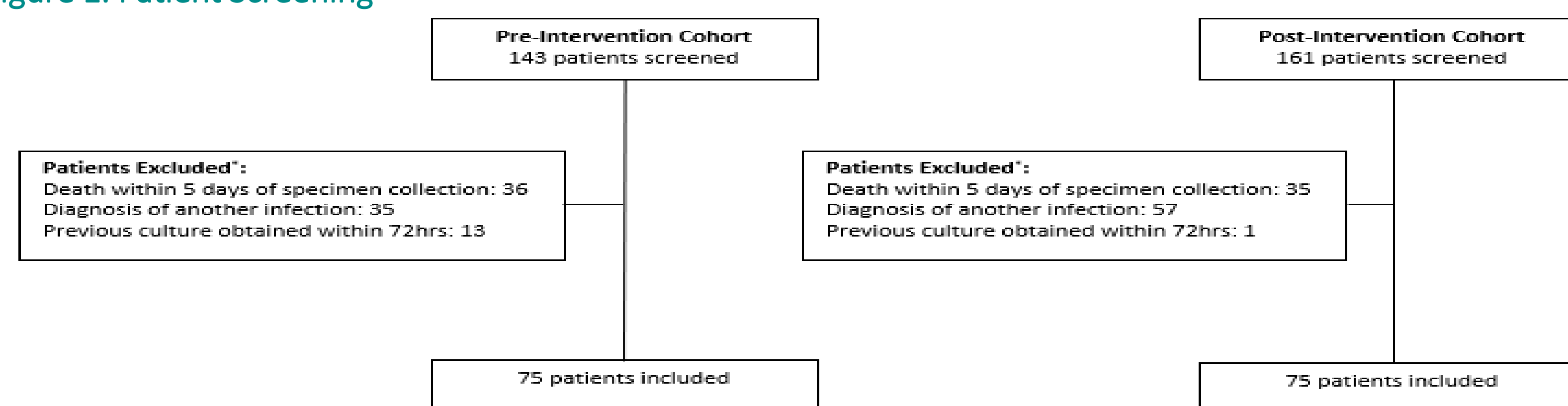
Time to antimicrobial change based on microbiologic test results within 5 days from obtaining a culture

### Key Secondary Outcomes

- Potential and actual antibiotic changes made based on culture and PNA panel results
- Time to adequate therapy in patients who were not on adequate antibiotic therapy
- Days of antibiotic therapy (DOTs)
- Vancomycin serum level monitoring
- Hospital and ICU length of stay up to 30 days from the date of culture
- In-hospital mortality within 30 days of culture

## RESULTS

Figure 1. Patient Screening



\*Patients could have met multiple exclusion criteria.

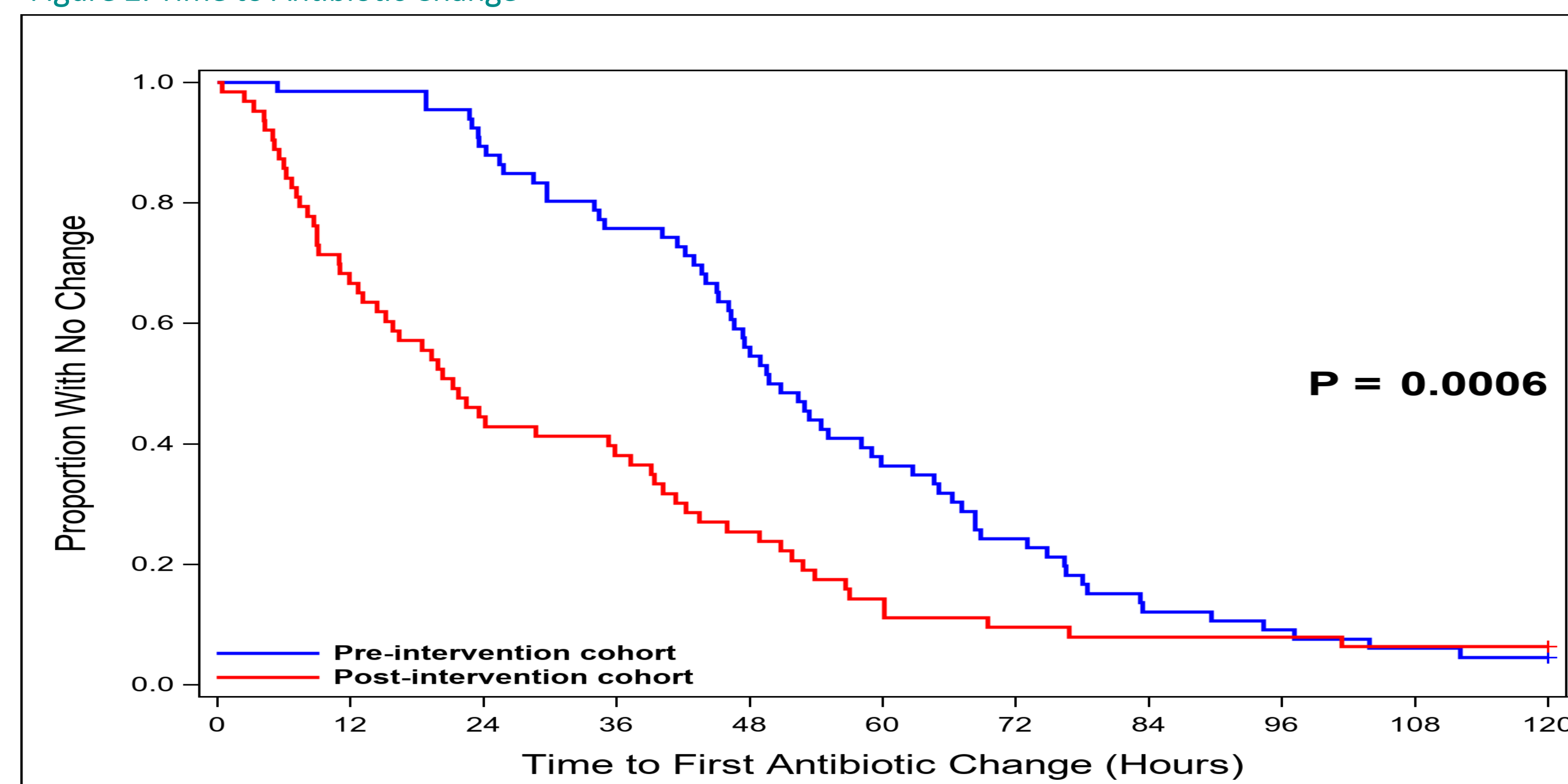
## RESULTS (CONT.)

Table 1. Patient and Test Characteristics

Characteristic	Pre-Intervention Cohort (N=75)	Post-Intervention Cohort (N=75)
Age, years, median (IQR)	54 (44 - 65)	59 (38 - 71)
Female	42 (56)	32 (43)
ICU Service		
• Medical	33 (44)	37 (49)
• Neuroscience	20 (27)	15 (20)
• Surgical	11 (15)	2 (3)
• Cardiovascular	6 (8)	2 (3)
• Cardiothoracic	2 (3)	4 (5)
• Trauma	3 (4)	12 (16)
• Burn	0	3 (4)
Type of Culture Specimen	BAL: 11 (15) TA: 64 (85)	BAL: 10 (13) TA: 65 (87)
Pathogen Identified on PNA Panel	N/A	Bacteria only: 36 (48) Virus only: 3 (4) Bacteria and virus: 3 (4)
Resistance Genes Identified	N/A	10 (13)
• MecA/C and MREJ		8 (11)
• CTX-M		2 (3)

All data represented as n (%) unless otherwise noted

Figure 2. Time to Antibiotic Change



- Median time to antibiotic change: 50 hrs (PRE) vs 21 hrs (POST), HR 2.31 (95% CI 1.57-3.39)
  - Of the antibiotic regimens changed based on the PNA panel, the median time to change was 10 hrs (IQR 7-16)
- Initial inadequate antibiotic therapy: 4 patients (PRE) vs 6 (POST)
  - Median time to adequate antibiotic therapy: 67 hrs (PRE) vs 37 hrs (POST), P=0.27

## RESULTS (CONT.)

Table 2. Potential and Actual Antibiotic Regimen Changes Based on PNA Panel in the Post-Intervention Cohort

Antibiotic Changes Based on PNA Panel	Post-Intervention Cohort (N=75)
Antibiotic Regimens Eligible for Change	56/75 (75)
Eligible Antibiotic Regimens Changed	30/56 (54)
• De-escalation	23/30 (77)
• Discontinued MRSA coverage	19/23 (83)
• Discontinue MRSA + gram-negative coverage	2/23 (9)
• Discontinued MRSA + de-escalated gram-negative coverage	2/23 (9)
• Escalation	
• Gram-negative coverage added	7/30
• Gram-positive coverage added	6/7 (86)
	1/7 (14)
Eligible Antibiotic Regimens Not Changed	26/56 (46)
• Regimens subsequently changed based on culture	15/26 (58)
• Regimens not changed based on culture	11/26 (42)

All data represented as n (%) unless otherwise noted

Table 3. Additional Secondary Outcomes

Secondary Outcomes	Pre-Intervention Cohort (N=75)	Post-Intervention Cohort (N=75)	P value
Total DOTs <sup>‡</sup>	8 (4 - 9)	6 (3 - 9)	0.07
Vancomycin DOTs <sup>‡</sup>	2 (0 - 3)	1 (0 - 3)	0.13
Anti-Pseudomonal beta-lactam DOTs <sup>‡</sup>	3 (0 - 5)	3 (0 - 4)	0.73
Vancomycin ordered, n (%)	48 (64)	50 (66.7)	0.86
Vancomycin serum levels <sup>‡</sup>	1 (0 - 3)	0 (0 - 1)	0.03
ICU length of stay up to 30 days from date of culture, days <sup>‡</sup>	5.6 (3 - 13)	7.1 (4 - 10)	0.37
Hospital length of stay up to 30 days from date of culture, days <sup>‡</sup>	11.3 (6 - 17)	12.9 (8 - 23)	0.09
In-hospital mortality within 30 days from date of culture, n (%)	17 (23)	17 (23)	1

All data represented as median (IQR) unless otherwise noted; <sup>‡</sup>per person in each cohort

## CONCLUSIONS

- The PNA panel was associated with a significant decrease in the time to the first antibiotic change and fewer antibiotic days of therapy.
- It may have had a greater impact if a higher percentage of potential antibiotic changes were implemented at the time of PNA panel result.
- The PNA panel is a promising antimicrobial stewardship tool.

