



Clinical Evaluation and Potential Impact of a Semi-Quantitative Multiplex Molecular Assay for the Identification of Pathogenic Bacteria and Viruses in Lower Respiratory Specimens*

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Rationale

Rapid identification of organisms causing lower respiratory tract infections (LRTIs) is central to appropriate antimicrobial utilization; however, culture methods are slow and insensitive, and molecular tests are not available or are not routinely ordered. We evaluated the FilmArray Pneumonia Panel (FA-Pneumo) (BioFire Diagnostics, Salt Lake City, UT, Investigational Use Only) for detection of respiratory pathogens in bronchoalveolar lavage (BAL) specimens.

Methods and Instrumentation

A total of 259 BAL specimens were collected from inpatients aged 18 years and older with symptoms of respiratory tract infection at 8 hospitals in the US. All specimens were tested using the FA-Pneumo assay, which identifies 18 bacterial agents (15 reported semi-quantitatively when the target genomic is present at or above 10^{3.5} copies/mL) in addition to 8 viral agents (reported qualitatively). Select resistance mechanisms including *mecA/C*, CTX-M, KPC, VIM, IMP, NDM, and OXA-48 are also detected. In this study, identification results for LRTI were compared to standard of care (SOC) methods including bacterial culture and PCR based on clinician order. Chart review was conducted to determine type and duration of antibiotic (abx) therapy for each subject.

The FilmArray® Pneumonia Panel
Sample Type: Sputum, Endotracheal Aspirate, and Bronchoalveolar Lavage

Panel Menu

Bacteria	Atypical Bacteria	Antimicrobial Resistance Genes
Semi-Quantitative Bacteria	Qualitative Bacteria	Qualitative Bacteria
<i>Acinetobacter baumannii</i> - <i>tobamini</i> complex	<i>Legionella pneumophila</i>	<i>meoA/C</i> and <i>MFEJ</i>
<i>Serratia marcescens</i>	<i>Mycoplasma pneumoniae</i>	KPC
<i>Proteus</i> spp.	<i>Chlamydia pneumoniae</i>	NDM
<i>Klebsiella pneumoniae</i> group		QacB/B1e
<i>Enterobacter aerogenes</i>	Viruses	CTX-M
<i>Enterobacter cloacae</i>	Influenza A	VIM
<i>Escherichia coli</i>	Influenza B	IMP
<i>Haemophilus influenzae</i>	Respiratory Syncytial Virus	
<i>Moraxella catarrhalis</i>	Human Rhinovirus/Enterovirus	
<i>Pseudomonas aeruginosa</i>	Human Metapneumovirus	
<i>Staphylococcus aureus</i>	Parainfluenza virus	
<i>Streptococcus pneumoniae</i>	Adenovirus	
<i>Klebsiella oxytoca</i>	Coronavirus	
<i>Streptococcus pyogenes</i>	Middle East Respiratory Syndrome Coronavirus	
<i>Streptococcus agalactiae</i>		

Workflow

Time to Results ~65 min
2 min hands on time

Conclusions

- FA-Pneumo detects potential pathogens in **60-70% more** specimens than culture
 - Not subject to NOF overgrowth, fastidious growth requirements, pre-treatment with Abx
- FA-Pneumo detects **additional pathogens** not high on differential
 - Viral agent detected in 20% of specimens
 - Only 22% of positive specimens has a corresponding SOC order
- Results are **clinically actionable**
 - Potential Abx adjustment in >60% of patients 3-4 days earlier
 - 50% of potential Abx adjustments were discontinuation or narrowing

Table 1. Comparison of FA-Pneumo and bacterial culture in BAL (n=259)

Organism	SOC+/FA+	SOC+/FA-	SOC-/FA+	SOC-/FA-	Total	PPA	NPA
<i>A. baumannii</i>	1	0	0	258	259	100%	100%
<i>Enterobacter</i>	10	0	5	244	259	100%	98.0%
<i>E. coli</i>	2	0	3	254	259	100%	98.8%
<i>H. influenzae</i>	4	0	19	236	259	100%	92.6%
<i>K. oxytoca</i>	2	0	6	251	259	100%	97.7%
<i>K. pneumoniae</i>	8	0	4	247	259	100%	98.4%
<i>M. catarrhalis</i>	2	0	8	249	259	100%	96.9%
<i>Proteus</i>	2	0	3	254	259	100%	98.8%
<i>P. aeruginosa</i>	17	2	6	234	259	89.5%	97.5%
<i>S. marcescens</i>	3	0	0	256	259	100%	100%
<i>S. agalactiae</i>	1	0	5	253	259	100%	98.1%
<i>S. pneumoniae</i>	2	0	3	254	259	100%	98.8%
<i>S. pyogenes</i>	0	0	1	258	259	100%	99.6%
<i>S. aureus</i>	21	1	21	216	259	95.5%	91.1%
Total	75	3	84	3464	3626	96.1%	97.6%

FA: FA-Pneumo; SOC: Standard of care

Table 2. Comparison of FA-Pneumo and viral NAAT in BAL (n=259)

Target	FA positive	SOC Order	SOC Agree	FA No Bacteria
hRV/EV	17	6/17 (35%)	6/6 (100%)	7/17 (41%)
CoV	9	2/9 (22%)	2/2 (100%)	7/9 (78%)
FluA	5	0/5 (0%)	n/a	3/5 (60%)
PIV	3	1/3 (33%)	1/1 (100%)	2/3 (66%)
FluB	2	1/2 (50%)	1/1 (100%)	1/2 (50%)
RSV	2	0/2 (0%)	n/a	2/2 (100%)
hMPV	1	0/1 (0%)	n/a	0/1 (0%)
AdV	1	0/1 (0%)	n/a	1/1 (100%)
<i>Legionella</i>	1	0/1 (0%)	n/a	1/1 (100%)
<i>Mycoplasma</i>	1	0/1 (0%)	n/a	1/1 (100%)
CoV+hMPV	1	1/1 (100%)	1 (100%)	0/1 (0%)
hRV/EV+PIV	3	0/3 (0%)	n/a	1/3 (33%)
hRV/EV+CoV	1	0/1 (0%)	n/a	0/1 (0%)
hMPV+FluA+CoV	1	0/1 (0%)	n/a	1/1 (100%)
None Detected	211	79/211 (37%)	76/79 (96.2%)	129/211 (61%)

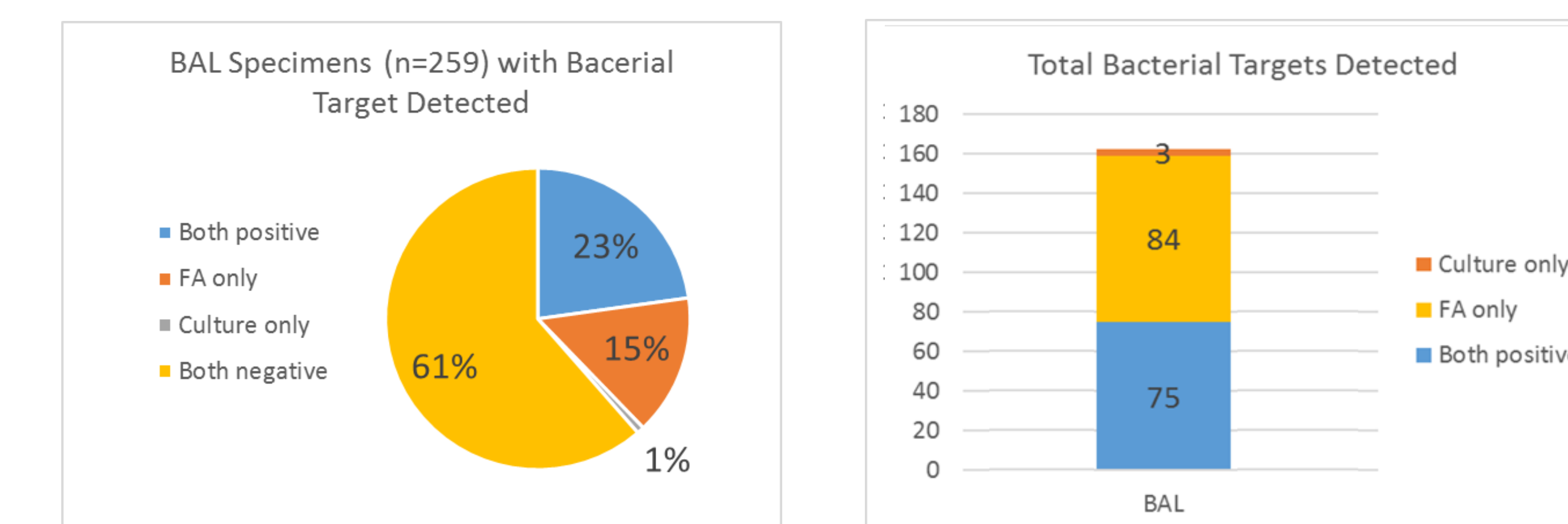
FA: FA-Pneumo; SOC: Standard of care. **Only 22% of positive specimens had an appropriate SOC order.**

Table 3. Impact of FA-Pneumo on antibiotic prescribing

Potential Change, no.	Antimicrobials	Patients	Hours
Appropriate de-escalation	206	122 (48%)	18,284.07
Appropriate escalation	5	5 (2%)	184.66
Inappropriate de-escalation*	6	6 (2%)	-
Inappropriate escalation**	42	42 (17%)	-
No change	-	78 (31%)	-
Unable to assess	-	16	-

* Organisms (n=3) or resistance mechanisms (n=3) identified by SOC but not by FA-Pneumo
** Organisms identified by FA-Pneumo but not by SOC. May represent normal oral flora (NOF) or true pathogen

Figure 1. Qualitative comparison of FA-Pneumo and culture (n=259)



FilmArray detected a bacterial target in **71% more BAL** specimens than routine culture, equating to a **108% increase** in total bacterial detections.

Figure 2. Discordance: FA-Pneumo positive/Culture negative

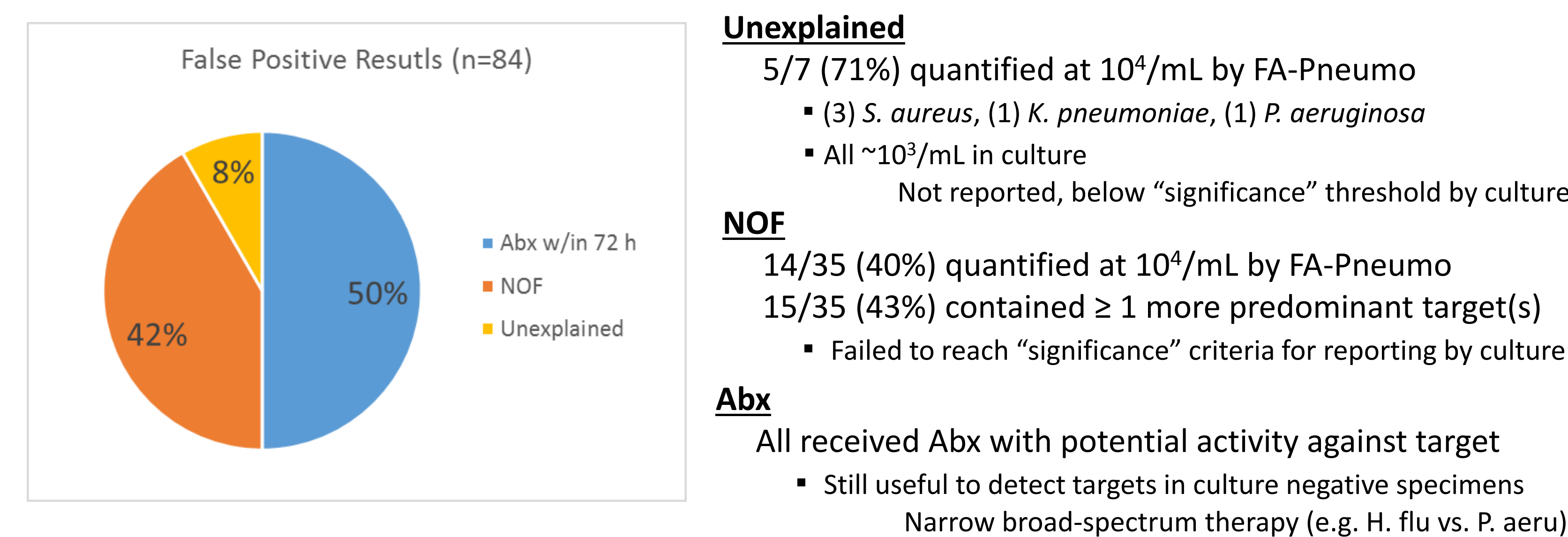
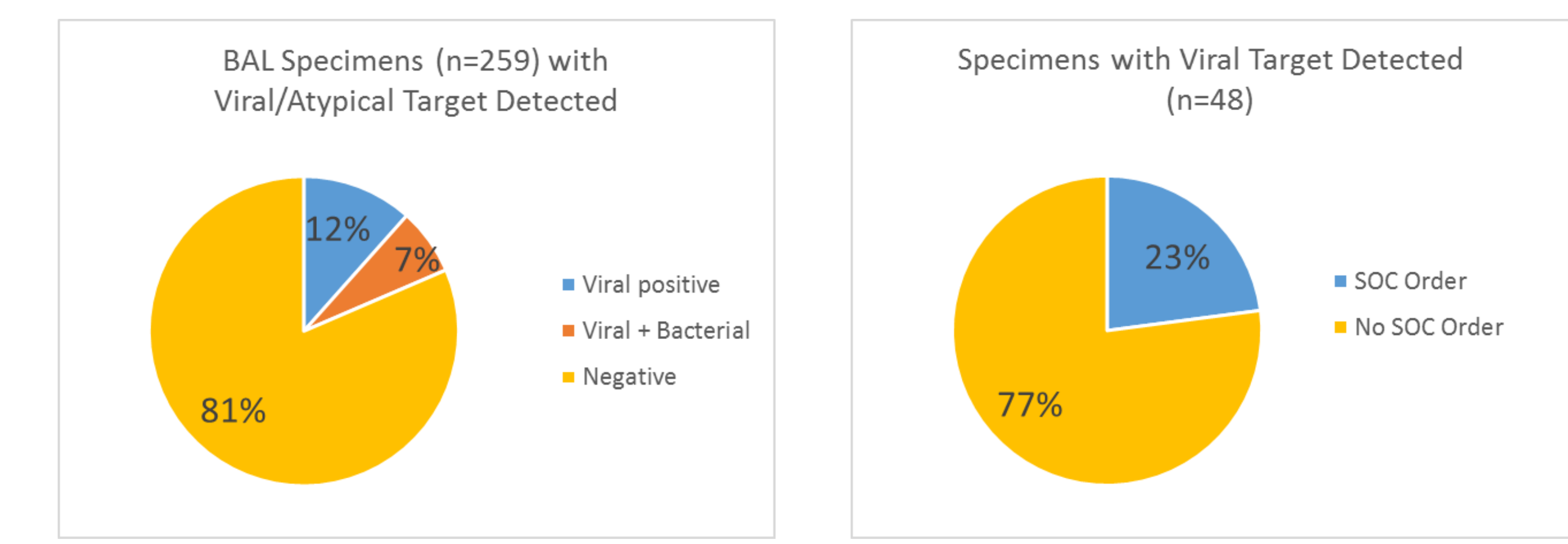
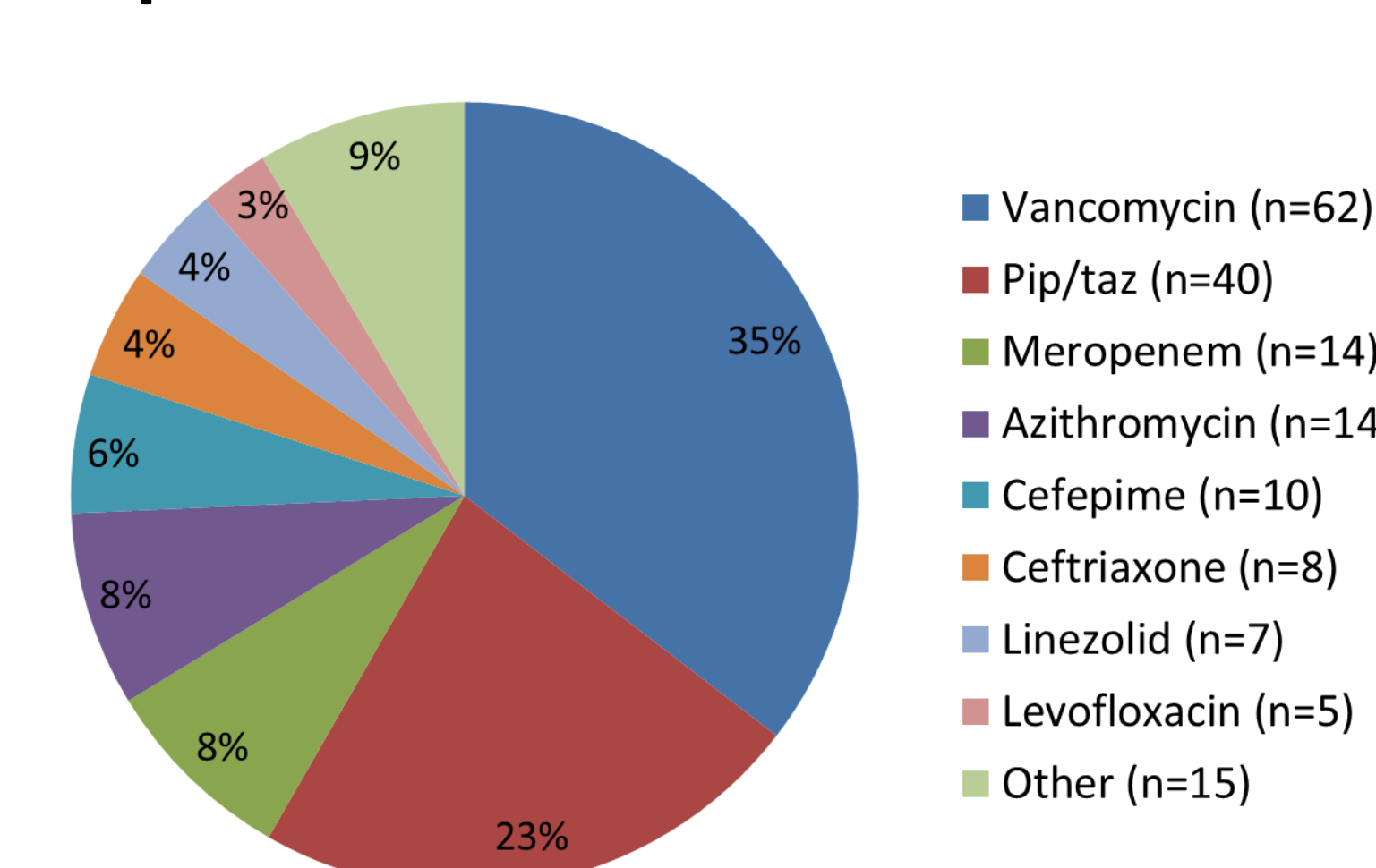


Figure 3. Prevalence of viral targets and related standard of care orders



FilmArray detected a viral target in **19% of BAL** **77%** of positive specimens **did not have SOC order**

Specific antibiotics de-escalated



- Antibiotic adjustment could be made on **165/243 (68%)** evaluable patients
- FA-Pneumo results enabled an avg. of **1.48 antibiotic interventions/patient**
- FA-Pneumo results enabled **≥18,000 antibiotic hours saved** (avg. 6.2 d/patient, 3.8 d/abx)

*The assays described in this poster have not been evaluated for IVD use by regulatory agencies