



Evaluation of Antibiotic De-escalation in Post Cardiac Arrest Patients with Culture-negative versus Culture-positive Aspiration Pneumonia

Natasha R. Herzig, PharmD; Tara L. Harpenau, PharmD, BCIDP; Kevin M. Wohlfarth, PharmD, BCPS, BCCCP, BCCP; Alicia M. Hochanadel, PharmD, BCPS
ProMedica Toledo Hospital | Toledo, OH

Presenter Contact Information:
Natasha Herzig, PharmD
PGY-2 Internal Medicine Pharmacy Resident
East Tennessee State University
1276 Gilbreath Dr, Johnson City, TN 37614
Email: Natasha.herzig@gmail.com
Phone: 419-973-8800

Background

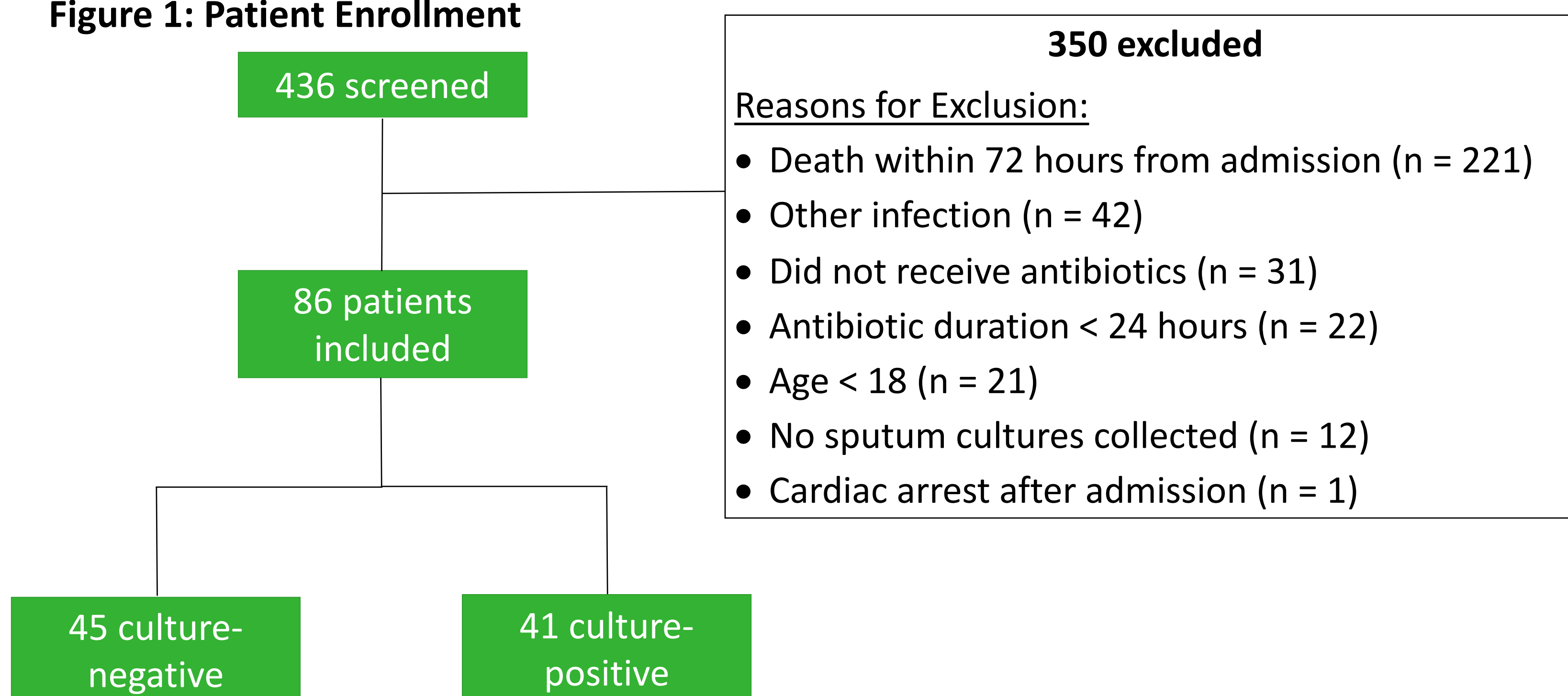
- Due to the forceful nature of cardiopulmonary resuscitation during cardiac arrest, aspiration of gastric contents is fairly common¹
- The most common pathogens in aspiration pneumonia post cardiac arrest include *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Escherichia coli*^{2,3}
- Previous literature has shown no difference in clinical outcomes when discontinuing antimicrobial therapy for suspected aspiration pneumonia with negative respiratory cultures
 - Application is limited in cardiac arrest patients⁴
- The purpose of this study was to evaluate antibiotic de-escalation practices for suspected aspiration pneumonia in this patient population

Methods

- Design:** single-center, retrospective cohort
- Inclusion criteria:** patients 18 years or older presenting between November 2016 and October 2019 with a documented out-of-hospital arrest < 24 hours prior to admission, received antibiotic therapy for aspiration pneumonia, and had a respiratory culture collected during the index admission
- Exclusion criteria:** bacterial infection other than aspiration pneumonia, antibiotics administered prior to admission, known pregnancy or breast feeding, cystic fibrosis, or death within 72 hours of admission
- Primary endpoint:** incidence of antibiotic therapy de-escalation before day seven in culture-negative vs culture-positive patients
- Secondary endpoints:** intensive care unit (ICU) length of stay (LOS) and overall hospital LOS, in-hospital mortality, ventilator-free days, type of de-escalation, and incidence of *Clostridioides difficile* infection
- Definitions:**
 - Antibiotic de-escalation: discontinuation of methicillin-resistant *Staphylococcus aureus* (MRSA), *Pseudomonas aeruginosa*, and/or atypical coverage or discontinuation of all antibiotics based on culture and serology results
 - Risk factors: Healthcare-acquired pneumonia (HCAP) risk factors per the 2005 IDSA guidelines, MRSA and *Pseudomonas aeruginosa* risk factors per the 2019 IDSA guidelines^{5,6}
 - Culture-positive: bacterial pathogen(s), not considered normal flora, isolated from respiratory cultures
 - Culture-negative: no pathogen(s) isolated from respiratory cultures or growth of normal respiratory flora only

Results

Figure 1: Patient Enrollment



Results

Table 1: Baseline Characteristics

Characteristic	Culture-negative (n = 45)	Culture-positive (n = 41)	p-value
Age, years [median (IQR)]	63 (58-73)	59 (44-70)	0.07
Male	24 (53.3)	31 (75.6)	0.03
Co-morbidities			
COPD	15 (33.3)	11 (26.8)	0.51
CHF	12 (26.7)	10 (24.4)	0.81
Initial presenting rhythm			
VF/VT	12 (26.7)	6 (14.6)	0.17
PEA or asystole	31 (68.9)	31 (75.6)	0.49
Unknown	2 (4.4)	4 (9.8)	0.33
Cause of PEA or asystole			
Cardiac cause	12 (26.7)	9 (22.0)	0.61
Respiratory cause	17 (37.8)	14 (34.1)	0.73
Drug overdose	2 (4.4)	8 (19.5)	0.03
Chest x-ray with infiltrates	25 (55.6)	30 (73.2)	0.09
Time to ROSC, minutes [median (IQR)]	20 (10-30)	15 (5-20)	0.11
Targeted temperature management	38 (88.4)	33 (80.5)	0.32
Vasopressor requirement	32 (71.1)	30 (73.2)	0.83
Mechanical ventilation required	44 (97.8)	39 (95.1)	0.93

All numbers represented as n (%) unless otherwise stated
Abbreviations: COPD = chronic obstructive pulmonary disorder; CHF = congestive heart failure; PEA = pulseless electrical activity; ROSC = return of spontaneous circulation; VF = ventricular fibrillation; VT = ventricular tachycardia

Figure 2: Risk Factors vs Empiric Antibiotic Coverage

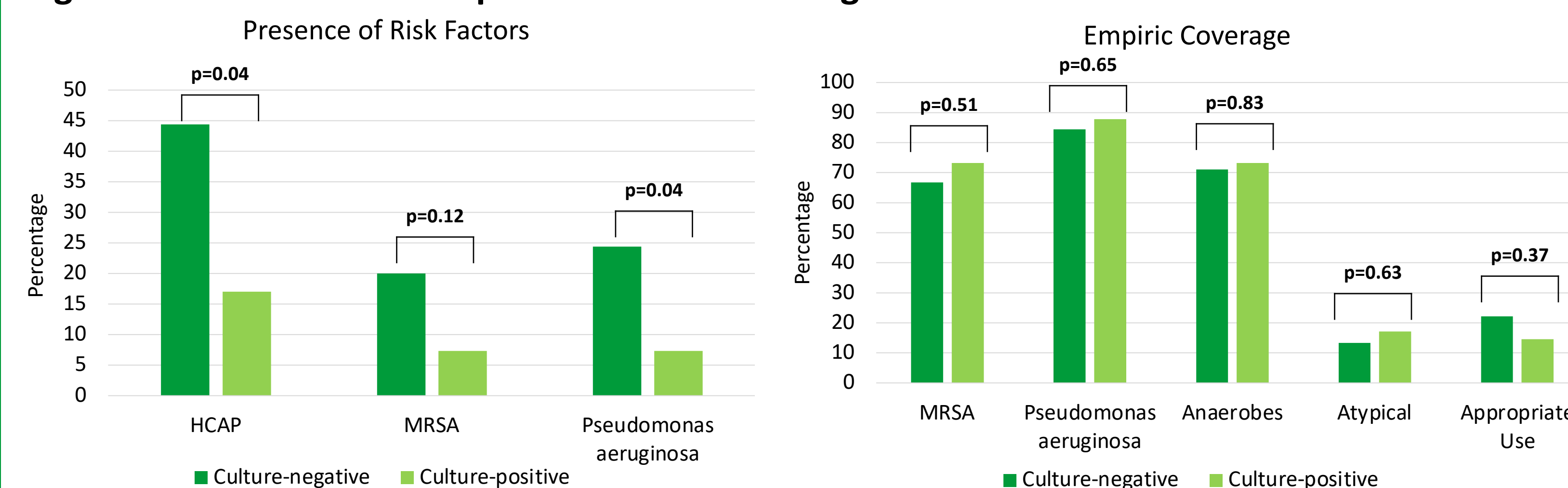
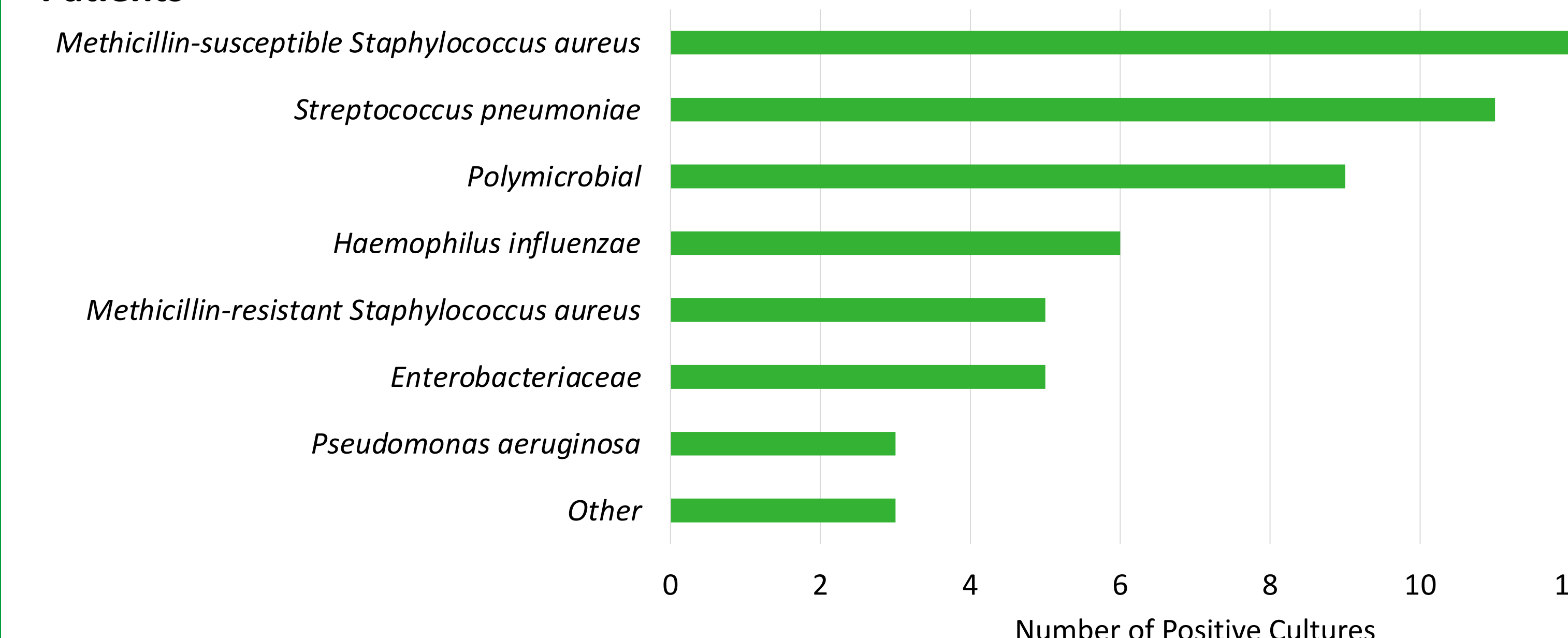


Table 2: Treatment Characteristics

Characteristic	Culture-negative (n = 45)	Culture-positive (n = 41)	p-value
Antibiotic duration, days [median (IQR)]	7 (6-8.5)	8 (7-10)	0.09
Day of de-escalation [median (IQR)]	3 (2-6)	4 (3-6)	0.17
Infectious diseases consultant involvement	3 (6.7)	11 (26.8)	0.02
Pharmacist de-escalation intervention	18 (40.0)	20 (48.8)	0.41
Intervention accepted	14 (77.8)	18 (90.0)	0.30

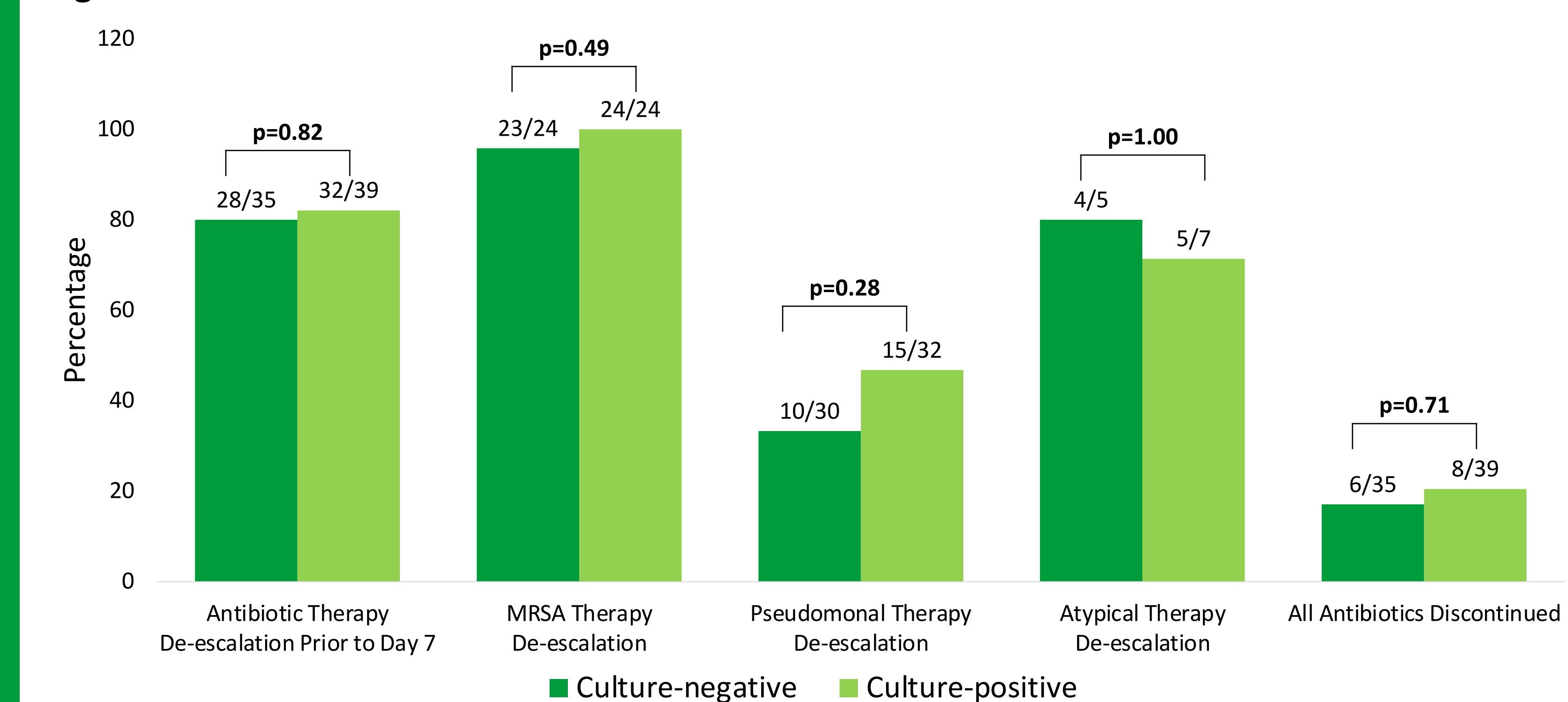
All numbers represented as n (%) unless otherwise stated

Figure 3: Epidemiology of Pathogens Isolated From Respiratory Cultures in Cardiac Arrest Patients



Results

Figure 4: Incidence of De-escalation*†



*excluded patients who died prior to day seven and did not have therapy de-escalated
† Type of therapy percentages taken from patients with indicated therapy on board, but absence of isolated organism in cultures

Table 3: Clinical Outcomes*

Outcome	De-escalation before day 7 (n = 60)	No de-escalation by day 7 (n = 26)	p-value
Hospital LOS, days	11.8 (8.4-19.2)	13.4 (8.9-17.9)	0.76
ICU LOS, days	7.9 (5.6-10.5)	7.6 (4.4-13.2)	0.82
In-hospital mortality, n (%)	20.0 (33.3)	16.0 (61.5)	0.03
Number of ventilator-free days	4.9 (1.7-9.1)	5.7 (2.9-9.0)	0.79
Incidence of CDI, n (%)	0 (0)	0 (0)	--

All numbers represented as median (IQR) unless otherwise stated
Abbreviations: CDI = *Clostridioides difficile* infection; ICU = intensive care unit; IQR = interquartile range; LOS = length of stay
*hospital LOS, ICU LOS, and ventilator-free days analyses excluded patients who died prior to day seven and did not have therapy de-escalated

Conclusions

- Despite lack of indication for broad therapy, majority of patients received MRSA and *Pseudomonas aeruginosa* coverage
- Roughly 50% of patients started on empiric antimicrobial therapy had documented positive results, consistent with prior literature⁴
 - Respiratory culture results were not associated with antibiotic de-escalation
- No difference in outcomes evaluated in de-escalated vs non-de-escalated patients
 - Aside from increased in-hospital mortality, which was likely attributed to other factors
- Observed high rates of MRSA de-escalation but low rates of de-escalation of unnecessary *Pseudomonas aeruginosa* coverage
 - Targeting unnecessary antipseudomonal therapy in this patient population remains an area for further stewardship efforts

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