Evaluation of pre-emptive methicillin-resistant *Staphylococcus aureus* polymerase chain reaction testing on vancomycin use for the treatment of non-severe pneumonia in the emergency department: A quasi-experimental pharmacist intervention study

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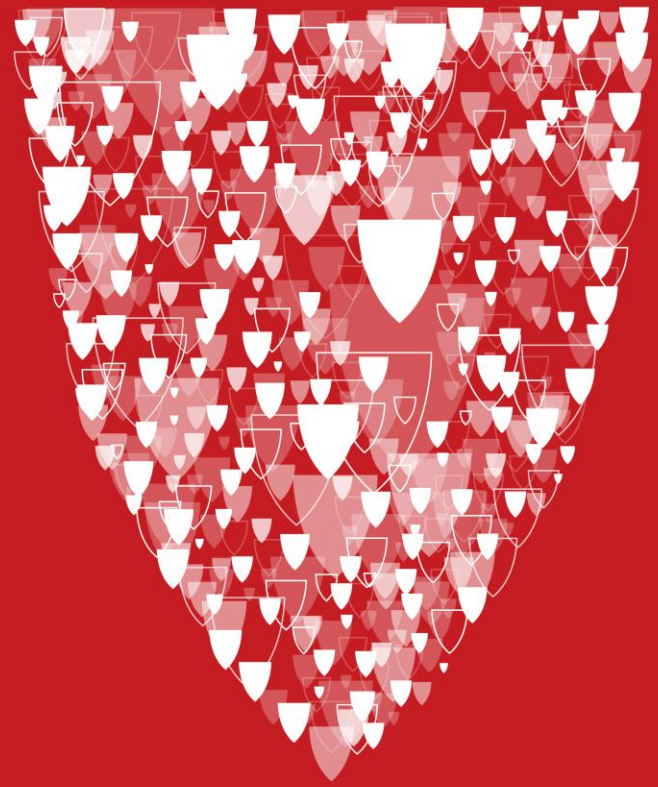
University Hospitals
St. John Medical Center
A CATHOLIC HOSPITAL



No conflicts of interest to disclose

Learning Objective

List the risk factors for methicillin-resistant *Staphylococcus aureus* (MRSA) in community-acquired pneumonia

Definitions

Abbreviation	Definition
AKI	Acute kidney injury
ATS	American Thoracic Society
MRSA	Community-acquired methicillin-resistant *Staphylococcus aureus*
CAP	Community-acquired pneumonia
ED	Emergency department
EM	Emergency medicine
HAP	Hospital-acquired pneumonia
IDSA	Infectious Diseases Society of America
IV	Intravenous
I-Vent	Pharmacy documentation in electronic health record
MRSA	Methicillin-resistant *Staphylococcus aureus*
PCR	Polymerase chain reaction
VAP	Ventilator-associated pneumonia

Background: CAP

- CAP is one of the leading causes of ED visits:
  - 1.2 million diagnoses made each year

- Patients are often placed on broad spectrum antibiotics empirically in the ED including MRSA coverage and de-escalation occurs during hospital admission

- Incidence of a community-acquired MRSA pneumonia is low
  - 0.51 to 0.64 cases per 100,000

Cairns C, et al. *National Hospital Ambulatory Medical Care Survey*. 2022.
Metlay JP, et al. *Am J Respir Crit Care Med*. 2019;200(7):e45-e67.
Vardakas KZ, et al. *Eur Respir J*. 2009;34:1148–58.

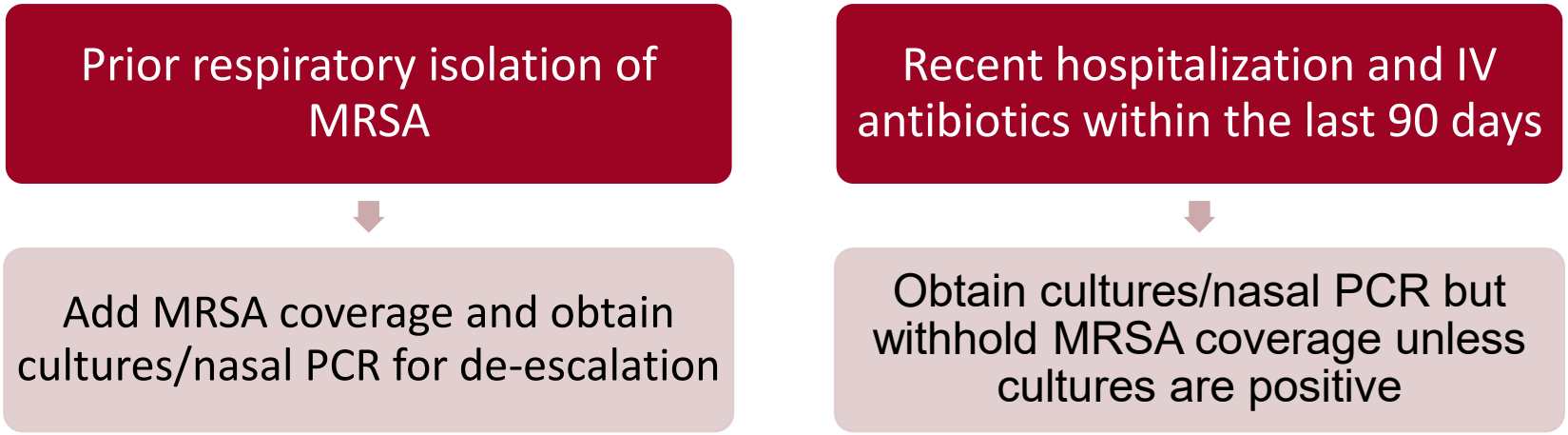
IDSA/ATS: Definition of Severe CAP

1 Major Criteria	≥ 3 Minor Criteria
• Septic shock with need for vasopressors • Respiratory failure requiring mechanical ventilation	• Respiratory rate ≥ 30 breaths/minute • PaO2/FiO2 ratio ≤ 250 • Multilobar infiltrates • Confusion/disorientation • Uremia (blood urea nitrogen level ≥ 20 mg/dL) • Leukopenia (white blood cell count < 4,000 cells/microliter) • Thrombocytopenia (platelet count <100,000/microliter) • Hypothermia (core temperature < 36°C) • Hypotension requiring aggressive fluid resuscitation

Metlay JP, et al. *Am J Respir Crit Care Med*. 2019;200(7):e45-e67.

2019 IDSA/ATS Guidelines for Non-Severe CAP

- Initial treatment with one of the following if no risk factors for MRSA:
  - Beta-lactam + macrolide
  - Respiratory fluoroquinolone
- Recommend to add on MRSA coverage if the following risk factors are present:
  - MRSA coverage includes vancomycin or linezolid



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Background: MRSA PCR Testing

- PCR test involves a swab of the anterior nares to identify MRSA colonization

- Helpful tool when ruling out CA-MRSA pneumonia:
  - **High negative predictive value: >95%**
  - Low positive predictive value: <40%

- MRSA PCR tests have a turnaround time within 24 hours

Johnson JA, et al. *Perm J*. 2015,19(1):34-6. doi: 10.7812/TPP/14-101.
Metlay JP, et al. *Am J Respir Crit Care Med*. 2019;200(7):e45-e67.

Literature Review

	Study Design	Intervention	Result
Meng et al. 2021.	Retrospective, quality improvement study	A nasal PCR protocol allowed pharmacists to order PCR testing if vancomycin was ordered for empiric pneumonia	Proportion of patients in the Post-PCR group in which vancomycin was discontinued within 24 hours of negative PCR results • 317 of 453 (70%) had vancomycin discontinued
Sindelar et al. 2022.	Retrospective, cohort study	Evaluated if negative PCR nasal swab collected in the ED improves early antibiotic de-escalation	Proportion of patients that had early de-escalation (received only one dose of MRSA-active therapy) based on PCR results • Early de-escalation occurred in 64.8% with a PCR vs 48% of patients without a PCR

Meng L, et al. *Open Forum Infect Dis*. 2021;8(4):ofab099.
Sindelar MA, et al. *Am J Emerg Med*. 2022.;55:133-137.

Study Objective

To evaluate the impact of pharmacist intervention combined with MRSA PCR tests on empiric vancomycin use for non-severe CAP patients in the ED

Study Site: University Hospitals St. John Medical Center

- 190-bed community suburban teaching hospital

- 24/7 adult and pediatric ED
    - Staffed by EM physicians, residents, and advanced practice providers

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Pharmacist Practice & Vancomycin Orders

- Pharmacists are consulted to dose all vancomycin orders on **admitted patients**
    - In the ED, one-time doses of vancomycin may be ordered with or without pharmacist consultation
    - All orders are subject to verification by pharmacists

- Vancomycin orders with an indication of pneumonia automatically prompts the ordering of a MRSA PCR in the electronic medical record
    - Pharmacists can order a MRSA PCR on any vancomycin ordered with an indication of pneumonia
    - All MRSA PCR results populate in a shared pharmacist in-basket

- EM pharmacists cover ED verification and provide clinical support 7 days per week ~9am-7pm

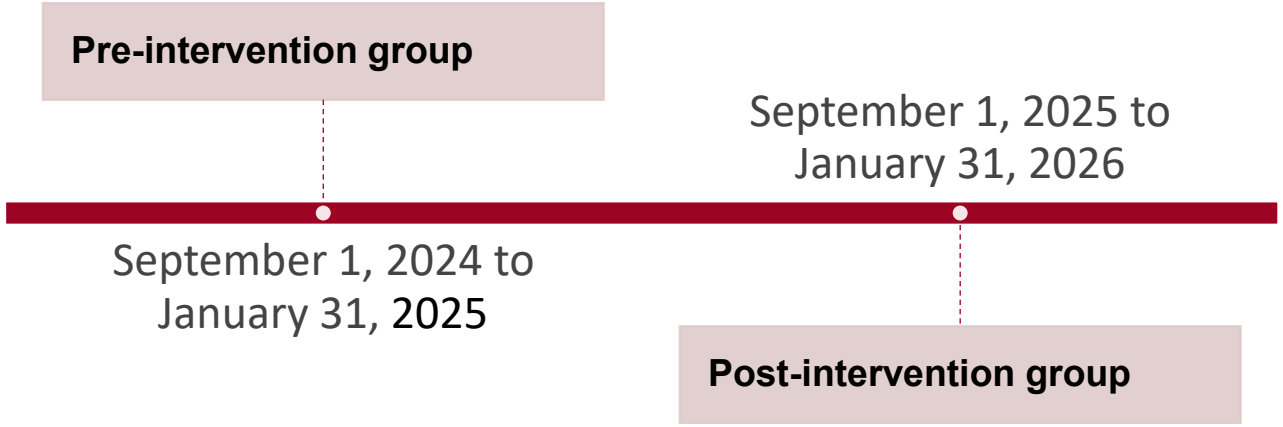
Pharmacist Intervention: Education

EM providers	Use of MSRA PCR to avoid empiric vancomycin therapy in non-severe CAP
EM nurses	Timely collection of MRSA PCR (nurses)
Pharmacists	Notify ordering provider and withhold vancomycin verification or ordering until MRSA PCR resulted in patients with non-severe CAP

Study Design and Methods

- Single-center, retrospective, quasi-experimental study that evaluated a pharmacist-led initiative in the ED on withholding vancomycin for non-severe CAP until MRSA PCR result
    - September 1, 2025, intervention and education was initiated

- Patients who had a negative MRSA PCR test in the ED were identified using SlicerDicer®



Outcomes

Primary:

- The proportion of patients with a negative MRSA PCR test administered vancomycin

Secondary:

- Rate of vancomycin administered prior to MRSA PCR result
- Acceptance rate of pharmacist interventions
- Time to MRSA PCR collection
- Time to vancomycin order discontinuation after MRSA PCR test result
- MRSA PCR turnaround time
- Continuation of vancomycin on admission
- Rate of AKI

Inclusion and Exclusion Criteria

Inclusion:

- Patients ≥ 18 years old with a negative MRSA PCR test in the ED
- Documentation in chart of concern for or confirmed diagnosis of CAP

Exclusion:

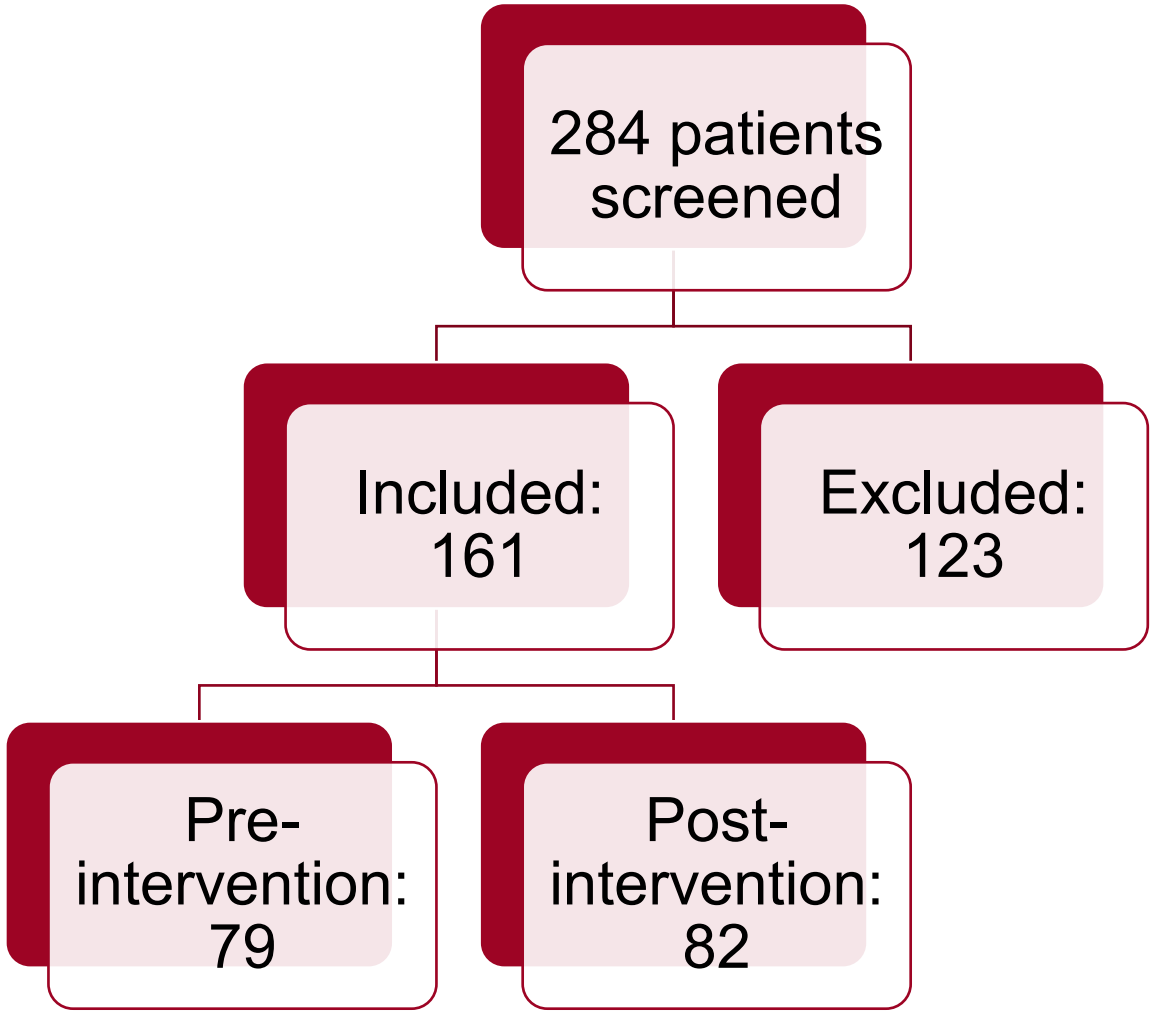
- Pregnancy
- Severe CAP
- Vancomycin ordered for a non-pneumonia indication
- Receiving IV vancomycin prior to presentation to the ED
- MRSA PCR ordered by admitting provider
- HAP, VAP
- Receipt of linezolid for CAP

Statistical Analysis

- Data was imported into SPSSv25.0 software and analyzed pre/post pharmacist intervention
- Categorical data analyzed via Chi-Square Test or Fisher's Exact Test
- Continuous data analyzed via Student's t-test
- 186 total patients were required to identify a reduction in empiric vancomycin use in the ED from 70% to 50% with a beta of 0.8
- All testing was two-sided with $p<0.05$ considered to be statistically significant

Sindelar MA, et al. *Am J Emerg Med*. 2022.;55:133-137.

Study Population



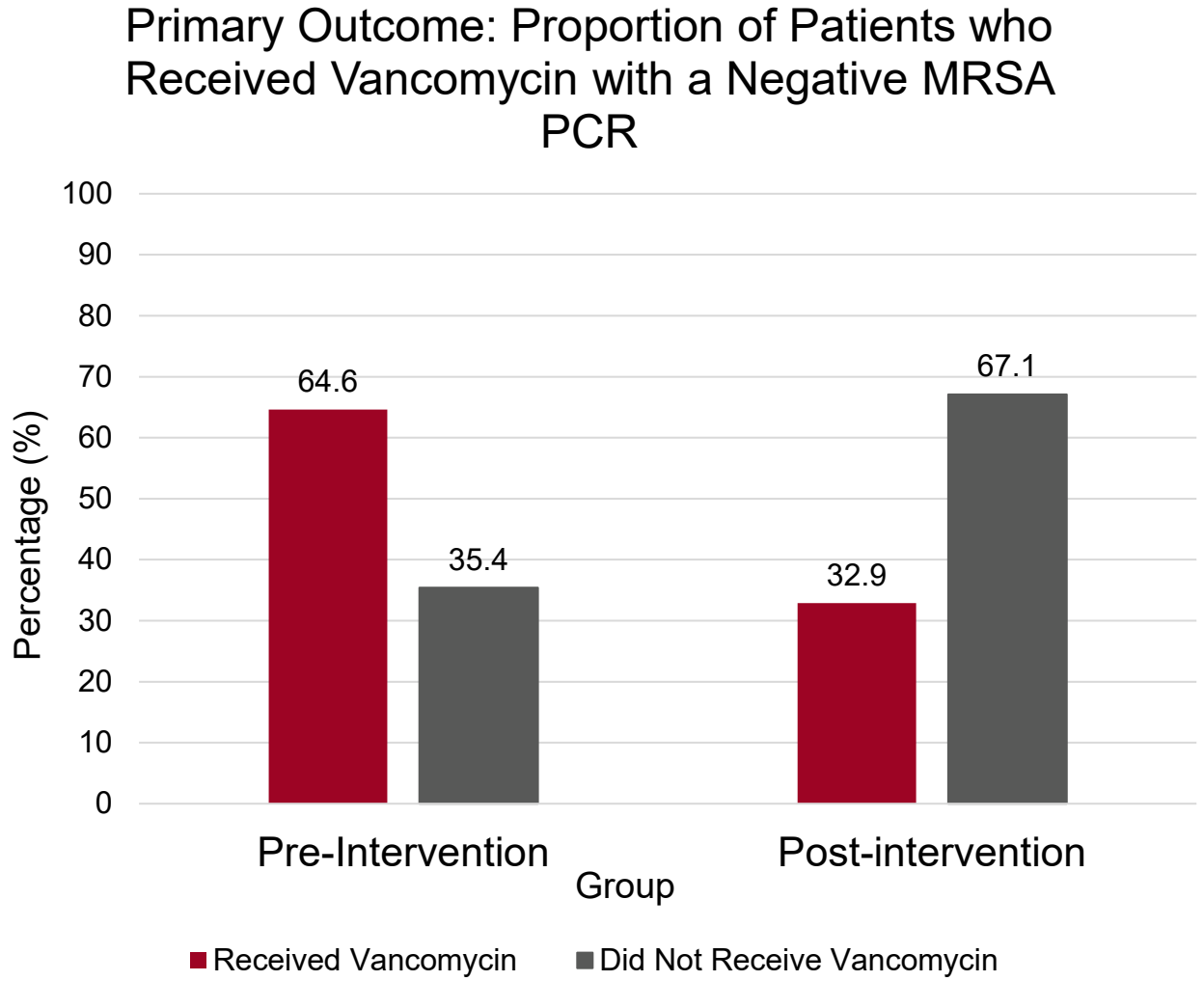
Reasons for exclusion:

- Severe CAP: 57
- Vancomycin for other indication: 19
- PCR ordered by admitting provider: 14
- Multiple sources of infection: 12
- VAP: 12
- Missing documentation of CAP: 4
- HAP: 3
- Age <18: 2

Results: Baseline Characteristics

Characteristic	Pre-intervention (n=79)	Post-intervention (n=82)	P-value
Age - mean (SD)	73.4 (15.76)	71.4 (14.51)	0.421
Female Sex - n (%)	35 (44.3)	35 (42.7)	0.836
Race - n (%) Black White Other	 0 76 (96.2) 3 (3.8)	 2 (2.4) 79 (96.3) 1 (1.2)	0.304
Hospitalization + IV antibiotics within 90 d - n (%)	**19 (24.1)**	**25 (30.5)**	**0.360**
Previous respiratory isolate of MRSA within 1 y - n (%)	**0**	**0**	**N/A**
Charlson Comorbidity Score - mean (SD)	2.9 (2.16)	2.5 (1.89)	0.229
EM pharmacist present at time of ED admission - n (%)	50 (63.3)	53 (64.6)	0.859

Results



Relative risk reduction: 49.1%, p<0.001

Results: Secondary Outcomes

Outcome	Pre-intervention (n=79)	Post-intervention (n=82)	P-value
Vancomycin administered prior to PCR result - n (%)	32 (62.7)	12 (44.4)	0.112
Vancomycin order discontinued prior to verification - n (%)	**18 (22.8)**	**46 (56.1)**	**<0.001**
Time to vancomycin order discontinuation after PCR result (min) - mean (SD)	37.9 (117.8)	33.4 (54.45)	0.855
PCR turnaround time* (h) - mean (SD)	2.33 (1.29)	2.34 (1.94)	0.982
Time to PCR collection (h) - mean (SD)	0.81 (1.23)	0.62 (0.53)	0.345
Vancomycin continued on hospital admission - n (%)	7 (9.2)	8 (10.7)	0.765
Rate of AKI - n (%)	3 (4)	4 (5.5)	0.717

*Turnaround time = time from PCR order to result

Results: Secondary Outcomes-Pharmacist Intervention

Outcome	Pre-intervention (n=79)	Post-intervention (n=82)	P-value
Documented I-Vent by pharmacist - n (%)	16 (20.3)	19 (23.2)	0.654
Pharmacist recommendation accepted - n (%) Yes No No recommendation	 13 (16.5) 3(3.8) 63 (79.7)	 18 (23.3) 1 (1.2) 62 (75.6)	0.371
Rate of acceptance in patients with documented interventions	**13/16 (81.3%)**	**18/19 (94.7%)**	**-**

Results: Primary Outcome Subgroup Analysis

Received Vancomycin in the ED		
	EM Pharmacist not present (n=58)	**EM Pharmacist present (n=103)**
Pre-intervention	21/29 (72.4%)	30/50 (60.0%)
Post-intervention	16/29 (55.2%)	**11/53 (20.8%)**
Total	37/58 (63.8%)	41/103 (39.8%)

Strengths

- Clear inclusion and exclusion criteria
- Similar baseline character distribution between groups
    - Including presence of EM pharmacist
- Followed guidelines recommendations for treatment of non-severe CAP and de-escalation using a MRSA PCR test
- Education to ED and pharmacy staff on use of MRSA PCR in the ED
- Consistent MRSA PCR turnaround time of 1.6 hours from collection to result

Limitations

- Single-center design
- Small study population
- EM pharmacy coverage limited to 10 hours per day
    - Subgroup analysis did not address pharmacist time away from ED and/or time off
- Study not powered to detect a difference in secondary outcomes and subgroup analyses
- Inconsistent pharmacist documentation of recommendation(s)
- Linezolid use for non-severe CAP was not assessed

Discussion & Conclusion

- Early pharmacist intervention combined with use of MRSA PCR in the ED led to a 49.1% reduction in empiric vancomycin use for non-severe CAP
    - The reduction in empiric vancomycin use appeared to be driven by the presence of an EM pharmacist

- This study is unique as no prior study has evaluated utilization of MRSA PCR in the ED combined with pharmacist intervention to inform empiric selection of antibiotics
    - **Intervention allowed for avoidance of vancomycin as opposed to discontinuation post-admission**

Acknowledgements/Co-Investigators

Co-Investigators:

- Sophia Heisler, PharmD
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- Kaitlyn Schumacher, PharmD, BCPS

Statistician:

- Dave Gothard, MS Statistics

Learning Assessment Question

Which of the following patients with CAP is at risk for MRSA and should be empirically covered with vancomycin?

A. A patient with previous hospitalization for acute venous thromboembolism two months ago (did not receive antibiotics)

B. A patient who receives routine hemodialysis in the ambulatory setting

C. A patient who resides in a long-term care facility

D. A patient with a previous respiratory culture positive for MRSA

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Questions?

References

1. Cairns C, Kang K. National Hospital Ambulatory Medical Care Survey: 2022 emergency department summary tables. Available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHAMCS/doc22-ed-508.pdf.

2. Dangerfield B, Chung A, Webb B, et al. Predictive value of methicillin-resistant Staphylococcus aureus (MRSA) nasal swab PCR assay for MRSA pneumonia. Antimicrob Agents Chemother.2014;58(2):859-864.

3. Dillon J, Vita D, Abrantes-Figueiredo J, et al. Impact of stewardship pharmacist driven MRSA nasal surveillance and de-escalation of anti-MRSA therapy (STEW PHARM MRSA NASAL SURVEILLANCE). Antimicrob Steward Healthc Epidemiol. 2024 Dec 12;4(1):e216.

4. Giancola SE, Nguyen AT, Le B, et al. Clinical utility of a nasal swab methicillin-resistant Staphylococcus aureus polymerase chain reaction test in intensive and intermediate care unit patients with pneumonia. Diagn Microbiol Infect Dis. 2016 Nov;86(3):307-310. doi: 10.1016/j.diagmicrobio.2016.08.011. Epub 2016 Aug 12. PMID: 27591173.

5. Johnson JA, Wright ME, Sheperd LA, et al. Nasal methicillin-resistant Staphylococcus aureus polymerase chain reaction: a potential use in guiding antibiotic therapy for pneumonia. Perm J. 2015 Winter;19(1):34-6. doi: 10.7812/TPP/14-101. Epub 2014 Nov 24. PMID: 25432002; PMCID: PMC4315374.

6. Khwaja A. KDIGO clinical practice guidelines for acute kidney injury. Nephron Clin Pract. 2012;120(4):c179-84. doi: 10.1159/000339789. Epub 2012 Aug 7. PMID: 22890468.

7. Meng L, Pourali S, Hitchcock MM, Ha DR, et al. Discontinuation Patterns and Cost Avoidance of a Pharmacist-Driven Methicillin-Resistant Staphylococcus aureus Nasal Polymerase Chain Reaction Testing Protocol for De-escalation of Empiric Vancomycin for Suspected Pneumonia. Open Forum Infect Dis. 2021 Mar 4;8(4):ofab099.

8. Metlay JP, Waterer GW, Long AC, et al. Diagnosis and Treatment of Adults with Community acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019 Oct 1;200(7):e45-e67.

9. Moran GJ, Krishnadasan A, Gorwitz RJ, et al. Prevalence of methicillin-resistant staphylococcus aureus as an etiology of community-acquired pneumonia. Clin Infect Dis. 2012 Apr;54(8):1126-33. doi: 10.1093/cid/cis022. PMID: 22438343.

10. Restrepo M, Faverio P, Reyes L, et al. Anti-MRSA Coverage Overutilization as Empiric Therapy for Hospitalized Patients With Community-Acquired Pneumonia and Healthcare-Associated Pneumonia. CHEST. 2017;152(4):A157

11. Rodriguez A, Rich RL, Semanco M. Utility of MRSA nares PCR for non-respiratory cultures in critically ill patients: an observational evaluation. Infect Dis (Lond). 2025 Apr;57(4):361-365.

12. Sindelar MA, Zepeski AE, Lawler BJ, et al. MRSA nasal swab PCR to de-escalate antibiotics in the emergency department. Am J Emerg Med. 2022 May;55:133-137.

13. Self WH, Wunderink RG, Williams DJ, Zhu Y, et al. Staphylococcus aureus Community-acquired Pneumonia: Prevalence, Clinical Characteristics, and Outcomes. Clin Infect Dis. 2016 Aug 1;63(3):300-9. doi: 10.1093/cid/ciw300. Epub 2016 May 8. PMID: 27161775; PMCID: PMC4946021.

14. Vardakas KZ, Matthaiou DK, Falagas ME. Incidence, characteristics and outcomes of patients with severe community acquired-MRSA pneumonia. Eur Respir J 2009;34:1148–58.

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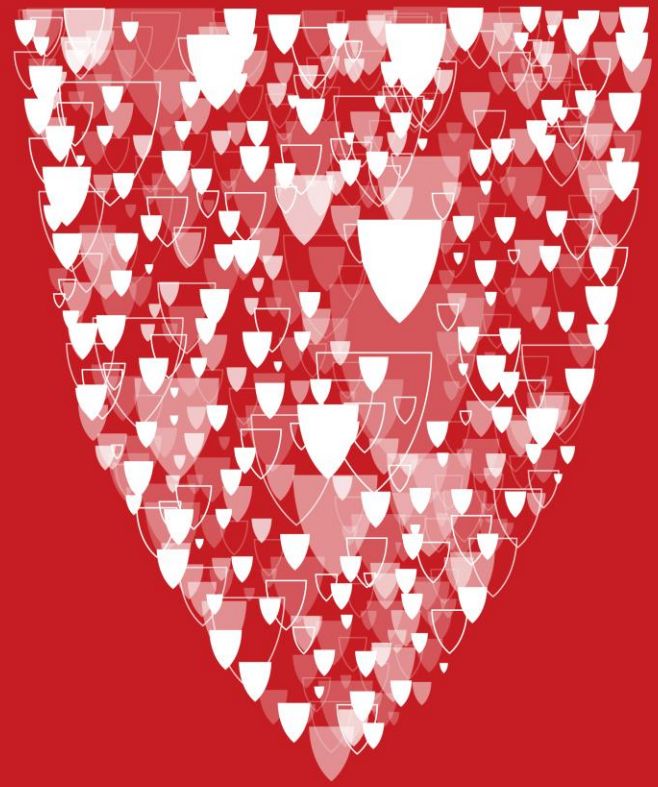

No conflicts of interest to disclose