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Inpatient Outcomes for Children Receiving Empiric Methicillin-Resistant Staphylococcus aureus Coverage for Complicated Pneumonia

Sophia Hackman
Children's Mercy Hospital

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Inpatient Outcomes for Children Receiving Empiric Methicillin-Resistant *Staphylococcus aureus* Coverage for Complicated Pneumonia

Presented by:

Sophia Hackman, DO MPH

Mentor:

Jessica Markham MD, MSc

Co-authors:

Matt Hall PhD

Alaina Burns PharmD, BCPPS

Jennifer L. Goldman, MD, MSc

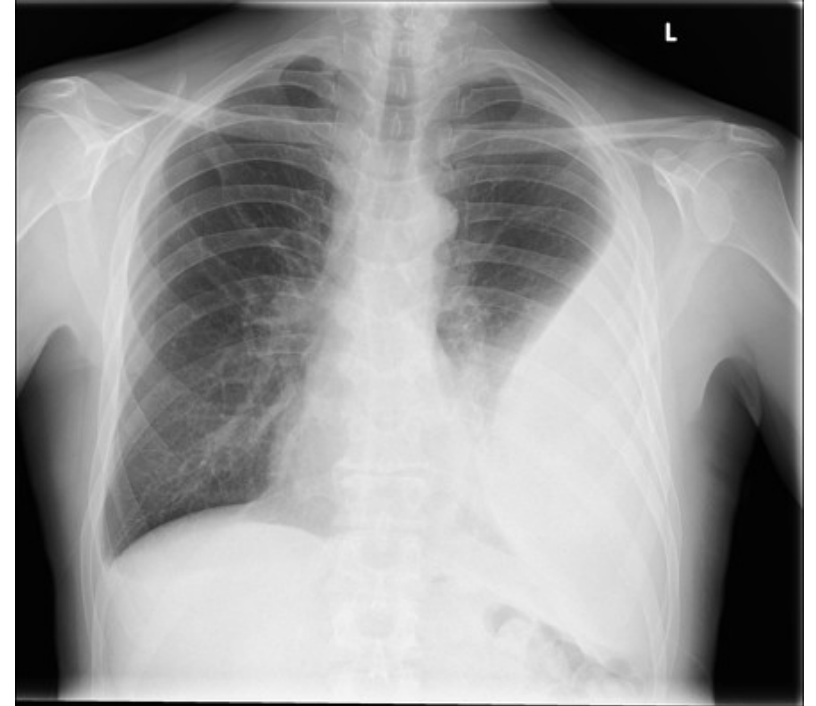


Disclosure

No relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider(s) of commercial services discussed in this CME activity.

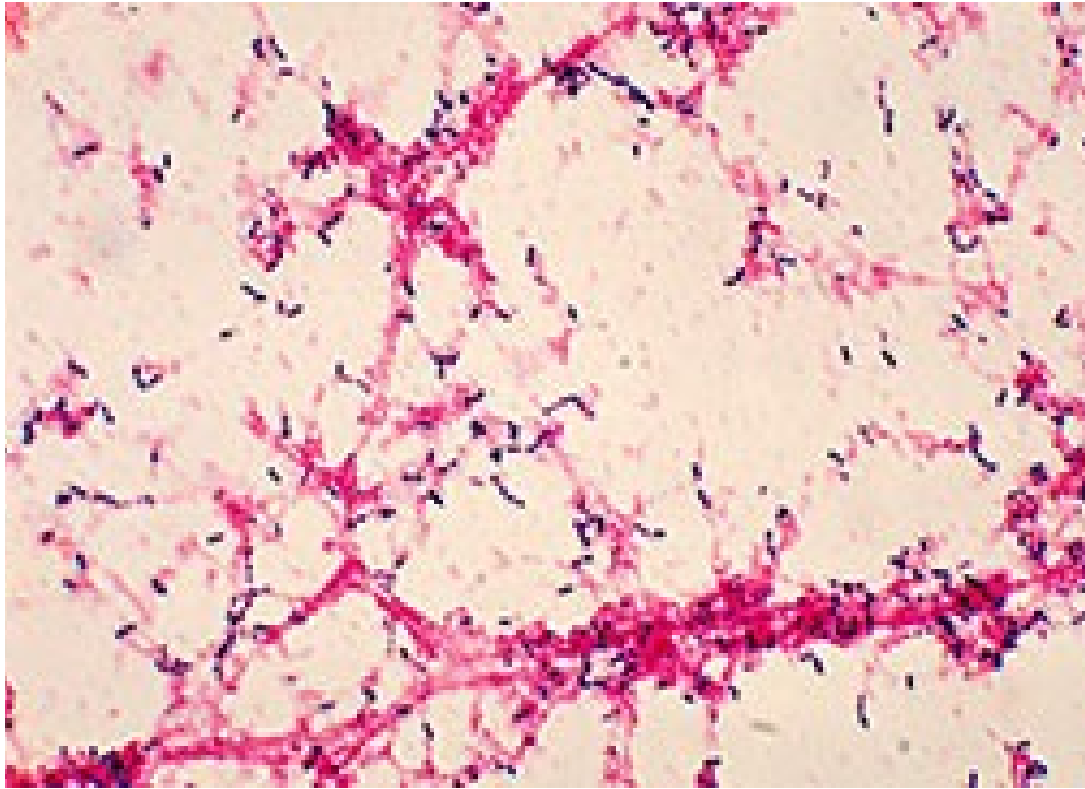
Background

- Pediatric community acquired pneumonia (CAP) is responsible for 124,000 hospitalizations/year
 - Up to 40% of hospitalized children develop complicated pneumonia
- Lack of guidelines for antibiotic management



- <https://radiopaedia.org/articles/empyema-vs-pleural-effusion-2>

Background



- Microbiology of CAP
 - Most common - *Streptococcus pneumoniae*
 - *Streptococcus pyogenes*
 - *Staphylococcus aureus*

<https://www.cdc.gov/pneumococcal/clinicians/streptococcus-pneumoniae.html>

Objectives

- Describe antibiotic use for complicated pneumonia
- Compare outcomes of empiric antibiotic regimens with and without MRSA coverage

Methods

- Retrospective cohort study using the Pediatric Health Information System (PHIS) database
- Inclusion criteria:
 - Hospitalization between 1/1/16-12/31/19
 - Age 2 mo – 18 years
 - Diagnosis of complicated pneumonia
 - pneumonia and of pleural effusion/empyema
 - Receipt of antibiotics within first 24 hours of hospitalization
 - Pleural drainage procedure
- Exclusion criteria:
 - Receiving antiviral and antifungal medications
 - Underlying pulmonary, hematologic, or immunologic conditions

Methods

- Exposure
 - Empiric antibiotic selection on day 0-1 of antibiotics
 - Grouped based on with or without MRSA coverage
 - MRSA coverage: clindamycin, linezolid, vancomycin, doxycycline, ceftaroline, sulfamethoxazole-trimethoprim, minocycline
- Outcomes
 - Primary outcome was length of stay (LOS)
 - Secondary outcomes: cost, 7 day ED revisit, 7 day readmission, repeat pleural drainage procedure
- Covariates
 - Patient demographics and clinical characteristics

Methods

- Summarized demographics, clinical characteristics, and unadjusted outcomes with descriptive statistics
 - Compared using χ^2 and Wilcoxon rank-sum tests
- Adjustments made for payor, ICU status, and mechanical ventilation
 - Used generalized linear mixed effects models

Results

- 1789 children met inclusion criteria
- 71.5% received empiric antibiotic regimen with MRSA coverage
- 28.5 % did not receive MRSA coverage

Antibiotic Class	N (%)
β -lactam or β -lactam/ β -lactamase inhibitor alone or in combination with another non-MRSA antibiotic	495 (97.1%)
Fluoroquinolone alone	12 (2.4%)
Macrolide alone	3 (0.6%)

Results

- Age
 - 9.2% 60 days to 1 year
 - 50.5% ages 1-5 years
 - 16.8% ages 6-9 years
 - 13.9% ages 10-14 years
 - 9.6% ages 15-17 years
- Payor
 - 47% governmental insurance
 - 48.9% private insurance
- Complex Chronic Conditions
 - 66% had 0
 - 22.8% had 1

Results

	Unadjusted Overall	No MRSA	MRSA	Adjusted OR/RR (95% CI)
Length of stay (days)	10.6 (1.8)	10.4 (1.9)	10.6 (1.8)	0.92* (0.87-0.97)
Cost (\$)	33,745.8 (2.2)	31,044.7 (2.4)	34,887.3* (2.2)	0.93* (0.88-0.99)
ED revisit within 7 days	55 (3.1)	15 (2.9)	40 (3.1)	1.02 (0.55-1.88)
Readmission within 7 days	47 (2.6)	15 (2.9)	32 (2.5)	0.77 (0.41-1.47)
Repeat pleural drainage procedure	474 (26.5)	136 (26.7)	338 (26.4)	0.92 (0.72-1.19)
Adverse drug reaction	240 (13.4)	61 (12.0)	179 (14.0)	1.11 (0.81-1.53)

Results

- Greater proportion of children receiving MRSA coverage compared to those not had a billing code for mechanical ventilation
 - 27.8% vs 19.8% ($p < 0.001$)
- Greater proportion of children receiving MRSA coverage compared to those not were admitted to the ICU
 - 51.2% vs 36.6% ($p < 0.001$)
- Children receiving MRSA coverage compared to those not had higher Hospitalization Resource Intensity Scores for Kids (H-RISK)
 - 5.4 vs. 5.1, ($p < 0.001$)

Limitations

- No access to culture data or previous history of MRSA infection
- Unable to assess duration of antibiotics following discharge
- Requiring pleural fluid drainage procedure may have missed patients with small to moderate effusion not requiring drainage

Conclusion

- Nearly $\frac{3}{4}$ of children received empiric MRSA coverage for complicated pneumonia
- Clinical outcomes were not substantially different regarding LOS or treatment failure
- Empiric MRSA coverage may not be associated with improved clinical benefit compared to narrow spectrum coverage

Future Directions

- Future research is needed to assist in developing recommendations for antibiotic guidelines for complicated pneumonia in children

Thank You!

- Jessica Markham MD, MSc
- Matt Hall PhD
- Alaina Burns PharmD, BCPPS
- Jennifer L. Goldman, MD, MSc

- Contact information: shackman@cmh.edu

Citations

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Questions?

