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

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IRB Number: MOD00009139 – Not human subjects

Describe role of Submitting/Presenting Trainee in this project (limit 150 words):
I participated in a retrospective review of PHIS data examining hospitalizations for children with complicated pneumonia. I performed a literature search while drafting our brief report. I also assisted with data review and interpretation. I participated in drafting the initial manuscript and editing the final version for submission to the Journal of Hospital Medicine.

Background, Objectives/Goal, Methods/Design, Results, Conclusions limited to 500 words

Background: Pediatric community acquired pneumonia is responsible for an estimated 124,000 hospitalizations annually in the United States, with up to 40% of hospitalized children subsequently developing a complicated pneumonia (i.e., effusion/empyema). Children with complicated pneumonia commonly require increased numbers of procedures, have exposure to broad-spectrum antibiotics, and have prolonged hospitalizations. While the prevalence of pneumonia has overall declined with childhood vaccination, the number of children with complicated pneumonia has remained stable. Current guidelines do not adequately address antibiotic management of pediatric complicated pneumonia specifically when to utilize methicillin-resistant *Staphylococcus aureus* (MRSA) coverage, likely contributing to wide variation in empiric antibiotic regimens across different hospitals.

Objectives/Goal: We sought to describe use and clinical outcomes of children hospitalized with complicated pneumonia who received empiric antibiotic regimens with and without methicillin-resistant *Staphylococcus aureus* (MRSA) coverage.

Methods/Design: We performed a retrospective cohort study of children between 2 months and 18 years hospitalized with complicated pneumonia from 1/1/2016 to 12/31/2019 using the Pediatric Health Information System (PHIS) database. We excluded children receiving antivirals and antifungals and those with underlying pulmonary, hematologic, or immunologic conditions (e.g., cystic fibrosis,

malignancy, respiratory malformation, immunodeficiency). We evaluated empiric antibiotic selection on Day 0–1, grouping based on use of an antibiotic with or without MRSA coverage. Antibiotics with MRSA coverage included the following: clindamycin, linezolid, vancomycin, doxycycline, ceftaroline, sulfamethoxazole-trimethoprim, and minocycline. Our primary clinical outcome was length of stay (LOS). Other clinical outcomes included costs, 7-day emergency department (ED) revisit, 7-day readmission, and repeat pleural drainage procedure. We used generalized linear mixed effects models adjusted for payor, ICU and mechanical ventilation to examine the association of MRSA coverage and clinical outcomes. Adjusted outcomes were presented as odds ratios for those receiving versus not receiving MRSA coverage.

Results: Across 46 children's hospitals, 1789 children were hospitalized with complicated pneumonia, of which 71.5% (*N* = 1279) received an empiric antibiotic regimen with MRSA coverage. Wide variation in empiric MRSA prescribing was observed across institutions. The geometric mean LOS for children with MRSA coverage was similar to those without (10.4 days [SD 1.9] versus 10.6 days [SD 1.8]). A greater proportion of children receiving MRSA coverage required mechanical ventilation (27.8% vs 19.8%, p<0.001) and ICU admission (51.2% vs 36.3%, p<0.001) compared to those not receiving MRSA coverage. In adjusted analyses, children with MRSA coverage had slightly shorter LOS (adjusted odds ratio [95% CI]: 0.92 [0.87-0.97]) and costs (adjusted odds ratio [95% CI]: 0.93 [0.88-0.99]) compared to those not receiving MRSA coverage. In adjusted analyses, the need for repeat pleural drainage procedures, 7-day ED revisits and 7-day readmissions were similar between groups.

Conclusions: Nearly three quarters of children received empiric MRSA coverage for complicated pneumonia though clinical outcomes were not substantially different between groups regarding hospital length of stay, costs, or treatment failure. Empiric MRSA coverage may not be associated with improved clinical benefit compared to more narrow spectrum coverage. Future prospective studies examining the need for MRSA coverage may assist in developing national antibiotic treatment guidelines for complicated pneumonia in children.