

EXCESS ANTIBIOTIC DURATION IN PATIENTS HOSPITALIZED FOR PNEUMONIA: A MULTI-HOSPITAL COHORT STUDY

Vaughn VM¹, Flanders S¹, Chopra V¹, Conlon A¹, Malani A², Thyagarajan R³, Hsaiky L³ and Gandhi T¹

¹University of Michigan Medical School, Ann Arbor, MI, ²St. Joseph Mercy Health System, Ann Arbor, MI and ³Beaumont Hospital, Dearborn, MI

BACKGROUND

- Pneumonia is often treated for longer than necessary
- Factors associated with excess treatment are unknown

AIM

- Quantify excess antibiotic duration in patients with pneumonia
- Determine factors associated with excess antibiotic therapy
- Evaluate the association of excess duration and patient outcomes

METHODS

- **Design:** Retrospective cohort study, 11/2015—1/2018, at 48 hospitals in the Michigan Hospital Medicine Safety Consortium
- **Participants:** General care, hospitalized medical patients with community-acquired (CAP) or healthcare-associated pneumonia (HCAP) diagnosed by ICD code, symptoms, positive radiographs, ≥3 days antibiotics; patients were ineligible if pregnant, previously included, or had severe immune-compromise or a concomitant infection
- **Excluded:** Unusual pathogens (e.g., fungal), conditions requiring longer antibiotic treatment (e.g., bacteremia, empyema)
- **Data collection:** Trained abstractors collected detailed patient data from chart review and 30-day post-discharge phone call
- **Appropriate duration:** determined based on comorbidities, disease, organism, clinical stability, and rate of improvement. Generally,
 - CAP: 5 days if <2 signs of instability (or discharged) by day 5
 - HCAP or CAP with risk factors: 7 days
 - Longer duration if slow to improve
- **Excess duration:** actual duration >1 day longer than appropriate
- **Predictors:** Disease, patient, provider factors (from medical record)
- **Secondary outcomes at 30-days:** Mortality, readmission, ED visit, antibiotic-related adverse event, *Clostridium difficile* infection
- **Statistical analysis:** Predictors of excess duration evaluated by stepwise selection using logistic GEE models; outcomes inverse probability of treatment weighted by potential confounders

RESULTS

Figure 1. Flow Diagram for Inclusion

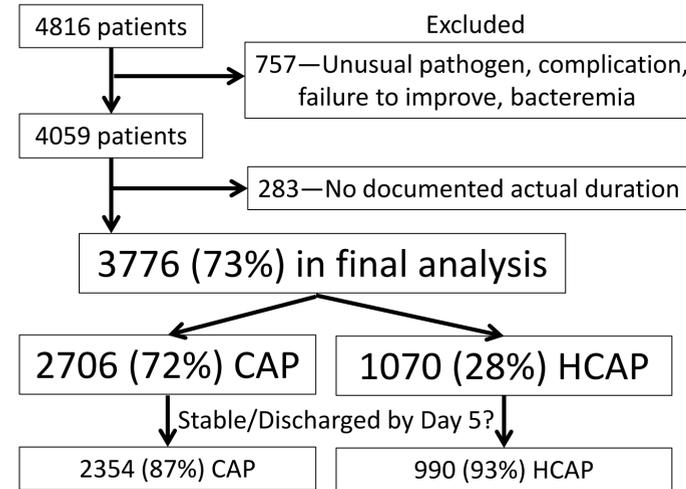
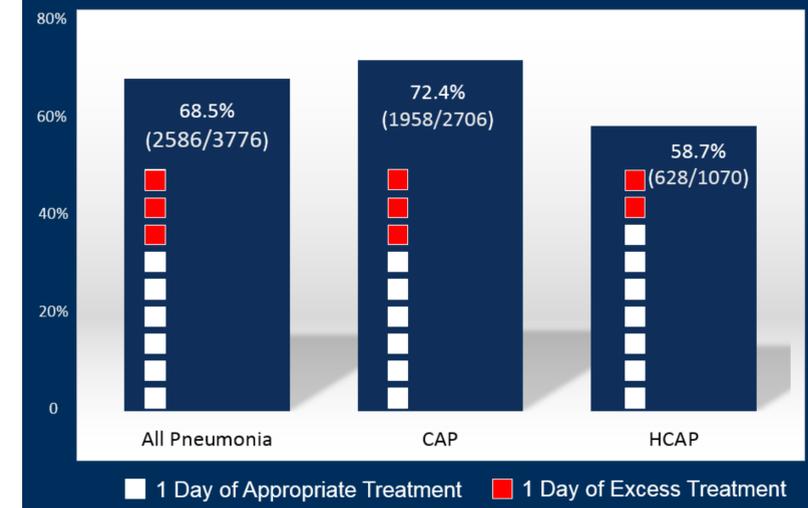


Figure 2. Proportion of Patients Who Received an Excess Antibiotic Duration



Antibiotics prescribed at discharge accounted for 52% of total and 95% of excess antibiotic days

Figure 3. Proportion of Patients who Received an Excess Antibiotic Duration by Hospital

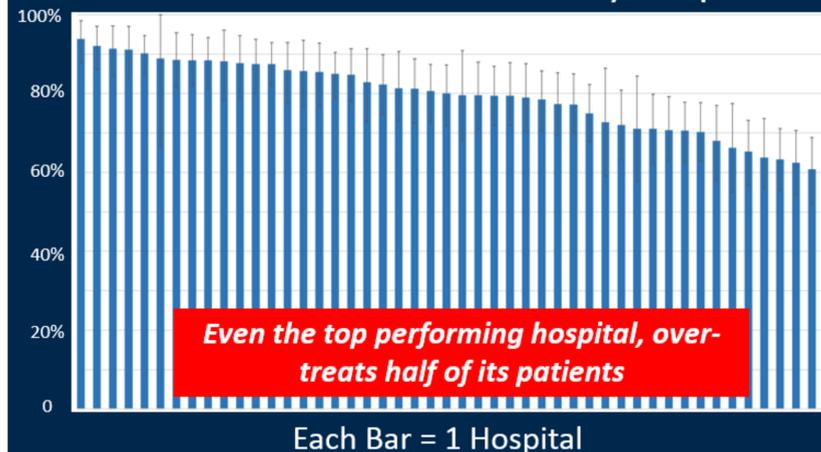


Table 1. Factors Associated with Excess Antibiotic Duration in Patients Hospitalized with Pneumonia (n=3776)

Variable	Odds Ratio (95% CI)	P-value
Bacterial Pathogen Identified (n=299)	1.9 (1.3, 2.8)	<0.001
Number of Signs of Pneumonia ^a (median 2, IQR: 1-3)	1.2 (1.1, 1.3) per additional sign	0.002
Congestive Heart Failure (n=1004)	0.8 (0.6, 0.9)	<0.001
Diagnosis		
Uncomplicated CAP (n=2103)	Reference group	
CAP with risk factors ^b (n=603)	0.4 (0.3, 0.5)	<.001
HCAP (n=1070)	0.4 (0.3, 0.6)	

^a Signs include: a) hypoxemia, b) abnormal temperature (≥38.0 C or <36.1 C), c) auscultator findings, or d) leukocytosis/leukopenia

^b CAP patients for whom we allowed a minimum duration of 7 days due to limited data supporting 5-day antibiotic duration, including: moderate immune compromise, structural lung disease, respiratory culture with *Staphylococcus aureus* or a non-fermenting gram-negative bacilli, moderate/severe chronic obstructive pulmonary disease

Abbreviations: CI, confidence interval; IQR, inter-quartile range; CAP, community-acquired pneumonia; HCAP, healthcare-associated pneumonia

RESULTS

Table 2. Association of Excess Antibiotic Duration with Patient Outcomes (n=3776)

Outcomes at 30-days	Appropriate Duration, n(%) (n=1190)	Excess Duration, n(%) (n=2586)	Adjusted OR (95% CI) ^a	Adjusted P-value
Mortality	12 (1%)	38 (2%)	1.7 (1.0, 3.0)	0.064
Readmission	162 (14%)	305 (12%)	1.0 (0.7, 1.3)	0.778
ED Visit	137 (12%)	279 (11%)	1.0 (0.8, 1.2)	0.897
<i>Clostridium difficile</i> Infection	6 (1%)	14 (1%)	1.1 (0.5, 2.5)	0.790
Antibiotic-Related Adverse Event ^b	52 (4%)	149 (6%)	1.3 (0.9, 1.8)	0.111

^a Odds ratios are inverse probability of treatment weighted by predictors known to be associated with the outcome

^b Physician documented or patient reported adverse drug event related to antibiotic use. Abbreviations: ED, emergency department; OR, odds ratio; CI, confidence interval

- Adverse-event rates were low
- Excess antibiotic duration was not associated with patient outcomes

SUMMARY

- Most hospitalized patients with pneumonia:
 - Are clinically stable by hospital day 5
 - Receive an excess antibiotic duration
- Excess vs. appropriate antibiotic duration was not associated with patient outcomes
- High-yield interventions to reduce excess antibiotic duration should:
 - Focus on community-acquired pneumonia
 - Target discharge prescribing

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For more information contact: valmv@med.umich.edu
@ValerieVaughnMD