Less is More: A Physician-Driven Quality Improvement Stewardship Initiative to Reduce Excessive Duration of Antibiotic Therapy in Veterans Hospitalized with Community-Acquired Pneumonia

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ABSTRACT

BACKGROUND:
The IDSA and American Thoracic Society (IDSA/ATS) Community Acquired Pneumonia (CAP) guidelines recommend 5 days of therapy for clinically stable patients that quickly defervesce, however, duration of therapy (DOT) is often longer. Pharmacists can curb this through (AMS), but budgetary constraints are barriers to robust AMS programs in some hospitals. Physicians are encouraged to participate in quality improvement (QI) and are a potential resource for AMS. We sought to determine the impact of a prospective, physician-driven stewardship intervention on DOT and clinical outcomes in hospitalized veterans with CAP.

METHODS:
Single center, quasi-experimental QI study evaluating two concurrent physician-driven interventions over a 5-month period in an inner-city Veterans Affairs Hospital. Using DMAIC QI methodology, the Chief Resident in Quality and Safety (CRQS) provided monthly education and daily audit and feedback with DOT recommendations. Outcomes were followed until 30 days post discharge.

RESULTS:
A total of 123 patients with CAP were included (57 in the historic control group and 66 in the AMS intervention group). The intervention increased the proportion of CAP patients treated for 5-days (56% versus 5.3%, p<0.0001), and reduced treatment beyond 7 days (12.1% versus 70.2%, p<0.0001). Median DOT was reduced (5 versus 8 days, p<0.0001). Median excess antibiotic days were reduced (0 versus 3, p<0.0001) and 118 days of unnecessary antibiotics were avoided (62 versus 180). 30-day all-cause mortality, readmission, Clostridium difficile infection, and median LOS were similar between groups.

CONCLUSIONS
A physician driven QI stewardship intervention reduced the total antibiotic DOT and excess antibiotic days without adversely affecting patient outcomes. Providers can be educated by a physician and will change prescribing practices.

INTRODUCTION

- The IDSA recommends 5-7 days of treatment for CAP [1,2]
- 5 days is appropriate for stable afebrile patients.[1-4]
- Guideline concordant DOT is low; 5.6%3 - 6.9%[4-6]
- Error in duration often happens at point of discharge[6]

OBJECTIVES

- **AIMS Statement**: Reduce the median DOT for inpatient veterans with CAP by ≥ 1 day within 5 months using a prospective, physician-driven stewardship intervention .
- Primary: Median DOT and excess antibiotic days
- Secondary: All cause mortality, readmission, (at 30 days post discharge), and median length of stay (LOS)

METHODS

- Single center: Academic VA Medical Center
- Pre-post quasi-experimental QI Study

2018	Sept	Oct	Nov	Dec	Jan	Feb	Mar

Historic Control
Oct 2018 – Feb 2019

2019	Sept	Oct	Nov	Dec	Jan	Feb	Mar

Stewardship Group
Oct 2019 – Feb 2020

Figure 1: DMAIC Methodology

D Define | **M** Measure | **A** Analyze | **I** Improve | **C** Control

Problem	How bad?	Where in the process are the errors?	Implement Improvement	Sustain it
We over treat pneumonia	Median DOT 8 days (2018-2019)	At discharge	Education Direct: DAFR	Process Control: Kaizen board
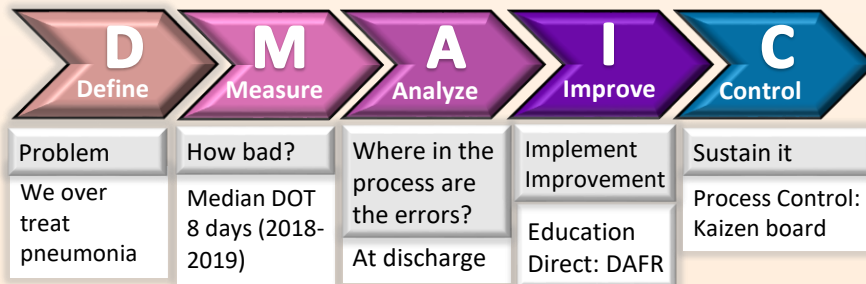
Table 1: Stability Criteria

Afebrile ≥48 hours and ≤ 1 sign of instability	
CAP-Associated Clinical Signs of Instability	
HR ≥ 100 bpm	RR ≥ 24 min
SBP ≤ 90 mmHg	PaO2 ≤ 90 %
Altered mentation	pO2≤ 60 mmHg*

Definitions: DAFR;Direct audit and feedback, CAP; Community Acquired Pneumonia, HR: heart rate, RR: respiratory rate, SBP:Systolic Blood Pressure, *room air

Figure 2: Patients Included and Excluded

2018
CAP admissions 94

Included 57	Excluded 37
	Alternate Dx: 11 ICU: 9 HCAP: 15 Complex* 4 SA/GNB: 3 Unstable: 0 Coinfection: 6

2019
CAP admissions 138

Included 66	Excluded: 72
	Alternate Dx: 23 ICU: 16 HCAP: 28 Complex* 2 SA/GNB: 1 Unstable: 0 Coinfection: 19

*Complex: empyema or effusion requiring chest tube. *Definitions*: CAP=Community acquired pneumonia, Dx=diagnosis, ICU=intensive care unit, HCAP= health care associated pneumonia, SA=staph Aureus; GNB=gram negative bacilli

RESULTS

Table 2: Baseline Characteristics

	Historic Group (n=57)	Stewardship Group (n=66)	P-value
Age (years), median (IQR)	67 (63.8-75)	71 (61.5-75.5)	0.204
Male, n (%)	54 (94.7)	65 (98.4)	0.272
Comorbidities			
Charlson comorbidity index, median (IQR)	6 (4-7)	6 (4-9.3)	0.116
cerebrovascular accident, n(%)	6 (10.5)	8 (12.1)	0.781
congestive heart failure, n(%)	17 (29.8)	21 (31.8)	0.239
myocardial infarction, n(%)	8 (14)	18 (27.3)	0.078
peripheral vascular disease, n(%)	7 (12.3)	15 (22.7)	0.134
connective tissue disease, n(%)	2 (3.5)	5 (7.6)	0.343
chronic pulmonary disease, n(%)	34 (59.6)	32 (48.5)	0.217
liver disease (mod/severe), n(%)	9 (15.8)	16 (24.2)	0.248
kidney disease* (mod/severe), n(%)	5 (8.7)	5 (7.6)	0.809
dementia, n(%)	3 (5.2)	3 (4.5)	0.854
peptic ulcer disease	4 (7)	3 (4.5)	0.558
previous CDI (last 90 days), n(%)	0 (0)	0 (0)	N/A
Immunocompromised			
AIDS, n (%)	0 (0)	0 (0)	N/A
diabetes, n (%)	20 (35)	23 (34.8)	0.978
leukemia or lymphoma, n (%)	0 (0)	1 (1.5)	N/A
solid tumor, n (%)	18 (31.6)	22 (33.3)	0.836
Laboratory Results on Admission			
WBC (10³/µL), median (IQR)	8.9 (7-19.5)	8.7 (6.3-12.9)	0.119
WBC <4 or >11 (10³/µL), n (%)	24 (42.1)	28 (42.4)	0.972
ANC <500 cells/mm³, n (%)	0 (0)	0 (0)	N/A
BUN (mg/dL), median (IQR)	17 (13-28)	17 (14-23.5)	0.638
Lactate >2 (mg/dL), n (%)	7 (12.3)	4 (6.1)	0.237
Medication Exposures, n (%)			
antibiotics (last 30 days)	9 (15.8)	7 (10.6)	0.397
antirejection medications	1 (1.8)	1 (1.5)	0.917
chemotherapy (last 30 days)	1 (1.8)	6 (9.1)	0.116
proton pump inhibitors	21 (36.8)	24 (36.4)	0.956
steroids (chronic systemic)	2 (3.5)	2 (3)	0.882
TNF-α Blockers	0 (0)	4 (6.1)	N/A
Factors Associated with Admission or Other Risk			
CURB-65 score, median (IQR)	1 (0.5-2)	1 (1-2)	0.238
DRIP score, median (IQR)	1 (0-2)	1 (1.5-2)	0.401
suspected/witnessed aspiration, n (%)	4 (7)	10 (15.2)	0.166

*Defined by Charleston Comorbidity Index as on hemodialysis, post-transplant, severe uremia, or Creatinine >3 mg/dL. *Definitions of abbreviations*: DRIP=drug resistance in pneumonia, mod=moderate, WBC=White blood cells; ANC=absolute neutrophil count

Table 3: Impact on Antibiotic Duration

	Historic (n=57)	Stewardship (n=66)	P-value
Total duration (days) Median (IQR)	8 (7-9)	5 (5-7)	0.0001
Excess Antibiotic Days Median (IQR)	3 (2-4)	0 (0-2)	0.0001

Table 4: Excess Antibiotic Days

	Historic (n=57)	Stewardship (n=66)
Excess antibiotic days	180	62

Table 5: Other Outcomes

	Historic (n=57)	Stewardship (n=66)	P-value
30-day mortality, n(%)	2 (3.5)	3 (4.5)	0.772
30-day readmission, n(%)	3 (2-4)	0 (0-2)	0.704
Length of Stay (days), median (IQR)	2 (2-3.5)	3 (2-4.25)	0.246

Fig 3. Kaizen Improvement Board

Fig 4. Impact on Antibiotic Courses

DOT:	5 days	6 days	7 days	8 days	9 days	≥10 days
P-value:	<0.001	0.60	0.54	0.001	0.019	0.042

Historic Group (n=57): 5.3, 10.5, 14, 7.6, 15.8, 14.1
Stewardship Group (n=66): 57.6, 13.6, 18.2, 40.4, 1.5, 3
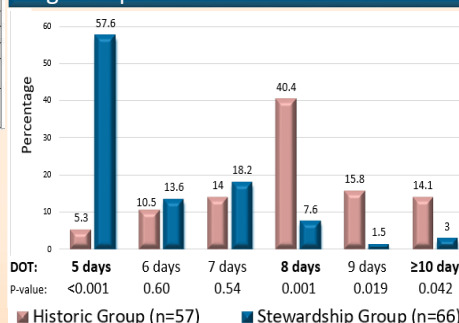
Definitions: DOT=duration of therapy

CONCLUSIONS

- A physician driven QI stewardship intervention reduced antibiotic DOT and excess antibiotic days without adversely affecting patient outcomes.
- Providers can be educated by a physician and will change prescribing practices.

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