Case Studies:
Adult Case—Community Acquired Pneumonia

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SHEA ASP Training Course, 2021

Disclosures

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Speaking fees from Thermo Fisher Scientific

Views do not necessarily represent those of the University of Utah or the Michigan Hospital Medicine Safety Consortium.

Community Acquired Pneumonia

Diagnosis

Treatment

COVID

80 year old woman with dementia presents for altered mental status.

She comes in alone from her nursing home and is unable to provide any history.

Physical exam

Stable vital signs, oriented x 1

Exam difficult due to poor patient cooperation

No obvious cough, dyspnea

Laboratory findings

WBC 10,000 (80% PMNs)

UA negative

Poor positioning and effort.
Cannot rule out underlying infection.

What next?

A) Supportive care + Chest CT to evaluate for pneumonia

B) Supportive care + empiric Vanc/Zosyn

C) Supportive care + empiric ceftriaxone

D) Supportive care + frequent re-evaluation

Michigan Hospital Medicine Safety Consortium

Collaborative quality initiative

>50 hospitals, diverse settings and payors

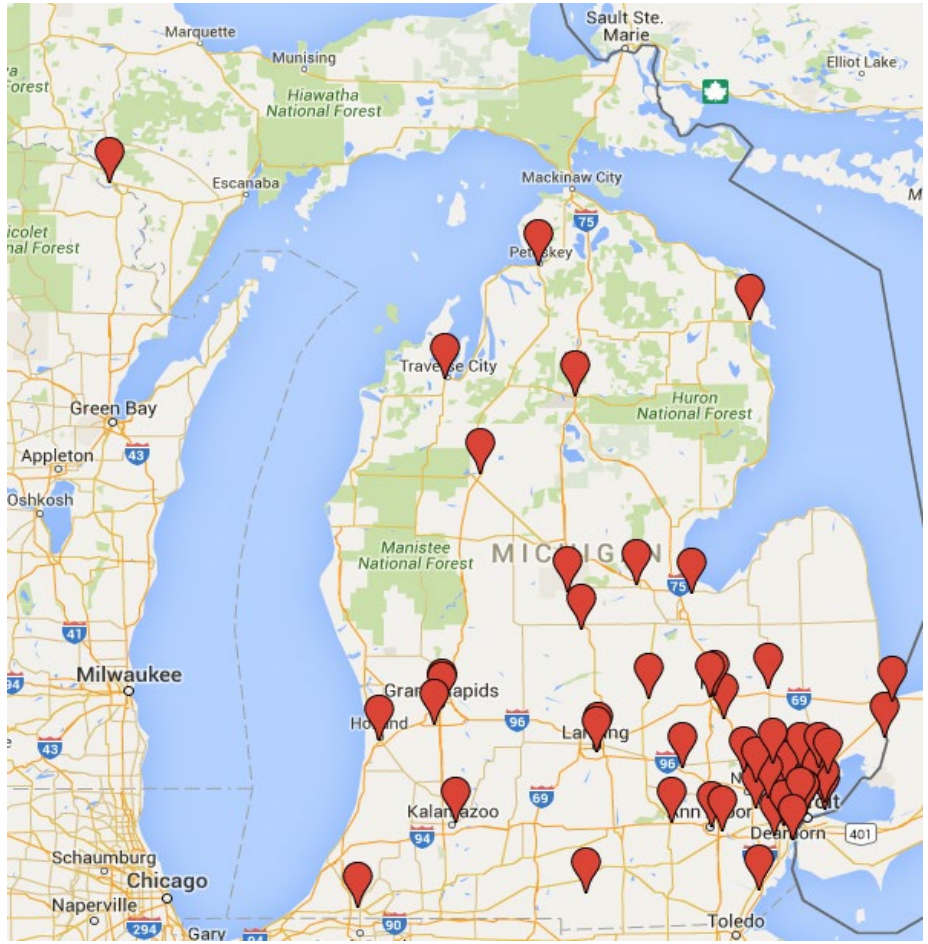
Multidisciplinary collaboration

Quality improvement

- Data and benchmarking
- Sharing best practices
- Facilitated implementation

Hospitalized medical patients with community-acquired pneumonia (CAP)

- ICD-10 discharge codes, antibiotics day 1/2



Signs, Symptoms, and Radiographic Findings Consistent with Pneumonia

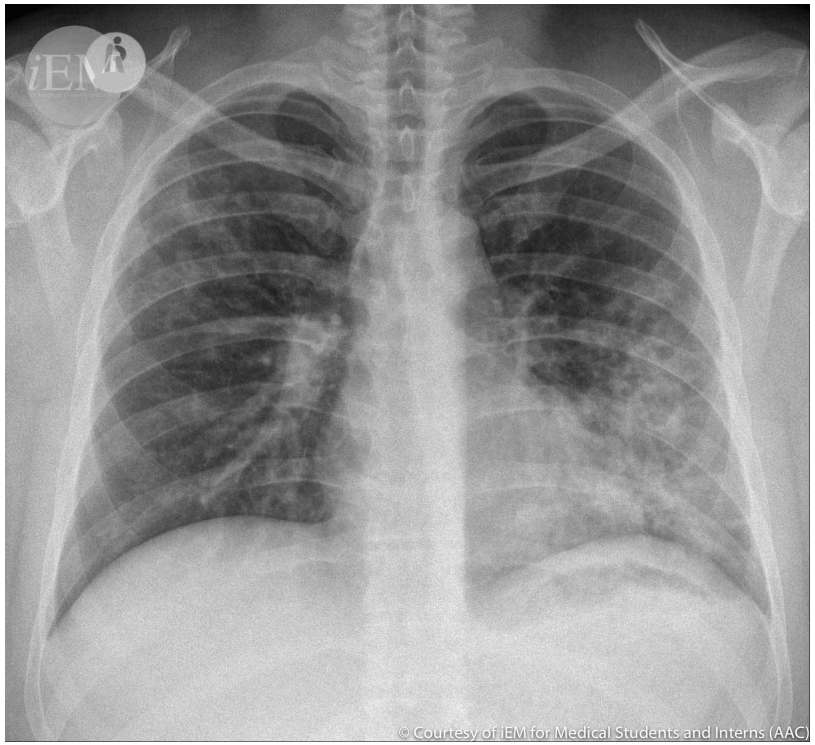
2 or more Signs or Symptoms

New or worsening
- Cough
- Sputum production/purulence
- Dyspnea
- Hypoxemia

Auscultatory findings (e.g., egophony, rales)

Abnormal
- Temperature
- Leukocyte count

Radiographic findings



Signs, Symptoms, and Radiographic Findings Consistent with Pneumonia

2 or more Signs or Symptoms	Radiographic findings

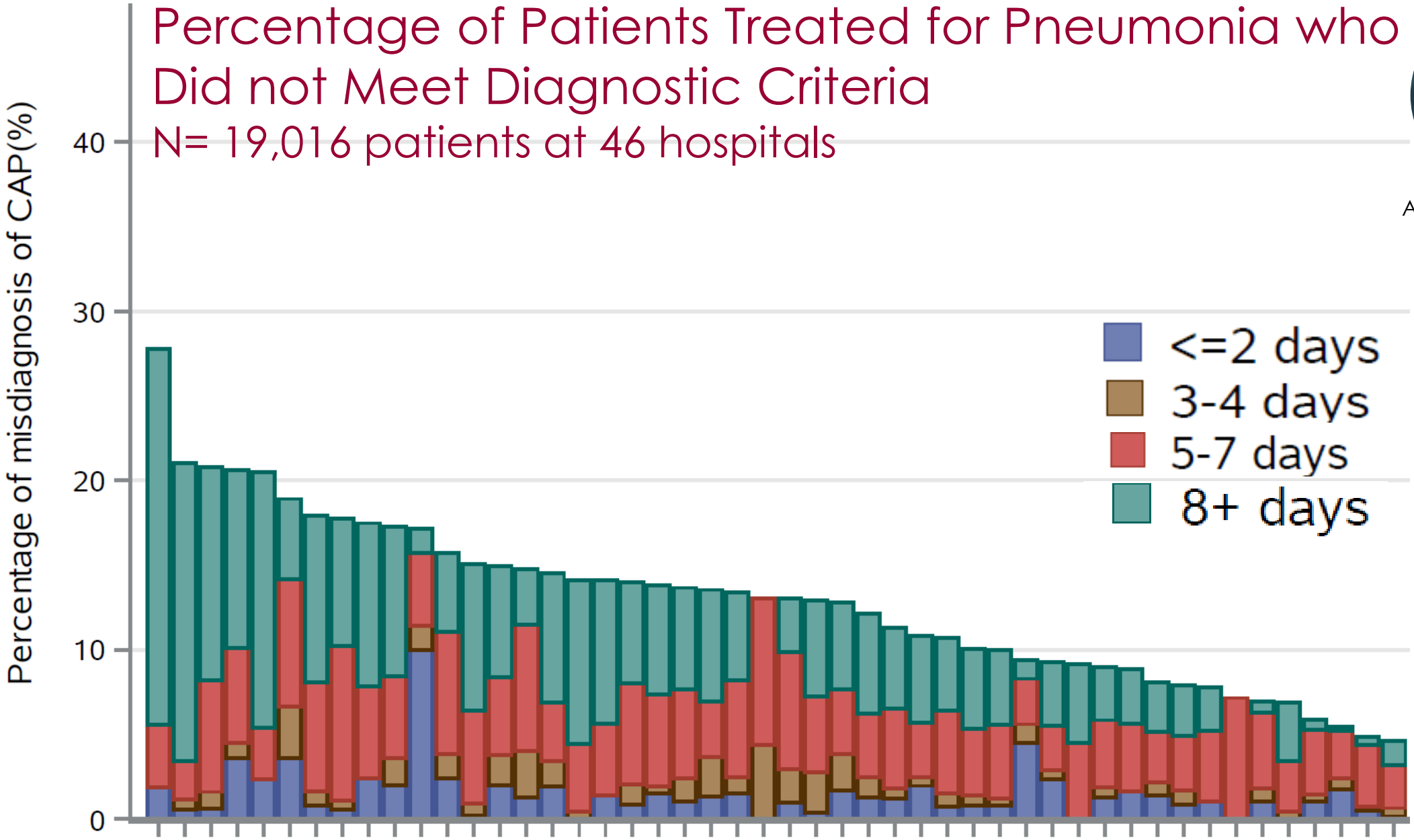
12.4% were misdiagnosed

(n=2,366/19,016)

Percentage of Patients Treated for Pneumonia who Did not Meet Diagnostic Criteria

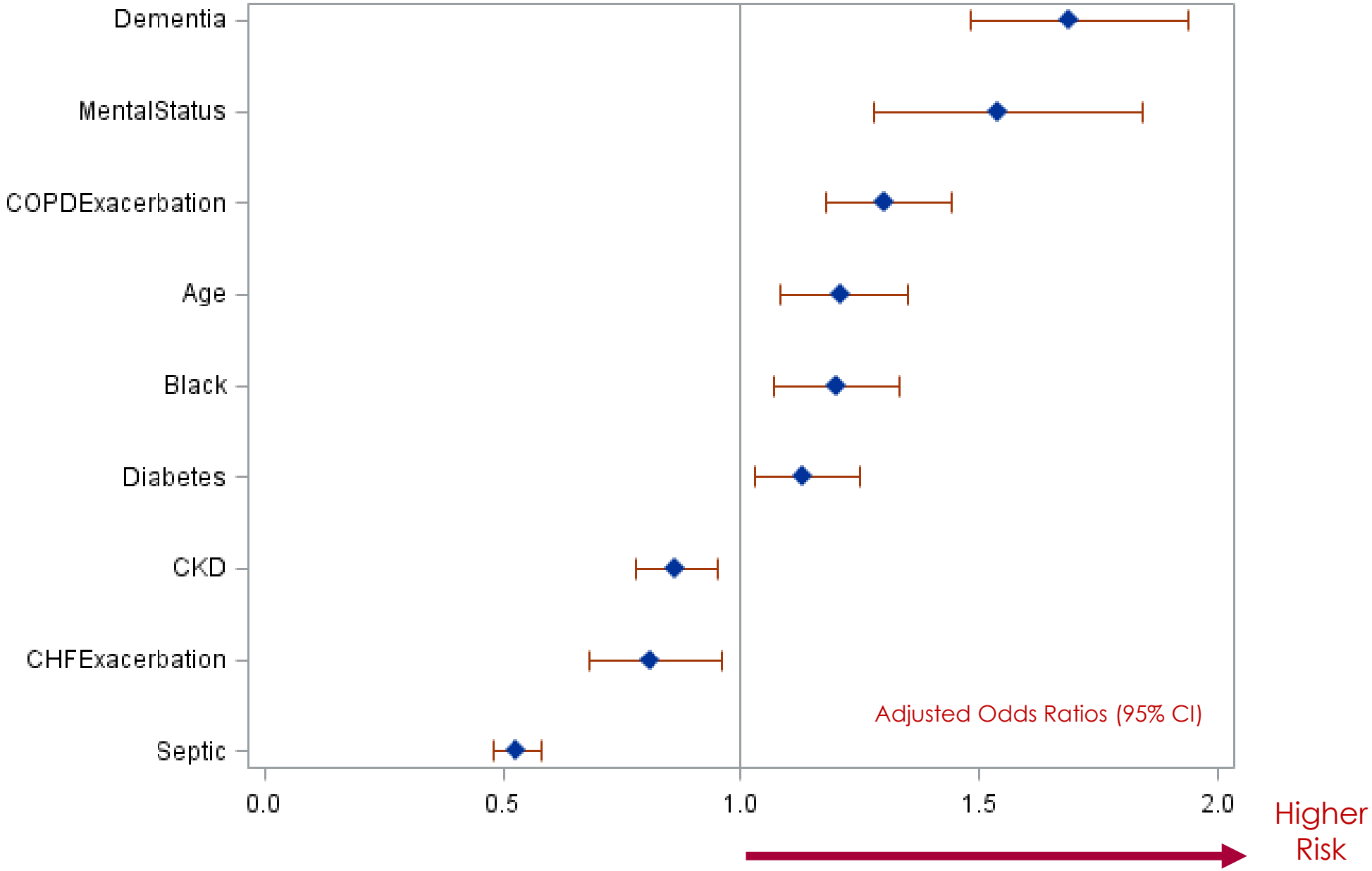
N= 19,016 patients at 46 hospitals

Ashwin Gupta, MD



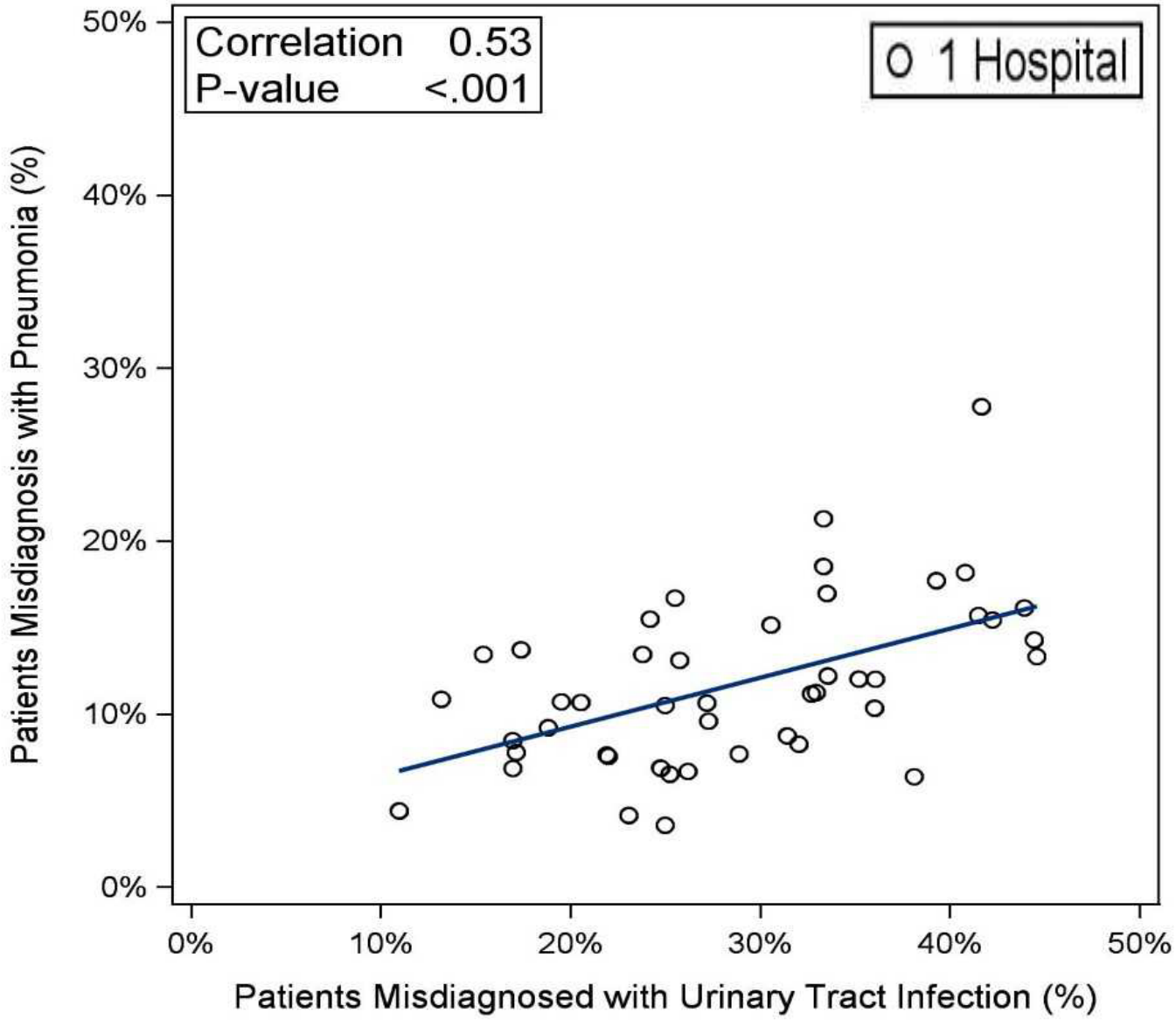
*Funded by Moore Foundation

Predictors of Misdiagnosis of Pneumonia

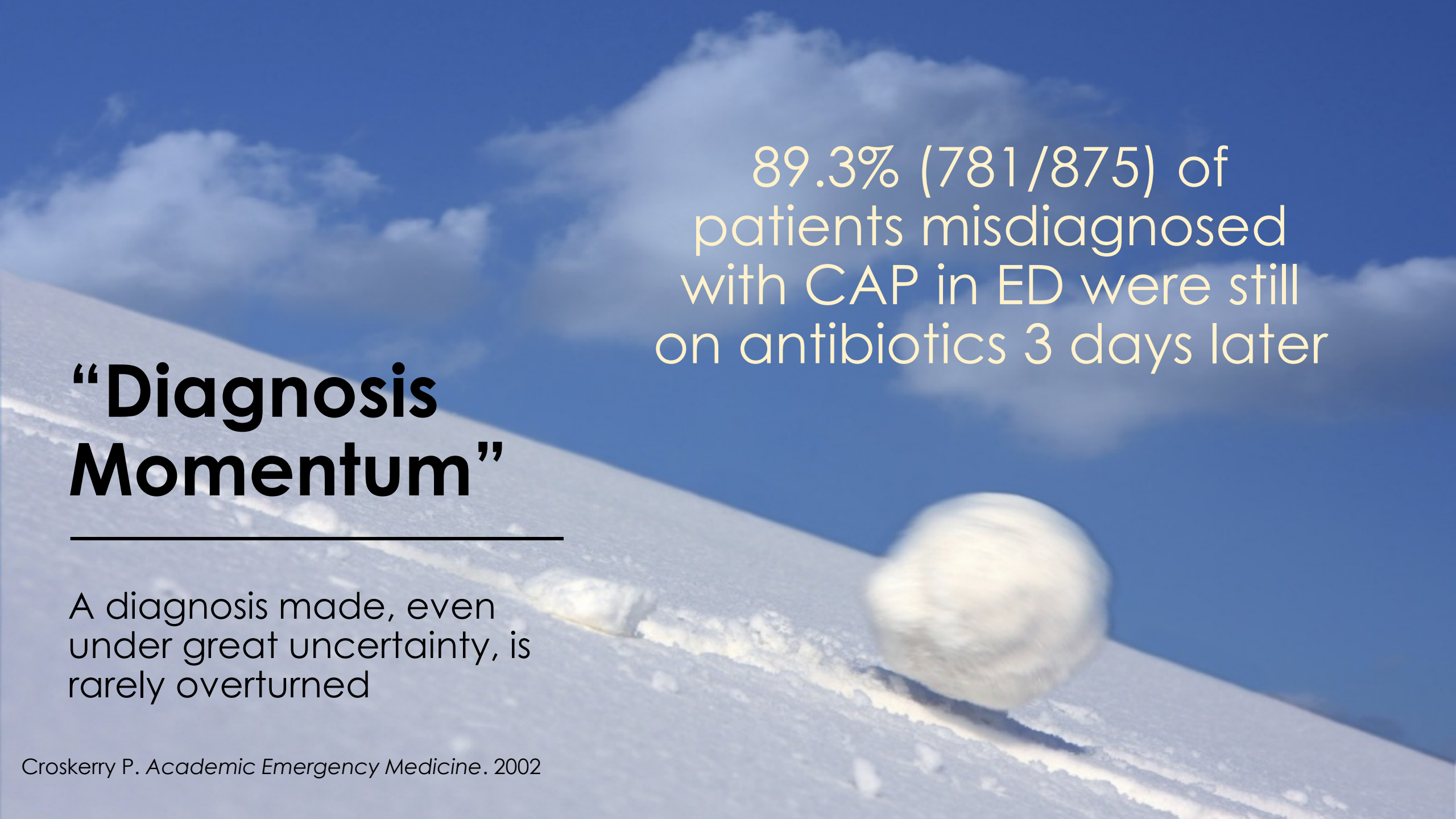


Misdiagnosis of Pneumonia Linked to ASB

Ashwin Gupta, MD



Gupta A et al. *Under Review.*



89.3% (781/875) of patients misdiagnosed with CAP in ED were still on antibiotics 3 days later

"Diagnosis Momentum"

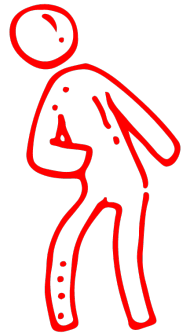
A diagnosis made, even under great uncertainty, is rarely overturned

Croskerry P. *Academic Emergency Medicine*. 2002

Outcomes of Misdiagnosis, N=2366

Physician documented adverse event

1.03 (1.01, 1.05)



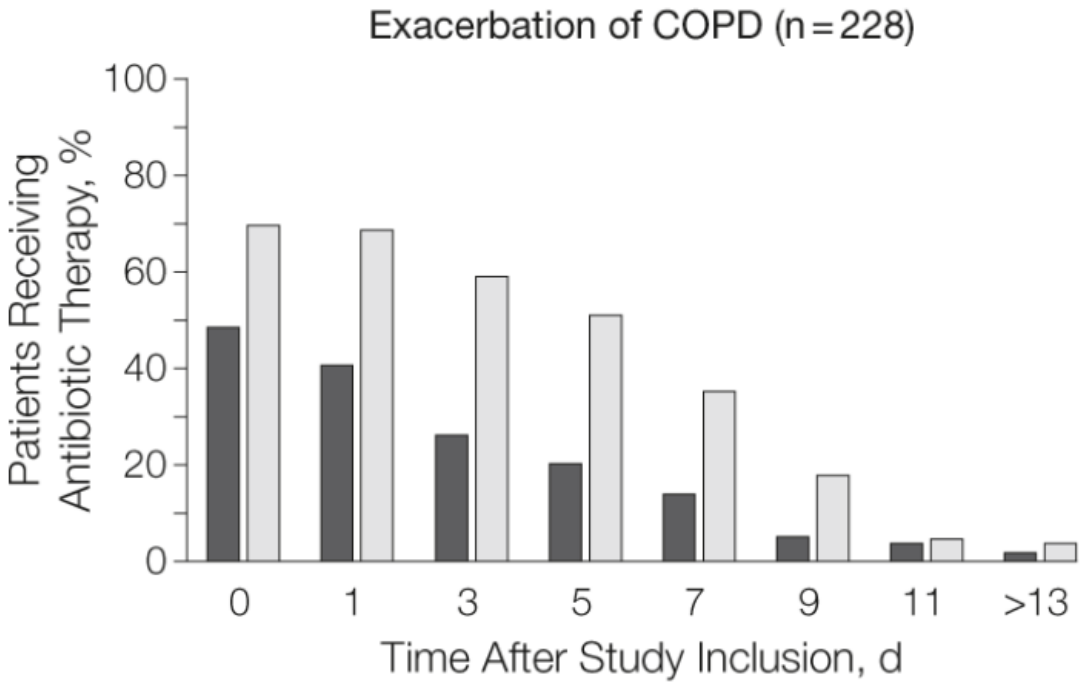
Patient reported adverse event

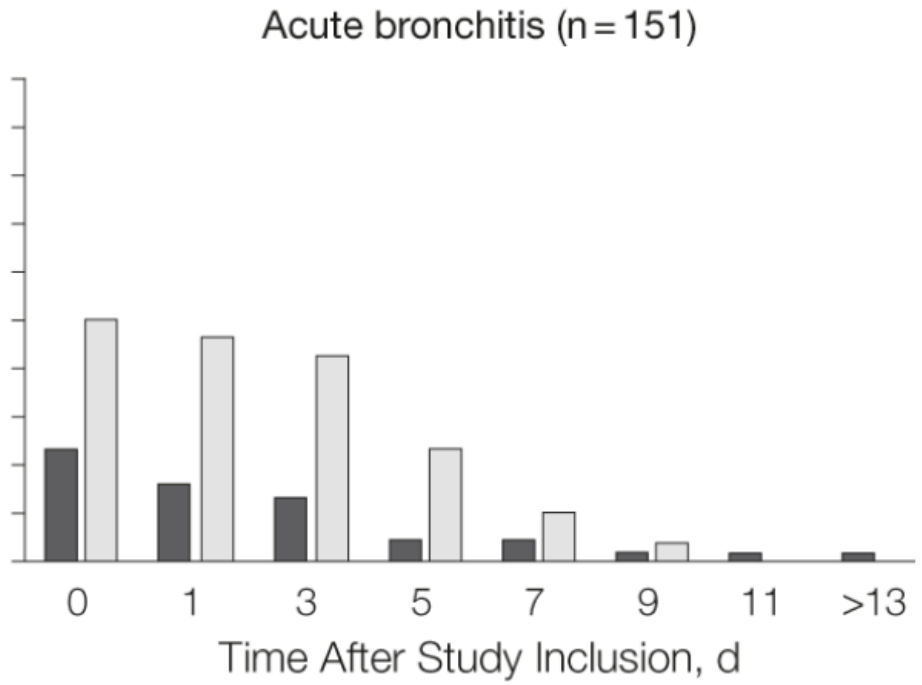
1.04 (1.03, 1.06)

What about procalcitonin?

ProHOSP

Fewer patients in procalcitonin group initiated on antibiotics





No. of patients								
PCT	56	47	30	23	16	6	4	2
Control	79	78	67	58	40	20	5	4

	16	11	9	3	3	1	1	1
	41	38	35	19	8	3	0	0

Schuetz P et al. JAMA. 2009.

ProHOSP

Fewer patients in procalcitonin group initiated on antibiotics

- Less antibiotic use
- Fewer antibiotic-associated adverse-events
- Other outcomes (e.g., mortality) similar
- Adherence really high
  - 90.8% had antibiotics initiated/stopped according to PCT algorithm

ProACT

14 US hospitals (1656 patients)

No difference in

- Antibiotic use
- Adverse antibiotic events

Difference?

- Adherence much lower
  - COPD-49.2%
  - CAP- 39.4%

Huang DT et al. NEJM. 2018.

Procalcitonin Low Down

Barriers still exist

- Time to obtaining procalcitonin can be long (send-outs)
- Clinicians send even when their decisions won't change their treatment
- Often used when confirms initial suspicions and ignored when doesn't

2019 CAP guidelines recommend against for

- Distinguishing viral from bacterial CAP

Can still be useful

- If alternative diagnosis available (e.g., viral, CHF) and want to rule out 2 concurrent processes
- If coupled with education or controlled by antibiotic stewardship

CAP Diagnosis- Stewardship Pearls

Misdiagnosis of pneumonia is common

- Antibiotic overuse
- Increased adverse-events
- Failure to identify true diagnosis (e.g., CHF exacerbation)

Linked to ASB

- More common in patients with dementia, altered mental status, and elderly

Tips for Stewardship

- Start with the ER (diagnostic momentum is hard) and Radiology
- If you use procalcitonin, recommend good implementation strategies

Community Acquired Pneumonia

Diagnosis

Treatment- CAP Guidelines

COVID

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

Joshua P. Metlay*, Grant Waterer*, Ann C. Long, Antonio Anzueto, Jan Brozek, Kristina Crothers, Laura A. Cooley, Nathan C. Dean, Michael J. Fine, Scott A. Flanders, Marie R. Griffin, Mark L. Metersky, Daniel M. Musher, Marcos I. Restrepo, and Cynthia G. Whitney; on behalf of the American Thoracic Society and Infectious Diseases Society of America

This official clinical practice guideline was approved by the American Thoracic Society May ~~c~~2019 and the Infections Diseases Society of America August 2019

Treatment Change #1

Less broad-spectrum coverage

Who Needs Broader Empiric Coverage ?
Severe* or Non-Severe Community Onset Pneumonia

Review Respiratory/Blood Cultures from the Prior Year

MRSA in culture
→ Start Vancomycin

Pseudomonas (or other resistant GN) in culture
→ Start Piperacillin/Tazobactam (or other appropriate GN coverage)

*use pneumonia severity score in ATS/IDSA guideline

Non-Severe
Community Onset
Pneumonia*

+

Previous 90 days:
Hospitalized X 48hrs
AND
IV antibiotics**

Obtain cultures + MRSA nasal swab
NO ADDITIONAL COVERAGE UNLESS CULTURES POSITIVE

*use pneumonia severity score in ATS/IDSA guideline

**including oral linezolid and FQ

Severe Community Onset Pneumonia*

+

Previous 90 days:
Hospitalized X 48hrs
AND
IV antibiotics**

Obtain cultures + MRSA nasal swab
COVER FOR MRSA AND P. AERUGINOSA
De-escalate if cultures/MRSA swab negative

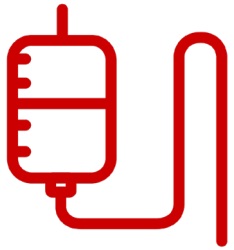
*use pneumonia severity score in ATS/IDSA guideline

**including oral linezolid and FQ

Who Does NOT Need Broader Empiric Coverage? Severe or Non-severe Community Onset Pneumonia

Patients from SNF and no other reviewed criteria

Hospitalization in previous 90 days as a single factor



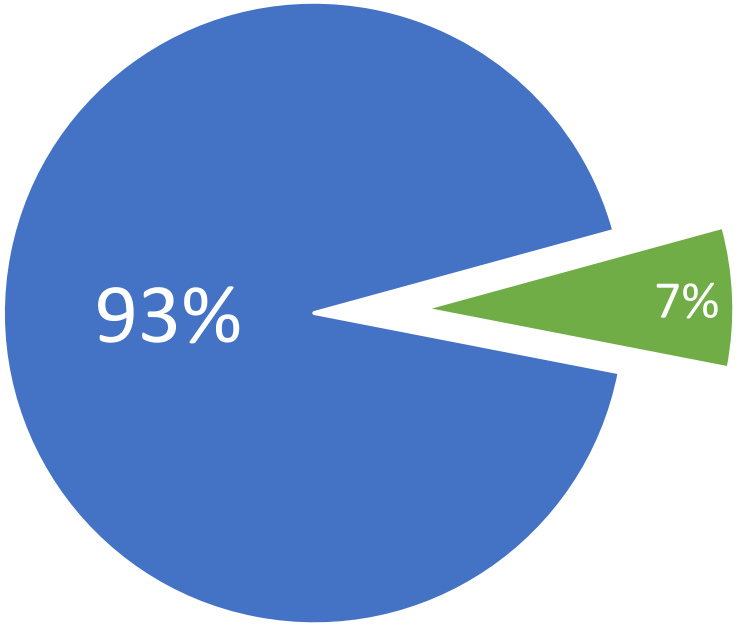
IV Antibiotics in previous 90 days as a single factor
--Still review their prior cultures which may indicate a need for broader coverage

2020 HMS data (non-ICU CAP)

Tejal Gandhi, MD

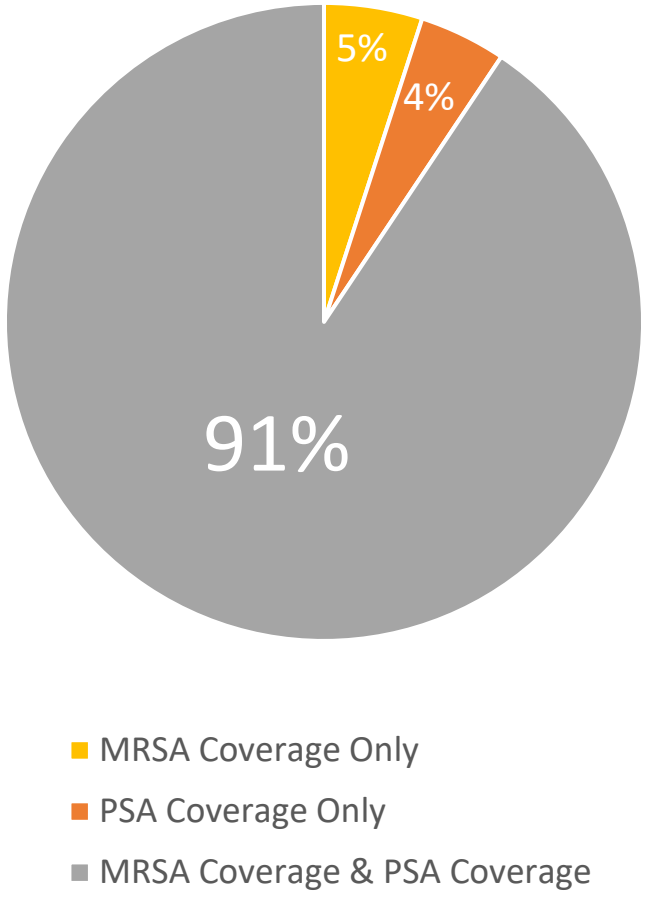
Who is Eligible for MRSA and/or PSA Coverage?

N=4664

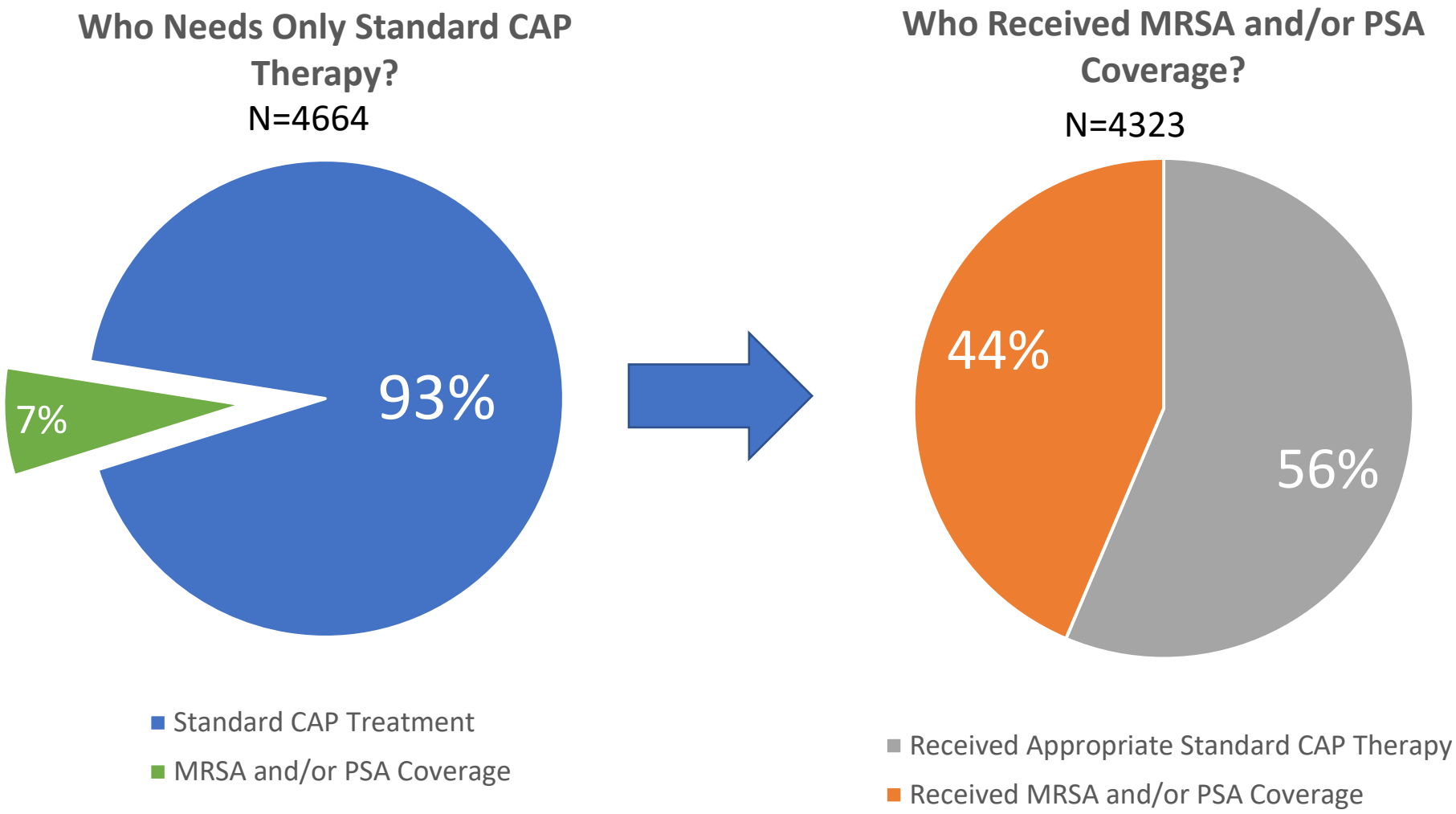


Breakdown of cases eligible for MRSA and/or PSA Coverage

N=341



2020 HMS data (non-ICU CAP)



Treatment Change #2

More 5-day antibiotic therapy

WHAT'S THE "RIGHT" DURATION FOR PNEUMONIA?

Most patients (>80%) with CAP should receive 5 days of treatment

- As long as afebrile x 48 hours and ≤ 1 vital sign abnormality by day 5 of treatment
- Longer for complications (e.g., empyema) or organism (staph/pseudomonas)

Consistent with ATS/IDSA CAP Guidelines

Diagnosis and Treatment of Adults with Community-acquired Pneumonia

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Joshua P. Metlay*, Grant Waterer*, Ann C. Long, Antonio Anzueto, Jan Brozek, Kristina Crothers, Laura A. Cooley, Nathan C. Dean, Michael J. Fine, Scott A. Flanders, Marie R. Griffin, Mark L. Metersky, Daniel M. Musher, Marcos I. Restrepo, and Cynthia G. Whitney; on behalf of the American Thoracic Society and Infectious Diseases Society of America

THIS OFFICIAL CLINICAL PRACTICE GUIDELINE WAS APPROVED BY THE AMERICAN THORACIC SOCIETY MAY ~~c~~2019 AND THE INFECTIONS DISEASES SOCIETY OF AMERICA AUGUST 2019

Because "HCAP" has been removed by new guidelines

These patients now also eligible for 5 days!!!

Annals of Internal Medicine

ORIGINAL RESEARCH

Excess Antibiotic Treatment Duration and Adverse Events in Patients Hospitalized With Pneumonia

A Multihospital Cohort Study

6481 patients, 43 hospitals

Two-thirds of patients received excess antibiotic therapy

Vaughn, V et.al. Annals of Internal Medicine. 2019

Annals of Internal Medicine

ORIGINAL RESEARCH

Excess Antibiotic Treatment Duration and Adverse Events in Patients Hospitalized With Pneumonia

A Multihospital Cohort Study 6481 patients, 43 hospitals

Two-thirds of patients received excess antibiotic therapy

Each excess day of treatment was associated with 5% increase in odds of antibiotic adverse events

Vaughn, V et.al. *Annals of Internal Medicine*. 2019

Annals of Internal Medicine

ORIGINAL RESEARCH

Excess Antibiotic Treatment Duration and Adverse Events in Patients Hospitalized With Pneumonia

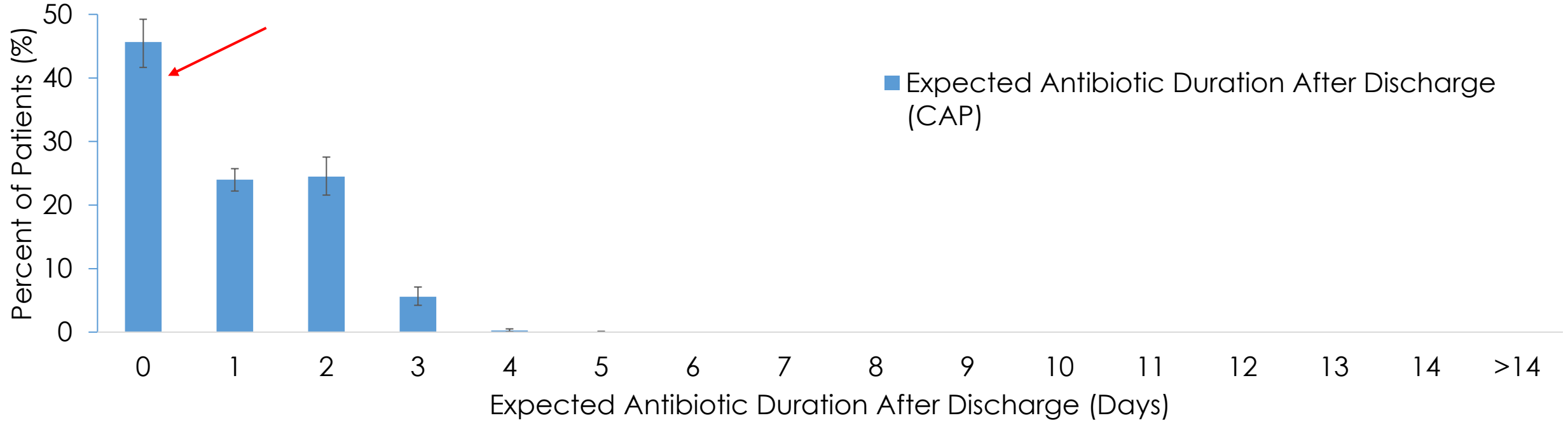
A Multihospital Cohort Study

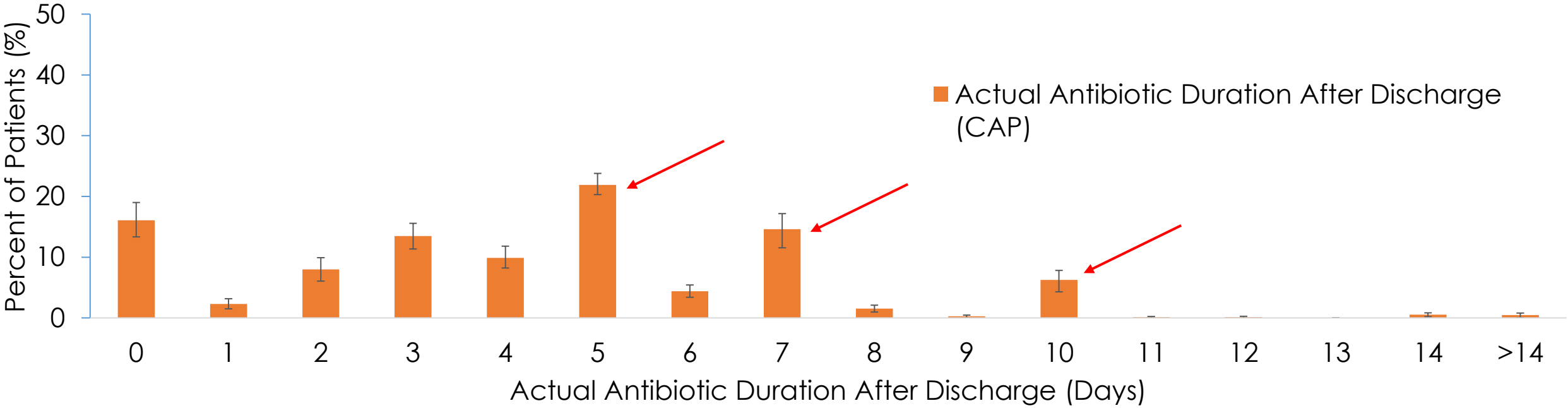
Two-thirds of patients received excess antibiotic therapy

93% of excess antibiotic duration occurs at discharge

Vaughn, V et.al. *Annals of Internal Medicine*. 2019

Often patients don't need any antibiotics at discharge!





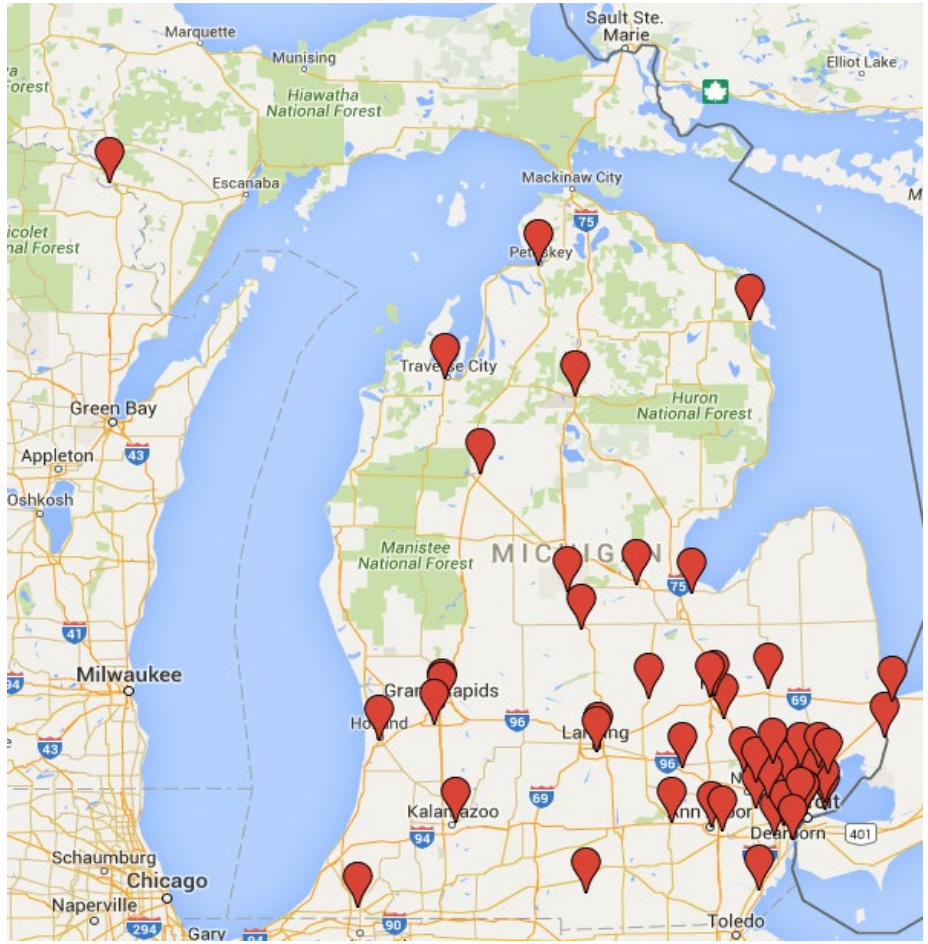
Vaughn VM et al. *Annals of Internal Medicine. 2019*

Targeting 5-day Duration

Data collection and benchmarking

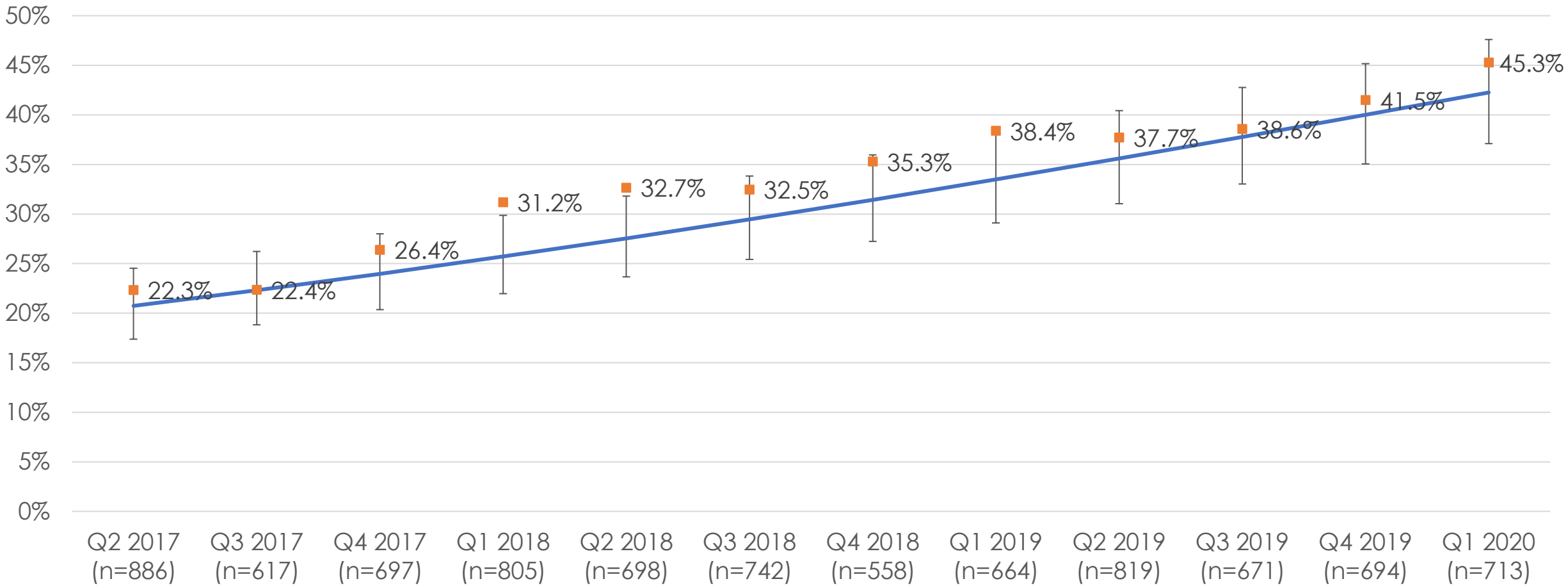
Sharing of best practices

Pay-for-performance



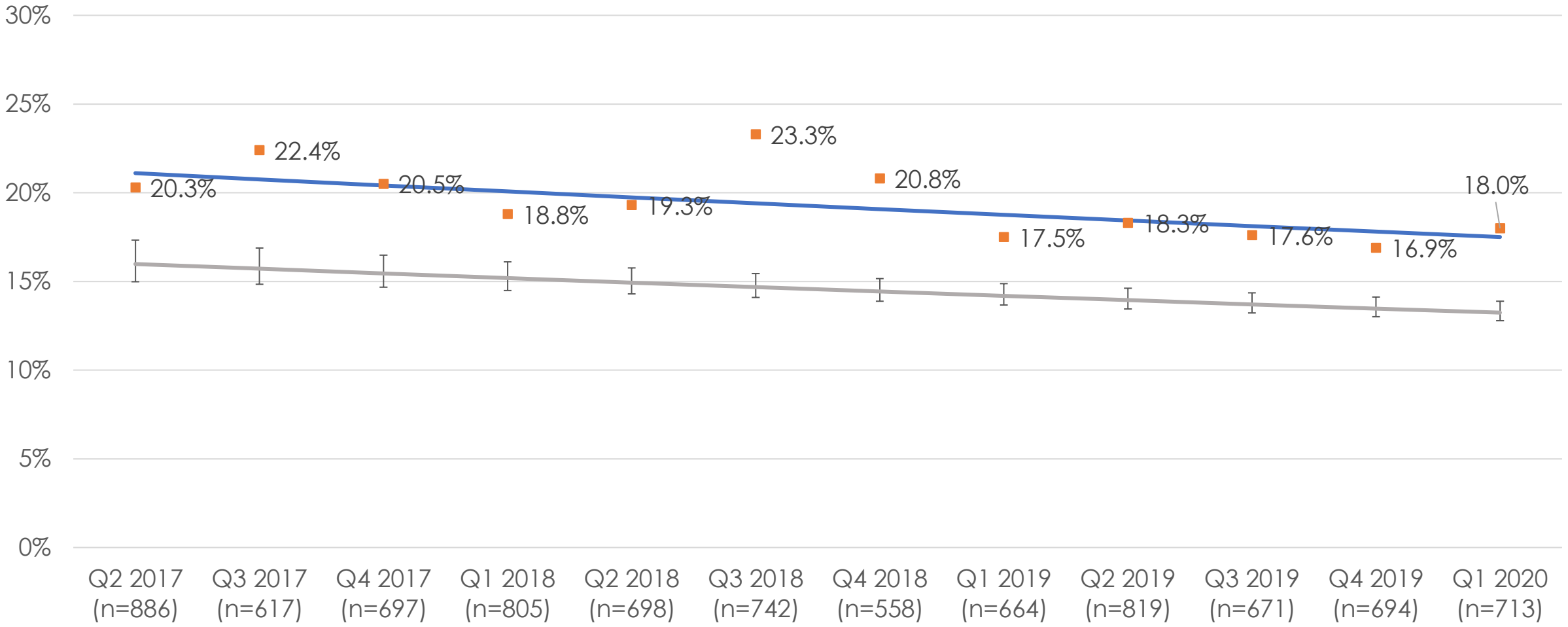
Change Over Time in % of Patients Hospitalized with CAP who Appropriately Received a 5-day Antibiotic Duration

N= 8936 patients at 41 hospitals



Change Over Time in % of Patients Hospitalized with CAP who Had a 30-day Composite Adverse-Event

N= 8936 patients at 41 hospitals



CAP Treatment- Stewardship Pearls

Most patients with CAP do NOT need anti-MRSA or anti-pseudomonal coverage (93% of non-ICU patients)

- Use MRSA/cultures to de-escalate (if started) or escalate (if withheld)
- About half of non-ICU CAP patients get *inappropriately broad* empiric antibiotic coverage

Most patients with CAP need only 5 days of antibiotic therapy

- 2/3 receive excess duration
- Excess duration linked to adverse events
- Many patients don't need any antibiotics at discharge

Community Acquired Pneumonia

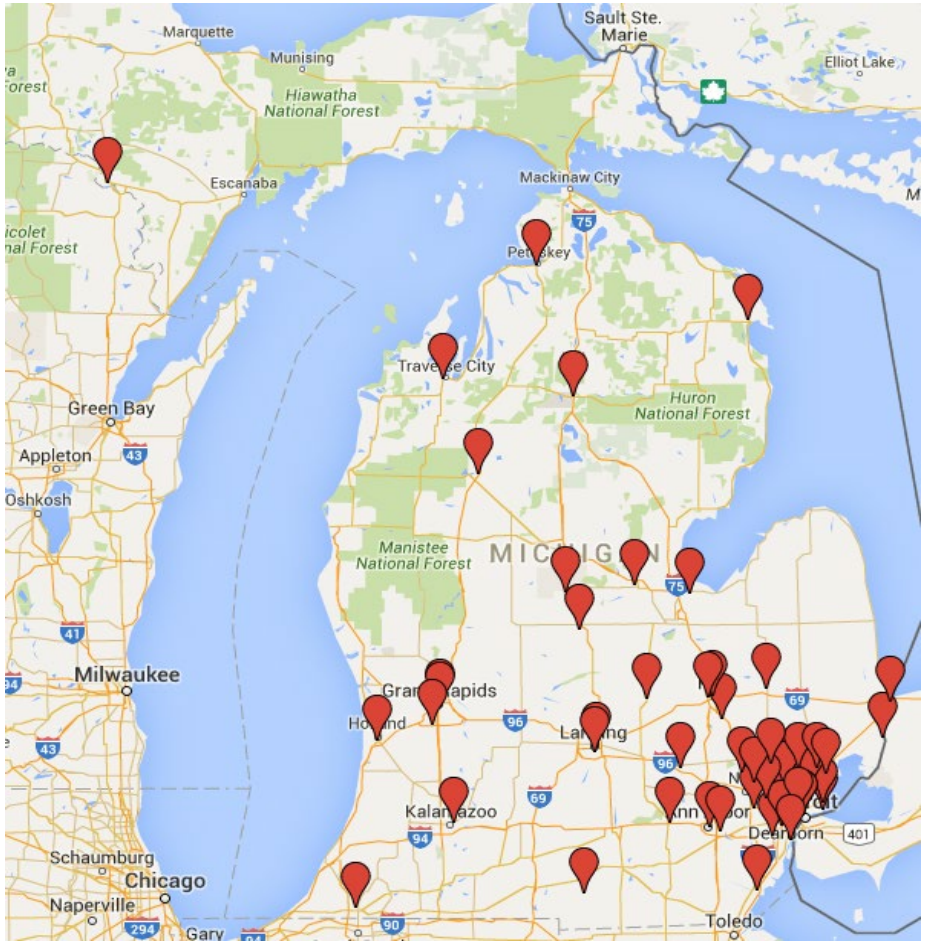
Diagnosis

Treatment

COVID

MiCOVID-19

HMS hospitals rapidly converted to collecting data on hospitalized patients with COVID



Clinical Infectious Diseases

Empiric Antibacterial Therapy and Community-onset Bacterial Co-infection in Patients Hospitalized with COVID-19: A Multi-Hospital Cohort Study

Valerie M Vaughn, MD, MSc ✉, Tejal Gandhi, MD, Lindsay A Petty, MD, Payal K Patel, MD, MPH, Hallie C Prescott, MD, MSc, Anurag N Malani, MD, David Ratz, MS, Elizabeth McLaughlin, MS, RN, Vineet Chopra, MD, MSc, Scott A Flanders, MD

Clinical Infectious Diseases, ciaa1239, https://doi.org/10.1093/cid/ciaa1239

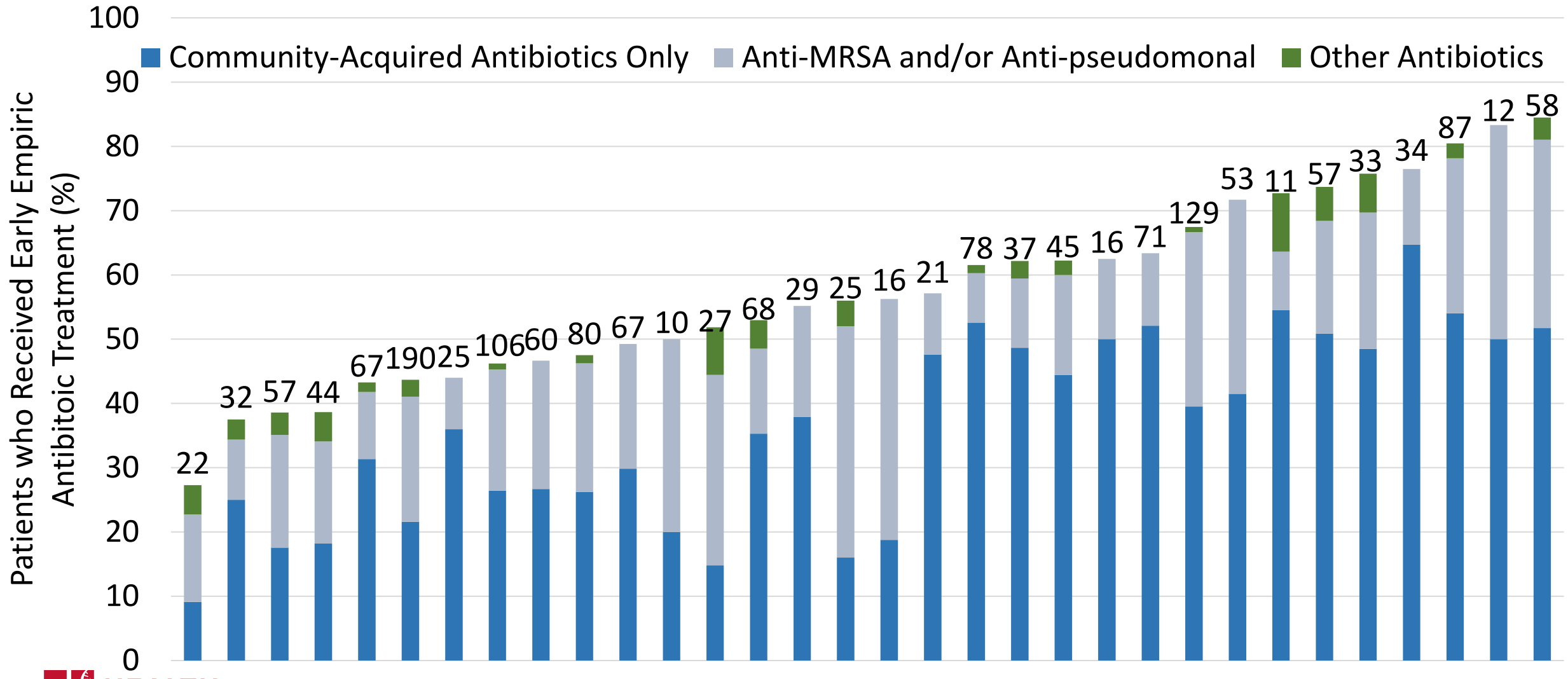
Published: 21 August 2020 **Article history** ▾

Antimicrobial Use & COVID-19

56.6% (965/1705) of hospitalized patients with COVID-19 received **empiric antibiotic therapy** (in first 2 days of hospitalization)

Early Empiric Antibiotic Treatment in Hospitalized Patients with COVID-19, by Hospital

(N=32 hospitals; 1,667 patients)

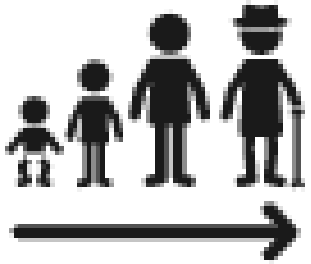


Community-onset bacterial coinfections were rare

1.8% Blood

1.7% Respiratory

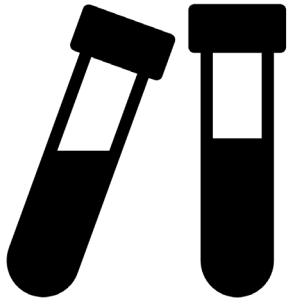
Predictors of Community-Onset Co-infections



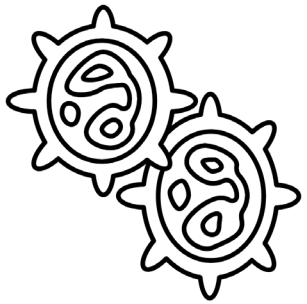
Age

Severe Disease

Nursing Home

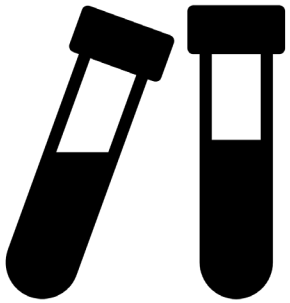


Higher Procalcitonin



Higher White Blood Cell Count

Procalcitonin in COVID-19



PPV >0.5 ng/mL=**9.3%**

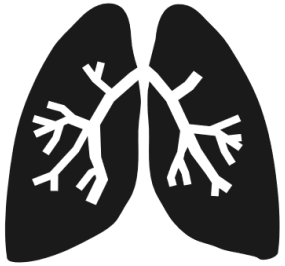
NPV <0.1ng/mL=**98.3%**

Vaughn V.M. et al./Clinical infectious diseases 2020; ciaa1239, https://doi.org/10.1093/cid/ciaa1239

COVID- Stewardship Pearls

Community-onset co-infections are rare in non-critically ill patients

- Early empiric antibiotic use is common and should be reduced
- Procalcitonin helpful for NPV (PPV is worthless)



CAP Stewardship Opportunities

Diagnosis	Empiric Therapy	De-escalation	Discharge
Overdiagnosis of Pneumonia is Common • ED • Radiology • ??Procalcitonin	90% of non-ICU patients need standard therapy • Prior cultures • Severe AND hospitalization with IV antibiotics	MRSA nares	5-day duration 50% of patients with CAP need NO antibiotics

Improvement Tips

Multi-faceted interventions

- Data and benchmarking
- Sharing best practices
- Pay for performance

Questions?

Keep In Touch!

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