

# Optimizing Antibiotic Use for Better Patient Outcomes: The HMS Antimicrobial Stewardship Initiative

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# Disclosure Statement



None of the people participating in this educational activity have relevant financial relationships to disclose with ineligible companies whose primary business is producing, marketing, selling, reselling, or distributing healthcare products used by or on patients.

# Agenda



Introduction to Hospital Medicine Safety (HMS) Consortium



HMS-Antimicrobial Initiative: Key Focus Areas



Significance and Data



Quality Improvement Tools



Q&A

# Meet the Team



## Dr. Lindsay Petty

*HMS QI Consultant*

*Antimicrobial Resource Expert*

HMS Team Member since 2017



### Michigan Medicine roles:

Associate Professor of Internal  
Medicine in the Division of Infectious  
Diseases

Adult Lead Ambulatory Antimicrobial  
Stewardship

Associate Director Antimicrobial  
Stewardship



## Tara Pearlman, BSN

*Quality Assurance Coordinator*

*Antimicrobial Initiative Co-Lead*

HMS Team Member Since 2022

Goal: To improve the quality of care for hospitalized medical patients who are at risk for adverse events

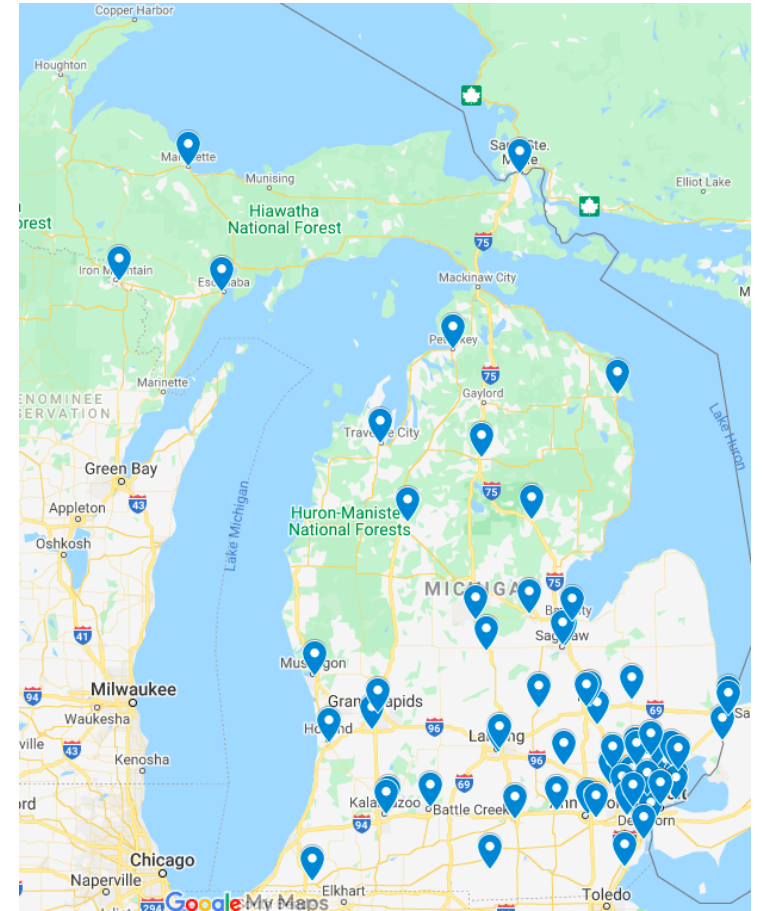
- Mission: [HMS](#) is a data-driven collaborative designed to provide the infrastructure needed to facilitate information sharing to support Michigan hospitals in improving patient safety and the quality of care for hospitalized medical patients



# HMS Hospitals



- 69 hospitals
  - Diverse types / settings
  - Large AMCs-Small rural hospitals
- Hospital Participants
  - Physician Champion- typically a Hospitalist
  - Multidisciplinary team members
  - Quality Lead
  - Data Abtractor
- Goals
  - Improving quality and value of care
  - Data and best practice sharing
  - Facilitated implementation



- Current Initiatives
  - Peripherally Inserted Central Catheter (PICC) Use/Midline Use
  - Antimicrobial Use
    - Pneumonia
    - Positive Urine Cultures
  - Sepsis

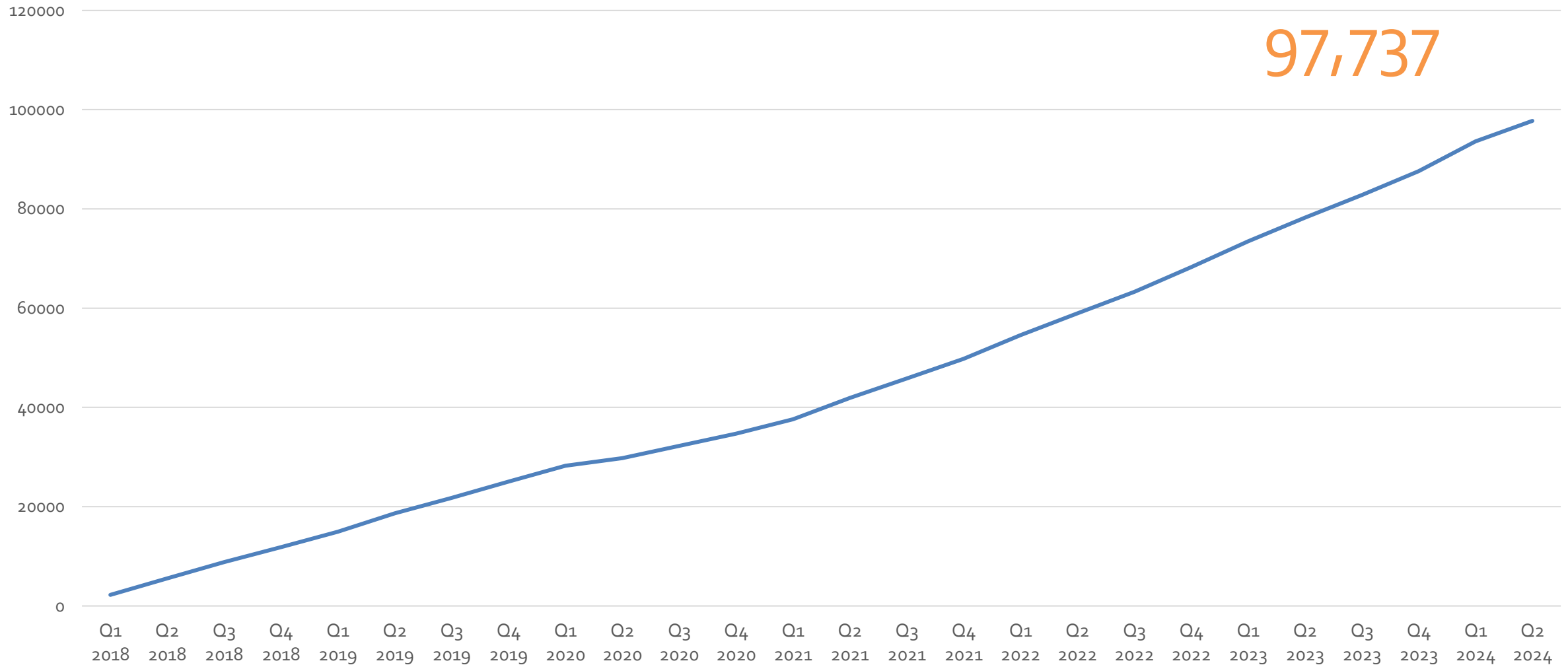
# Antimicrobial Initiatives:

Significance, Data, and QI





# Antimicrobial Days Saved- Across ASB and PNA initiatives



# Where Can I Find Resources and Tools?

Available for reference and download on the public HMS Website:

[HMS Antimicrobial Use Toolkit](#)

Able to customize the tools with your institution's logo



## HMS Antimicrobial Use Toolkit

### Tier 1: Implement Global Strategies to Improve Antimicrobial Use



Convene a Workgroup to Focus on Tier 1 Strategies



Develop and Share Institutional Guidelines for Urinary Tract Infection (UTI), Asymptomatic Bacteriuria (ASB) and Community-Acquired Pneumonia (CAP)



Integrate and Operationalize Institutional Guidelines for UTI/ASB and CAP



Reduce Duration of Antibiotic Treatment for Uncomplicated CAP to 5 Days



Reduce Testing and Treatment of Asymptomatic Bacteriuria (ASB)



Reduce Unnecessary Use of Broad-Spectrum Agents for UTI and Pneumonia



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*This toolkit is a live document and will continually be updated as new tools are developed. Please visit the HMS website for the most up-to-date toolkit. If you have tools to be added to the toolkit, please see the HMS contact information below.*

#### Contact Information:

Email: [hospmedqi@umich.edu](mailto:hospmedqi@umich.edu)

Website: <http://mi-hms.org/>

Twitter: [@HMS\\_MI](https://twitter.com/HMS_MI)

# Coming Up: Antimicrobial Topics



- Increasing adherence to a 5-day antibiotic course for uncomplicated CAP
- Reducing the use of inappropriate empiric broad-spectrum antibiotics in patients with uncomplicated CAP
- Decreasing fluoroquinolone use in patients with a positive urine culture or uncomplicated community-acquired pneumonia (CAP)
- Reducing unnecessary testing and treatment of asymptomatic bacteriuria (ASB)

# Increasing Use of 5-Day Antibiotic Duration for Uncomplicated CAP

# Defining Uncomplicated CAP



HMS Pneumonia Definition	
1 Radiographic Component + 2 or More Clinical Findings	
Radiographic Component <sup>1,2,3</sup>	Clinical Findings <sup>1</sup>
Air Bronchograms	Cough
Air Space Density/Opacity/Disease	Increased Secretions/Sputum Production
Aspiration <sup>4</sup>	Dyspnea/Shortness of Breath or Tachypnea <sup>9</sup>
Aspiration Pneumonia	Hypoxia/Hypoxemia <sup>10</sup>
Bronchopneumonia	Fever <sup>11</sup> or hypothermia <sup>12</sup>
Cannot Rule Out Pneumonia	Exam consistent with pneumonia (Rales, Crackles, Dullness on Percussion, Bronchial Breath Sounds, Egophony, or Rhonchi)
Cavitation	WBC >10,000 or < 4,000
Consolidation	
Ground Glass <sup>5</sup>	
Infection (Cannot Rule Out Infection, Likely Infection)	
Infiltrate (Single Lobe, Multiple, Not Specified, or New or Worsening)	
Loculations	
Mass <sup>6</sup>	
Necrotizing Pneumonia	
Nodules or Nodular Airspace Disease <sup>7</sup>	
Pleural Effusion <sup>8</sup>	
Pneumonia	
Post Obstructive Pneumonia	



### Pneumonia Definition Details

**[CAP]:** All cases classified as pneumonia per the HMS Pneumonia Definitions. Patients previously classified as HCAP are now classified as CAP.

**[Complicated CAP]:** Patients were classified as having "complicated CAP" if they had any condition which data supporting a 5-day antibiotic duration is limited. These conditions include a) moderate immune compromise, (b) structural lung disease [including lung malignancy], (c) respiratory culture with Staphylococcus aureus or a non-fermenting gram-negative bacilli [e.g., Pseudomonas] or (d) moderate to severe chronic obstructive pulmonary disease [COPD, diagnosed by physician or FEV1 <80% predicted].

**[Uncomplicated CAP]:** All other CAP patients who did not meet the criteria for Complicated CAP.

**[?PNA (Questionable Pneumonia)]:** All other patients who did not meet the criteria for CAP

# Reducing Excess Duration in Uncomplicated CAP



- Why is this important? Here are some findings from just one publication:
  - Excess duration of antibiotic therapy did not lead to better outcomes- Mortality, re-admission, ED visits
  - Each day of excess therapy → 5% increase in odds of patient reported ABX-associated adverse event after discharge
  - Patients with a total duration documented in the discharge summary were less likely to be treated too long
  - 93% of excess duration was prescribed at discharge



**Annals of Internal Medicine**

ORIGINAL RESEARCH

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

**A Multihospital Cohort Study**

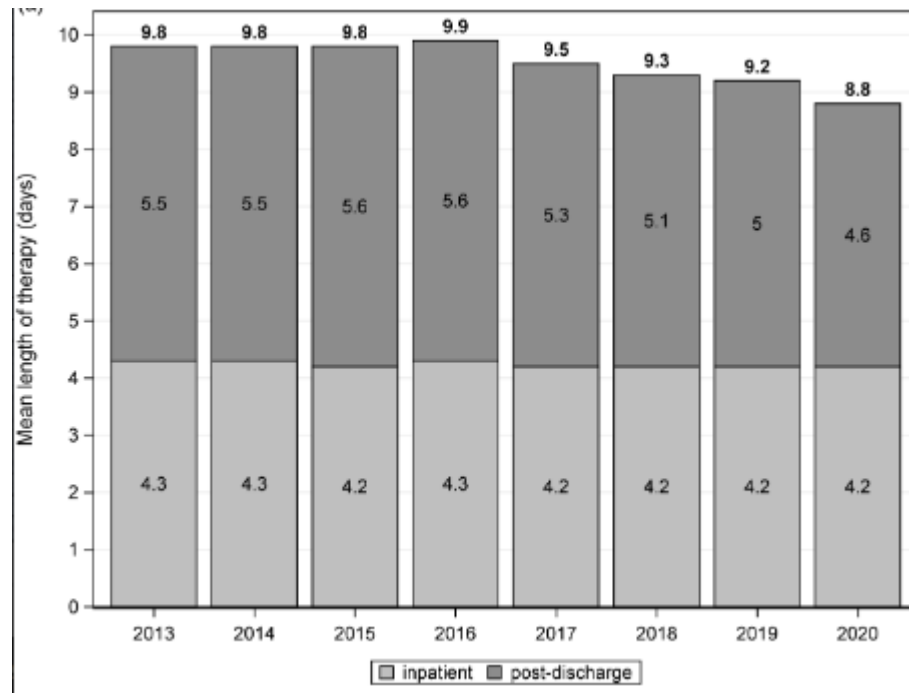
Valerie M. Vaughn, MD, MSc; Scott A. Flanders, MD; Ashley Snyder, MS; Anna Conlon, PhD; Mary A.M. Rogers, PhD, MS; Anurag N. Malani, MD; Elizabeth McLaughlin, MS, RN; Sarah Bloemers, MPH; Arjun Srinivasan, MD; Jerod Nagel, PharmD, BCPS; Scott Kaatz, DO; Danielle Osterholzer, MD; Rama Thyagarajan, MD; Lama Hsaiky, PharmD, BCPS; Vineet Chopra, MD, MSc; and Tejal N. Gandhi, MD

Vaughn VM, et al. Ann Int Med. 2019

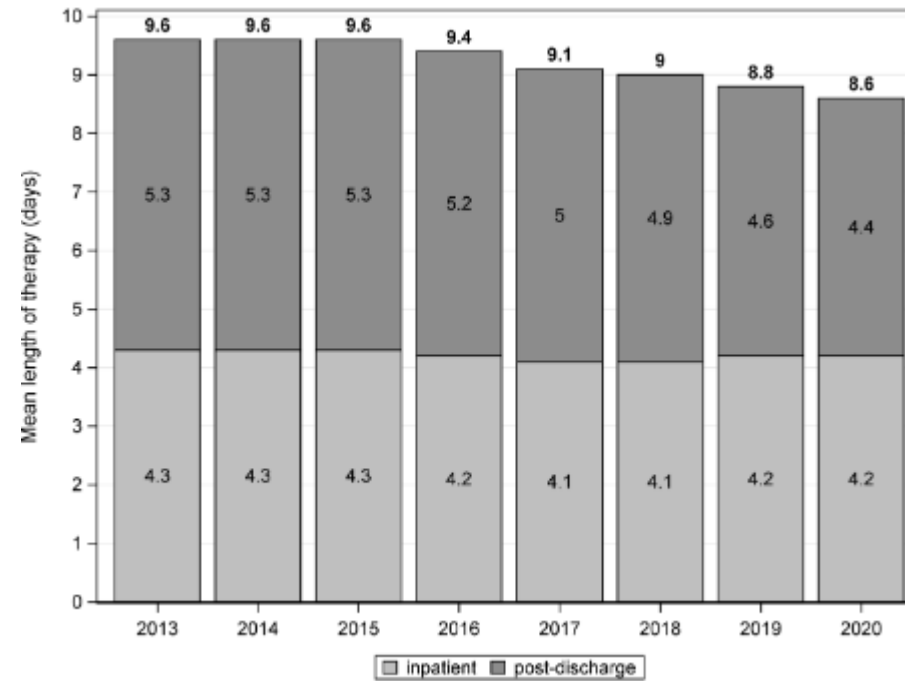
# Duration of Antibiotic Therapy Among Hospitalized Adults with Uncomplicated CAP in USA, 2013-2020



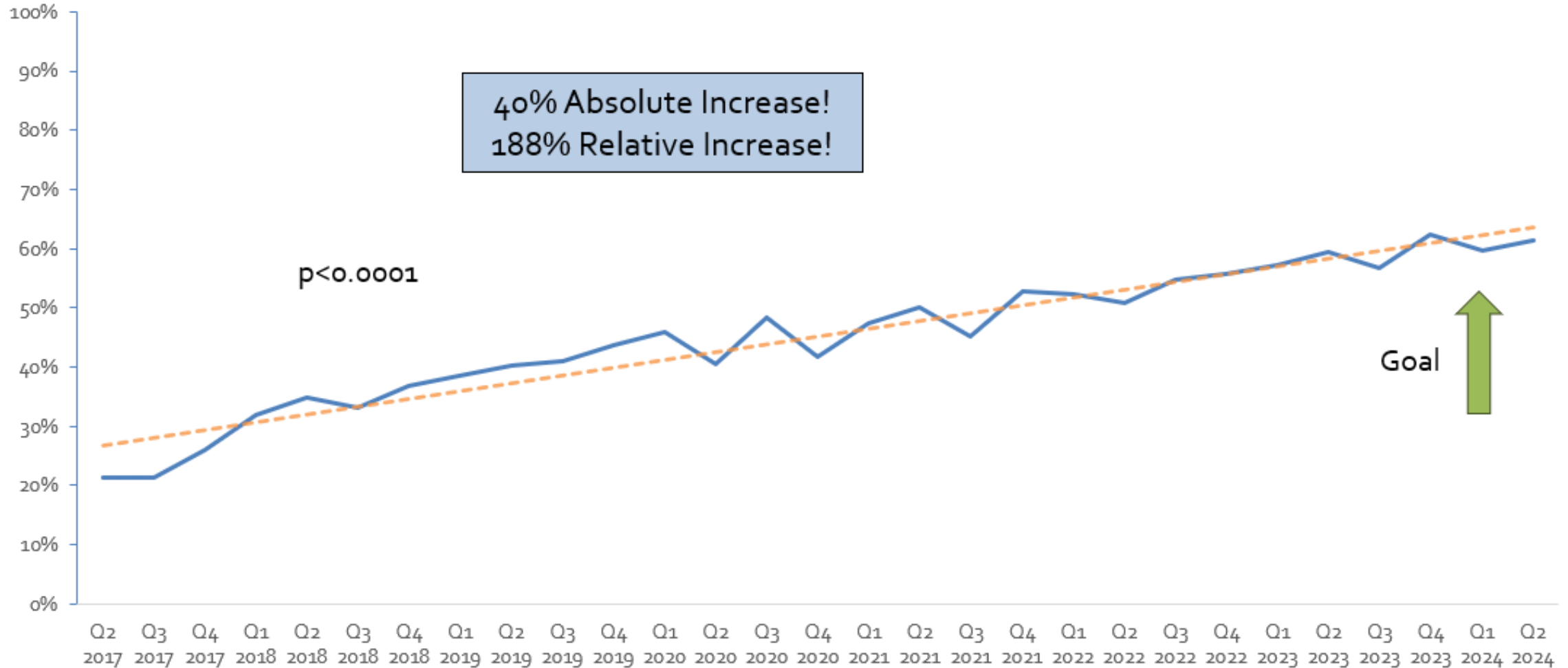
## Age 18-64 years



## Age ≥ 65 years



# CAP 5 Day: Percent of Patients Treated with 5 Days of Antibiotics by Quarter

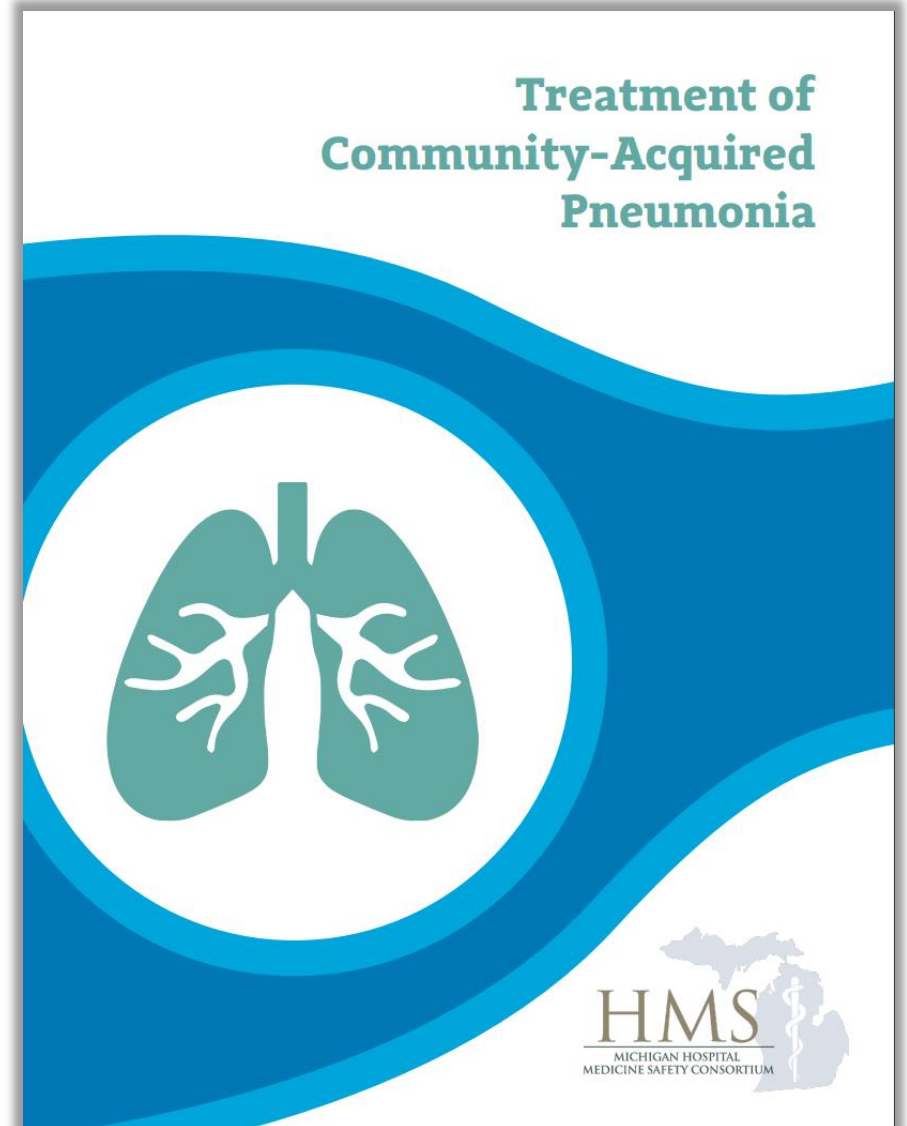




# Developing Local Guidelines



- Develop (or maintain) institutional guidelines for treatment of CAP that are locally-adapted from national and/or HMS guidelines
- CAP Institutional Guidelines should:
  - Recommend 5-day antibiotic treatment duration for Uncomplicated CAP
  - Review IDSA/ATS CAP guidelines, taking into account PNA severity and risk factors for MDRO
  - Provide recommendations for transition to oral therapy
  - De-emphasize fluoroquinolones
  - Include diagnostic criteria for CAP



# QI Tools: Example Institutional Guideline

## Inpatient Guidelines for the Treatment of Pneumonia – November 2023

Diagnosis of Pneumonia requires  $\geq 2$  clinical signs/symptoms and at least one radiographic criteria as listed below:

$\geq 2$ Clinical Signs or Symptoms	PLUS	Radiographic Criteria (CXR or CT)
<ul style="list-style-type: none"> <li>Cough</li> <li>Sputum</li> <li>Dyspnea or tachypnea</li> <li>Hypoxia</li> <li>Exam finding (i.e. rales, crackles, etc.)</li> <li>Fever or hypothermia</li> <li>WBC <math>&gt;10,000</math> or <math>&lt;4,000</math>/mcl or <math>&gt;15\%</math> bands</li> </ul>		<p><b>Definitely Positive</b></p> <ul style="list-style-type: none"> <li>Air space density/opacity/disease</li> <li>Bronchopneumonia</li> <li>Cavitation</li> <li>Ground glass</li> <li>Infection</li> <li>Infiltrate</li> <li>Loculations</li> <li>Nodular airspace disease</li> <li>Pleural effusion</li> <li>Pneumonia</li> <li>Tree in bud</li> </ul> <p><b>Equivocal:</b></p> <ul style="list-style-type: none"> <li>"cannot rule out pneumonia"</li> <li>"atelectasis vs. pneumonia"</li> </ul>

**HMS-Preferred empiric treatment for CAP includes:**

- Ampicillin-Sulbactam PLUS Azithromycin, Clarithromycin, or Doxycycline
- Ceftriaxone or Cefotaxime PLUS Azithromycin, Clarithromycin, or Doxycycline

Infection	Antimicrobial Therapy <sup>§</sup>	Duration	Alternative but HMS Non-Preferred treatment	Comments
<p><b>Community-acquired pneumonia (CAP)<sup>1</sup></b></p> <p>With NO recent hospitalization (3 months) AND no prior respiratory isolation of <i>Pseudomonas aeruginosa</i> or MRSA (within 1 year)</p>	<p>Ceftriaxone 1g IV Q24h PLUS Azithromycin 500 mg IV/PO X5 days OR doxycycline 100mg IV/PO Q12h (if macrolide intolerance/allergy)</p>	<p>5 days initial duration* 7 days for complicated pneumonia*</p> <p>Complicated pneumonia: structural lung disease, mod/severe COPD, confirmed staphylococcus or pseudomonas, and/or immunosuppression<sup>4</sup></p> <p>*Longer durations of therapy may be indicated, depending upon clinical response</p>	<p>Alternative but HMS Non-Preferred treatment</p>	<p>Anaerobic coverage for aspiration pneumonia is not routinely warranted unless:</p> <ul style="list-style-type: none"> <li>Lung abscesses</li> <li>Empyema</li> </ul> <p><math>\beta</math>-lactam substitution for patients with severe delayed immunologic reactions or organ-specific reactions <math>\beta</math>-lactam allergy (e.g. DRESS, SJS, AIN) OR a severe cephalosporin allergy where structurally dissimilar antibiotic is unavailable (see cross-reactivity chart): Levofloxacin 750 mg<sup>1</sup> IV/PO Q24h</p> <p>Consider doxycycline as an alternative to azithromycin in patients at high risk for QTc prolongation</p> <ul style="list-style-type: none"> <li>QTc prolongation (<math>&gt;500</math>ms)</li> <li>Hypokalemia</li> <li>Hypomagnesemia</li> <li>Significant bradycardia</li> <li>Uncompensated heart failure</li> <li>Patients receiving class IA or class III antiarrhythmic drugs</li> </ul> <p>Non-severe CAP<sup>**</sup>: Do not routinely obtain respiratory OR blood cultures OR <i>Legionella</i> urinary antigens</p> <p>Severe CAP<sup>**</sup>: Obtain respiratory culture AND blood cultures AND <i>Legionella</i> urinary antigens</p> <p>Patients should be switched from IV to PO when they are hemodynamically stable,</p>

5 days of therapy for Uncomplicated CAP patients

Signs of clinical instability impacting determination for therapy duration

5 days if afebrile with  $<2$  signs of clinical instability on days 3-5

Signs of Clinical Instability:

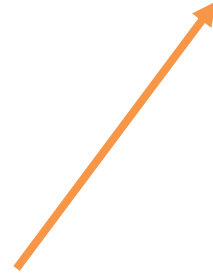
- Arterial O<sub>2</sub> sat  $\leq 90\%$
- HR  $\geq 100$  bpm
- RR  $\geq 24$  breaths/min
- BP  $\leq 90$  mmHg
- Altered mental status (vs. baseline)



- Includes diagnostic criteria for pneumonia
- Includes antibiotic selection guidance
  - Addresses common broad spectrum use concerns
- Includes oral stepdown and duration guidance

# Suggested Implementation Strategies

- Focus efforts on discharge prescribing
  - Discharge prescriptions account for most excess duration
- Incorporate nursing and pharmacy into the review of discharge antibiotics
- Provide audit and feedback directly to providers
- Consider incorporating compliance with treatment duration for uncomplicated CAP as part of provider performance targets



## Antibiotic Time Out Checklist



### HOW TO USE THIS CHECKLIST:

Review the need for antibiotics on each patient DAILY. This review allows you to evaluate new information, such as clinical improvement and new culture results, to update your treatment plan.

### CRITICAL TIMES TO USE THIS CHECKLIST:

48-72 hours after admission, Any transition of care or change in status, Handoff between providers, At hospital discharge



#### 1. Do we think this patient has a bacterial infection or is another diagnosis more likely?

- Problems which initially begin as symptoms (e.g., dyspnea) should be updated to diagnoses (e.g., community-acquired pneumonia, acute on chronic systolic heart failure)
- Is the diagnosis still infectious? Bacterial, fungal, viral?
- If the problem is no longer thought to be due to a bacterial infection, **STOP ANTIBIOTICS**



#### 2. If the patient has a bacterial infection, can we de-escalate?

- If culture results have returned, de-escalate to the narrowest effective antibiotic
- If culture results are negative, the patient is improving, and the patient was on broad-spectrum antibiotics, de-escalate by removing anti-MRSA and anti-pseudomonal coverage (this can be done at the same time - e.g., changing vancomycin + zosyn to ceftriaxone)
- If no cultures were obtained, but the patient is improving, consider de-escalation



#### 3. Can the patient be switched to an oral antibiotic?

- For uncomplicated infections, if the patient has a functional GI tract, is tolerating oral intake, and is hemodynamically stable, then usually an oral antibiotic is appropriate unless there is antibiotic resistance
- Some complicated infectious may be able to be treated with oral antibiotics - please consult Infectious Diseases
- A patient on oral antibiotics is often able to be discharged



#### 4. How long should the patient receive antibiotics?

- Plan a disease-based appropriate duration as early as possible
- Patients should receive the minimum effective antibiotic duration for their diagnosis
  - For example, patients with community-acquired pneumonia who are improving, afebrile, and clinically stable by day 2 or 3 need 5 total days of antibiotics, including inpatient and outpatient/discharge therapy



#### 5. Now that you have decided on a final antibiotic, is it prescribed at the right dose?

- Make sure you consider the type of infection, route of administration, renal and hepatic function, weight, age and interaction(s) with other medications



#### 6. Have we documented dose, duration, and indication for all antibiotics?

- In progress notes/at discharge, you should also include total planned antibiotic duration (including start and planned stop dates) to improve communication with the Primary Care Provider

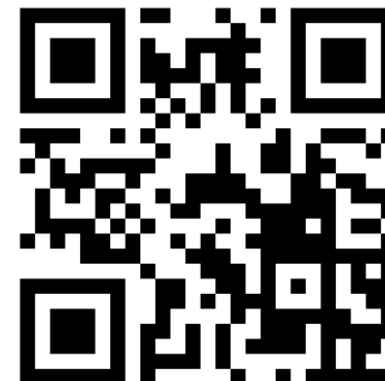


# QI Tool: Growing a Culture of Stewardship



- Presentation by Dr. S. Burdick describing QI journey at HMS member hospital:
  - QI processes
  - Leveraging standardization
  - Pneumonia clinical pathways
  - Pneumonia discharge order sets broken down by inpatient or ED discharge
  - PCN allergy de-labeling
  - Include end users in process

The screenshot shows a user interface for 'ED Pneumonia Discharges' on the Corewell Health platform. It features two main options: 'CAP Complex Discharge' and 'CAP Simple Discharge', each with a list icon and a document icon. Below these options, there is a section titled 'ED Discharge SmartSet for *simple* Community Acquired Pneumonia patients.' This section includes a list of criteria for using the 'CAP Complex Discharge' SmartSet: VAP | Lung abscess of Empyema | MSSA, MRSA, pseudomonas, legionella | Moderate/severe structural lung disease | HIV | Chemo in last 30 day | Biologics | chronic steroids | other immunosuppressants | BMT or transplant patients | Instability at day 5 of antibiotics.



# QITool: Clinical Pathways and Order Set Examples



- Resources shared by Dr. Burdick associated with Growing a Culture of Stewardship presentation:

## RESOURCES INCLUDED

In this packet, you will find example mockups of the screenshots shared during this presentation.

These include:

Pneumonia Inpatient Order Set Example

Pneumonia Inpatient Order Set Example – Medication Detail

Pneumonia Inpatient Order Set Example – Standard CAP Treatment Option

Pneumonia Inpatient Order Set Example – MRSA Coverage Treatment Option

CAP Simple & Complex Emergency Department Discharge Order Set Examples

Pneumonia Discharge Order Set Example

Pneumonia Discharge Order Set Example – Discharge Medication Detail



# QI Tools: Posters



## Uncomplicated Community Acquired Pneumonia (CAP) in the Inpatient Setting: **Strive for Five\***

### Empiric Therapy for Uncomplicated, Non-severe CAP: Hospitalized Patients\*

Therapy	Notes
Ceftriaxone PLUS azithromycin (or ceftriaxone plus doxycycline)	<ul style="list-style-type: none"> <li>Ceftriaxone can be used in non-severe penicillin allergic patients</li> </ul>
Levofloxacin	<ul style="list-style-type: none"> <li>Consider use only if severe penicillin allergy</li> <li>Strongly associated with development of C. difficile</li> <li>Associated with prolonged QTc intervals, tendinopathies and altered mental status especially in the elderly</li> </ul>

- Anaerobic coverage is not routinely warranted in non-critically ill patients with aspiration pneumonia

### Step-Down and Transitioning to Oral Therapy

- Convert to oral antibiotics as soon as clinical improvement is observed and the patient is able to tolerate oral therapy.

### Empiric Oral Antibiotics for Step-down Therapy when no Etiologic Pathogen Identified:

Amoxicillin*	
Amoxicillin-Clavulanate*	
Cefdinir* or Cefuroxime*	<ul style="list-style-type: none"> <li>can be used in non-severe penicillin allergic patients.</li> </ul>
Levofloxacin	<ul style="list-style-type: none"> <li>Consider use only if severe Penicillin allergy</li> <li>Strongly associated with development of C. difficile</li> <li>Associated with prolonged QTc intervals, altered mental status &amp; tendinopathies.</li> </ul>

\*Azithromycin can be added to above step-down therapy. However, 3 days of azithromycin is generally sufficient in uncomplicated CAP given its long half-life unless treating Legionella.

### For more information and guidance:

- Refer to the Beaumont Health Adult Community-Acquired Pneumonia (CAP) Antimicrobial Treatment Guidelines located on both PolicyStat and the Beaumont Antimicrobial Stewardship Site and the HMS Guidelines located at: <https://mi-hms.org/sites/default/files/CAP-Empiric-Treatment-and-Duration-Guidelines-041218.pdf>
- Use the Order Set titled: IP Pneumonia Management

### Duration of Therapy: STRIVE FOR 5\*

- 5 days of therapy is sufficient for most patients with uncomplicated CAP.

- Patients will commonly be discharged with only 1 or 2 (or 0) days of discharge antibiotics depending on days of therapy received while hospitalized.
- The prescribing of extra days of antibiotics at discharge is the #1 reason patients are treated too long.
- The Empiric Oral Antibiotics listed in the chart to the left are also suggested discharge antibiotics. Azithromycin is not recommended as monotherapy at discharge or if patient has already received 3 days of azithromycin therapy (unless treating Legionella).
- Therapy can be continued for patients who are febrile or clinically unstable\*\* on the 5<sup>th</sup> day of treatment
- Consider prolonging to at least 7 days if patient is immunocompromised, has underlying structural lung disease, or did not have adequate clinical response within 72 hours
- If the patient has Legionella, P. aeruginosa, or S. aureus, longer durations of therapy are usually required, particularly if there is associated bacteremia or a parapneumonic effusion
- A lingering cough and chest x-ray abnormalities may take several weeks to improve.

**STRIVE FOR FIVE**  
Most cases of pneumonia can be treated with five days of antibiotics.

## HEALTHCARE PROFESSIONALS: BE ANTIBIOTICS AWARE At Hospital Discharge

- ### 1 Use the most targeted and safe antibiotic<sup>1,2</sup>

  - If a penicillin allergy is listed in the medical record, determine whether the patient is truly allergic.
  - If the patient is to be discharged on a fluoroquinolone, consider a safer alternative when appropriate.
  - If planning outpatient parenteral antibiotic therapy, consider review by the antibiotic stewardship program or infectious disease consultation service.
- ### 2 Use the shortest effective antibiotic duration<sup>3,4</sup>

  - Account for inpatient antibiotic days when considering the duration of a post-discharge prescription.
  - Examples of total treatment duration for common infections:
    - Community-acquired pneumonia: 5 days<sup>5</sup>
    - Hospital-acquired pneumonia: 7 days<sup>6</sup>
    - Non-purulent cellulitis: 5 days<sup>7</sup>
- ### 3 Document and communicate a structured and timely discharge summary<sup>8</sup>

Information communicated across transitions of care may include:

  - Diagnosis and treatment plan
  - Antibiotic therapy
    - List inpatient antibiotic(s) and total number of days received in the hospital.
    - Specify if antibiotic therapy was completed in the hospital or if continued therapy post-discharge is needed.
    - For a post-discharge prescription, list the planned antibiotic, dose, and end date.
  - Results of relevant diagnostic tests (including pending tests)
  - Instructions for follow-up medical care, including contact information for additional questions
- ### 4 Educate patients and caregivers<sup>9</sup>

  - Indication and planned antibiotic course
  - Instructions for follow-up medical care
  - Signs and symptoms of worsening infection, and sepsis.
  - Signs and symptoms of antibiotic-associated adverse events, including *Clostridioides difficile* infection

This document is meant to provide general guidance and does not apply to all clinical scenarios. Always assess the individual patient, use your clinical judgment, and follow your institution's treatment guidelines and protocols when applicable.

References:  
 1. CDC's Core Elements of Hospital Antibiotic Stewardship Program <https://www.cdc.gov/antibiotic-use/downloads/hospital-hms.pdf>  
 2. CDC Drug Safety Communications <https://www.cdc.gov/drug-safety/communications/antibiotic-use-041218.pdf>  
 3. Society for Hospital Medicine. Antimicrobial Stewardship Transition of Care <https://www.hospitalmedicine.org/antimicrobial-stewardship-transition-of-care>  
 4. Michigan Hospital Medicine Safety Consortium. D.I.S.C.A. R.G.E. Antibiotic Facts and Solutions [https://mi-hms.org/sites/default/files/Discharge2024Antibiotic\\_Research032024.pdf](https://mi-hms.org/sites/default/files/Discharge2024Antibiotic_Research032024.pdf)  
 5. Hooley JF, et al. Am J Respir Crit Care Med. 2018;198(10):1445-451  
 6. Ash AC, et al. Infect Dis. 2018;38(10):1445-451  
 7. Stevens DL, et al. Clin Infect Dis. 2014;58(10):1445-451  
 8. Campbell SM, et al. Am J Respir Crit Care Med. 2013;188(10):1201-1205



[www.cdc.gov/antibiotic-use](http://www.cdc.gov/antibiotic-use)

## HOSPITAL PHARMACISTS: BE ANTIBIOTICS AWARE Use the Shortest Effective Antibiotic Duration

### SCENARIO

You are performing medication reconciliation and reviewing discharge antibiotic orders for a patient.

Antibiotic stewardship programs are targeting interventions to reduce unnecessarily long durations of antibiotic treatment. In adult patients who have a timely clinical response, guidelines suggest the following durations for uncomplicated cases of these infections:

- Community-Acquired Pneumonia: Five days<sup>1</sup>
- Hospital-Acquired Pneumonia: Seven days<sup>2</sup>
- Non-purulent Cellulitis: Five days<sup>3</sup>

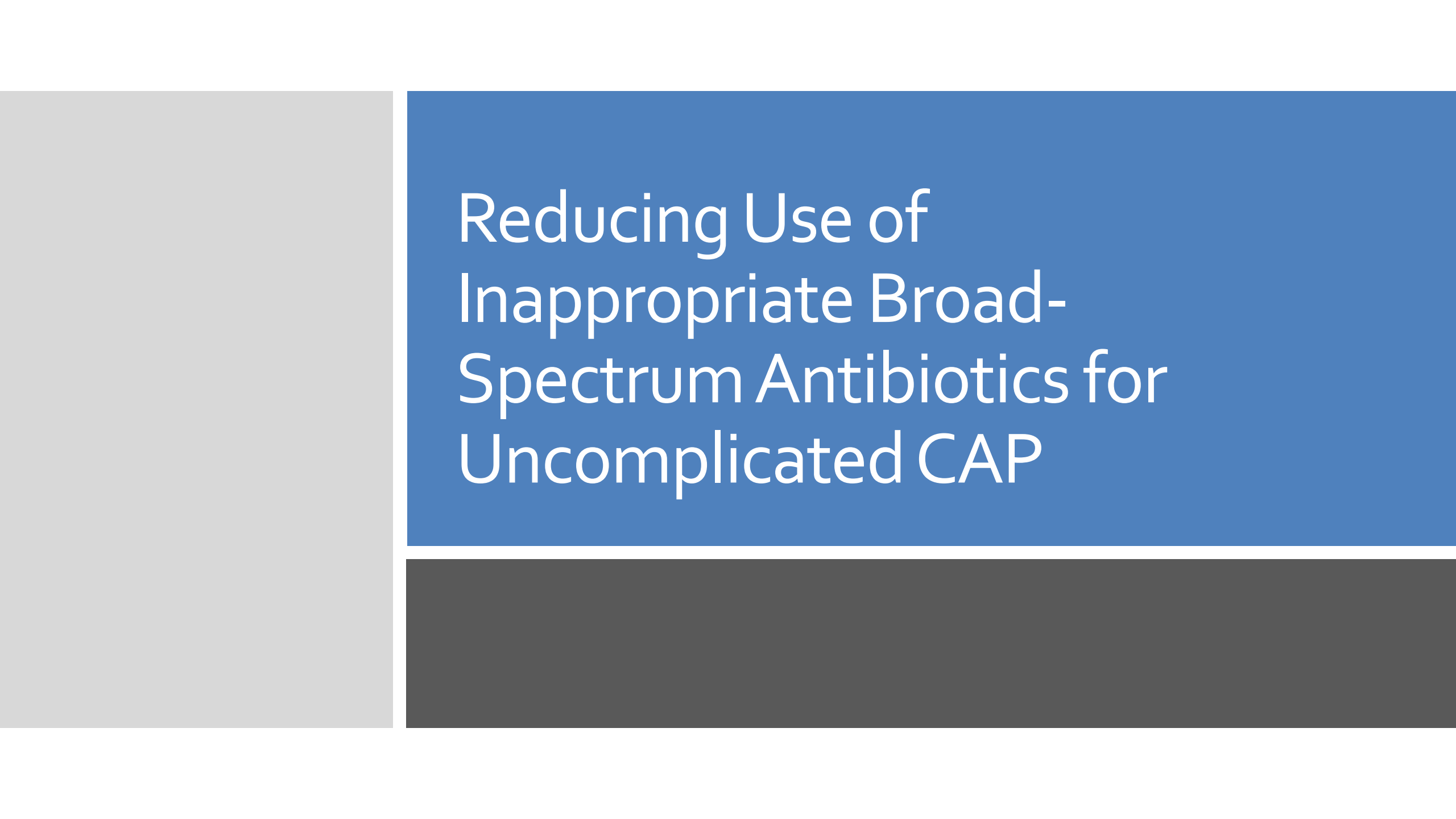
### Pharmacists can help optimize antibiotic duration by:

- Adding the total number of days of uninterrupted inpatient antibiotic therapy to planned post-discharge antibiotic duration.
- Alerting the provider if the total duration of inpatient and post-discharge antibiotic therapy exceeds the recommended duration according to treatment guidelines.
- Discussing optimizing the duration of post-discharge antibiotic therapy with the provider if the patient had an uncomplicated clinical course and has responded appropriately to treatment.

*The scenarios and recommendations discussed are applicable to most immunocompetent adult patients. Prior to making interventions, always assess the individual patient and use your clinical judgment. Follow your institution's treatment guidelines when applicable.*

References:  
 1. Henschel LA, Wundwani RG, Anstee A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis. 2007;44 Suppl 2:S17-25. <https://pubs.ascp.org/doi/10.1093/cid/cim313>  
 2. Ash AC, Wundwani RG, Anstee A, et al. Management of Adults With Hospital-Acquired and Ventilator-Associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society. Clin Infect Dis. 2016; <https://pubs.ascp.org/doi/10.1093/cid/civ606>  
 3. Stevens DL, Besser TE, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 Update by the Infectious Diseases Society of America. Clin Infect Dis. 2014;58(10):1445-451. <https://pubs.ascp.org/doi/10.1093/cid/cit704>

\*These recommendations are intended for non-ICU patients with CAP who are not severely immunosuppressed and do not have risk factors for MDR organisms  
 \*\* Signs of clinical instability: oxygen saturation > 90% or new oxygen requirement, heart rate > 100 beats/minute, respiratory rate > 24 breaths/minute, systolic blood pressure < 90 mmHg, altered mental status (different than baseline).



# Reducing Use of Inappropriate Broad- Spectrum Antibiotics for Uncomplicated CAP

- ATS CAP Guidelines were updated in 2019
  - Focus on empiric coverage of the most common pathogens – *S. pneumoniae*, *H. influenzae*, *M. pneumoniae*, *S. aureus*, *Legionella species*, *C. pneumoniae*, and *M. catarrhalis*
- Most patients do not need coverage for drug-resistant organisms
- Focus on most targeted empiric antibiotics for patients based on risk factors for drug-resistant organisms



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



Patients from SNF and no other 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

# 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

# Who Needs Broader Empiric Coverage?



**Severe** Community Onset Pneumonia\*



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

Please obtain cultures + MRSA nasal swab  
Remember to de-escalate in 2-3 days if cultures are negative or no MDR pathogen

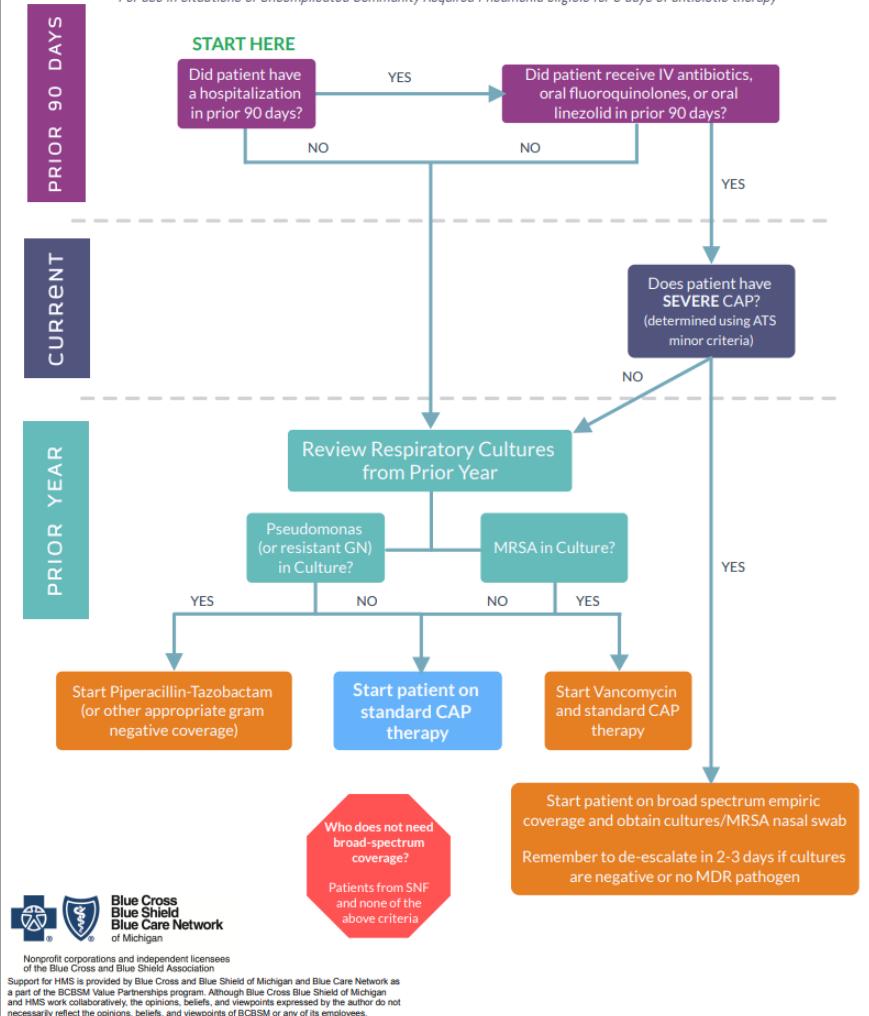
\*use pneumonia severity score in ATS/IDSA guideline

\*\*including oral linezolid and FQ

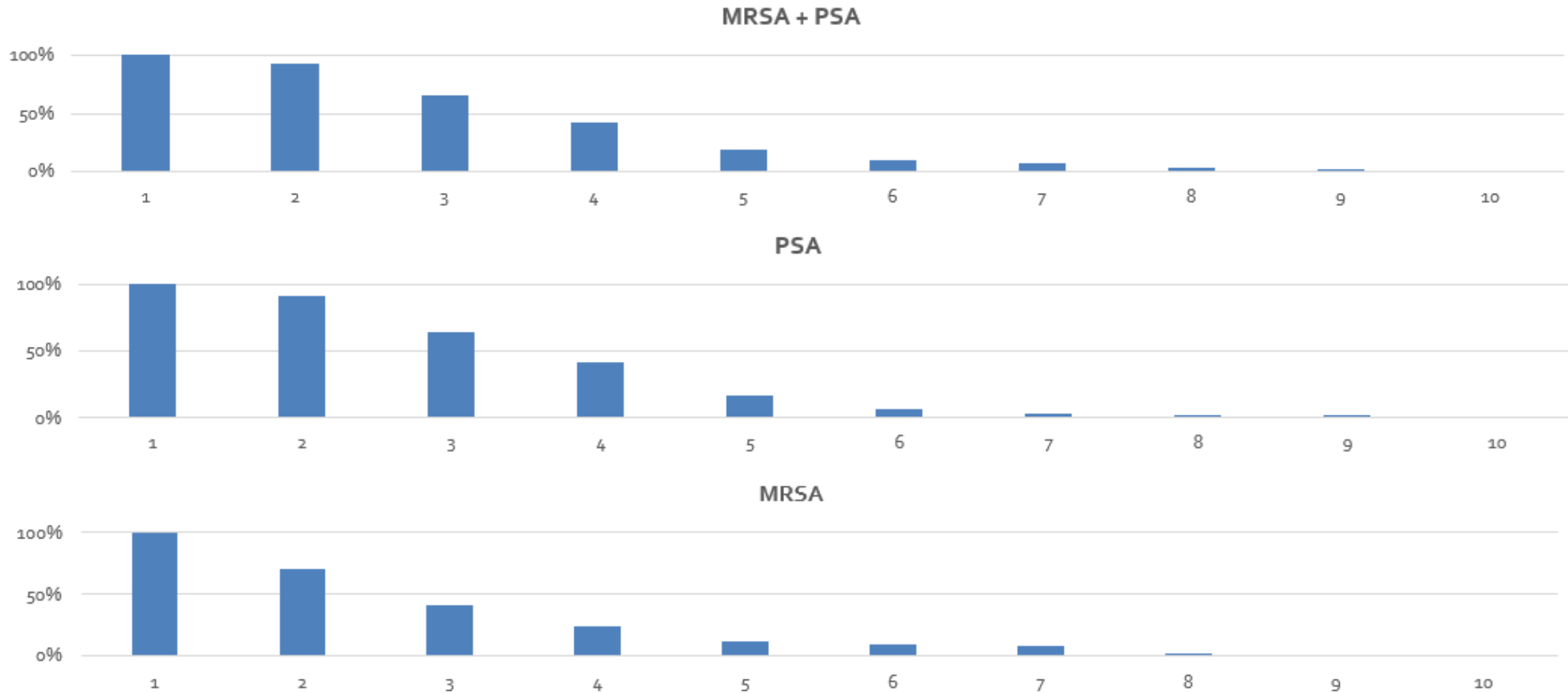


## Who Needs Broad-Spectrum Empiric Coverage in CAP?

For use in situations of Uncomplicated Community Acquired Pneumonia eligible for 5 days of antibiotic therapy



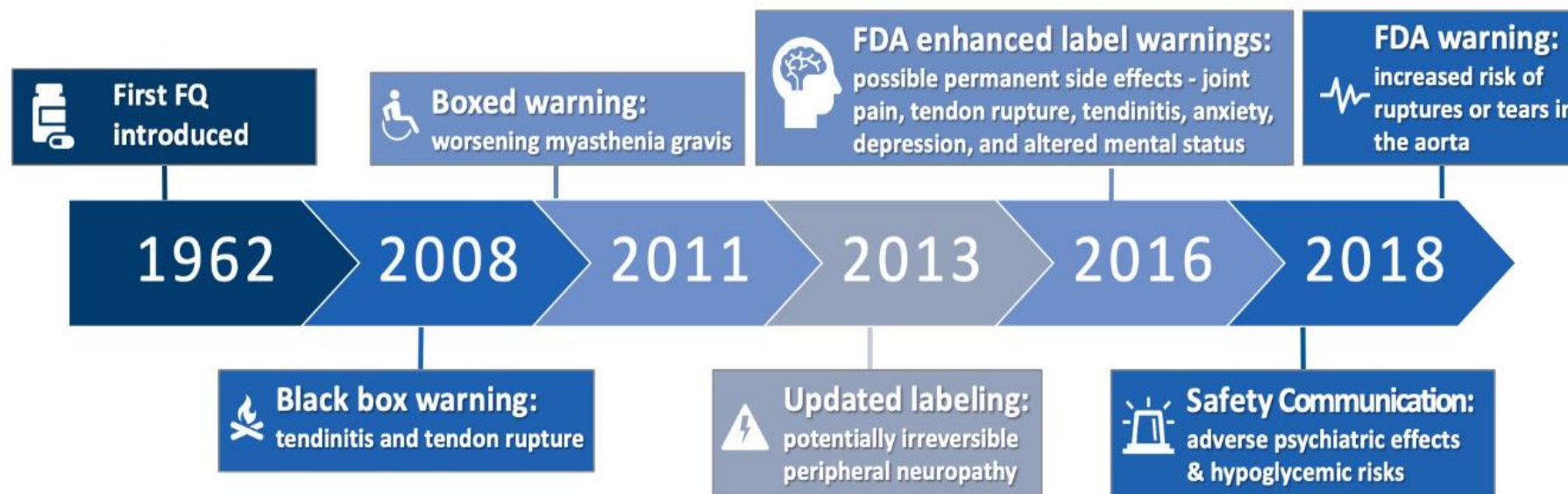
# 5-Day CAP Cohort: Duration of Inappropriate Broad-Spectrum Therapy





# Reducing Fluoroquinolone Use in Patients with Positive Urine Cultures and Uncomplicated CAP

# The HISTORY of Fluoroquinolones



<https://www.fda.gov/downloads/Drugs/DrugSafety/UCM513019.pdf>. Accessed August 2, 2018.  
<https://www.fda.gov/downloads/Drugs/DrugSafety/UCM612834.pdf>. Accessed August 2, 2018.

# Adverse Effects of Fluoroquinolones

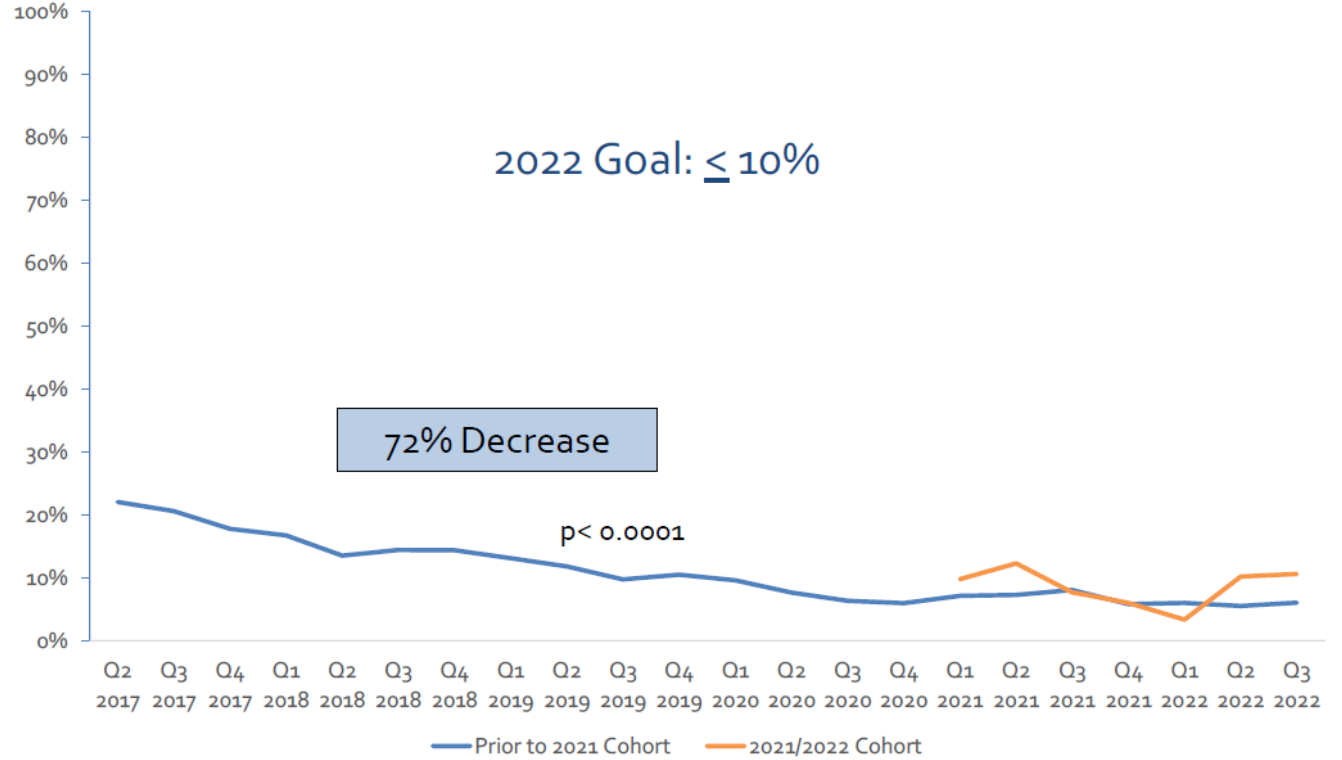


- 8%-27% of inpatients who receive a fluoroquinolone will have an adverse event (mild to severe)
- Large driver of *C.difficile* infections
  - Longer durations (1-3 d vs >7 d) can double the risk of CDI
  - Risk factor for recurrent CDI
  - Decreases in FQ use associated with reduced HO-CDI rates
- Associated with antimicrobial resistance
  - MRSA/VRE
  - MDR Gram-negative infections

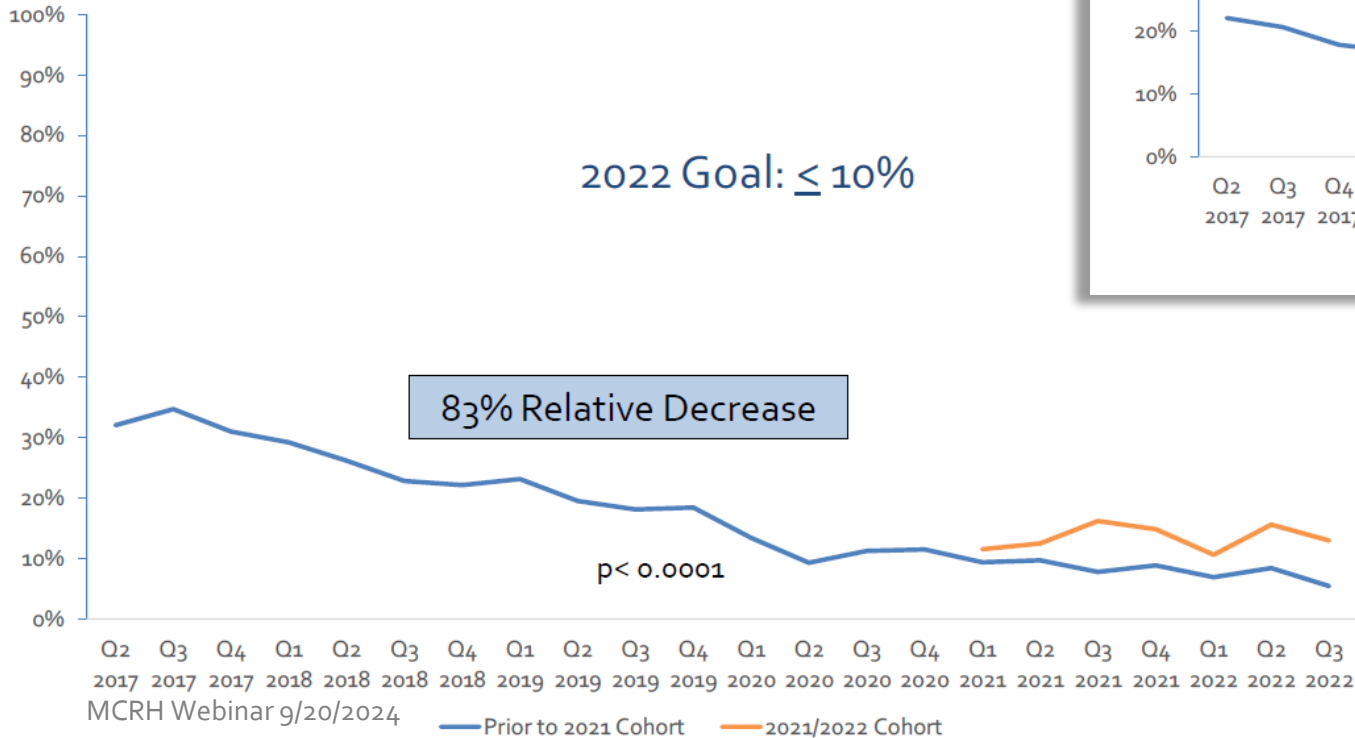
Tacconelli J Antimicrob Chemother 2008  
Kallen AJ Infect Control Hosp Epidemiol 2009  
Dingle. Lancet Infect Dis. 2017  
Werner. BMC Infect Dis. 2011  
Tamma. JAMA IM. 2017  
Pepin. CID. 2005  
Deshpande Infect Control Hosp Epidemiol 2015  
Lautenbach CID 2001  
Gouliouris JAC 2018

# HMS FQ Success

## Quarterly Percentage: Patients with a Positive Urine Culture Receiving a Non-Preferred FQ



## 5-Day CAP Cohort: Percent of Patients Receiving a Non-Preferred FQ by Quarter





# Fluoroquinolone Opportunities



- Fluoroquinolone use is fairly common for both pneumonia and UTI
  - In 2019 we identified that 42.6% of patients were prescribed a fluoroquinolone (during hospitalization or after discharge)
  - Most treatment occurred after discharge (66.6%)
- To limit aggregate fluoroquinolone exposure, stewardship programs should target both inpatient and discharge prescribing
  - Institutional guidelines should de-emphasize fluoroquinolone use
  - *Consider* requiring approval for restricted antibiotics
  - *Consider* implementing prospective audit and feedback for prescribing clinicians
- Goal: A safer alternative therapy should be chosen when treating UTI and Uncomplicated CAP



[Clin Infect Dis](#). 2019 Oct 15; 69(8): 1269–1277.

Published online 2019 Feb 13. doi: [10.1093/cid/ciy1102](https://doi.org/10.1093/cid/ciy1102)

PMCID: PMC6763628

PMID: [30759198](https://pubmed.ncbi.nlm.nih.gov/30759198/)

The Association of Antibiotic Stewardship With Fluoroquinolone Prescribing in Michigan Hospitals: A Multi-hospital Cohort Study

Valerie M Vaughn,<sup>1,2</sup> Tejal Gandhi,<sup>3</sup> Anna Conlon,<sup>1</sup> Vineet Chopra,<sup>1,2</sup> Anurag N Malani,<sup>4,5</sup> and Scott A Flanders<sup>1</sup>

# QI Tool: Clinician Education Video



- This video is a collaboration from the CDC and Medscape, and seeks to offer information on fluoroquinolone prescribing and use data, and why appropriate fluoroquinolone prescribing is an important patient safety issue



Perspective > CDC Expert Commentary

COMMENTARY

## Thinking of a Fluoroquinolone? Think Again

Sarah Kabbani, MD, MSc  
DISCLOSURES | July 16, 2018

EDITORIAL COLLABORATION Medscape & CDC

**Medscape Editor's Note:** Since this commentary was prepared, the US Food and Drug Administration (FDA) has strengthened its black box warning for fluoroquinolones to require a separate warning about the drug's potential mental side effects (disturbances in attention, disorientation, agitation, nervousness, memory impairment, and delirium), and to add a warning about the risk for coma with hypoglycemia. They reiterate their position that because the risk for serious side effects generally outweighs the benefits for patients with acute bacterial sinusitis, acute bacterial exacerbation of chronic bronchitis, and uncomplicated urinary tract infections, fluoroquinolones should be reserved for use in patients with these conditions who have no alternative treatment options.



00:00 / 04:38 CC

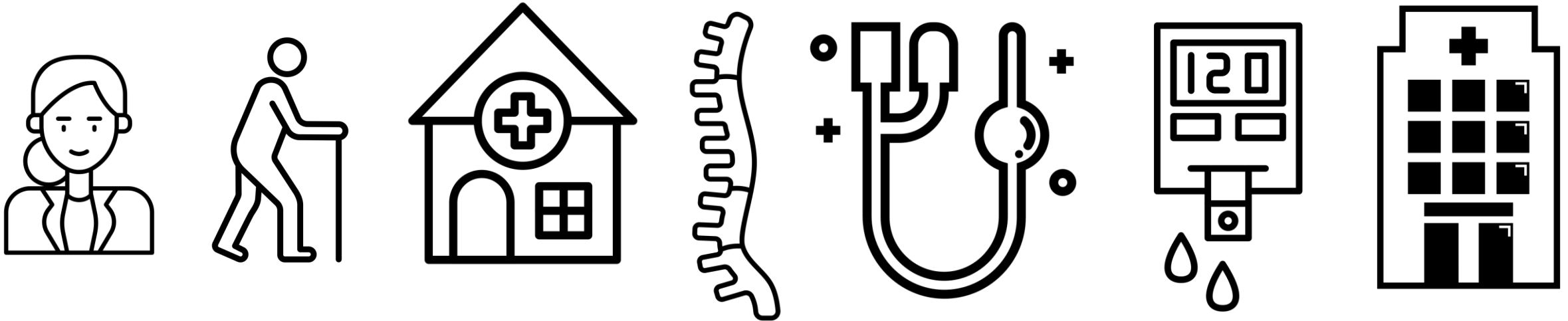


# Reducing Unnecessary Testing and Treatment of ASB

- What is Asymptomatic Bacteriuria?
  - Patients with a positive urine culture without any symptoms attributable to a UTI
    - In the absence of signs or symptoms attributable to a urinary tract infection, patients with a positive urine culture and/or pyuria should not be treated with antibiotics irrespective of high bacterial colony count, or a multi-drug resistant organism

# Asymptomatic Bacteriuria: No Benefit to Treatment

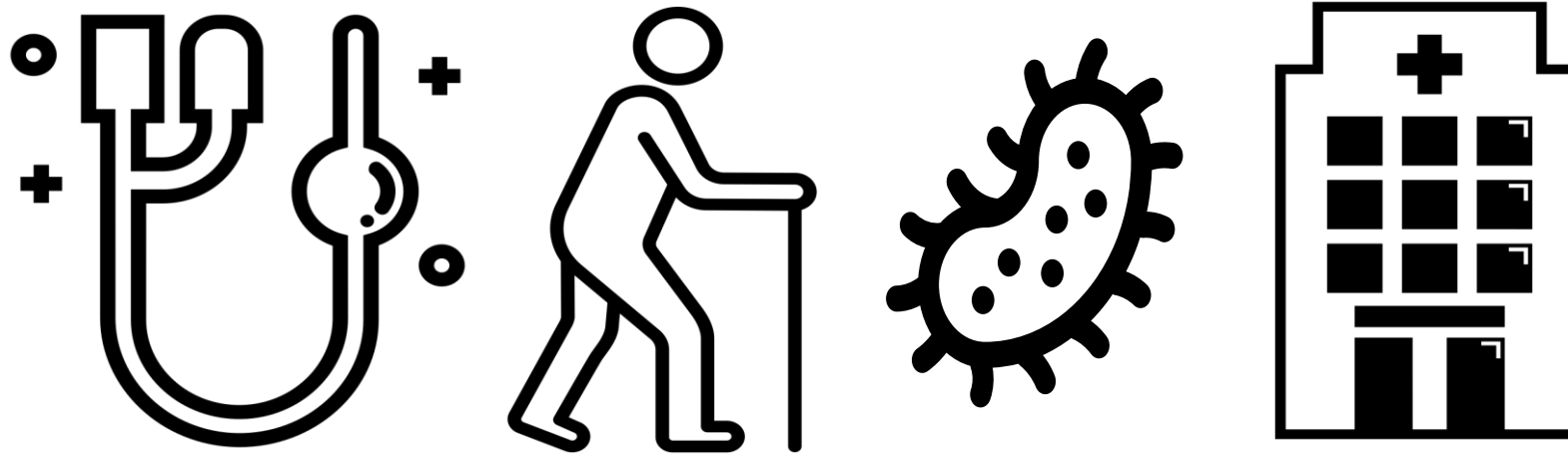
- Prospective studies and RCTs:



- Findings:

- No difference in frequency of symptomatic UTI, development of CKD, HTN, chronic GU symptoms, DM complications, survival

# Harms to Treatment of ASB



- Increased antibiotic use leads to increased *C. difficile* and adverse drug events
- 20% of non-clinically indicated antibiotic regimens were associated with adverse drug events
- HMS data shows: Associated with longer length of hospital stay


- Develop (or maintain) institutional guidelines for treatment of UTI/ASB that are locally-adapted from national guidelines
- UTI/ASB Institutional Guidelines should:
  - Recommend against sending urine cultures in the absence of urinary symptoms
  - Recommend against treating a positive urine culture in the absence of urinary symptoms
  - Provide recommendations for transition to oral therapy
  - De-emphasize fluoroquinolones



## Asymptomatic Bacteriuria

National guidelines recommend against testing for asymptomatic bacteriuria, except in select circumstances\*\*

**★** In the **absence of signs or symptoms** (see below) attributable to a urinary tract infection, patients with a positive urine culture and/or pyuria **should not be treated** with antibiotics irrespective of high bacterial colony count, or a multi-drug resistant organism.

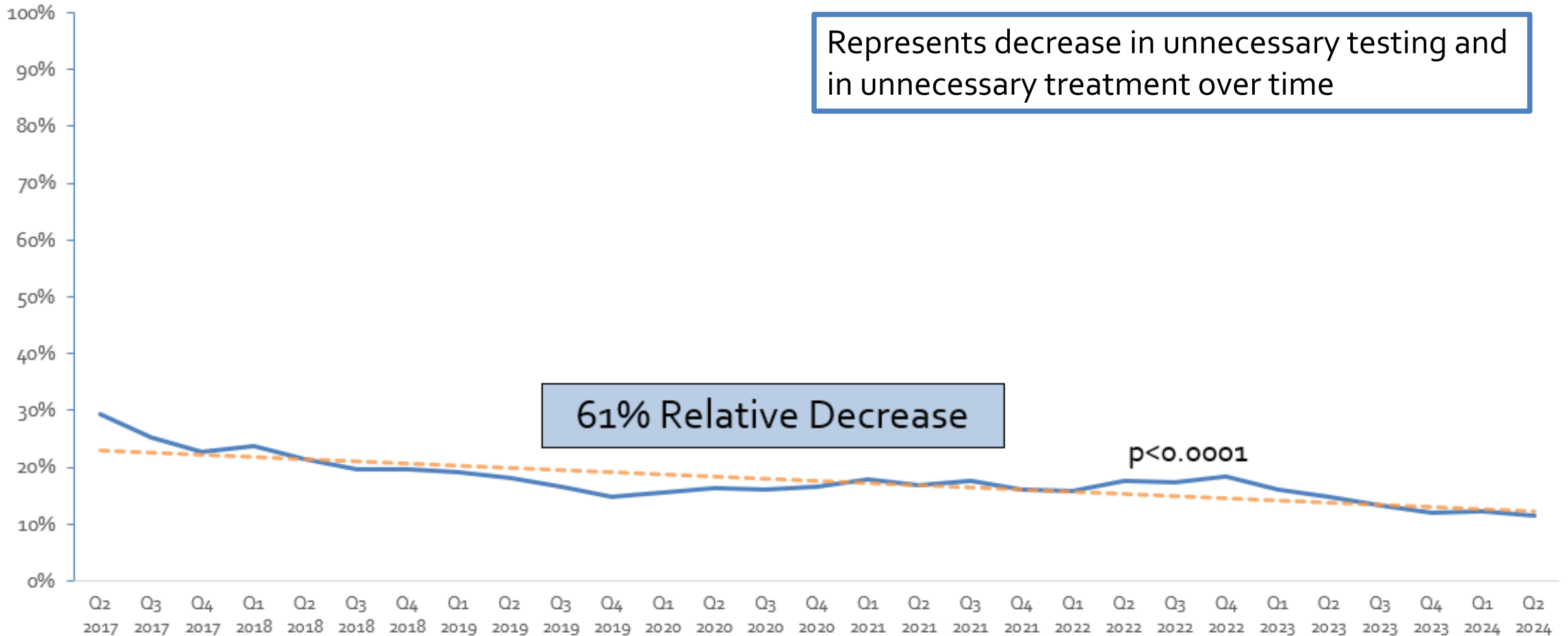
 <p>Do <b>NOT</b> Send Urinalysis or Urine Culture if none of these symptoms are present or there is an alternative cause for the symptom</p>	Signs & Symptoms without alternative cause
	Fever >38° C or rigors
	Urgency, frequency, dysuria
	Suprapubic pain or tenderness
	Costovertebral pain or tenderness
	New onset mental status changes with leukocytosis (>10,000 cells/mm <sup>3</sup> ), hypotension (<90mmHg Systolic), or >= 2 SIRS criteria <sup>1</sup>
	Acute hematuria
Spasticity or autonomic dysreflexia in patients with spinal cord injury	

*\*\*Symptom-based screening may not be reliable in the setting of renal transplants or urinary diversion. Additionally, please use your clinical judgement in patients with severe sepsis/septic shock or with baseline cognitive or functional impairment with new functional decline or falls who are hemodynamically unstable without alternative etiology.*

*Urine culture alone is appropriate for febrile neutropenia and ASB screening for pregnancy or prior to urologic procedures.*

3

# Quarterly Percentage: Patients Treated for ASB Out of All Positive Urine Cultures – Day 2 or Later





# ASB Testing - Percent of Patients with ASB Out of All Positive Urine Cultures (Only hospitals not meeting measure)

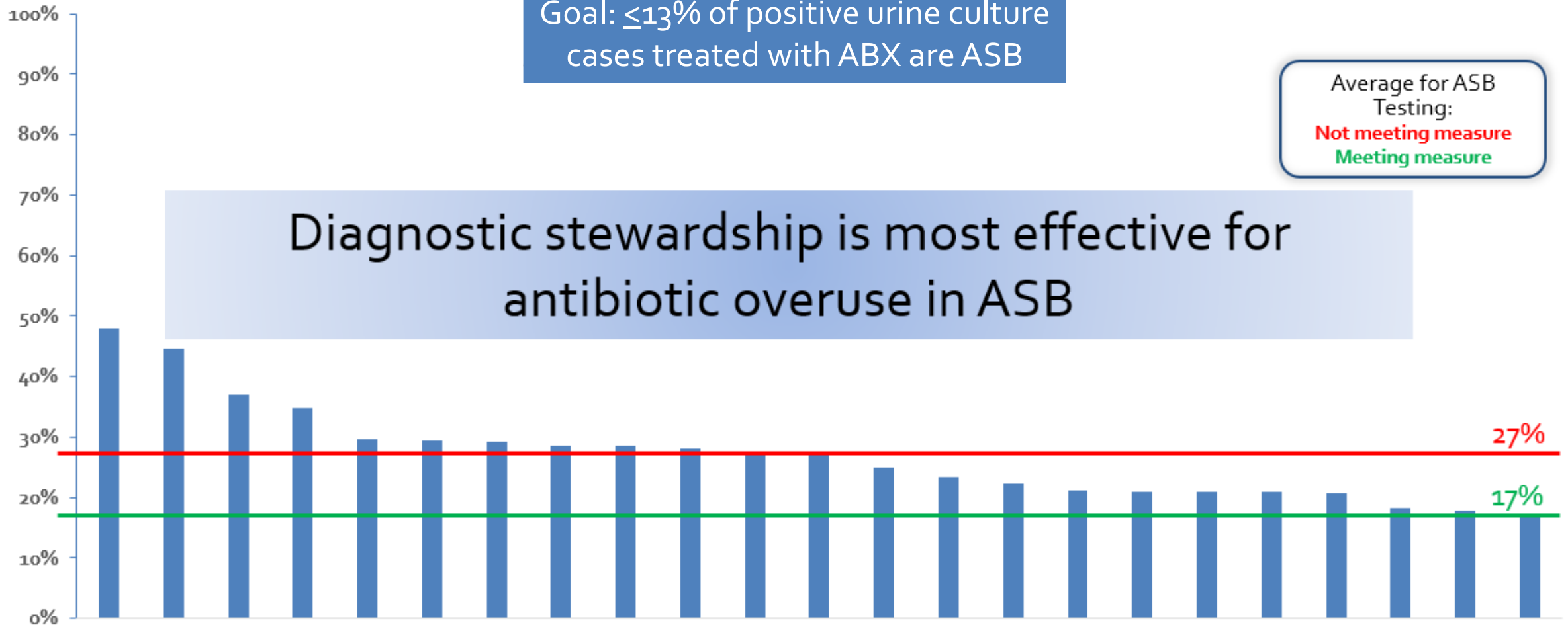
Q2 2024 - Adjusted



Goal:  $\leq 13\%$  of positive urine culture cases treated with ABX are ASB

Average for ASB Testing:  
**Not meeting measure**  
**Meeting measure**

Diagnostic stewardship is most effective for antibiotic overuse in ASB




Each bar equals 1 hospital



[A Statewide Quality Initiative to Reduce Unnecessary Antibiotic Treatment of Asymptomatic Bacteriuria](#)

# Improvement in ASB Testing: Diagnostic Stewardship

- Diagnostic stewardship intervention examples:
  - Require indications for urine culture testing
  - Implement best practice alerts to discourage ordering urine testing in the absence of signs or symptoms of UTI
  - Remove urine cultures for certain standard order sets
  - Do not automatically reflex UAs to urine cultures for abnormal findings when a urine culture was not specifically requested

 <p><b>Urine Testing</b></p> <p><b>Do NOT Send Urinalysis or Urine Culture</b> if none of these symptoms are present or there is an alternative cause for the symptom</p>	Signs & Symptoms without alternative cause
	Fever $>38^{\circ}$ C or rigors
	Urgency, frequency, dysuria
	Suprapubic pain or tenderness
	Costovertebral pain or tenderness
	New onset mental status changes with leukocytosis ( $>10,000$ cells/ $\text{mm}^3$ ), hypotension ( $<90$ mmHg Systolic), or $\geq 2$ SIRS criteria <sup>1</sup>
	Acute hematuria
	Spasticity or autonomic dysreflexia in patients with spinal cord injury

# Assessment of Testing and Treatment of Asymptomatic Bacteriuria Initiated in the Emergency Department

Lindsay A. Petty,<sup>1</sup> Valerie M. Vaughn,<sup>2</sup> Scott A. Flanders,<sup>3</sup> Twisha Patel,<sup>4</sup> Anurag N. Malani,<sup>5</sup> David Ratz,<sup>3</sup> Keith S. Kaye,<sup>1</sup> Jason M. Pogue,<sup>4</sup> Lisa E. Dumkow,<sup>6</sup> Rama Thyagarajan,<sup>7</sup> Lama M. Hsaiky,<sup>8</sup> Danielle Osterholzer,<sup>9</sup> Steven L. Kronick,<sup>10</sup> Elizabeth McLaughlin,<sup>3</sup> and Tejal N. Gandhi<sup>1</sup>

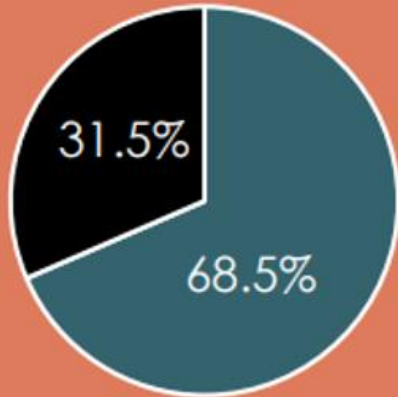
Among those treated:

↑ LOS

↑ C. difficile rates

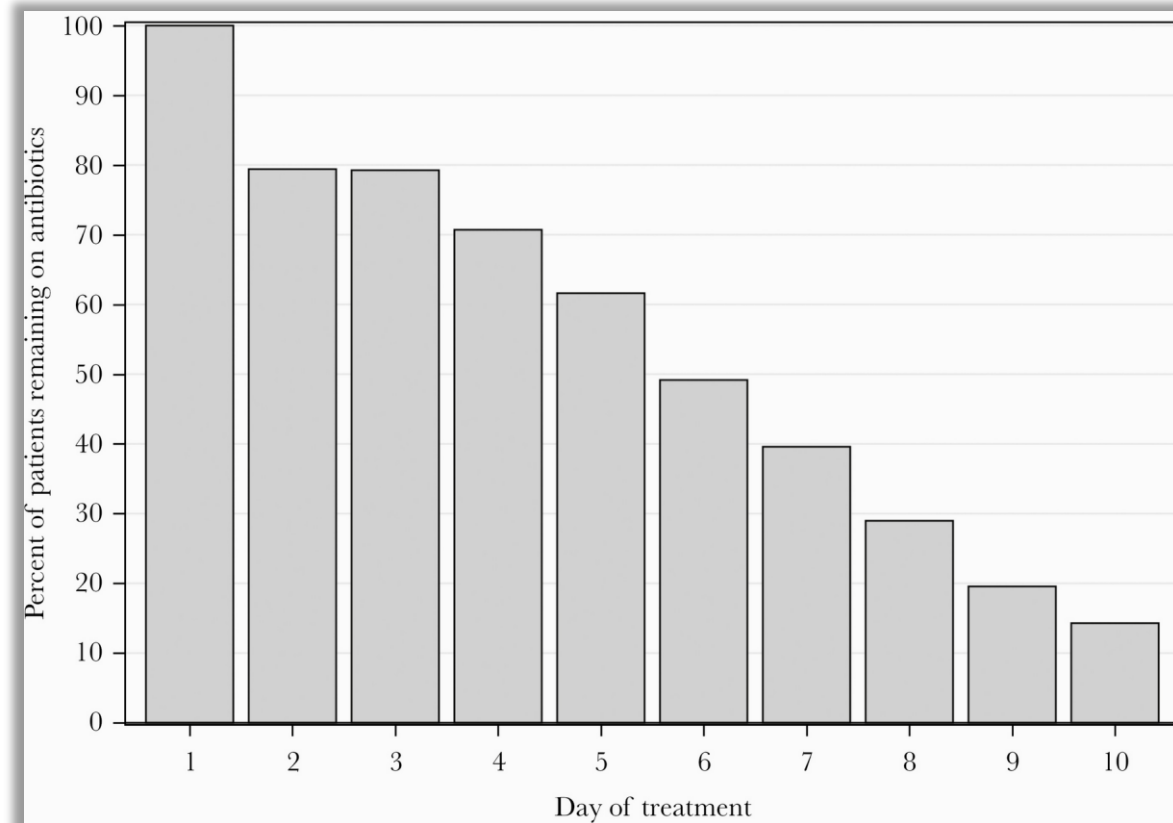


## Emergency Medicine Clinicians Initiated Most ASB ABX Treatment



- Others Initiated
- Emergency Medicine Initiated

**~80% of patients remained on ABX for at least 3 days**



## URINE CULTURE ORDERING CHECKLIST

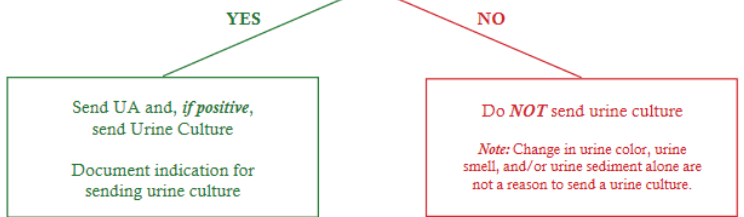
Asymptomatic bacteriuria is often treated unnecessarily, and accounts for a substantial burden of unnecessary antimicrobial use. Therefore, urine cultures should only be obtained on adult inpatients for appropriate reasons.

The following is an effective strategy for how and when to order a urinalysis and/or urine culture:

Does the patient have any of the following *without alternate explanation*?

- Urgency, frequency, dysuria
- Suprapubic pain or tenderness
- Costovertebral pain or tenderness
- New onset mental status changes with leukocytosis (WBC > 10,000 cells/mm<sup>3</sup>), hypotension (SBP < 90mmHg), or ≥ 2 SIRS criteria\*
- Fever > 38° C or Rigors
- Acute hematuria
- Increased spasticity or autonomic dysreflexia in a spinal cord injury patient

\*SIRS Criteria includes: temperature > 38.5°C or < 35°C, HR > 90 bpm, RR > 20 breaths per minute or PaCO<sub>2</sub> < 32 mmHg, abnormal WBC (> 12,000/μL or < 4,000/μL or > 10% immature [band] forms)



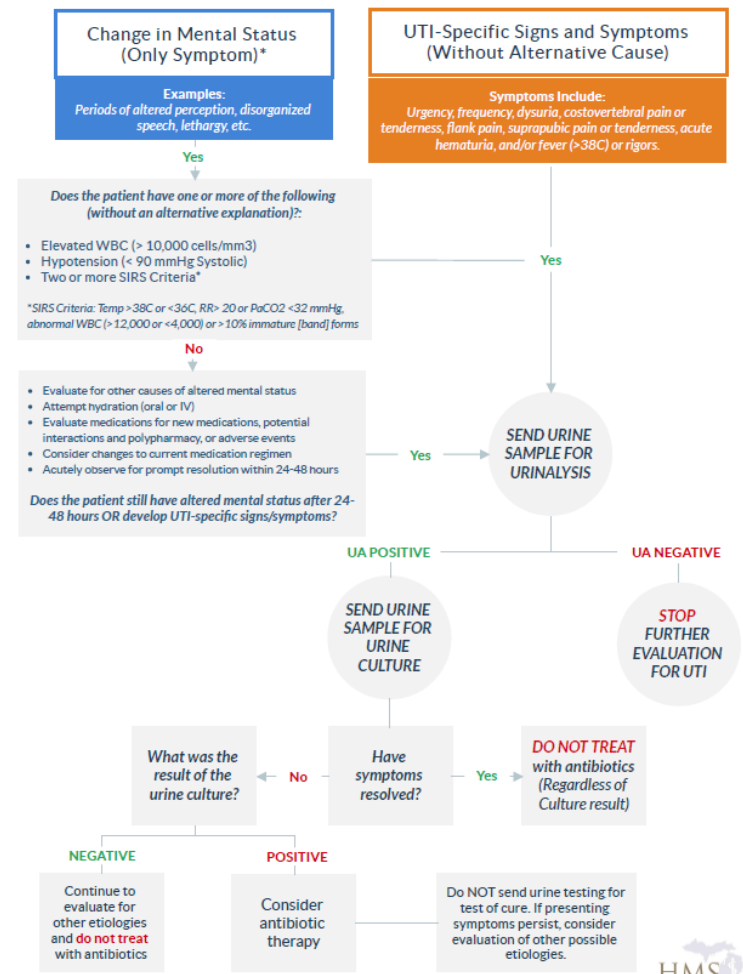
\*\*Symptom-based screening may not be reliable in the setting of renal transplants or urinary diversion. Additionally, please use your clinical judgement in patients with severe sepsis/septic shock or with baseline cognitive or functional impairment with new functional decline or falls who are hemodynamically unstable without alternative etiology.

Urine culture alone is appropriate for febrile neutropenia and ASB screening for pregnancy or prior to urologic procedures.



## ASSESSING FOR URINARY TRACT INFECTION IN ELDERLY INPATIENTS WITH ACUTELY ALTERED MENTAL STATUS (AMS)

Modeled based on Mody, L (2014) JAMA 311(8): 844-854. doi: 10.1001/jama.2014.303



\*Please use your clinical judgement in patients with baseline cognitive or functional impairment with new functional decline or falls who are hemodynamically unstable without alternative etiology.



# QI Tool: Urine Culture Order Set Example



## Clinical decision support in EHR

- System effort requiring “indication” for urine cultures
  - Implemented October 2018

A screenshot of an EHR interface for a 'Culture, Urine (Colony Count)' order set. The window has a blue header with the title and 'Accept' and 'Cancel' buttons. The main area contains several sections: 'Reference' with a link to '1. OHS Lab Test List'; 'Links' with a search icon; 'Priority' with buttons for 'Routine', 'STAT', 'Timed', and 'Add-On', where 'Routine' is selected; 'Frequency' with buttons for 'Once', 'Once in AM', and 'Once', where 'Once' is selected; 'Starting' with a date picker set to '2/27/2019' and buttons for 'Today' and 'Tomorrow', and a time field set to 'At: 0925'; 'First Occurrence' set to 'Today 0925'; 'Scheduled Times' with a 'Hide Schedule' link and a list showing '2/27/19 0925'; 'Specimen Type' with a dropdown menu showing 'Urine, clear'; and 'Indication' with a red exclamation mark icon and a grid of buttons for various clinical conditions: 'Dysuria', 'Increased Urinary Urgency', 'Increased Urinary Frequency', 'Suprapubic Pain/Tenderness', 'CVA Pain or Tenderness', 'Hematuria', 'Rigors', 'Fever', 'Altered Mental Status', 'Urological Surgery', 'Pregnancy', 'Spinal Injury/Increased Spasticity or Autonomic Dysreflexia', and 'Other (See Comments)'. There is also an empty text box to the right of the 'Indication' buttons.

Beaumont

# QI Tool: Urinary Tract Infection Order Set Example

## UTI ORDER SET EXAMPLE



### GEN ADULT Urinary Tract infection

**NOTE FOR UTI: \*\*\* Empiric therapy selection should take into account recent previous cultures\*\*\***

- **Asymptomatic bacteriuria:** In most circumstances, should not be treated, regardless of pyuria, bacterial density, or isolation of resistant organisms. Treatment is recommended in the following circumstance: pregnancy and prior to urologic procedures.
- **Uncomplicated cystitis:** Non- pregnant female without obstruction, catheters, flank pain, or co-morbid conditions except well-controlled diabetes mellitus.
- **Complicated Lower UTI WITHOUT Sepsis or Bacteremia:** Male, urinary catheter present or removal within the last 48 hrs, recent GU instrumentation, anatomic abnormality or obstruction, pregnancy or other significant co-morbid conditions such as uncontrolled diabetes or immunosuppression.

### Uncomplicated Cystitis (Single Response)

Nitrofurantoin is contraindicated if CrCl < 50mL/min. Due to the cost of fosfomycin, nitrofurantoin is preferred if not contraindicated. Adjust cephalexin and sulfamethoxazole-trimethoprim dose based on renal function

- PREFERRED: nitrofurantoin (MACROBID) capsule (Do NOT use if CrCl<50) 100 mg, Oral, 2 TIME DAILY for 5 Days
- PREFERRED: fosfomycin (MONUROL) packet 3 g, Oral, ONCE for 1 Doses, for 1 Doses
- ALTERNATIVE: cephalexin (KEFLEX) capsule 500 mg, Oral, EVERY 12 HOURS SCHEDULED for 7 Days
- ALTERNATIVE: sulfamethoxazole-trimethoprim DS (BACTIRM DS) tablet 1 tablet, Oral, EVERY 12 HOURS SCHEDULED for 3 Days

### Complicated Lower Urinary tract infection without Sepsis or Bacteremia (Single Response)

#### Treatment duration:

**Non-Catheter Associated:** depends on patient characteristic and clinical response, 7 days usually appropriate

**Catheter Associated:**

- Prompt resolution of symptoms: 7 days
- Delayed response to therapy: 10-14 days
- Women <65 y/o without upper tract symptoms after catheter removal: 3 days

Adjust cephalexin, sulfamethoxazole-trimethoprim, cefazolin, aztreonam, and piperacillin-tazobactam dose based on renal function

#### Oral Regimens (Single Response)

- PREFERRED: nitrofurantoin (MACROBID) capsule (Do NOT use if CrCl<50) 100 mg, Oral, 2 TIME DAILY for 5 Days
- PREFERRED: fosfomycin (MONUROL) packet 3 g, Oral, ONCE for 1 Doses, for 1 Doses
- ALTERNATIVE: cephalexin (KEFLEX) capsule 500 mg, Oral, EVERY 12 HOURS SCHEDULED for 7 Days
- ALTERNATIVE: (if susceptibility confirmed) sulfamethoxazole-trimethoprim DS (BACTIRM DS) tablet 1 tablet, Oral, EVERY 12 HOURS SCHEDULED for 3 Days

#### IV options if patients cannot take PO medications (Single Response)

- PREFERRED: cefazolin (ANCEF) IV 1 g, Intravenous, EVERY 8 HOURS SCHEDULED
- ALTERNATIVE (In patients with anaphylactic PCN/Cephalosporin allergy): aztreonam (AZCTAM) IV 1 g, Intravenous, EVERY 8 HOURS SCHEDULED

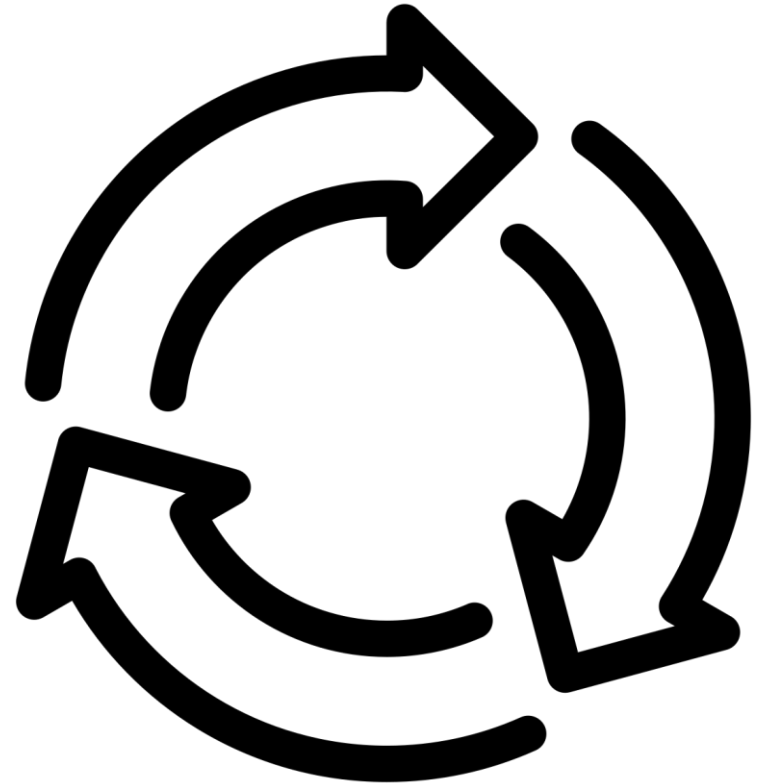
#### History of resistant Gram-negative bacteria OR Not responding to PO antibiotics (Single Response)

- PREFERRED: piperacillin-tazobactam (ZOSYN) IV 4.5 g, Intravenous, EVERY 8 HOURS SCHEDULED
- ALTERNATIVE (In patients with anaphylactic PCN/Cephalosporin allergy): aztreonam (AZCTAM) IV 1 g, Intravenous, EVERY 8 HOURS SCHEDULED



## Summary

Targeted antibiotic stewardship practices can improve antibiotic use, leading to improved patient care and decreased antimicrobial resistance





# Questions/Open Discussion

# Thank You!



Please feel free to contact me with any additional questions:  
[pearlmat@med.umich.edu](mailto:pearlmat@med.umich.edu)

- [HMS Website:](#)



- [Antimicrobial Use Toolkit](#)