

# HQIC Community of Practice Call

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## The Core Elements of Antibiotic Stewardship: National Updates and Promising Practices

November 9, 2023

# Introduction

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Welcome!

**Shaterra Smith**

Social Science Research Analyst  
Division of Quality Improvement Innovation Models Testing  
iQuality Improvement and Innovations Group  
Center for Clinical Standards and Quality  
Centers for Medicare & Medicaid Services

# Agenda

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- Introduction
- Today's topic: **The Core Elements of Antibiotic Stewardship: National Updates and Promising Practices**
- Presenters:
  - **Centers for Disease Control & Prevention (CDC)**
    - Arjun Srinivasan, MD
  - **University of Utah School of Medicine**
    - Valerie Vaughn, MD, MSc
  - **MyMichigan Health**
    - Robert Neetz, PharmD, BCPS
- Open discussion
- Closing remarks

## As You Listen, Ponder...

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- What impactful actions can you take as a result of the information shared today?
- How are you able to increase engagement within your facilities to ensure a true change in patient safety?
- Based on what you heard today, what activities do you currently have underway that can leverage immediate action over the next 30, 60 or 90 days?

# Meet Your Speakers



**Arjun Srinivasan, MD**

CAPT USPHS  
Deputy Director for Program Improvement  
Division of Healthcare Quality Promotion  
Centers for Disease Control & Prevention



**Valerie Vaughn, MD MSc**

Assistant Professor & Director of Hospital  
Medicine Research  
University of Utah School of Medicine  
Hospitalist Lead – Antimicrobial Use  
Initiative Michigan Hospital Medicine  
Safety Consortium



**Robert Neetz, PharmD BCPS**

Lead Antimicrobial Stewardship  
Clinical Pharmacist  
MyMichigan Health

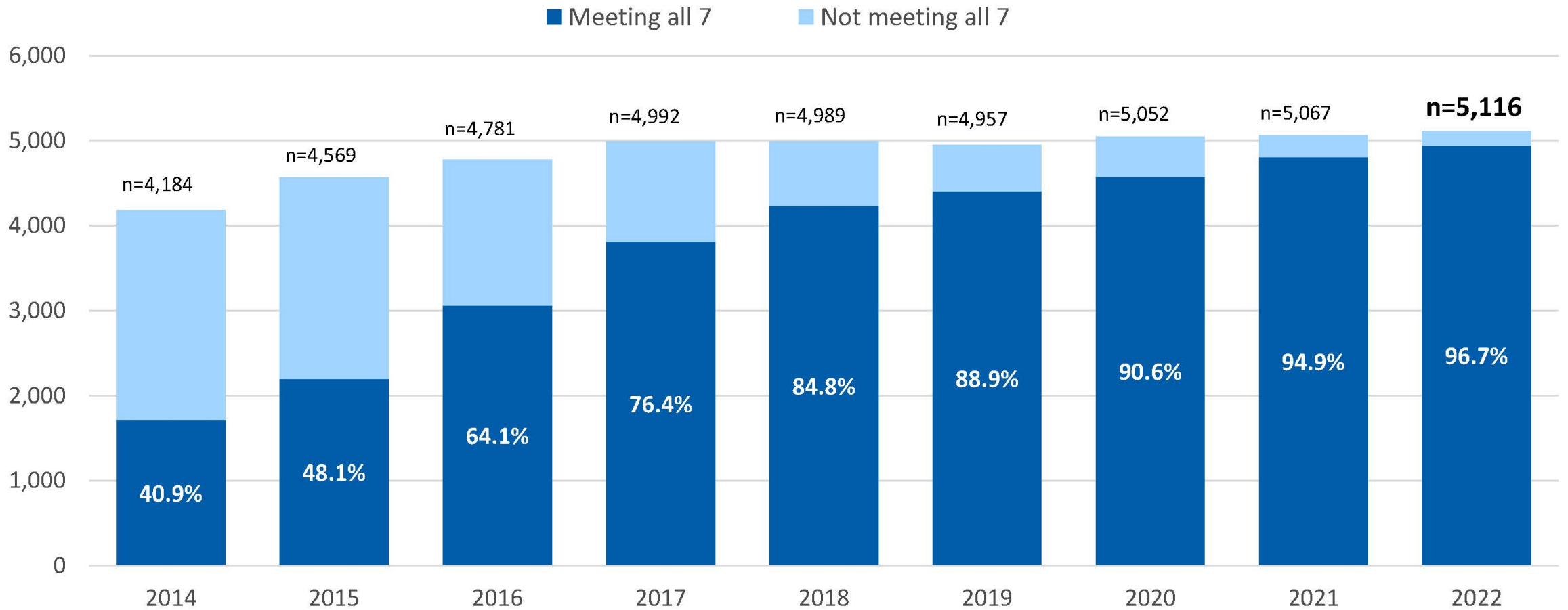
# **CDC- Hospital Antibiotic Stewardship Updates**

**Arjun Srinivasan, MD**

**Deputy Director for Program Improvement  
Division of Healthcare Quality Promotion**



# NHSN Annual Hospital Surveys 2014-2022: Number and percentage of hospitals meeting all 7 Core Elements



# Percentage of hospitals meeting all 7 Core Elements, 2014-2022, by hospital characteristic

Characteristic	2014	2015	2016	2017	2018	2019	2020	2021	2022
<b>Overall</b>	40.9%	48.1%	64.1%	76.4%	84.8%	88.9%	90.6%	94.9%	96.7%
<b>Facility Type</b>									
Children's hospital	50.0%	53.2%	73.9%	86.0%	91.9%	90.5%	92.2%	98.0%	97.3%
General acute care hospital	44.6%	53.1%	69.5%	81.9%	88.5%	92.0%	93.2%	97.0%	98.1%
Surgical hospital	33.6%	45.4%	58.1%	77.3%	79.9%	87.7%	87.2%	91.7%	94.5%
Critical access hospital	19.6%	26.3%	43.0%	57.8%	73.2%	79.5%	82.7%	88.9%	92.9%
<b>Bed Size</b>									
≤50 beds	23.6%	31.1%	46.0%	61.4%	75.4%	81.8%	84.9%	90.4%	93.6%
51 - 200 beds	40.4%	49.6%	69.0%	82.5%	88.6%	91.6%	92.5%	97.1%	98.7%
>200 beds	58.4%	66.1%	81.5%	90.7%	93.9%	96.2%	97.1%	99.5%	99.6%
<b>Teaching Status</b>									
Major teaching	55.4%	63.4%	76.3%	86.4%	91.0%	93.8%	95.0%	97.7%	98.5%
Non-teaching/undergrad	35.6%	42.4%	58.5%	71.4%	81.1%	85.7%	87.6%	92.9%	95.3%



# Priorities for Hospital Core Element Implementation



## Hospital Leadership Commitment

Antibiotic stewardship physician and/or pharmacist leader(s) have antibiotic stewardship responsibilities in their contract, job description, or performance review.



## Accountability

Antibiotic stewardship program (ASP) is co-led by a physician and pharmacist.\*



## Stewardship/Pharmacy Expertise

Antibiotic stewardship physician and/or pharmacist leader(s) have completed infectious diseases specialty training, a certificate program, or other training on antibiotic stewardship.



## Action

Antibiotic stewardship program has facility-specific treatment recommendations for common clinical condition(s) and performs prospective audit/feedback or preauthorization.



## Tracking

Hospital submits antibiotic use data to the NHSN Antimicrobial Use Option.



## Reporting

Antibiotic use reports are provided at least annually to target feedback to prescribers. In addition, the ASP monitors adherence to facility-specific treatment recommendations for at least one common clinical condition.

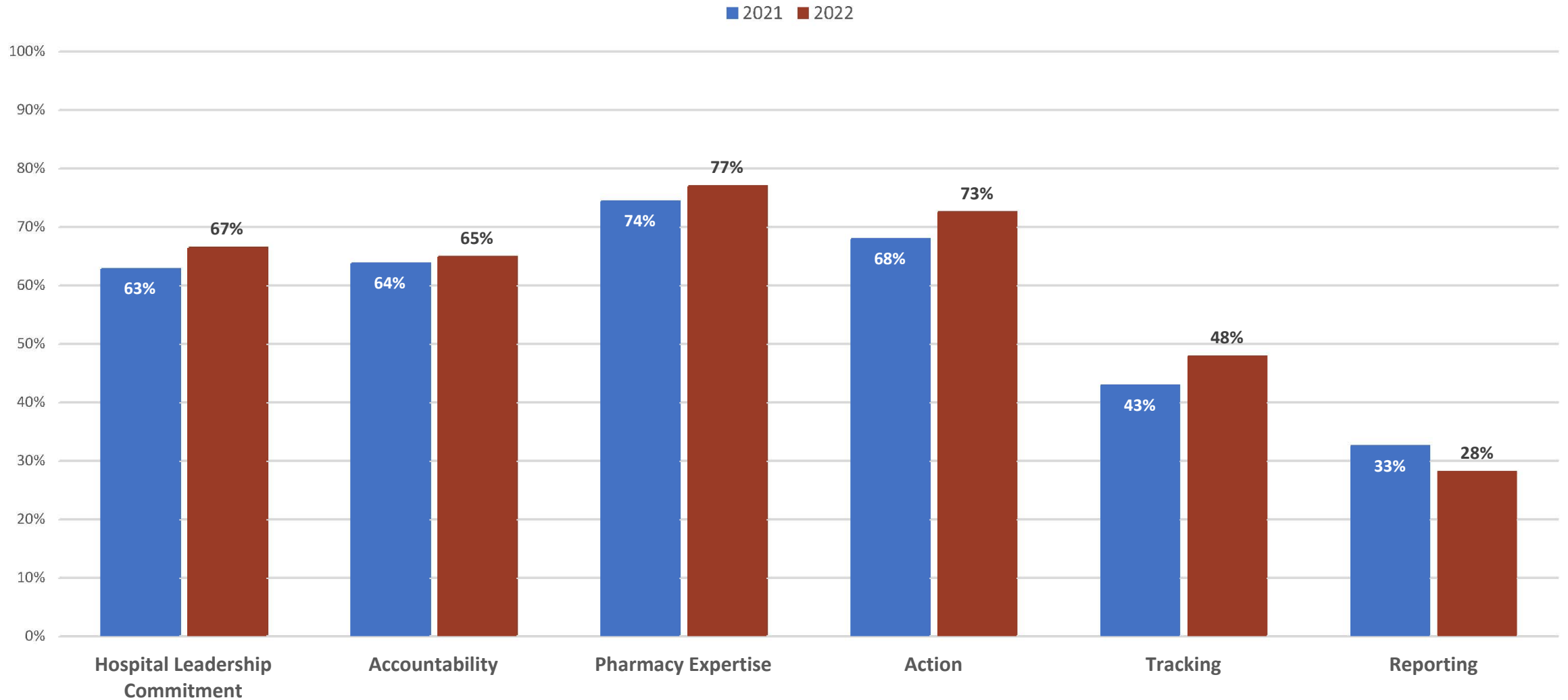


## Education

No implementation priority identified.

\*For critical access hospitals (CAHs), this criterion can be met if the hospital has a physician leader with a pharmacist involved in stewardship (recognizing that some CAHs do not have pharmacists on staff, so co-leadership is not possible).

# Percentage of facilities meeting each Priority for Hospital Core Element Implementation, 2021-2022



# Antimicrobial Use Resistance (AUR) Module data are required in CY 2024

- Beginning in **CY 2024**, AUR Module data are required under the Public Health and Clinical Data Exchange Objective of the CMS PI Program
- Applies to eligible hospitals and critical access hospitals that participate in the CMS PI Program
- **Measure includes submission of both AU and AR Option data**
- For CY 2024 facilities attest to either:
  - Being in active engagement with NHSN to submit AUR data or,
  - Claim an applicable exclusion

<https://www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms>



# Two ways to be in active engagement with NHSN

- Option 1 – Pre-production and validation
  - Registration within NHSN
  - Testing & validation of the CDA files
- Option 2 – Validated data production
  - Submitting production AU & AR files to NHSN
    - CY 2023 – 90 continuous days of AUR data submission
    - CY 2024 – 180 continuous days of AUR data submission
- **Note:** Beginning in CY 2024, facilities can only spend one calendar year in Option 1 (pre-production and validation)

## Three exclusions currently

1. Does not have any **patients** in any patient care location for which data are collected by NHSN during the EHR reporting period; or
2. Does not have **electronic medication administration records (eMAR)/barcoded medication administration (BCMA)** records or an **electronic admission discharge transfer (ADT)** system during the EHR reporting period; or
3. Does not have an **electronic laboratory information system (LIS)** or **electronic ADT** system during the EHR reporting period.

# AUR Data Are NOT Shared With CMS

- CDC/NHSN does not provide any data to CMS for this reporting measure
  - Goal of CMS PI Program is to increase interoperable healthcare data exchange
- Reimbursement is not impacted by SAAR values or AR data.
- Facilities must attest to CMS that they are in active engagement with NHSN
  - Attest within the CMS Hospital Quality Reporting (HQR) system:  
<https://hqr.cms.gov/hqrng/login>
- **NHSN provides documentation to facilities to use as proof**

# Assessing Correlation of Antibiotic Use and Resistance

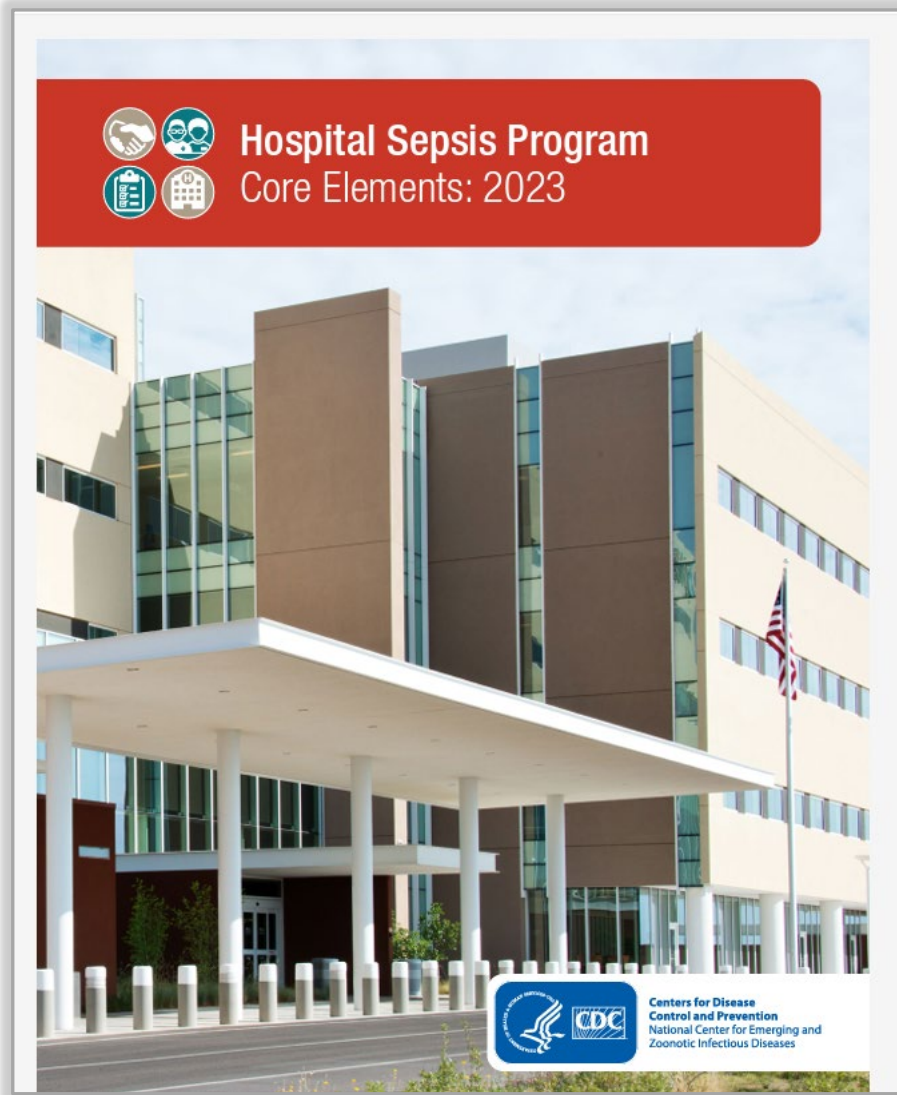
- Correlations between antibiotic use and resistance can be informative for potential opportunities to improve use.
- Are there hospitals where use of some agents is much higher than what we would expect given resistance patterns?
  - E.g., a hospital using a lot of ceftazidime-avibactam, but with very little CRE
- Are there hospitals where use of some agents is much lower than what we would expect given resistance patterns?

# Impact of Improving Antibiotic Use on Resistant Pathogens- Why This Matters to Our Patients

- Implications of reducing antibiotic treatment duration for antimicrobial resistance in hospital settings: A modelling study and meta-analysis
- Both the mathematical modelling and meta-analysis suggested modest reductions in resistance carriage could be achieved by reducing antibiotic treatment duration.
- The meta-analysis determined that a single additional antibiotic treatment day is associated with a 7% absolute increase in risk of resistance carriage (80% credible interval 3% to 11%).

<https://doi.org/10.1371/journal.pmed.1004013>





<https://www.cdc.gov/sepsis/pdfs/sepsis-core-elements-H.pdf>

<https://www.cdc.gov/sepsis/core-elements.html>

## Hospital Sepsis Program Core Elements



### Hospital Leadership Commitment

Dedicating the necessary human, financial, and information technology resources.



### Accountability

Appointing a leader or co-leaders responsible for program goals and outcomes.



### Multi-Professional Expertise

Engaging key partners throughout the hospital and healthcare system.



### Action

Implementing structures and processes to improve the identification of, management of, and recovery from sepsis.



### Tracking

Measuring sepsis epidemiology, management, and outcomes to assess the impact of sepsis initiatives and progress toward program goals.



### Reporting

Providing information on sepsis management and outcomes to relevant partners.



### Education

Providing sepsis education to healthcare professionals, patients, and family/caregivers.

## NEW CDC DATA

In a typical year, 1 in 3 people who dies in a hospital had sepsis during that hospitalization.

**But half of U.S. hospitals provide dedicated time for sepsis program leaders.\***

*\*2022 survey of 5,000+ hospitals*



## U.S. HOSPITAL SEPSIS PROGRAM DATA, 2022



of hospitals have a sepsis committee



of hospitals provide dedicated time for sepsis program leaders



of sepsis committees involve Antibiotic Stewardship Programs

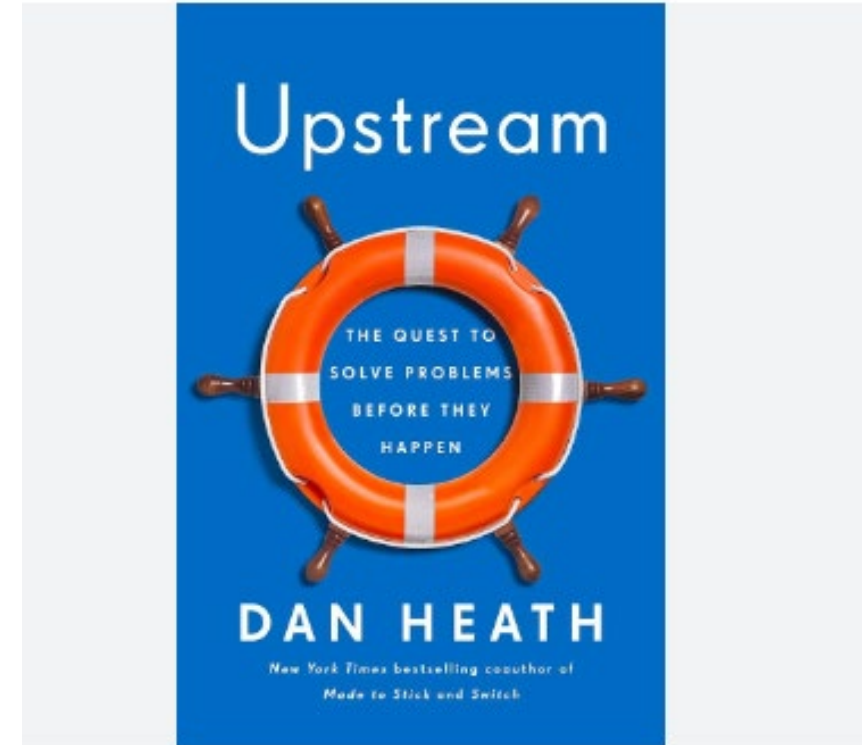
Find resources on how to optimize sepsis programs:  
<https://bit.ly/SepsisCoreElements>

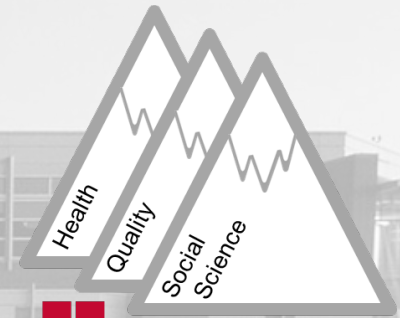
# Antibiotic Stewardship and Sepsis- Better Together

- We need to advocate for sepsis efforts to connect with stewardship programs.
- We can help each other optimize therapy to ensure that patients with sepsis get the right antibiotics quickly and that they don't get exposed to antibiotics they don't need.
- Unnecessary antibiotic exposure can worsen outcomes in patients with sepsis- increased risks for C. diff, renal toxicity, etc.
- 100% of sepsis committees should involve antibiotic stewardship programs!

# Diagnostic Excellence and Antibiotic Stewardship

- There is huge enthusiasm and support right now to focus on diagnoses (“diagnostic stewardship”, “diagnostic excellence”).
- We should take advantage of that- and help people see that we’ve already been doing it in our antibiotic stewardship work!





# Reducing Unnecessary Antibiotic Treatment for Asymptomatic Bacteriuria: Diagnostic vs. Antibiotic Stewardship

**U**QuAL

Valerie Vaughn, MD MSc

Director of Hospital Medicine Research, University of Utah

Hospitalist Lead, Antimicrobial Use Initiative, Michigan Hospital Medicine Safety Consortium



**Disclosures:** Work Supported by BCBSM, AHRQ, CDC, Gordon and Betty Moore Foundation

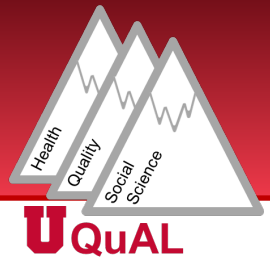
Deputy Editor, TJC Quality and Patient Safety



@ValerieVaughnMD

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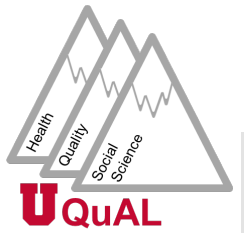
# Background



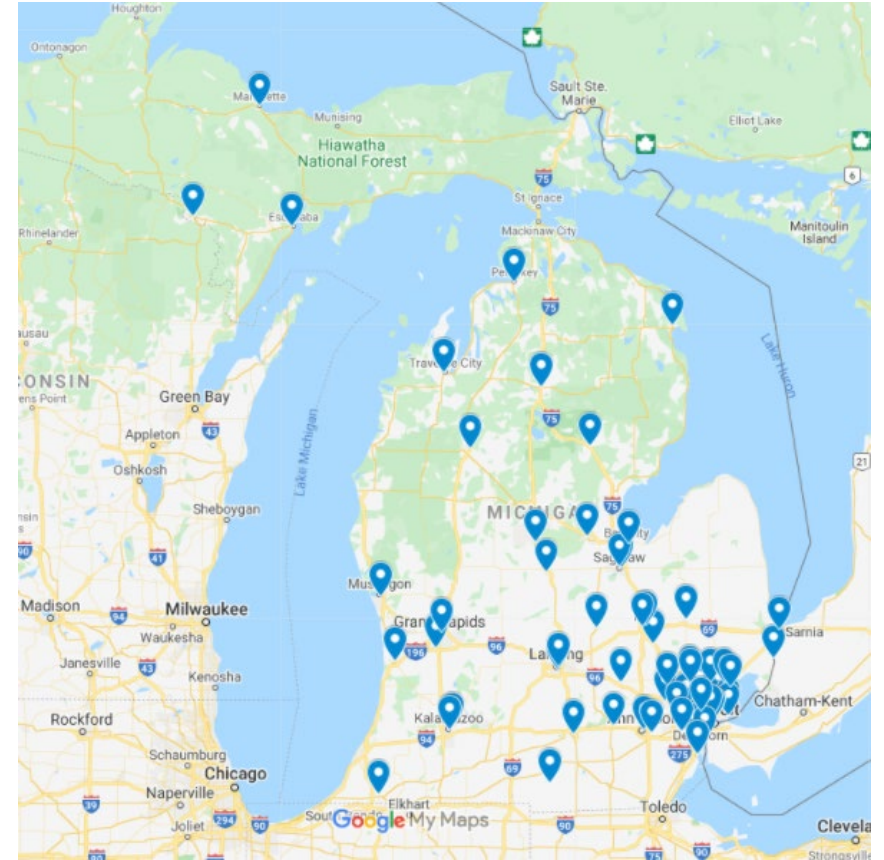
- Asymptomatic bacteriuria
  - Common in hospitalized patients
  - Antibiotic treatment does NOT improve outcomes
  - Antibiotic treatment DOES increase risk of antibiotic side effects, resistance, and for hospitalized patients → increases LOS
- Despite national guidelines recommending against treatment
  - Up to 80% of hospitalized patients with Asymptomatic Bacteriuria receive antibiotics

Nicolle et al. *Clin Infect Dis* 2019;  
Petty et al. *JAMA IM* 2019;  
Harding et al. *N Engl J Med* 2002

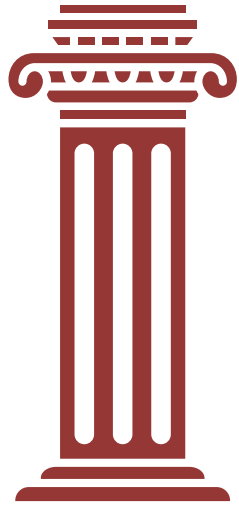
# Michigan Hospital Medicine Safety Consortium



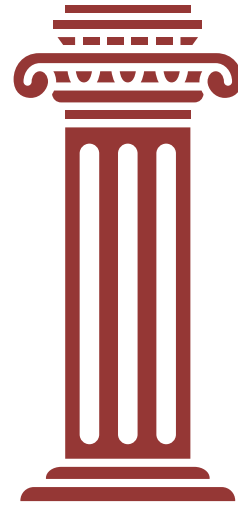
- Consortium of 69 hospitals (and growing) from around the state of Michigan
  - Our analyses based on 46 hospitals that participated from July 2017 – March 2020
- Supported by Blue Cross and Blue Shield of Michigan
  - Data abstraction (chart review)
  - Tri-annual meetings
  - Pay for performance



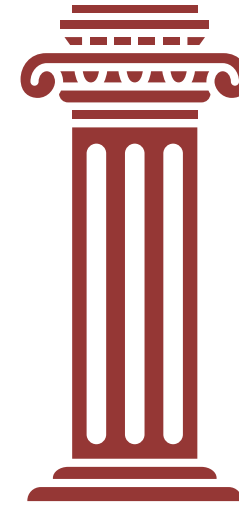
# 3 Pillars of Improvement



Data for  
Benchmarking



Sharing Best  
Practices



Pay-for-  
Performance



Did HMS successfully reduce Asymptomatic Bacteriuria treatment?

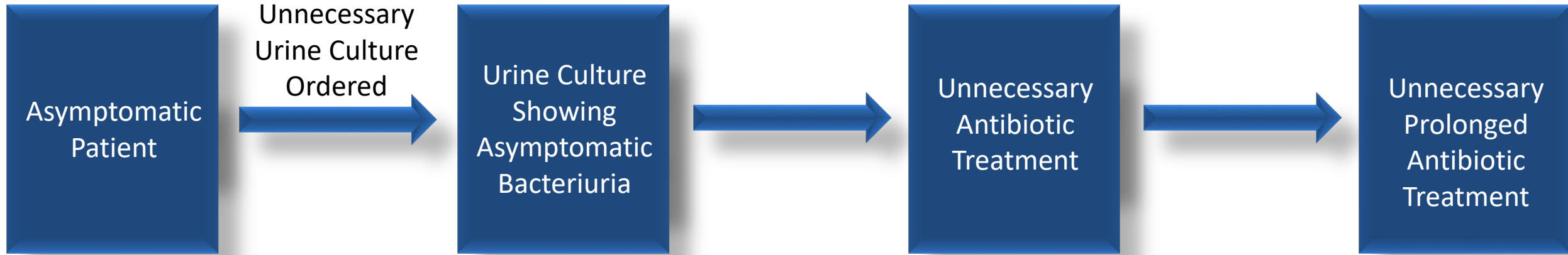
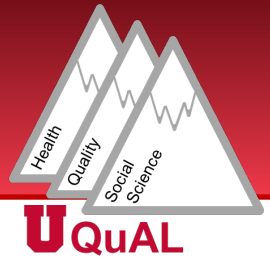
- If so, was it diagnostic vs. antibiotic stewardship that did it?

# The Pathway to Antibiotic Overuse in Hospitalized Patients with Asymptomatic Bacteriuria

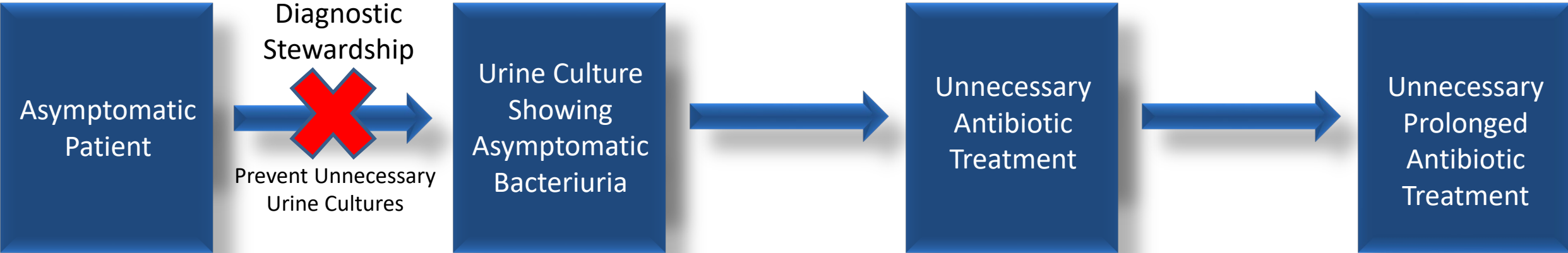
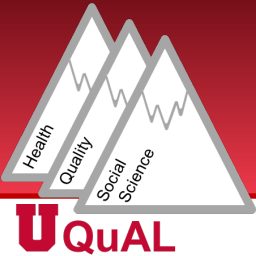


Asymptomatic  
Patient

# The Pathway to Antibiotic Overuse in Hospitalized Patients with Asymptomatic Bacteriuria

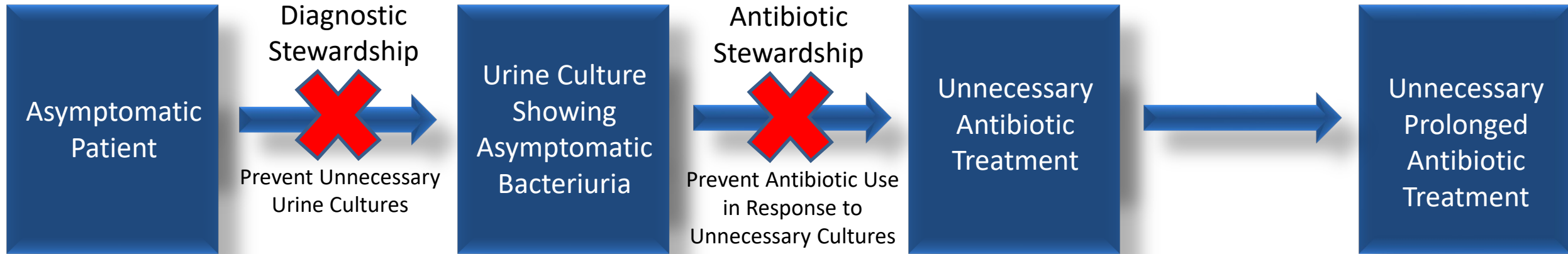
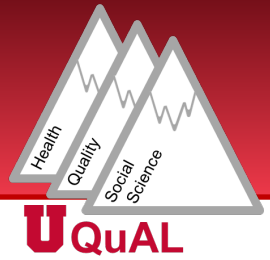


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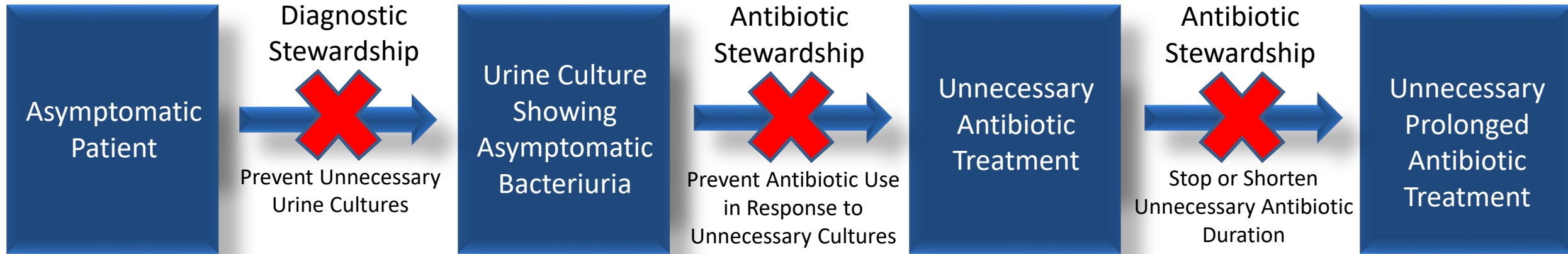
Morgan et al. *JAMA* 2017  
Advani et al. *Curr Infect Dis Rep* 2021

# The Pathway to Antibiotic Overuse in Hospitalized Patients with Asymptomatic Bacteriuria



Morgan et al. *JAMA* 2017  
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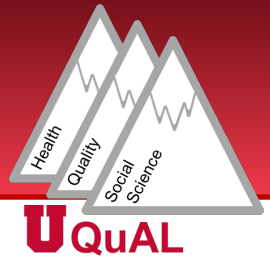
# The Pathway to Antibiotic Overuse in Hospitalized Patients with Asymptomatic Bacteriuria



\*Oversimplification as some diagnostic stewardship or antibiotic stewardship interventions target multiple steps in the pathway

Morgan et al. *JAMA* 2017  
Advani et al. *Curr Infect Dis Rep* 2021

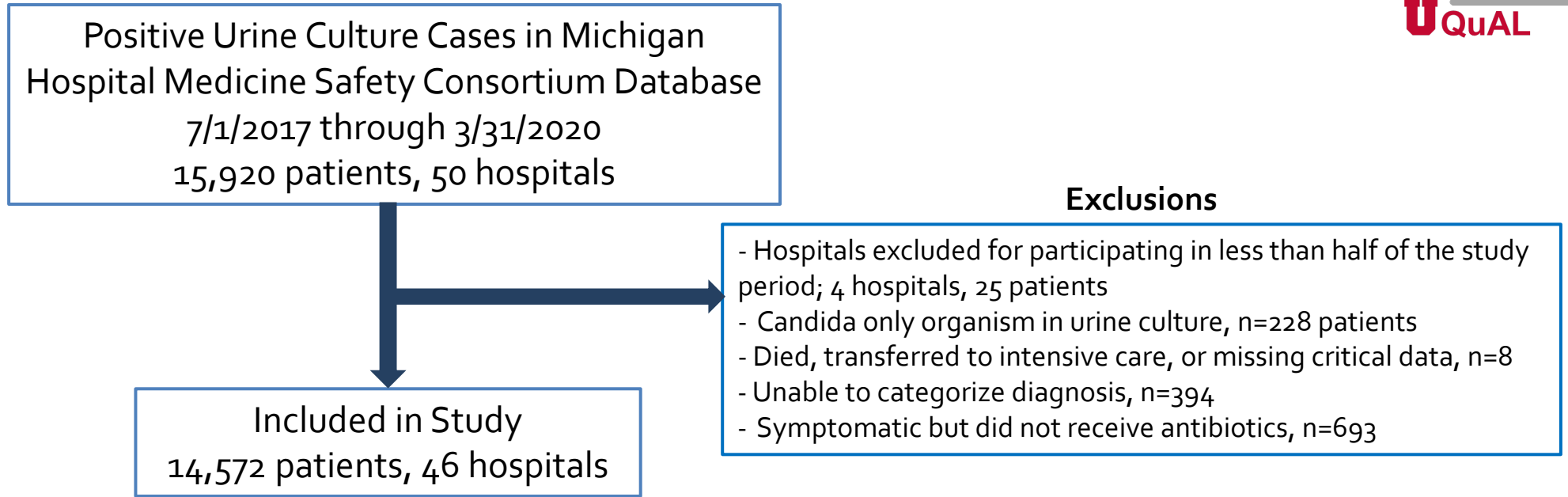
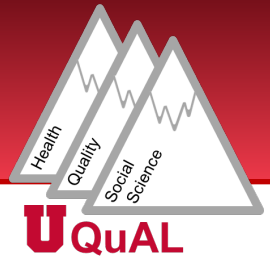
# Did HMS successfully reduce Asymptomatic Bacteriuria treatment?



## Outcomes

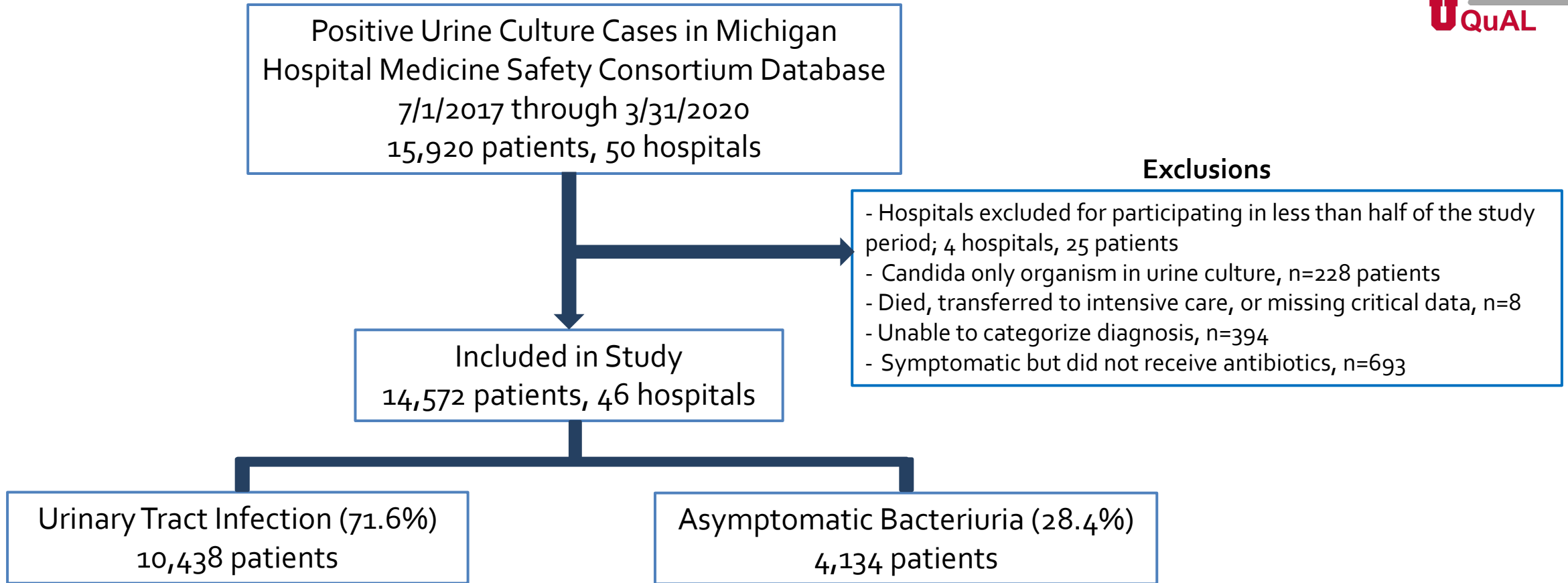
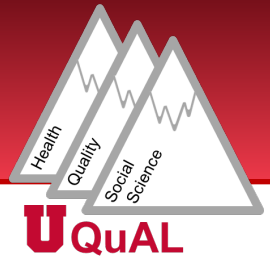
- Overall: % of patients treated for a urinary tract infection that actually had asymptomatic bacteriuria
  - (lower is better)
  - NQF endorsed metric (#3690) <https://mi-hms.org/inappropriate-diagnosis-urinary-tract-infection-uti-hospitalized-medical-patients>
- Diagnostic stewardship: % of urine cultures that were asymptomatic bacteriuria
- Antibiotic stewardship
  - % of asymptomatic bacteriuria treated with antibiotics
  - Antibiotic duration for asymptomatic bacteriuria

# Study Flow Diagram

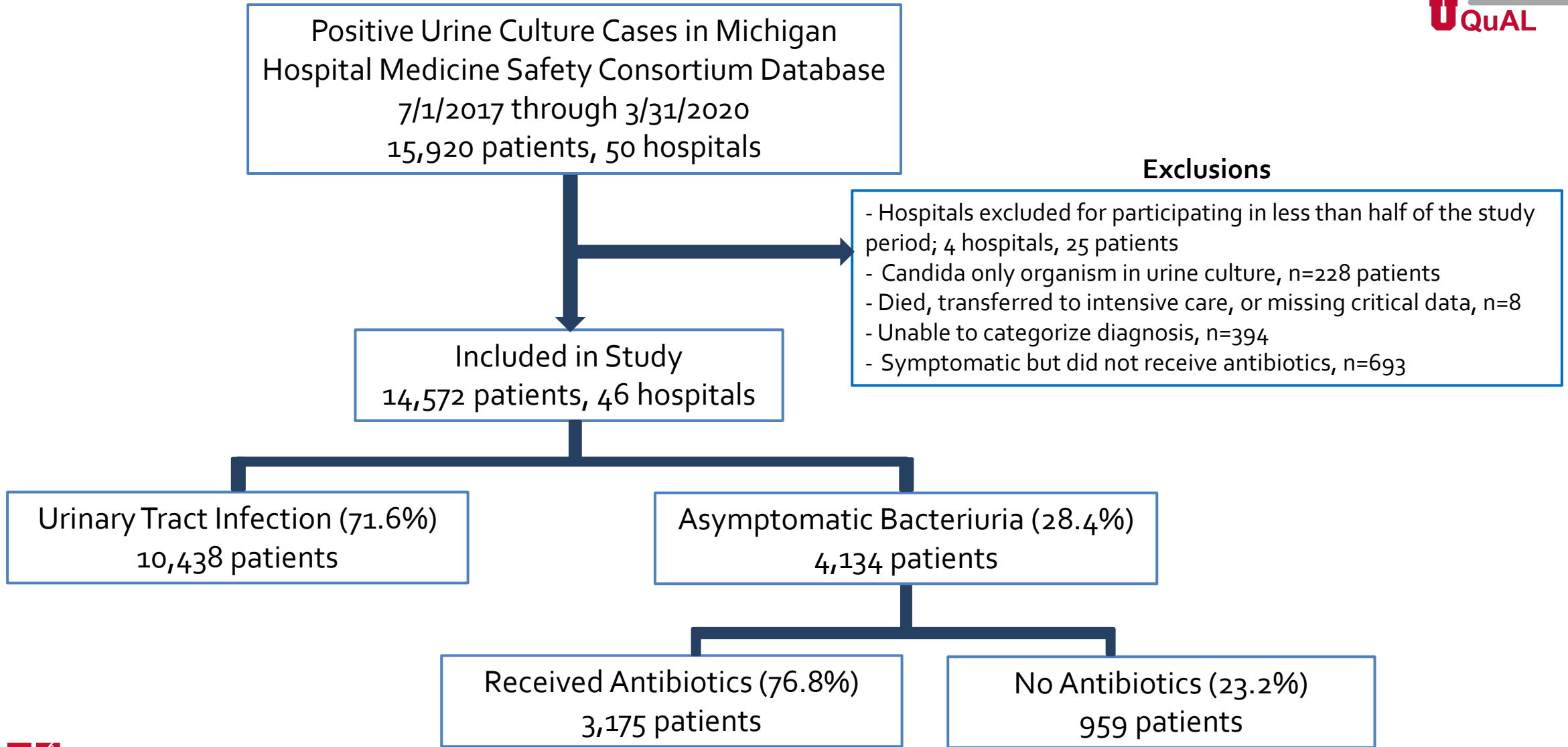




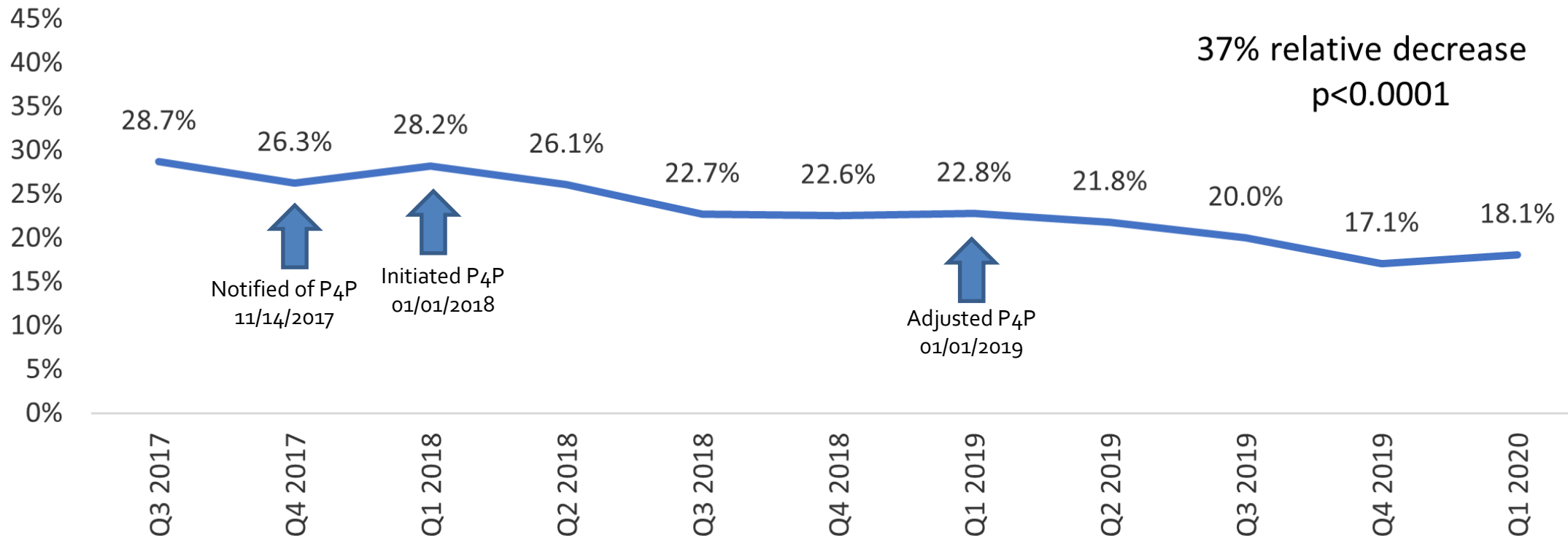
# Study Flow Diagram



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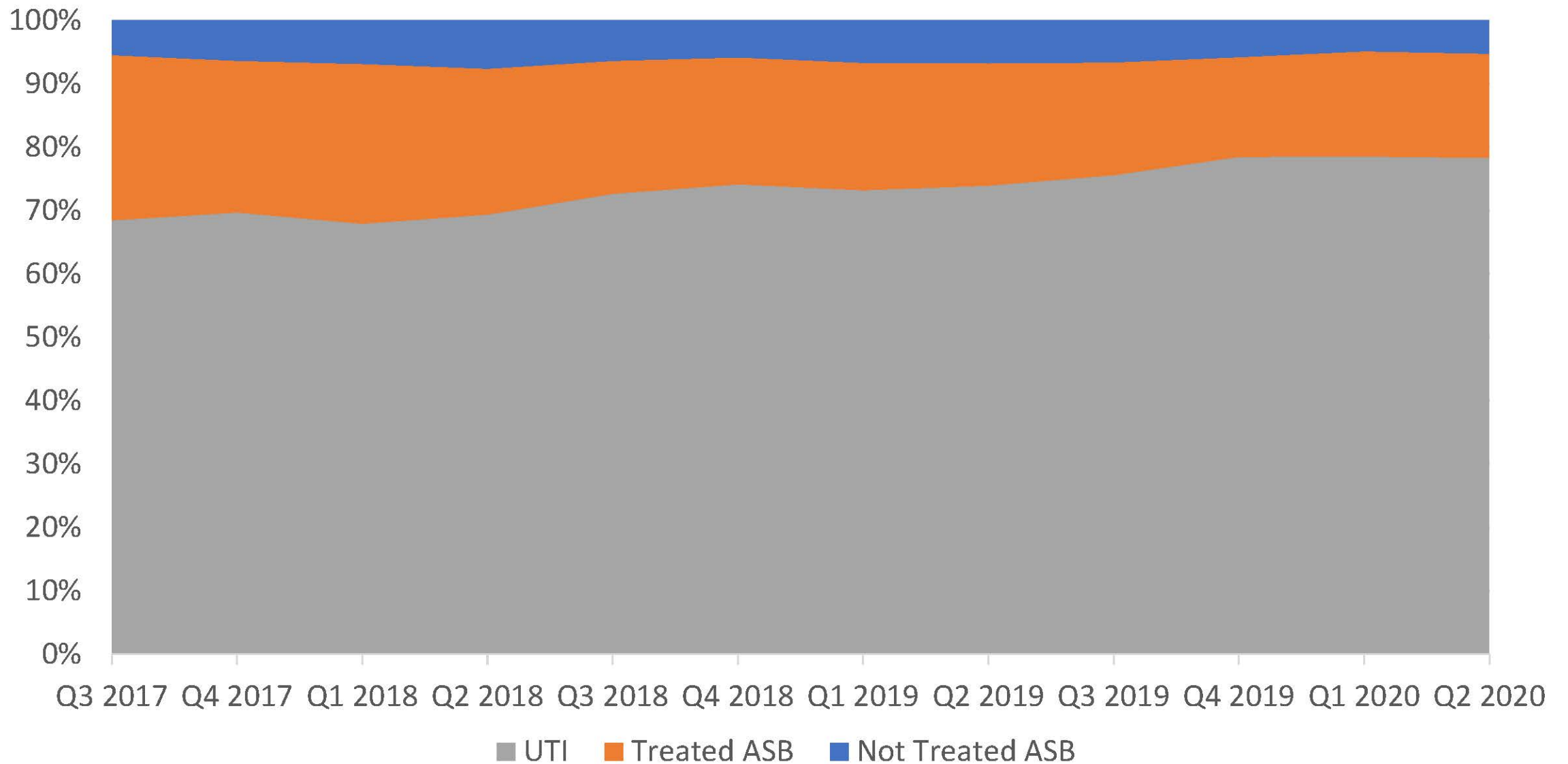


# Percentage of patients treated for a UTI who actually had ASB, over time



NQF endorsed metric (#3690)- <https://mi-hms.org/inappropriate-diagnosis-urinary-tract-infection-uti-hospitalized-medical-patients>

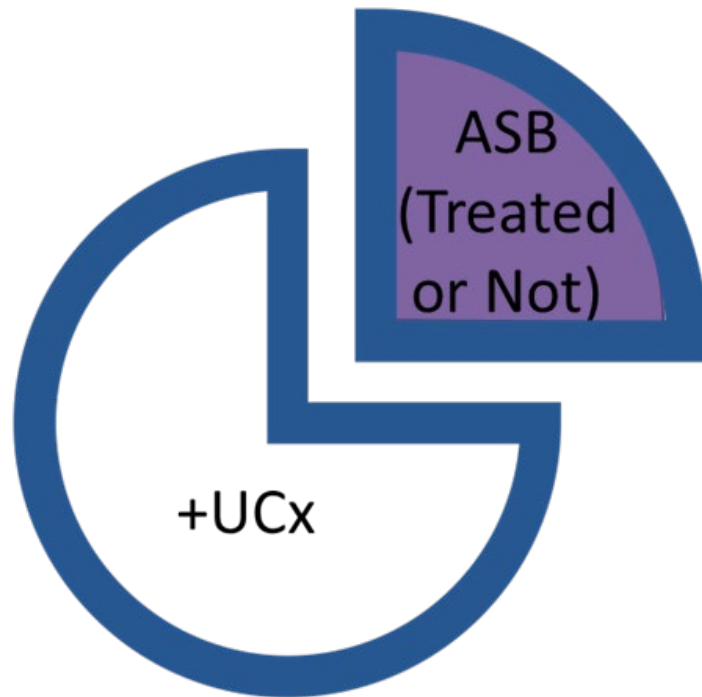
# Breakdown of Patient Categories Over Time, N=14,572 patients in 46 hospitals



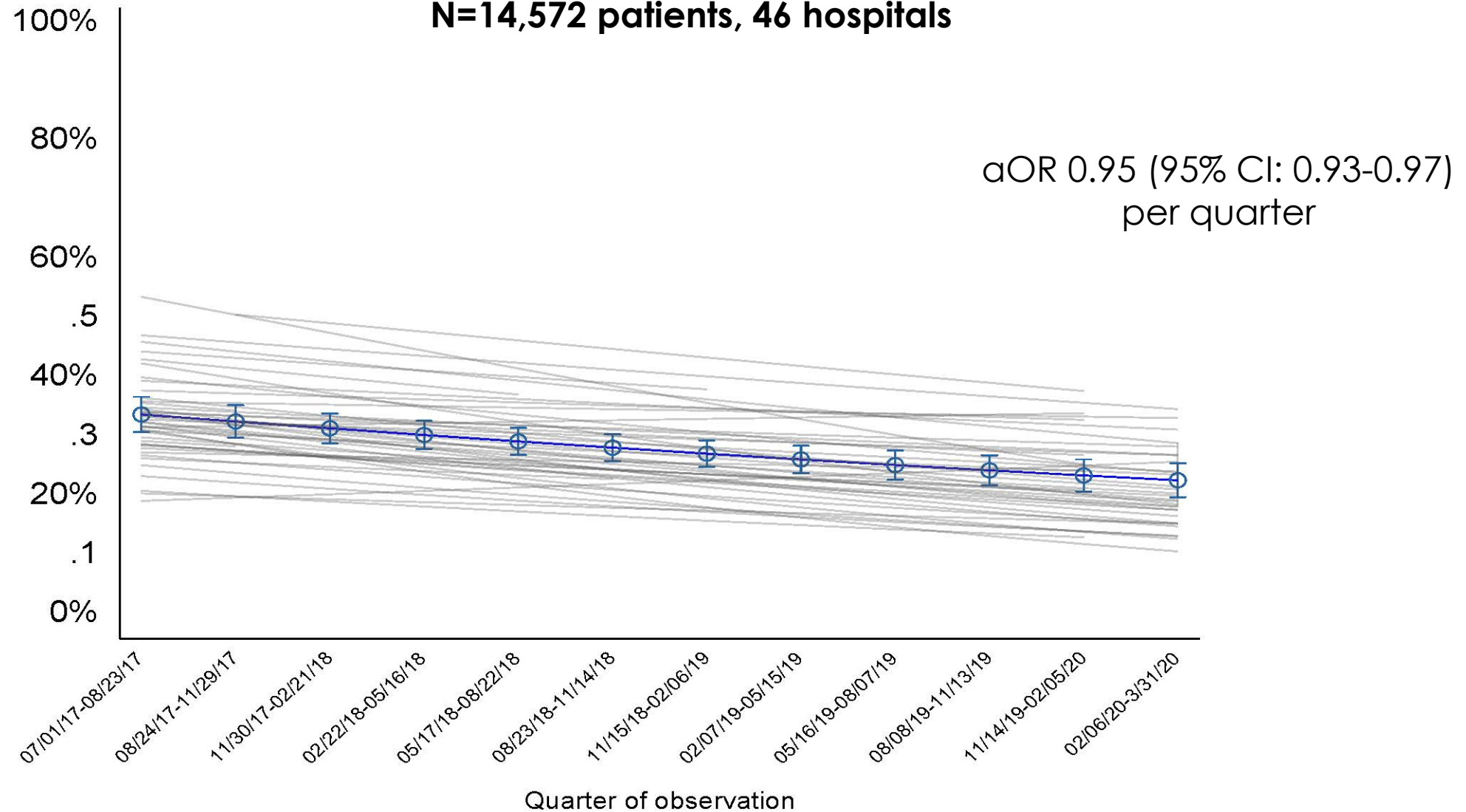
# Diagnostic vs. Antibiotic Stewardship



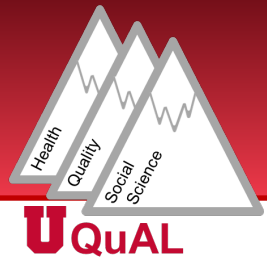
## Diagnostic Stewardship



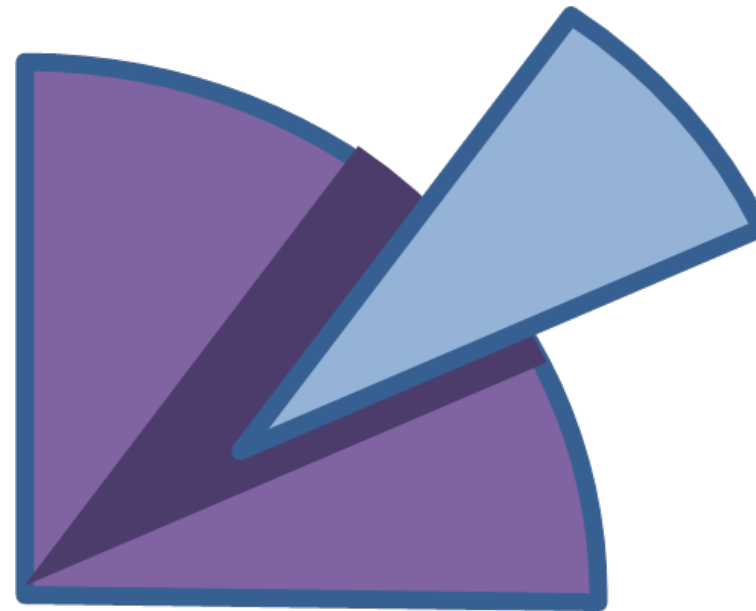
# Percent of Patients with a Positive Urine Culture who Had Asymptomatic Bacteriuria Over Time (Predicted Probability Over Time) N=14,572 patients, 46 hospitals



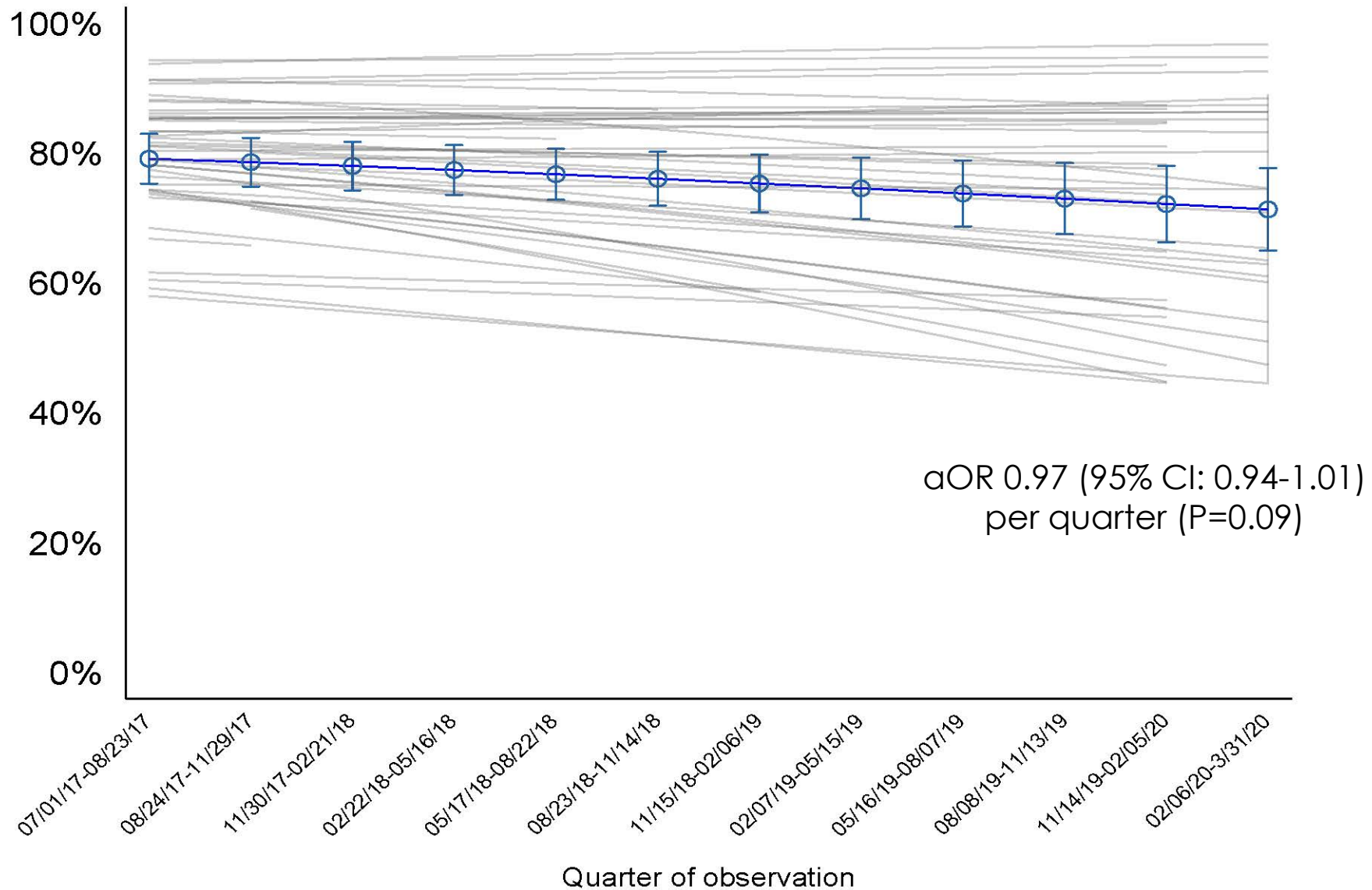
# Diagnostic vs. Antibiotic Stewardship



Antibiotic Stewardship

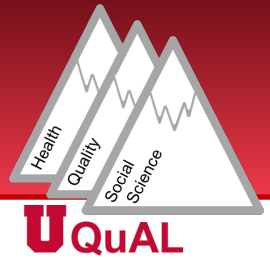


# Percent of Patients with Asymptomatic Bacteriuria who were Treated with Antibiotics (Predicted Probability Over Time) N=4,134 patients, 46 hospitals





# Asymptomatic Bacteriuria Treatment Duration



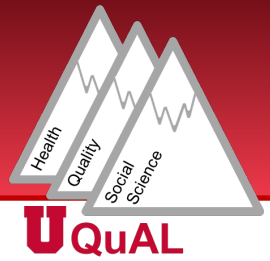
- In patients with asymptomatic bacteriuria who received antibiotic therapy
  - Median (IQR) duration of therapy was 6 (4-8) days
    - Median at discharge = 2 (0-5) days
  - 84.3% received  $\geq 3$  days
- After adjusting for hospital clustering
  - Mean duration decreased only slightly—if at all
    - 6.38 days (95% CI: 6.00, 6.78) to 5.93 (95% CI: 5.56, 6.35)
  - aRR 0.99 per quarter (95% CI: 0.99-1.00, p=0.045)

# Summary

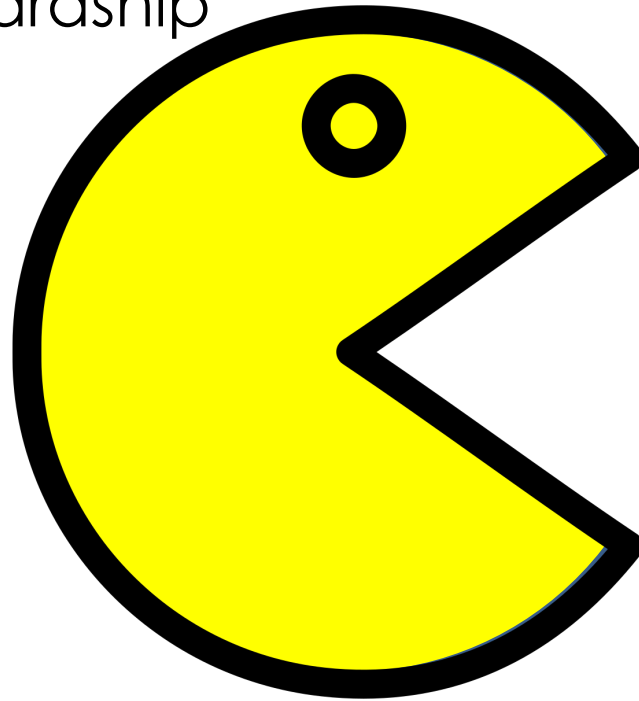


- Over time, HMS resulted in reduced treatment of asymptomatic bacteriuria
  - Percent of patients treated for a UTI that actually had asymptomatic bacteriuria decreased by  $\sim 1/3$
- Reduction driven by diagnostic stewardship
  - % of + urine cultures that were asymptomatic bacteriuria significantly decreased
  - % of asymptomatic bacteriuria that was treated with antibiotics did NOT decrease
  - Asymptomatic bacteriuria duration marginally decreased ( $<-.5$  days/3 years)

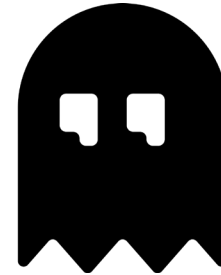
# Conclusion



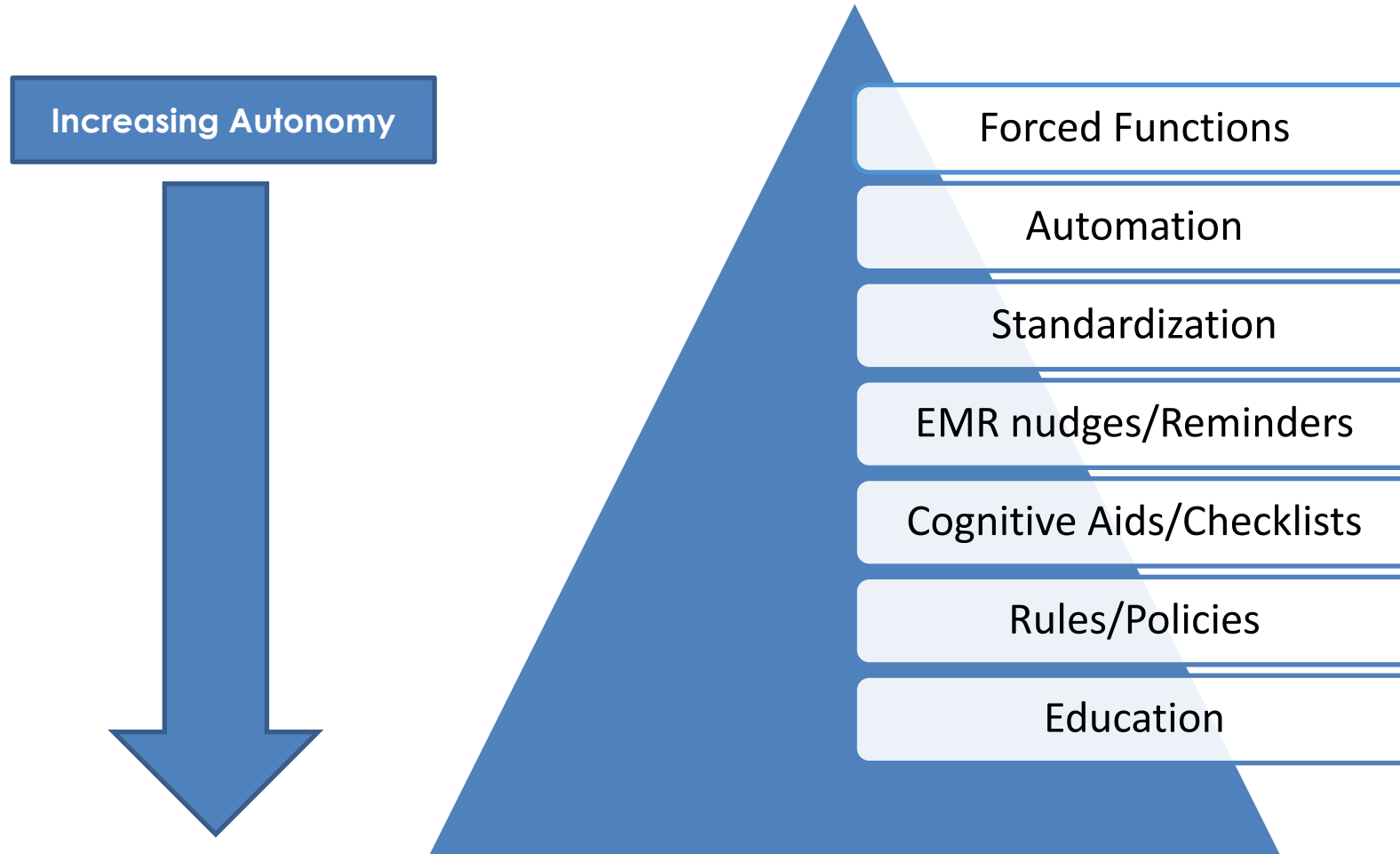
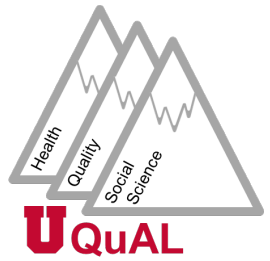
Diagnostic  
Stewardship



Antibiotic  
Stewardship

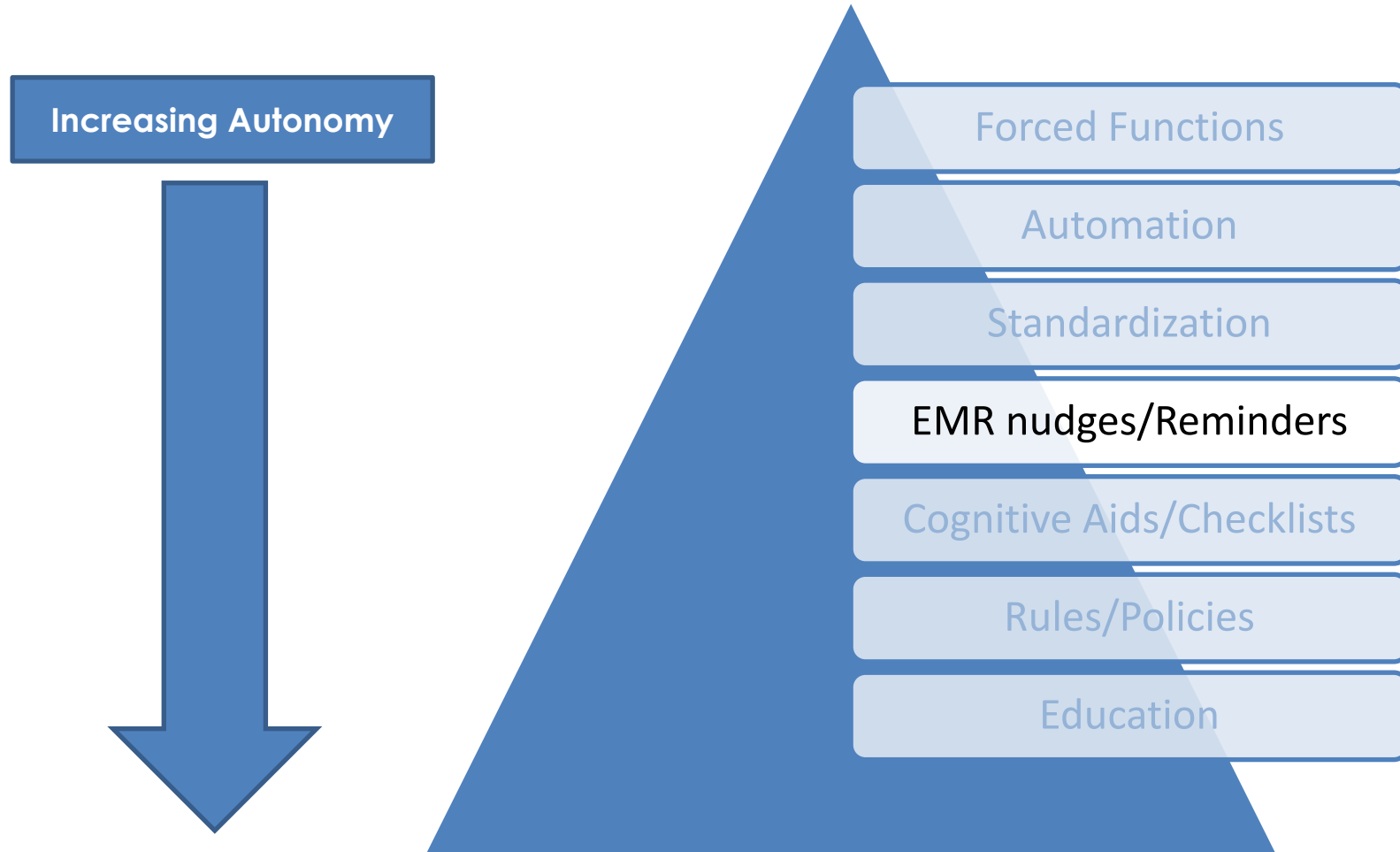
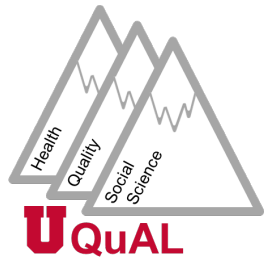


# Now that we've said that... how do you do diagnostic stewardship?



Advani S, Vaughn VM. "Quality Improvement Interventions and Implementation Strategies for Urine Culture Stewardship in the Acute Care Setting: Advances and Challenges." *Curr Infect Dis Report*. Oct 2021.

# Now that we've said that... how do you do diagnostic stewardship?



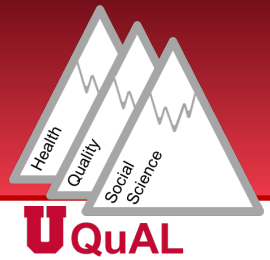
Advani S, Vaughn VM. "Quality Improvement Interventions and Implementation Strategies for Urine Culture Stewardship in the Acute Care Setting: Advances and Challenges." *Curr Infect Dis Report*. Oct 2021.

# Nudges



- Allow autonomy but are automatic once you get them done...
  - Orderset hygiene →
    - Remove urine cultures from admission, ED, pre-surgical ordersets
  - Suppressing urine culture results in certain scenarios (e.g., reflex testing)
  - Make ordering inappropriate urine cultures more difficult
    - Have UA as an option on main screen
    - Make UA with reflex or Urine Culture require more clicks
  - Frame urine test results →
    - “positive urine cultures in hospitalized patients often represent asymptomatic bacteriuria, only treat if patient has symptoms”

# ED initiative

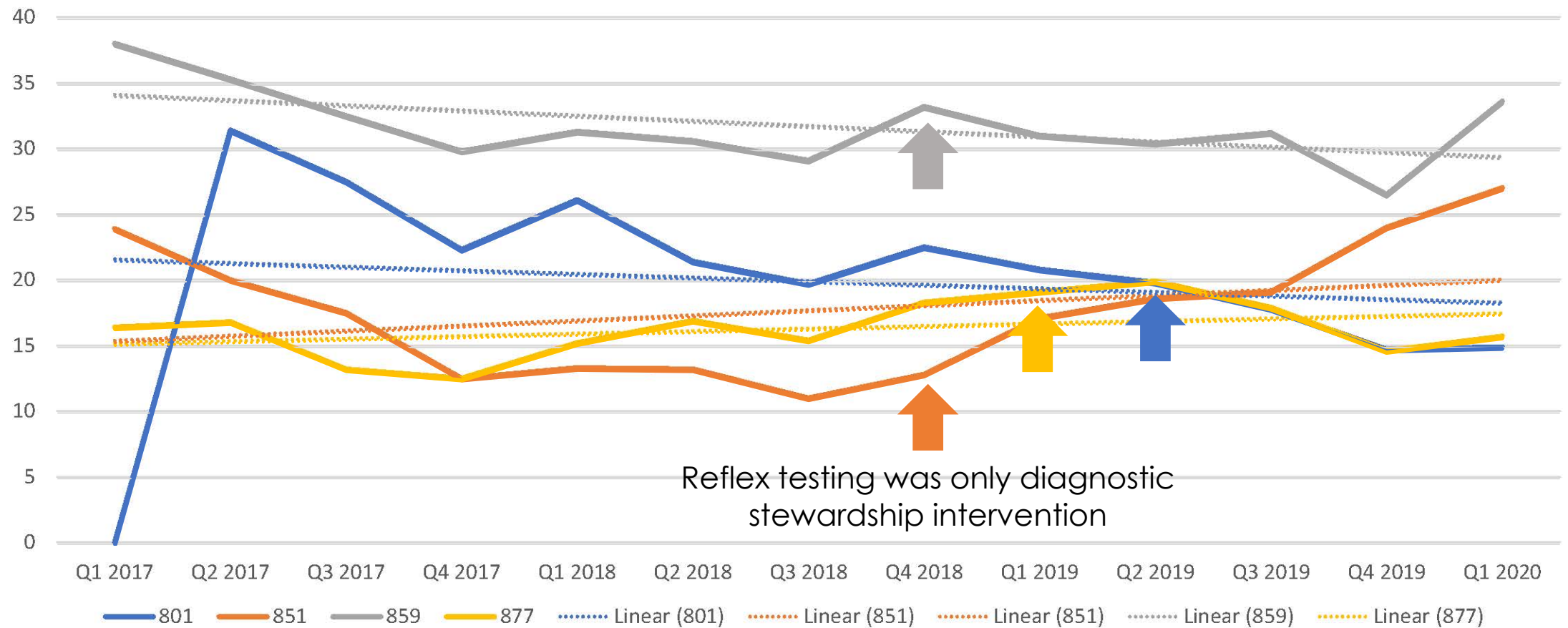


- Education
  - Easy(ish), but likely less effective
- Use data to figure out who is responsible
  - Maybe there's a single clinician to give feedback to
- Two step process
  - Nurse can get urine, but to run it you need a clinical order

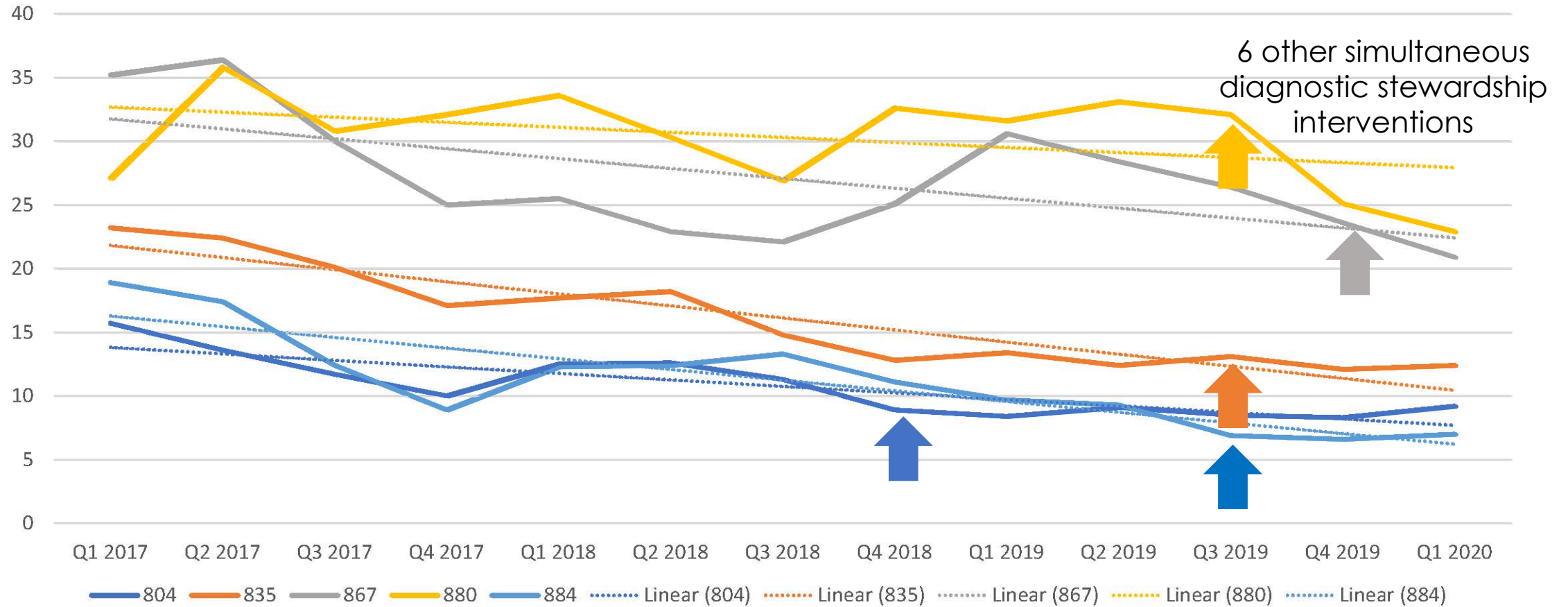
# What about reflex testing?



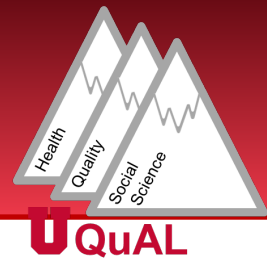
# Hospitals Adding Reflex Testing



# Hospitals Removed Reflex Testing

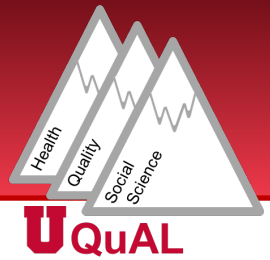


# Conclusion



- Diagnostic stewardship (preventing inappropriate urine cultures) works better than trying to reduce treatment after urine culture obtained

# Final Tips & Tricks for Diagnostic Stewardship



- Find out how urine cultures are ordered
  - May need to do orderset hygiene
  - May need to create new clinical pathways (2-step cultures)
- Find out who orders urine cultures
  - Likely the ED, but could be others (or maybe a single provider)
- Talk to micro
  - See what diagnostic stewardship they're already doing (they may not call it this)
  - Brainstorm additional possibilities

# Experience from a Community Health System

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Clinical Pharmacist – Antimicrobial Stewardship

MyMichigan Health, Midland, Michigan



# About MyMichigan Health System

- Seven hospitals across mid-east/northeast Michigan
  - Alma – 97 beds (Meds to Beds pharmacy)
  - Alpena – 139 beds (Meds to Beds pharmacy)
  - Clare – 49 beds
  - Gladwin – 25 beds
  - Midland – 324 beds (Meds to Beds pharmacy)
  - Sault St. Marie – 49 beds
  - West Branch – 86 beds

# Asymptomatic bacteriuria (ASB) – Diagnostic Stewardship



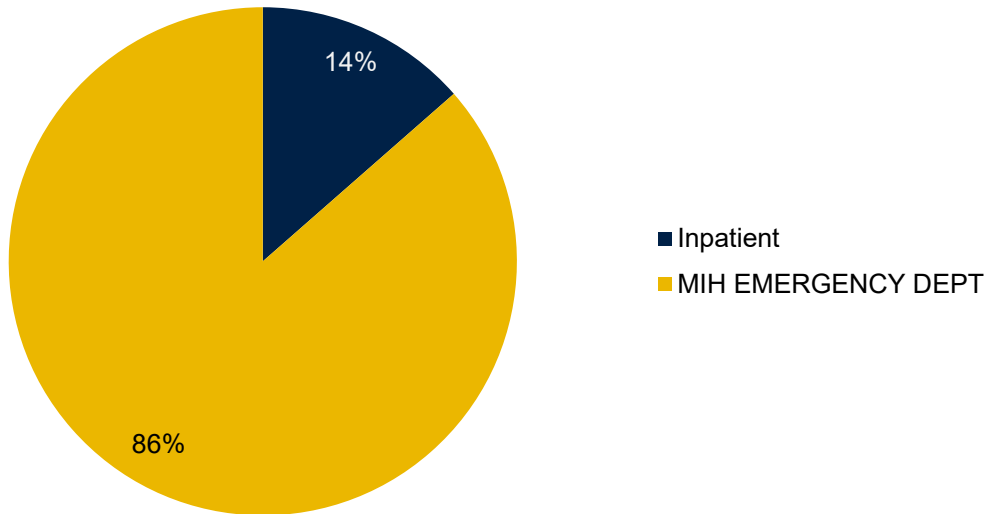
# Where to Start?

- Data
- Education – short term success?
- EMR changes – long term success?

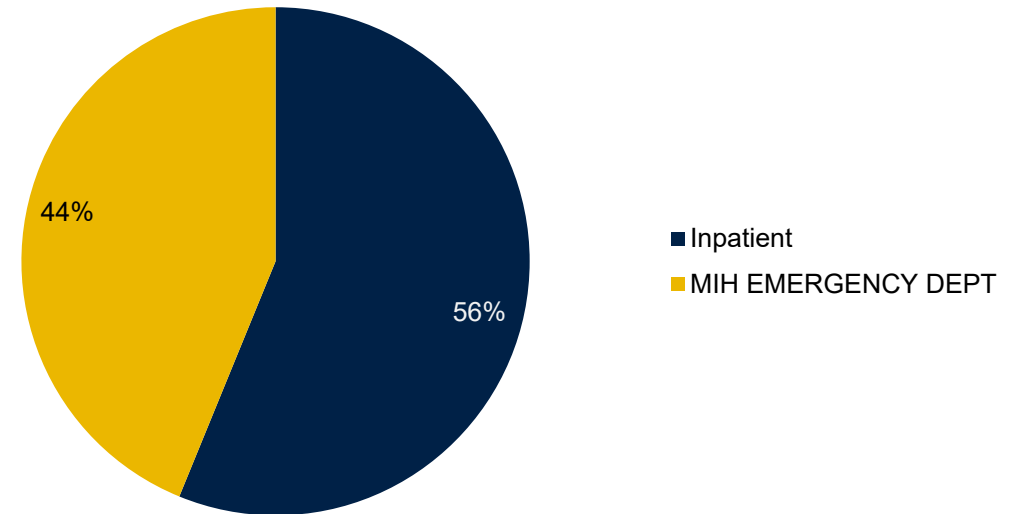


# Where to Target?

Urinalysis Ordering (n=635)



Urine Culture Ordering (n=283)



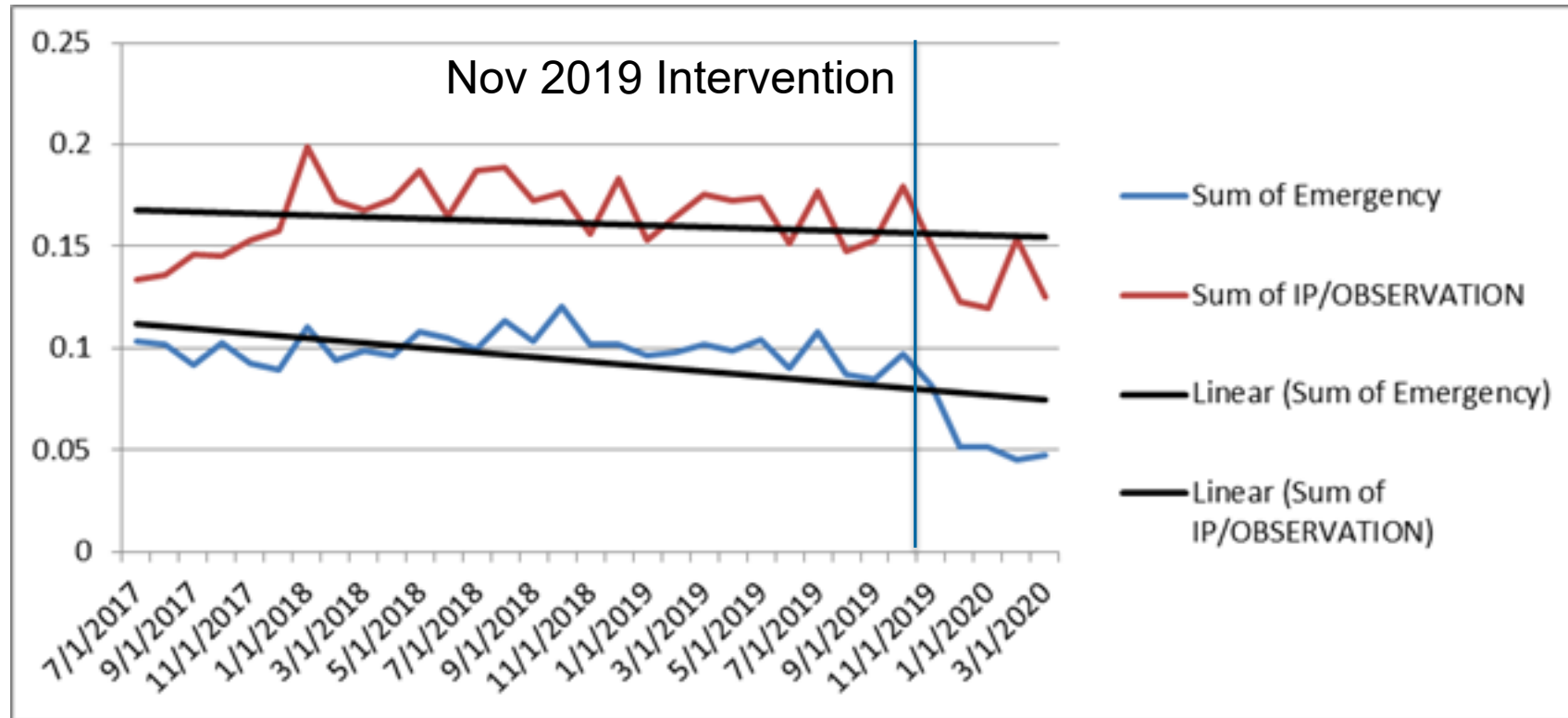
# First Contact: Emergency Department

- Challenges:
  - Time is everything – order now, figure out later
  - Nurses order a lot of urinalysis (UA) orders

# Individualized Education

- ED providers
  - Focus on low hanging fruit
  - UA from specific populations very likely to show pyuria, e.g. elderly, LTCF residents, urine catheters
- ED nurses (don't forget triage nurse!)
  - Avoid telling patient or family they have a UTI
  - Smelly or cloudy urine does not mean UTI

# Removing UA with Culture if Indicated



# EMR Example

Which indications does the patient have for UA? If asymptomatic, only order UA if for non-infectious eval or screening in pregnancy or for urologic procedure. If symptomatic AND UA returns ABNORMAL then remember to add on urine culture AFTER UA review.

- Screening in pregnancy or prior to urologic procedure
- Non-infectious evaluation (no indication for urine culture if UA abnormal in this setting)
- Localized symptoms of UTI (urgency, frequency, dysuria, suprapubic or CVA pain)
- Fever or Sepsis without alternate cause     Acute hematuria
- New mental status changes WITH leukocytosis, hypotension, or 2 or more SIRS criteria
- Increase spasticity or autonomic dysreflexia in spinal cord injury     Other
- Asymptomatic (not pregnant or upcoming urologic procedure)     Clinical Lab Staff Ordering



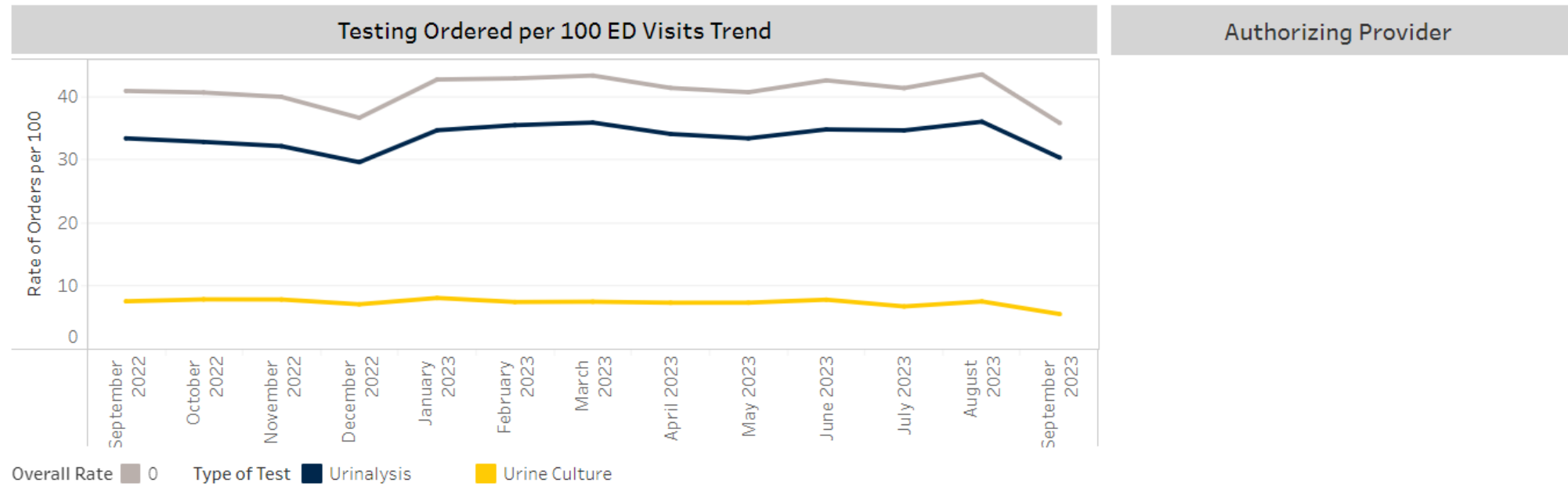
## **⚠ You cannot sign the following orders:**

- Urinalysis with Microscopic if Indicated - Urinalysis with microscopic (clean catch) - If UA is being done for non-infectious etiologies or for ASB testing due to pregnancy or planned urologic procedure, please choose these options, or choose other and document reason. If no signs or symptoms of UTI then do not recommend urinalysis.

# Data Collection

## ED Attending Provider: UA/ UC Ordered

Month	September 2023	<b>Number of Visits</b>	<b>Number of Tests Ordered</b>	<b>Testing Ordered per 100 ED Visits</b>
Department...	(All)	September 2023	14,704	5,249
Type of Test	(All)			35.70



Authorizing Provider

# Inpatient

- Provider education
  - More information available, use it!
  - Be an advocate for stewardship to patient and family
- Nursing education
  - Smelly or cloudy urine does not mean UTI
  - Be an advocate for stewardship to patient and family

# Order Sets – Quick Wins

- Opens conversation with different specialties to discuss diagnostic stewardship and ASB
- IT support and communication is key!



# Engaging Leaders

- Involve front line staff to take ownership
  - Discuss education needs and EMR changes
  - Listen and use feedback
- Executive leadership
  - Sell on CAUTI \$\$\$, Hospital acquired C diff rates, relief for microbiology lab, etc.

# System Wide Challenges

- Engage pharmacists – stewardship certificates available
  - SIDP
  - MAD-ID
- Disseminating information
- Different sites have different needs

# Thank you!

- [Robert.neetz@mymichigan.org](mailto:Robert.neetz@mymichigan.org)



## Discussion

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- What impactful actions can you take as a result of the information shared today?
- How are you able to increase engagement within your facilities to ensure a true change in patient safety?
- Based on what you heard today, what activities do you currently have underway that can leverage immediate action over the next 30, 60 or 90 days?

# Final Thoughts

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## Join Us for the Next Community of Practice Call!

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Please note that there will not be a Community of Practice Call held on December 14, 2023.

We look forward to connecting with you in January 2024!

Thank You!

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THANK YOU

*Your opinion is valuable to us. Please take 4 minutes to complete the [post assessment](#).*

*We will use the information you provide to improve future events.*