Reducing Unnecessary Antibiotic Treatment for Asymptomatic Bacteriuria:

Diagnostic vs. Antibiotic Stewardship

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Background

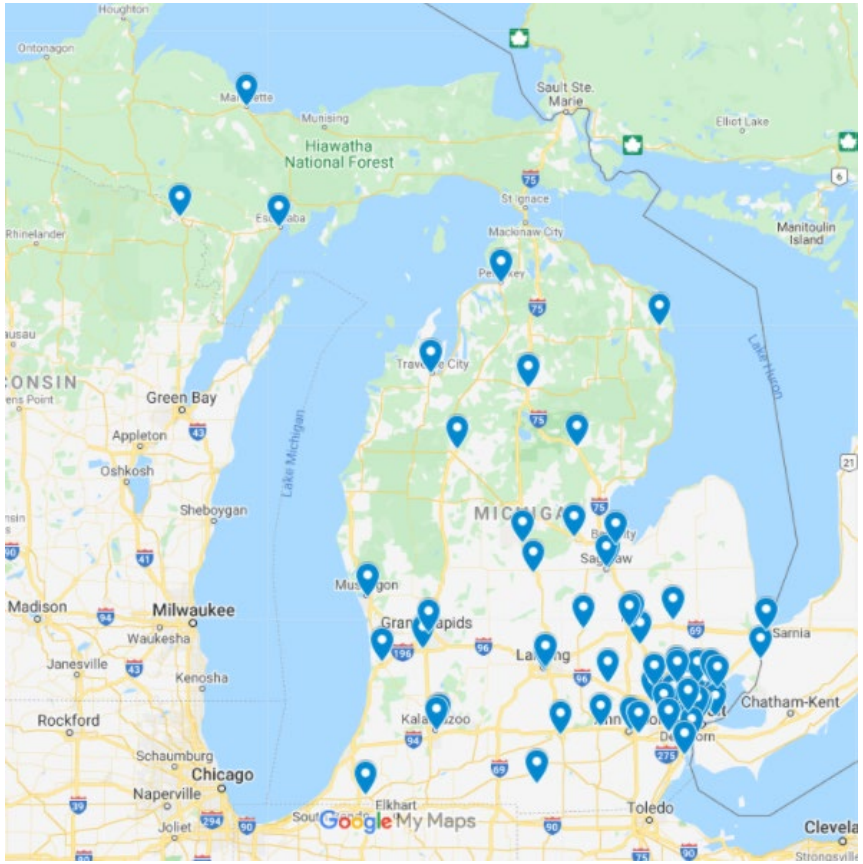
- Asymptomatic bacteriuria
  - Common in hospitalized patients
  - Antibiotic treatment does NOT improve outcomes
  - Antibiotic treatment DOES increase risk of antibiotic side effects, resistance, and for hospitalized patients→increases LOS

- Despite national guidelines recommending against treatment
  - Up to 80% of hospitalized patients with Asymptomatic Bacteriuria receive antibiotics

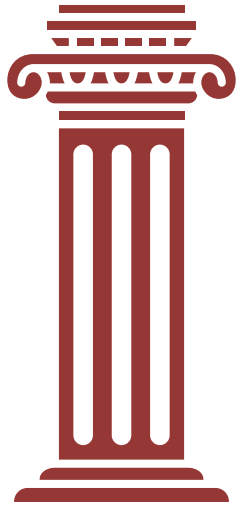
Nicolle et al. *Clin Infect Dis* 2019;
Petty et al. *JAMA IM* 2019;
Harding et al. *N Engl J Med* 2002

Michigan Hospital Medicine Safety Consortium

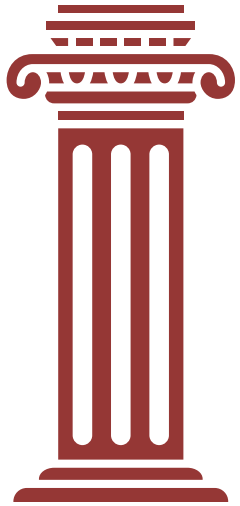
- Consortium of 69 hospitals (and growing) from around the state of Michigan
  - Our analyses based on 46 hospitals that participated from July 2017 – March 2020
- Supported by Blue Cross and Blue Shield of Michigan
  - Data abstraction (chart review)
  - Tri-annual meetings
  - Pay for performance



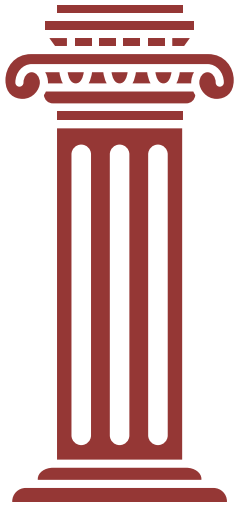
3 Pillars of Improvement



Data for Benchmarking



Sharing Best Practices



Pay-for-Performance

Vaughn et al. *Clin Infect Dis* 2022

Goals

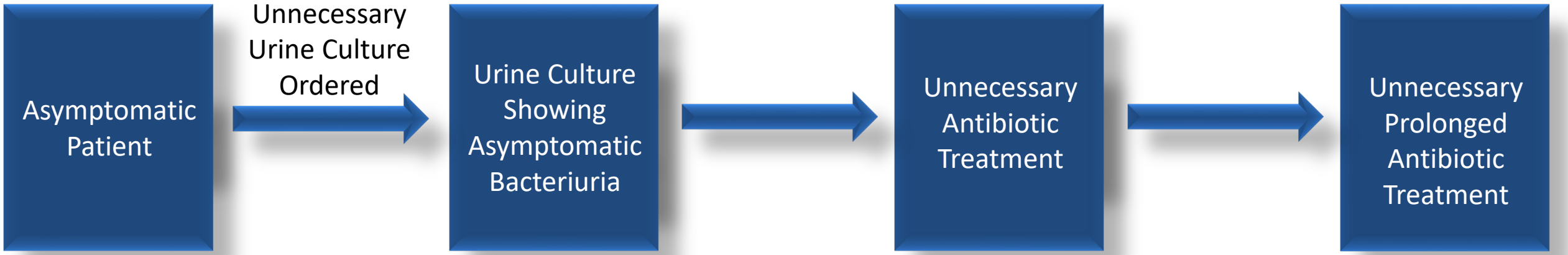
Did HMS successfully reduce Asymptomatic Bacteriuria treatment?

- 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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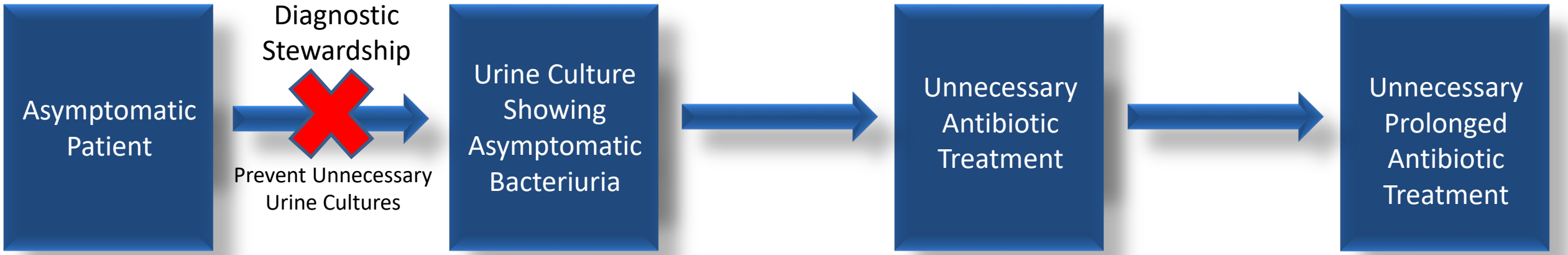

Morgan et al. *JAMA* 2017
Advani et al. *Curr Infect Dis Rep* 2021

The Pathway to Antibiotic Overuse in Hospitalized Patients with Asymptomatic Bacteriuria

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Advani et al. *Curr Infect Dis Rep* 2021

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

Included Patients

- Hospitalized general care, medicine patients with a positive urine culture
  - Local definition of "positive"
  - Pseudo-randomized selection (~16 patients/2 weeks)

- Asymptomatic Bacteriuria
  - Asymptomatic
  - Altered mental status without systemic signs of infection

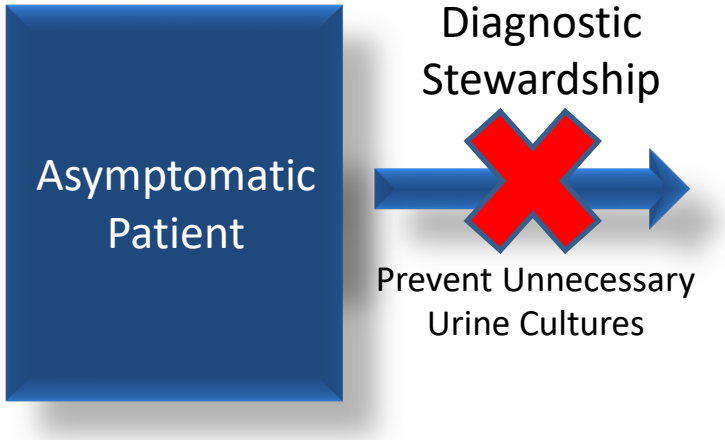
Did HMS successfully reduce Asymptomatic Bacteriuria treatment?

% 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 vs. Antibiotic Stewardship

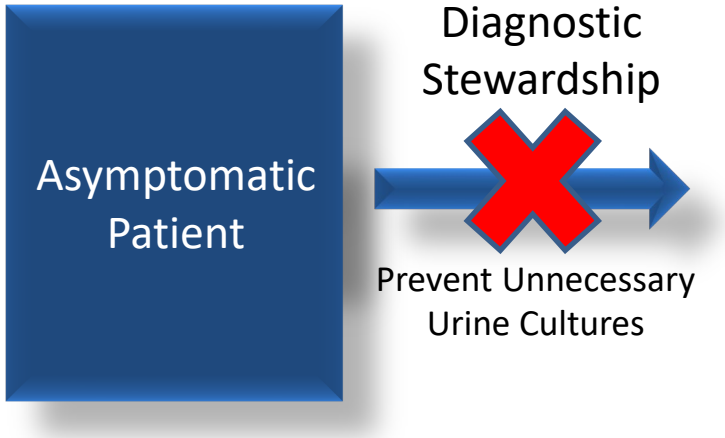
Diagnostic Stewardship



Fewer ASB cases
More UTI cases

ASB (Treated or Not Treated)
+UCx

Diagnostic Stewardship



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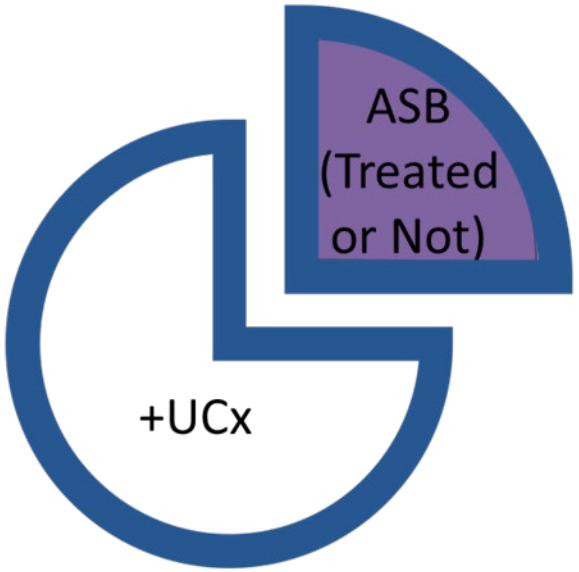
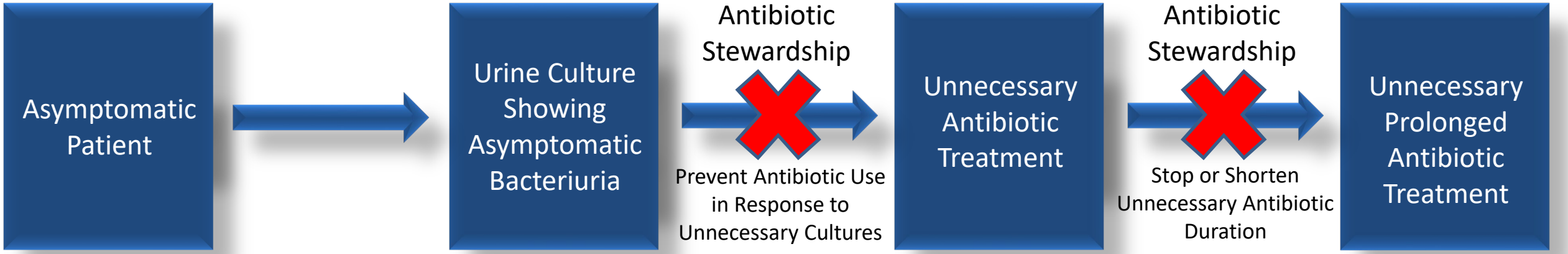
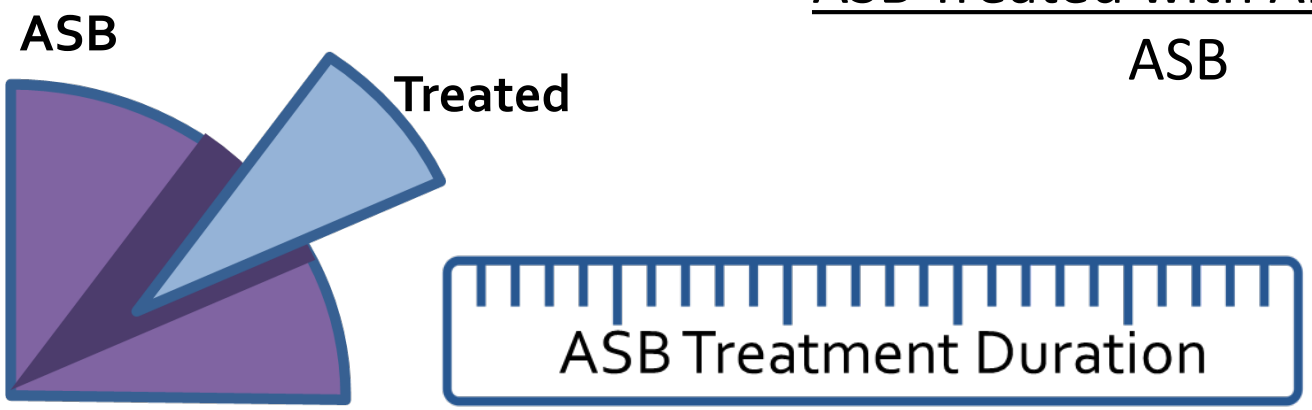


The Pathway to Antibiotic Overuse in Hospitalized patients with Asymptomatic Bacteriuria



ASB Treated with Antibiotics / ASB

ASB Treatment Duration



Diagnostic vs. Antibiotic Stewardship

Diagnostic Stewardship

ASB (Treated or Not Treated)
+UCx

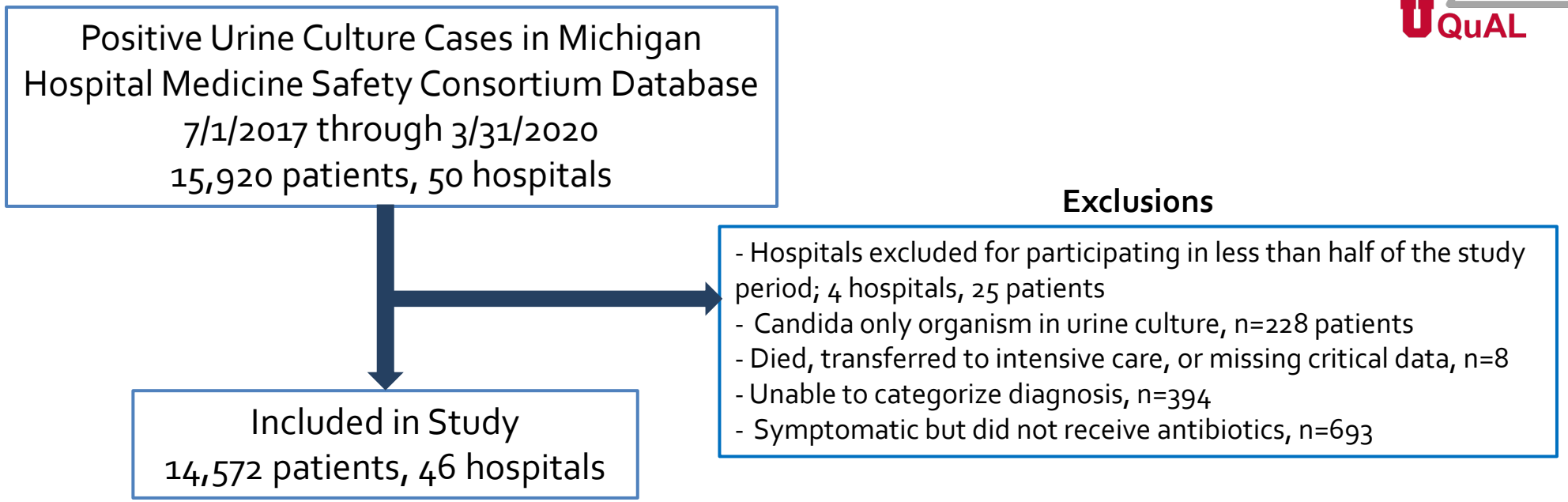
Antibiotic Stewardship

ASB Treated with Antibiotics
ASB

ASB Treatment Duration

Results

Study Flow Diagram



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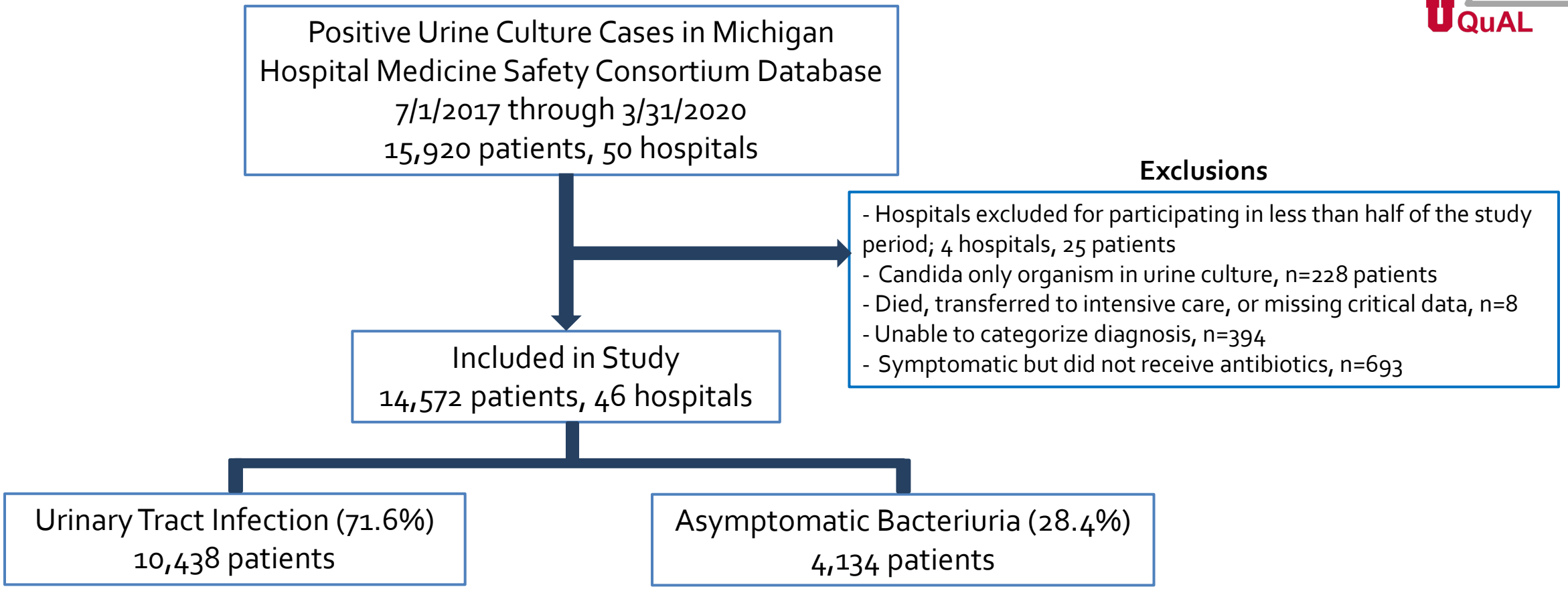

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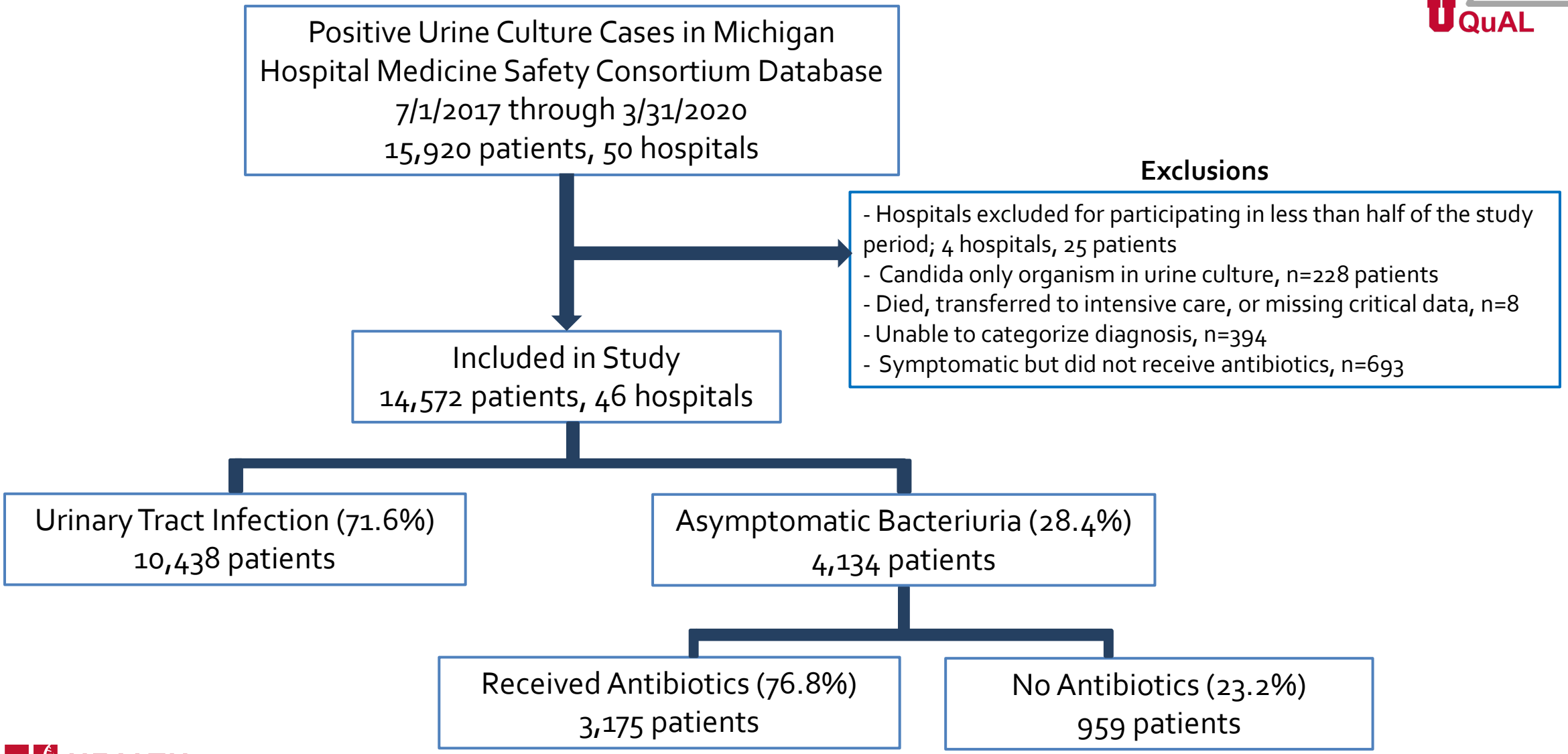
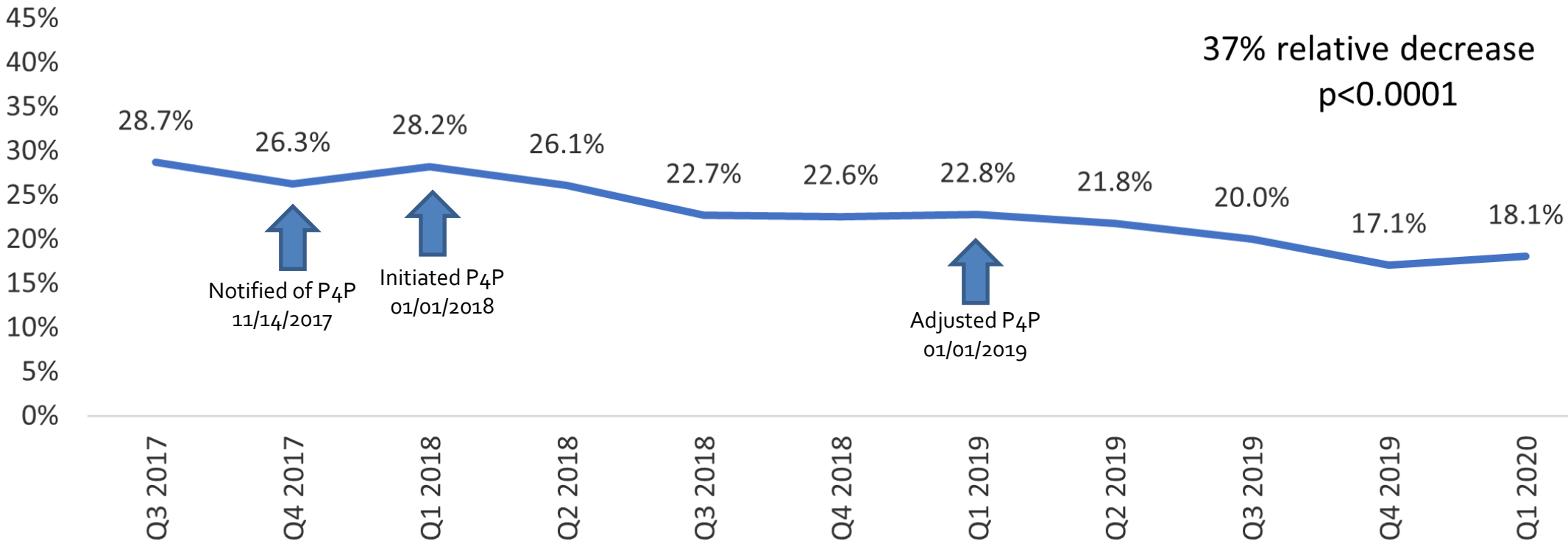


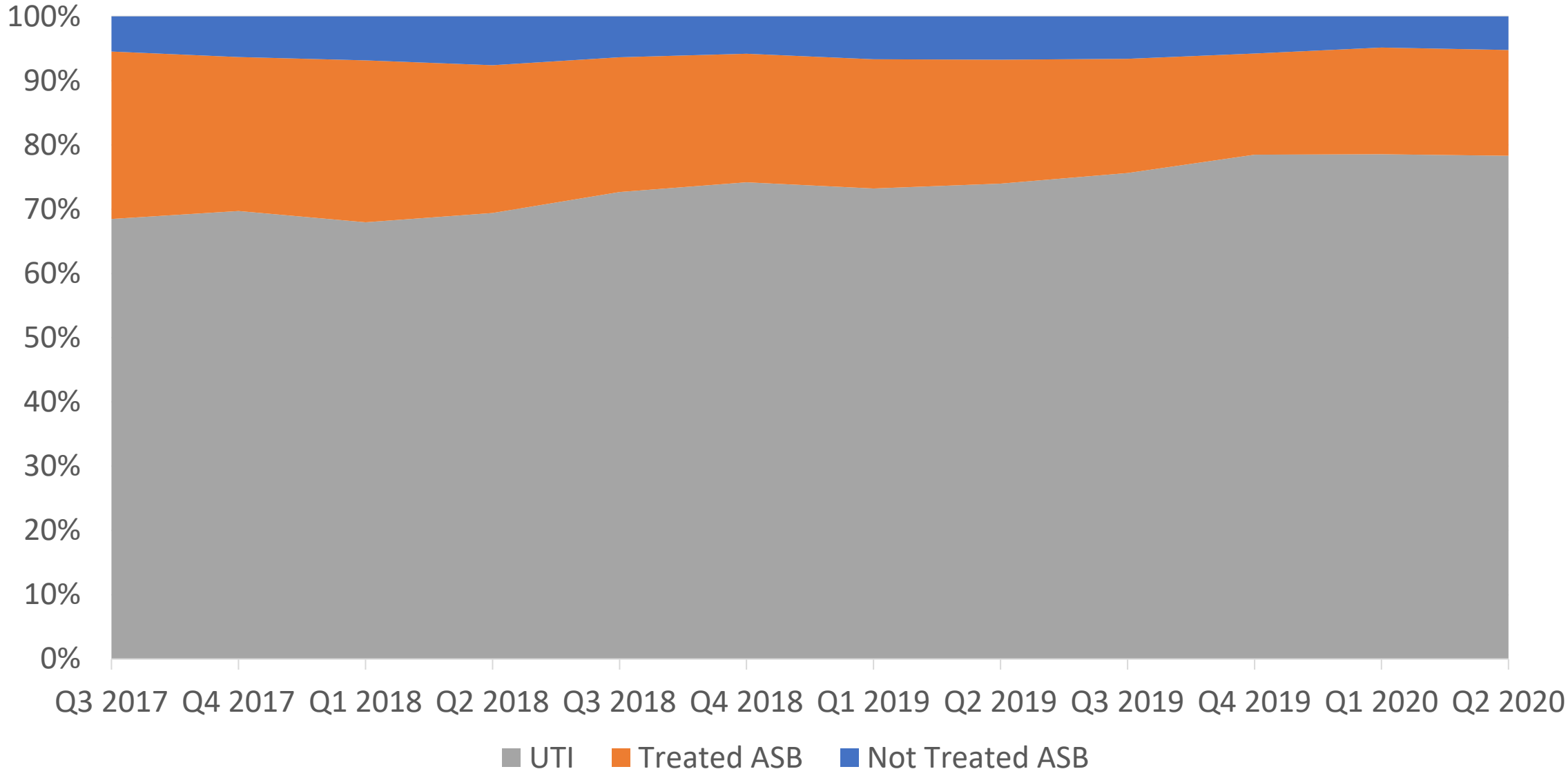
Percentage of patients treated for a UTI who actually had ASB, over time

14,572 patients, 46 HMS hospitals



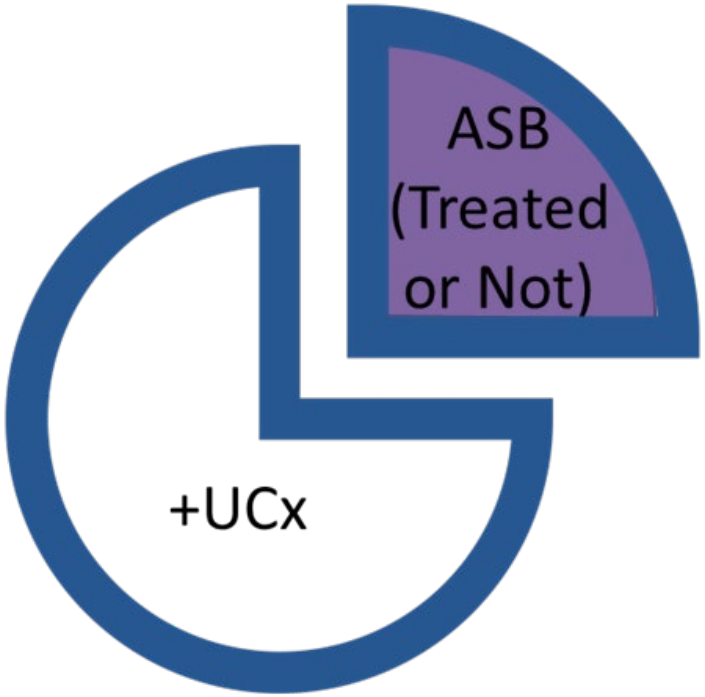
Vaughn VM et al. "A Statewide Quality Initiative to Reduce Unnecessary Antibiotic Treatment of Asymptomatic Bacteriuria." *JAMA Internal Medicine*. 2023.
NQF endorsed metric (#3690)- https://mi-hms.org/inappropriate-diagnosis-urinary-tract-infection-uti-hospitalized-medical-patients

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

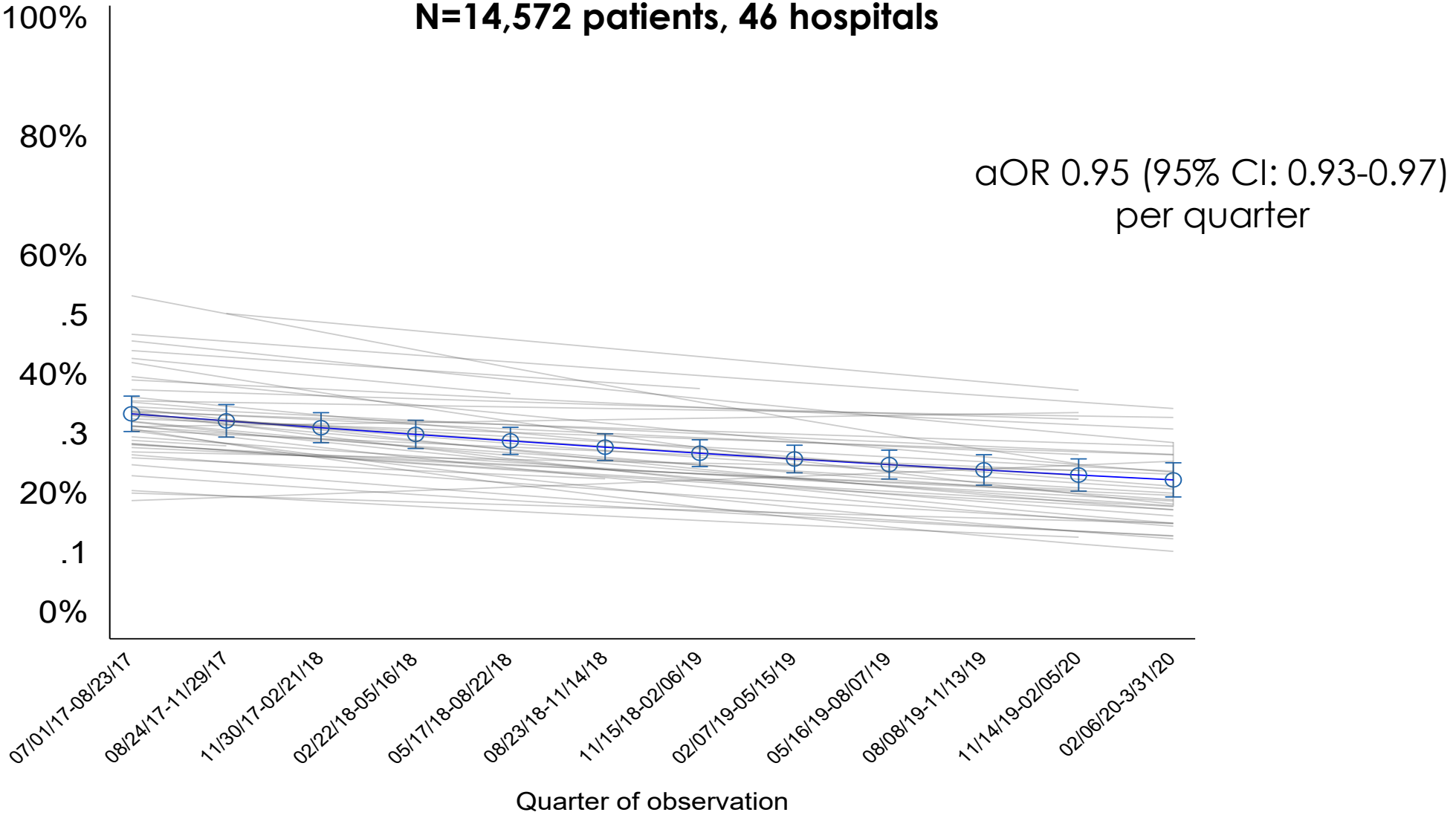


Diagnostic vs. Antibiotic Stewardship

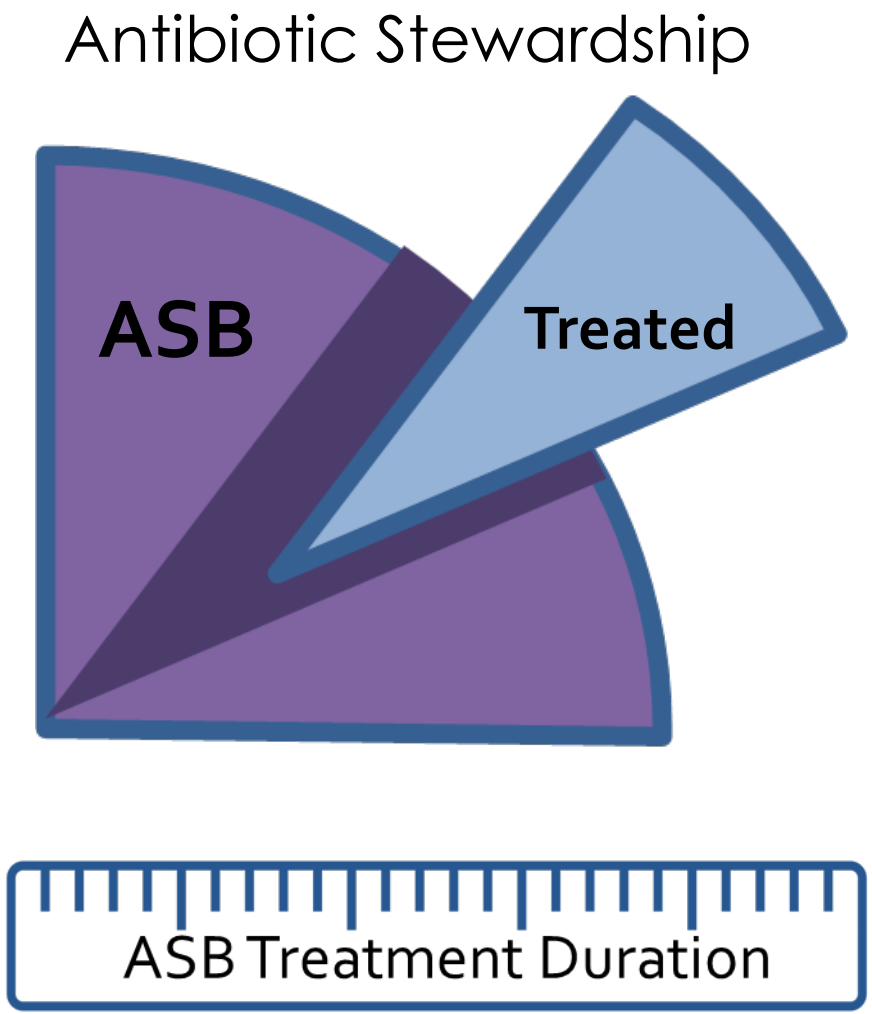
Diagnostic Stewardship



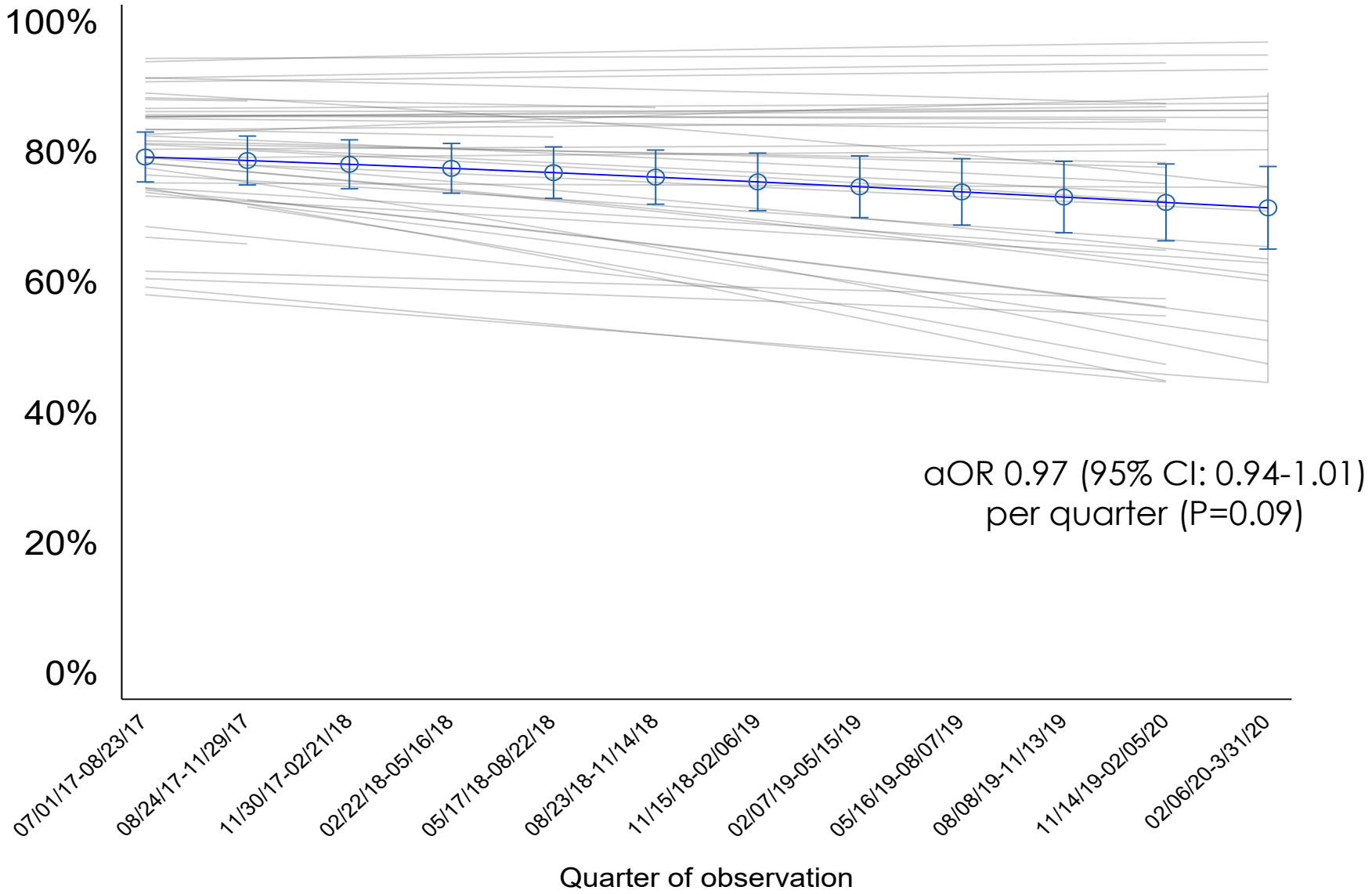
Percent of Patients with a Positive Urine Culture who Had Asymptomatic Bacteriuria Over Time (Predicted Probability Over Time)
N=14,572 patients, 46 hospitals



Diagnostic vs. Antibiotic Stewardship



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 ≥ 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)

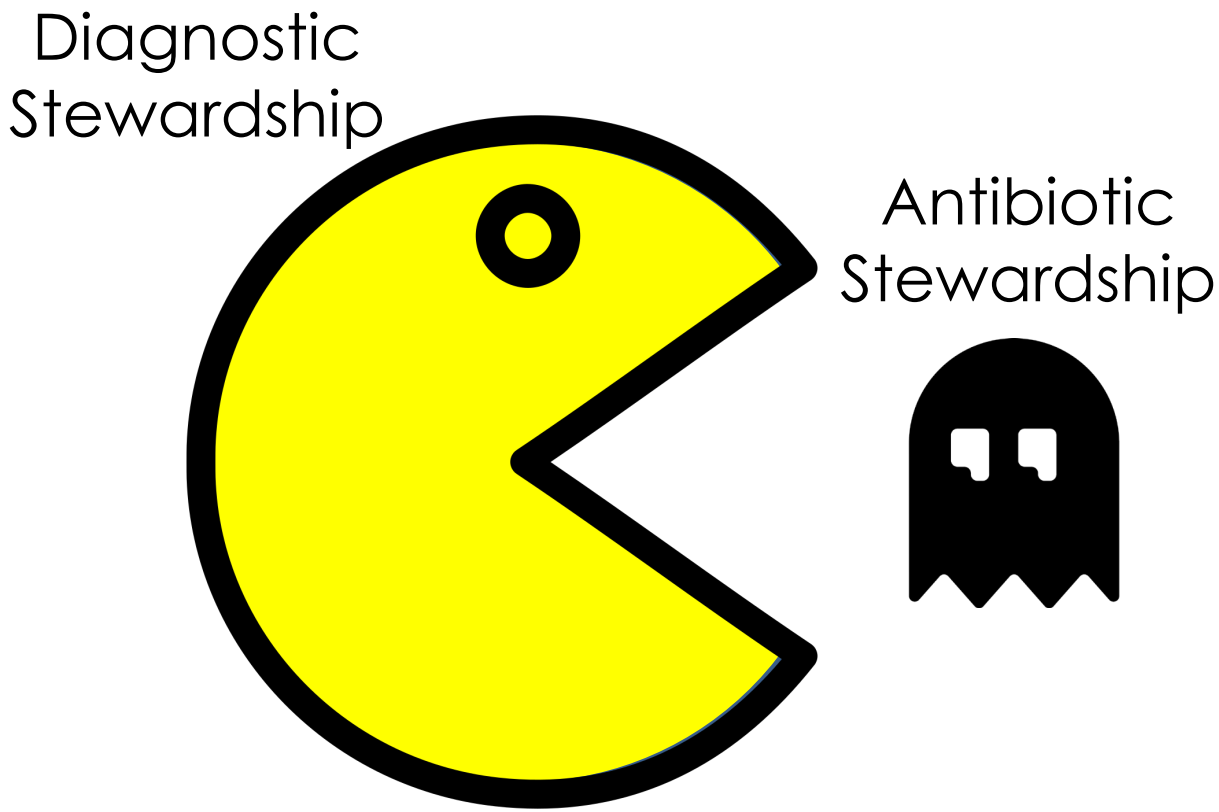
Summary

- Over time, HMS resulted in reduced treatment of asymptomatic bacteriuria
  - Percent of patients treated for a UTI that actually had asymptomatic bacteriuria decreased by ~1/3
- **Nearly 100% of reduction was from 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)

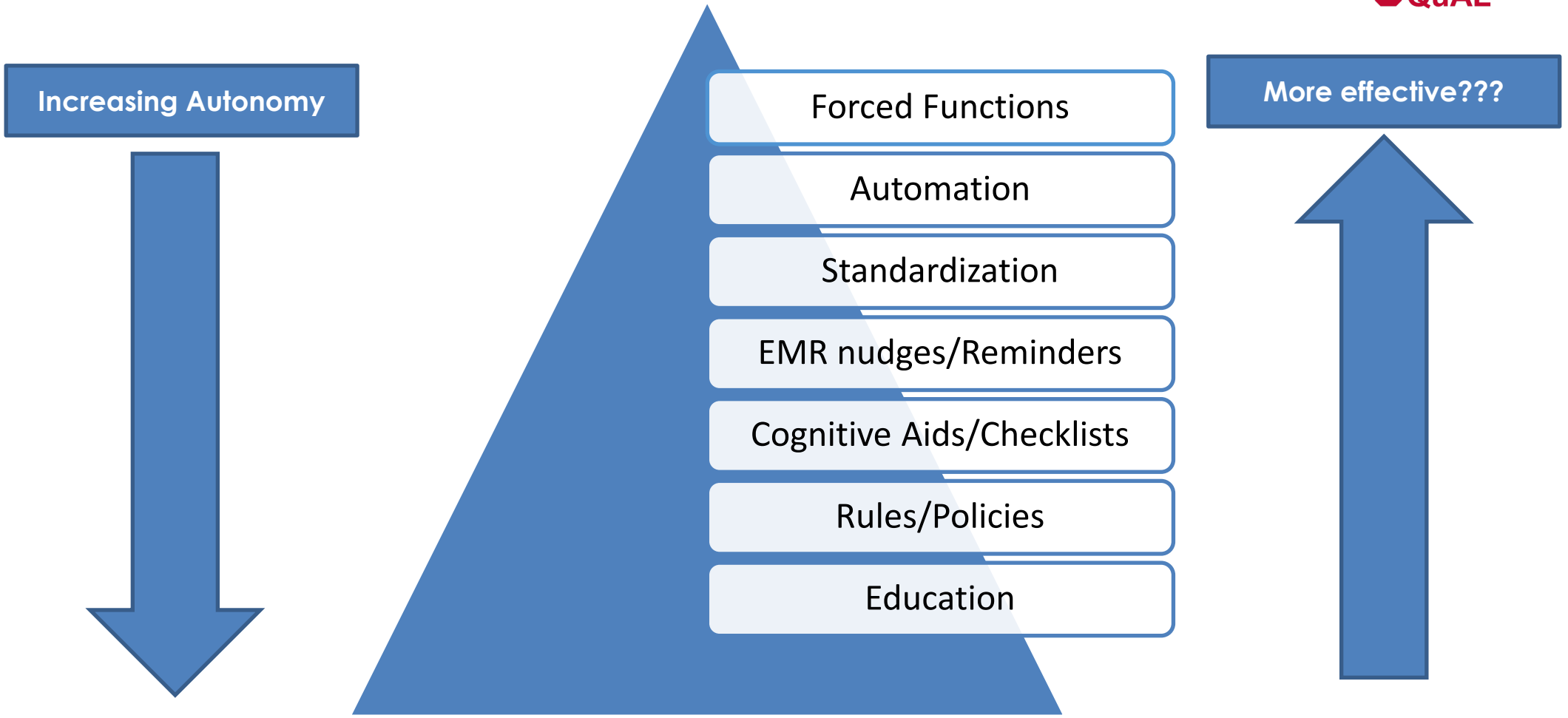
Other thoughts

- Antibiotic stewardship and diagnostic stewardship are often not dichotomous, separate interventions
  - Bundled interventions
  - Overlapping/same teams
  - Diagnostic stewardship often included within antibiotic stewardship activities (e.g., education, audit and feedback)
  - Though the average hospital did not see a reduction in the % of patients with Asymptomatic Bacteriuria who were treated with antibiotics… some did!

Conclusion



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



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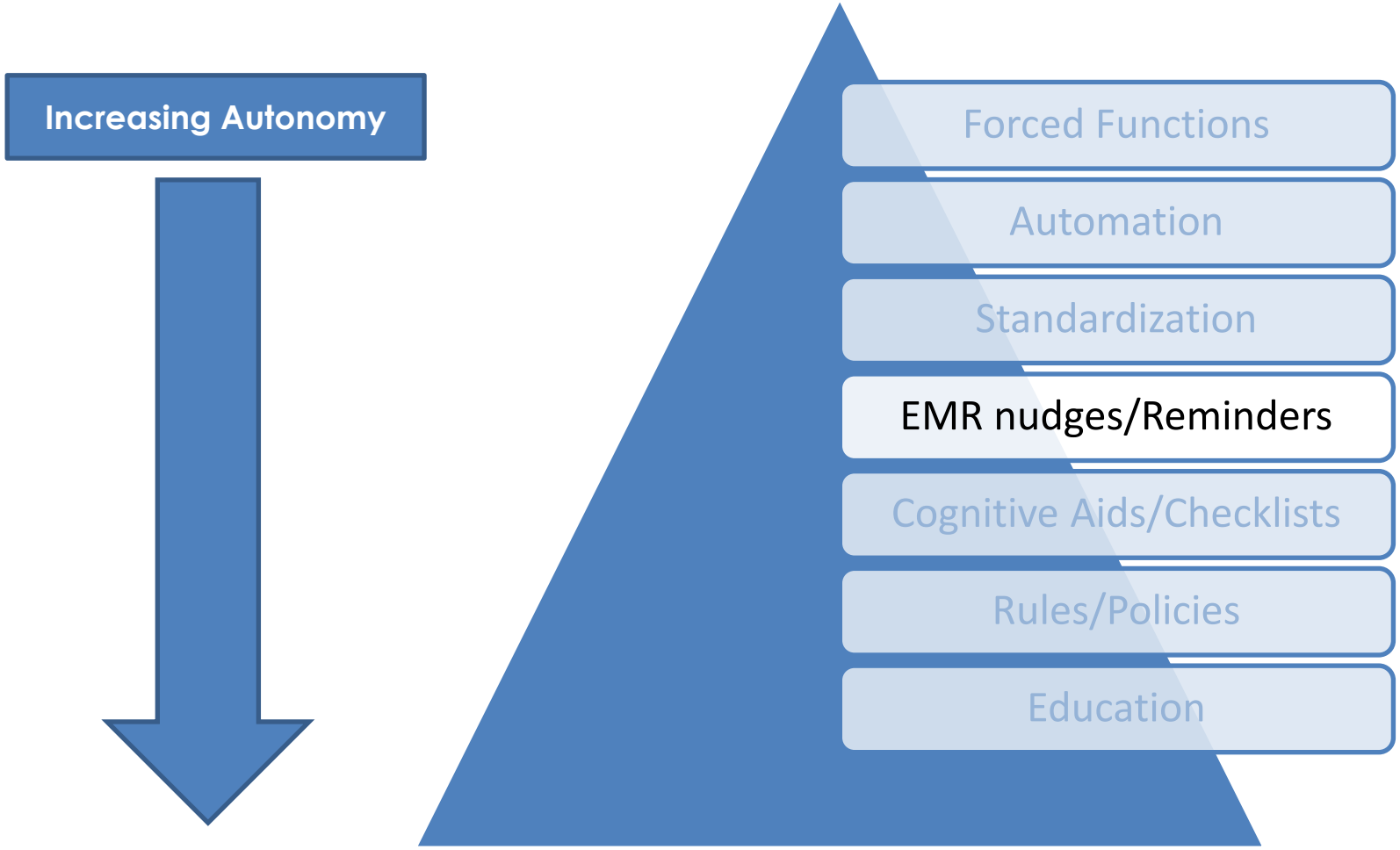

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Nudges

- Allow autonomy but are automatic once you get them done…
  - Orderset hygiene →
    - Remove urine cultures from admission, ED, pre-surgical ordersets
  - Suppressing culture results in certain scenarios (e.g., reflex testing)
  - Make ordering inappropriate urine cultures more difficult in EMR
    - 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

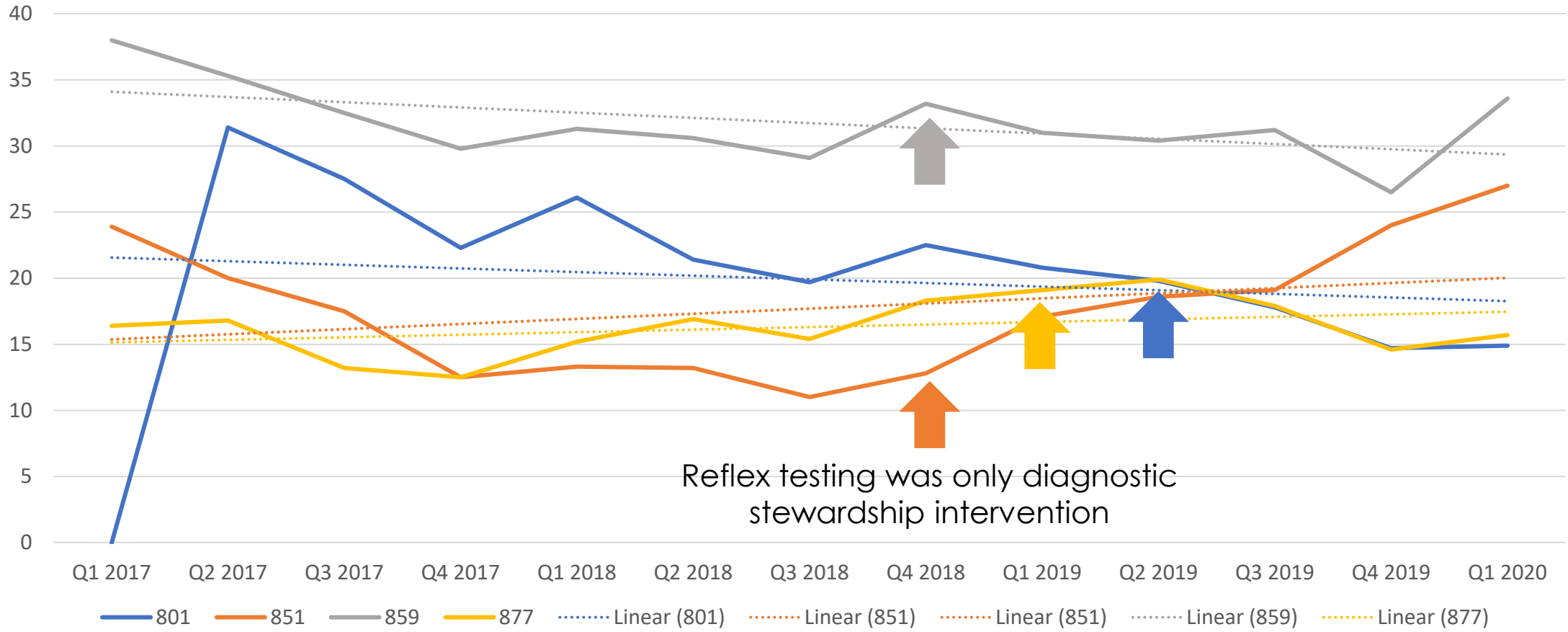
What about reflex testing?

HMS Hospitals

- Added reflex testing
  - n=4 (during our study time frame)

- Removed reflex testing
  - n=5 (during our study time frame

Hospitals Adding Reflex Testing

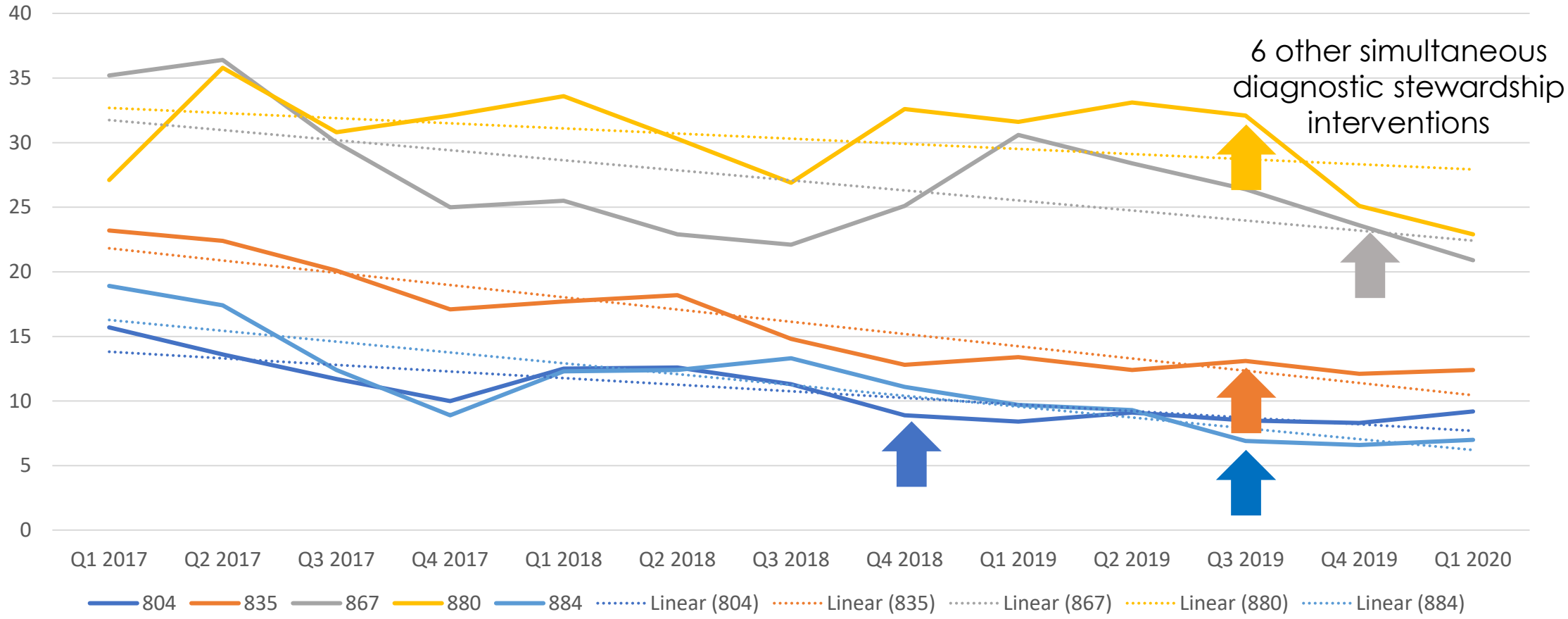


Adding Reflex Testing

- No change in before/after adding reflex testing in:

$\frac{\text{ASB treated}}{\text{All ASB}}$	79.3% → 83.2% (p=0.32)
$\frac{\text{ASB treated}}{\text{All UTI}}$	p=0.18

Hospitals Removed Reflex Testing



Removing Reflex Testing

- Decrease after removing reflex testing in:

$\frac{\text{ASB treated}}{\text{All ASB}}$	66% → 50% (p=0.002)
$\frac{\text{ASB treated}}{\text{All UTI}}$	p<0.001

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

Conclusion

- UA isn't great at distinguishing ASB and UTI
- Clinicians don't know that
  - +UA is the strongest predictor for treating ASB

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

Questions?

Keep In Touch!

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