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

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

Background

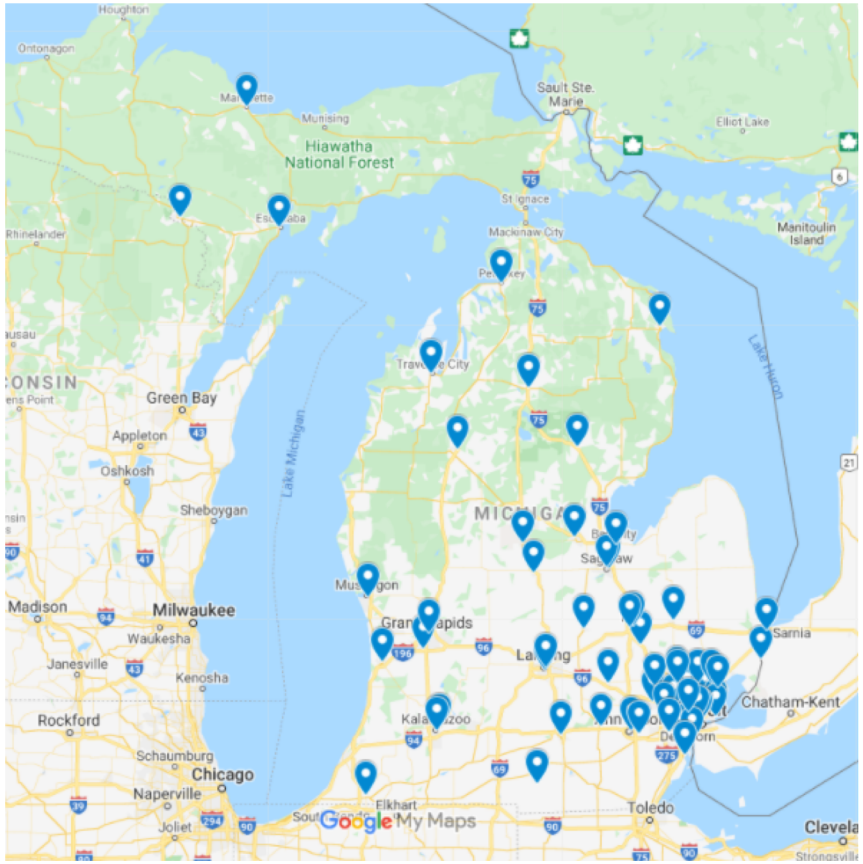
- Asymptomatic bacteriuria
  - Common in hospitalized patients
  - Antibiotic treatment does NOT improve outcomes
  - Antibiotic treatment DOES increase risk of antibiotic side effects, resistance, and for hospitalized patients→increases LOS

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

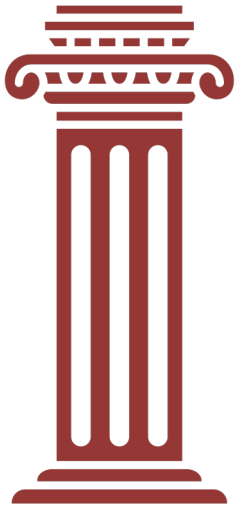
Nicolle et al. *Clin Infect Dis* 2019;
Petty et al. *JAMA IM* 2019;
Harding et al. *N Engl J Med* 2002

Michigan Hospital Medicine Safety Consortium

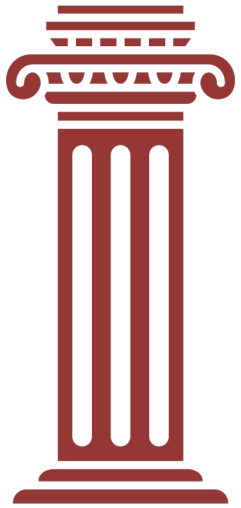
- Consortium of 69 hospitals (and growing) from around the state of Michigan
  - Our analysis based on 46 hospitals that participated from July 2017 – March 2020
- Supported by Blue Cross and Blue Shield of Michigan
  - Data abstraction (chart review)
  - Tri-annual meetings
  - Pay for performance



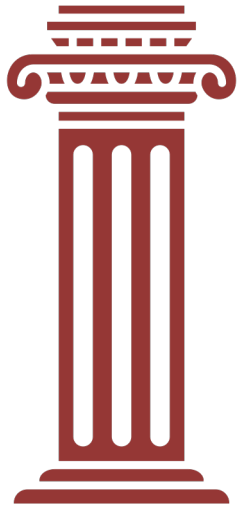
3 Pillars of Improvement



Data for Benchmarking
***critical step**



Sharing Best Practices



Pay-for-Performance

Vaughn et al. *Clin Infect Dis* 2022

Goals

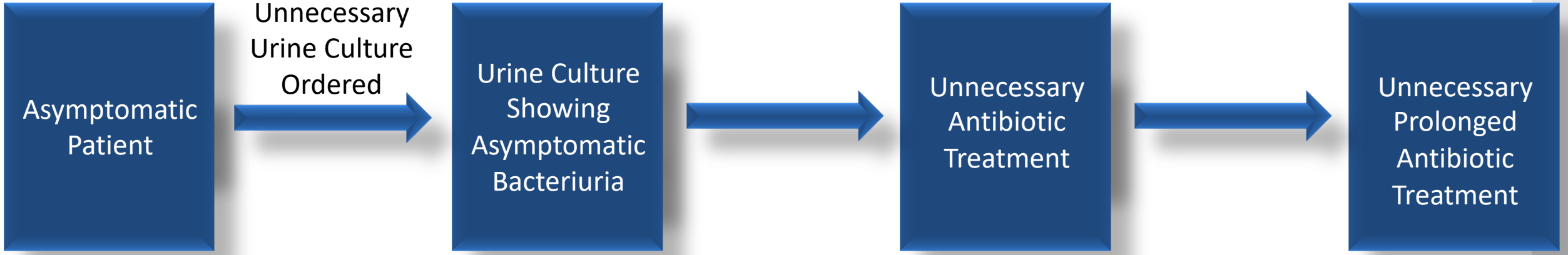
Did HMS successfully reduce ASB treatment?

- Did diagnostic vs. antibiotic stewardship result in most of the gains?

The Pathway to Antibiotic Overuse in Hospitalized Patients with ASB

Asymptomatic Patient

The Pathway to Antibiotic Overuse in Hospitalized Patients with ASB



The Pathway to Antibiotic Overuse in Hospitalized Patients with ASB

*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 patient with a positive urine culture
  - Local definition of "positive"
  - Pseudo-random selection (~16 patients/2 weeks)

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

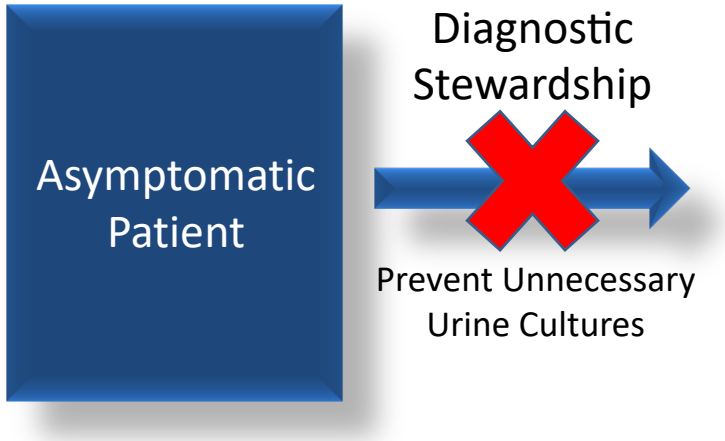
Did HMS successfully reduce ASB treatment?

Outcome

- % of patients who were treated for a UTI that actually had ASB
  - (lower is better)
- NQF endorsed metric (#3690)- https://mi-hms.org/inappropriate-diagnosis-urinary-tract-infection-uti-hospitalized-medical-patients
  - (this is the measure you all are using!)

Diagnostic vs. Antibiotic Stewardship

Diagnostic Stewardship



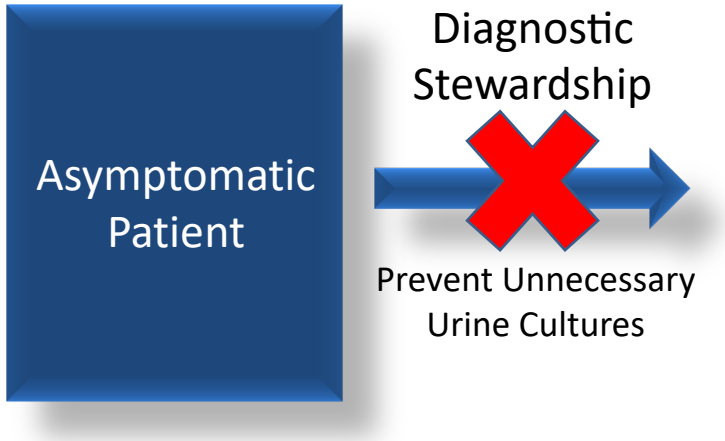
Fewer ASB cases

More UTI cases

<u>ASB (Treated or Not Treated)</u>

+UCx

Diagnostic Stewardship



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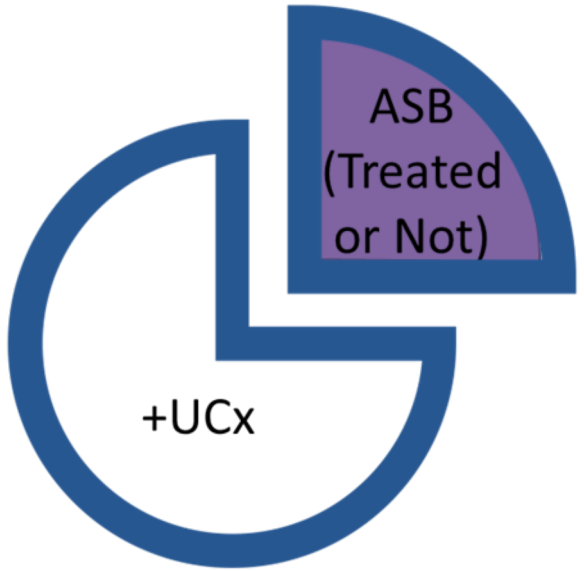
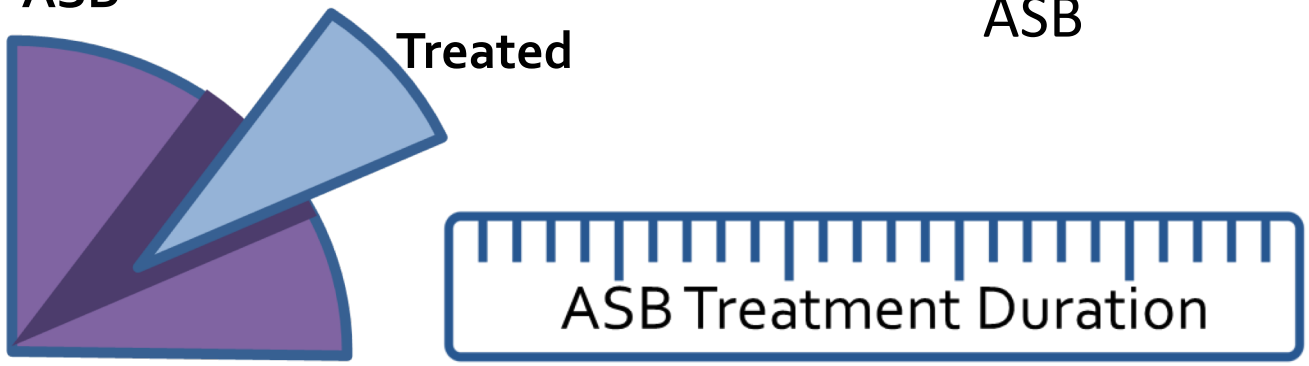


Antibiotic Stewardship

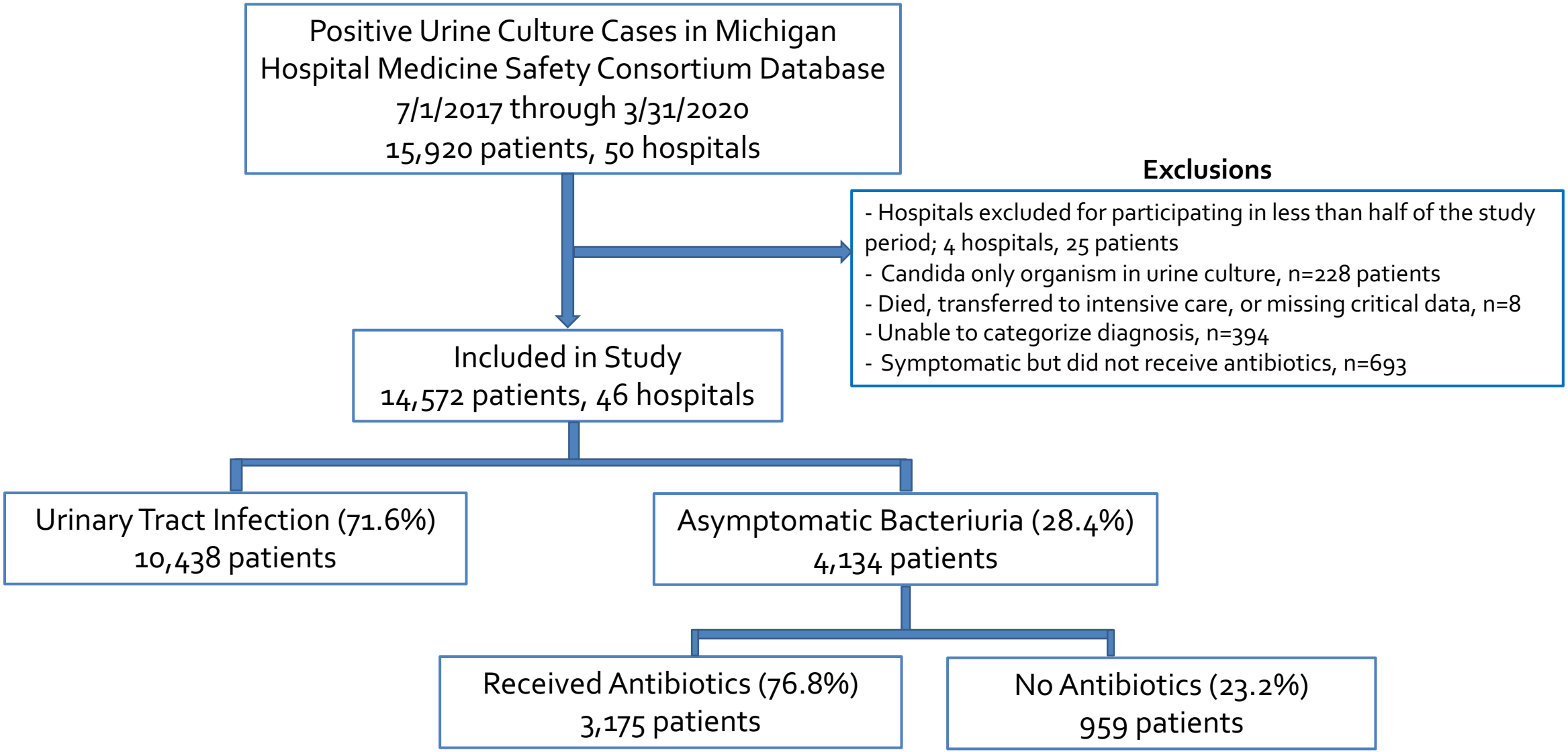
Asymptomatic Patient → Urine Culture Showing Asymptomatic Bacteriuria → Antibiotic Stewardship: Prevent Antibiotic Use in Response to Unnecessary Cultures → Unnecessary Antibiotic Treatment → Antibiotic Stewardship: Stop or Shorten Unnecessary Antibiotic Duration → Unnecessary Prolonged Antibiotic Treatment

ASB Treated with Antibiotics / ASB

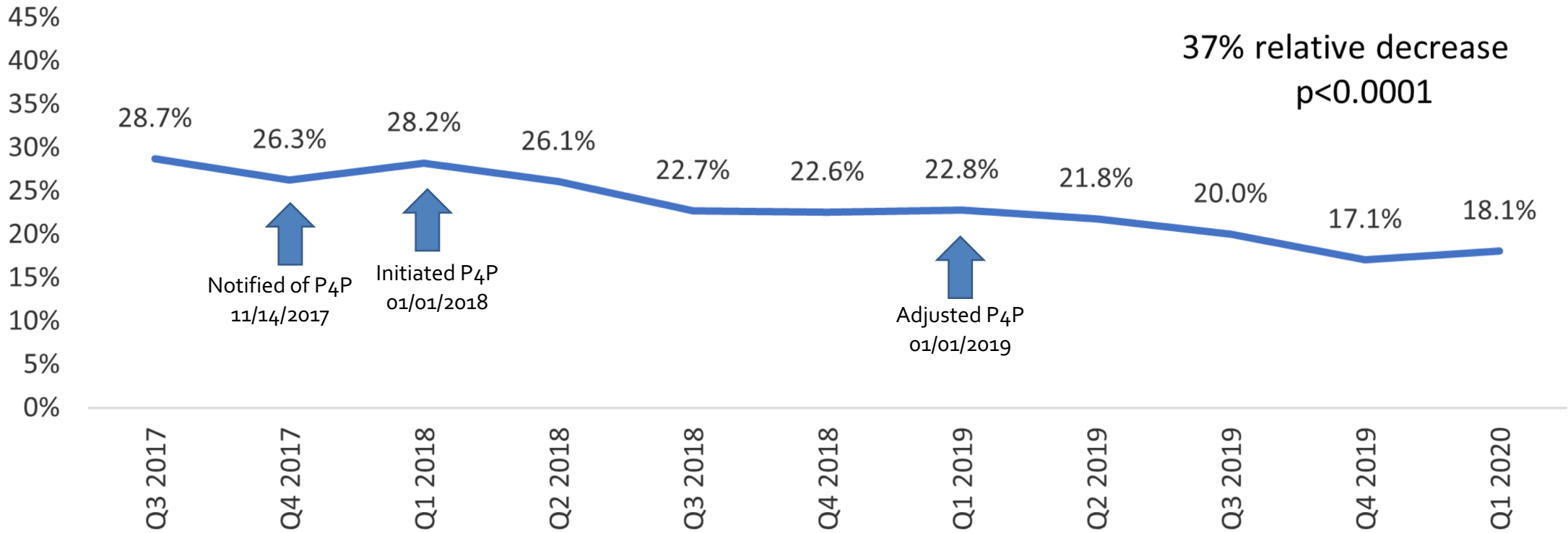
ASB Treatment Duration



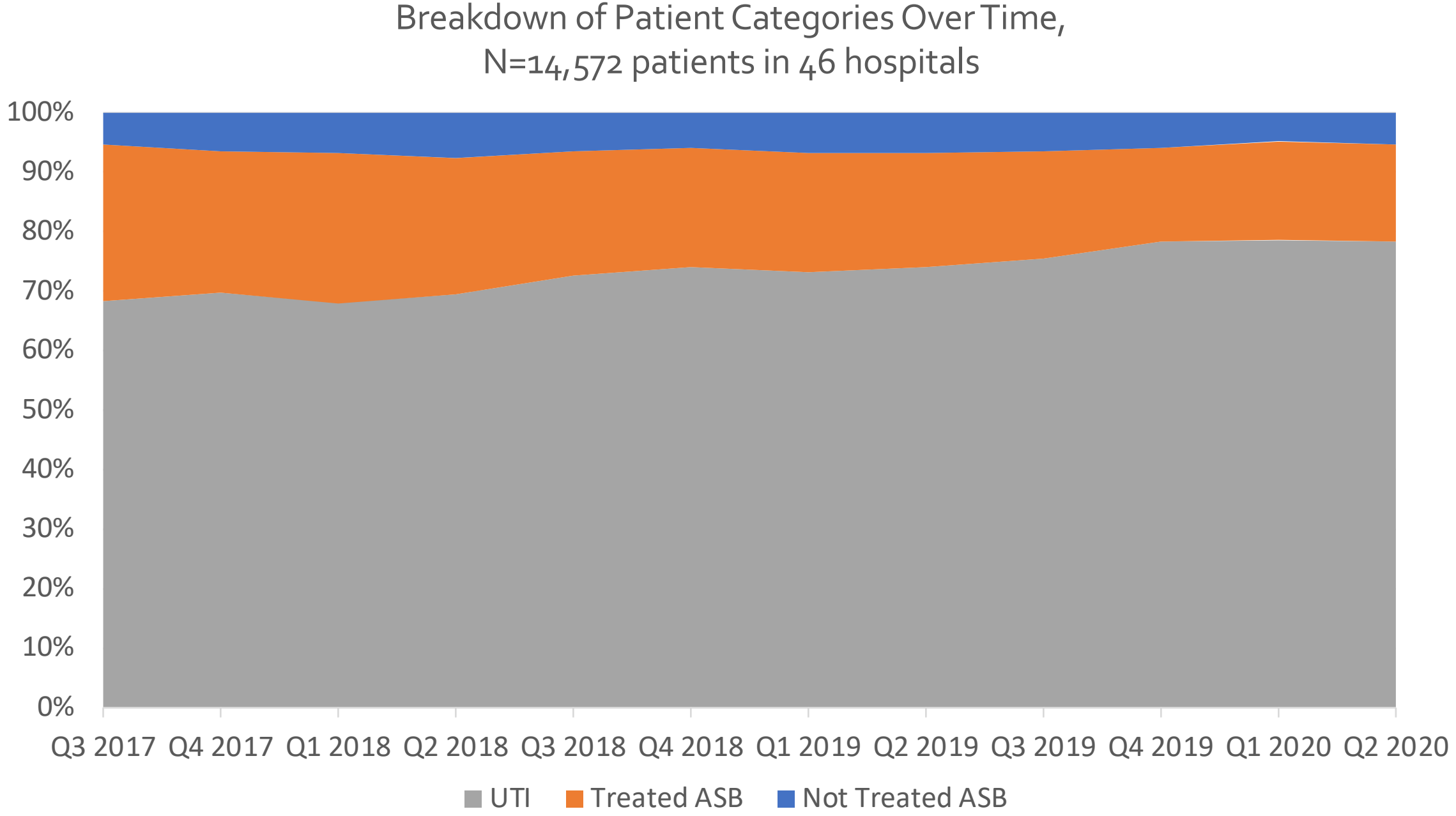
Study Flow Diagram



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

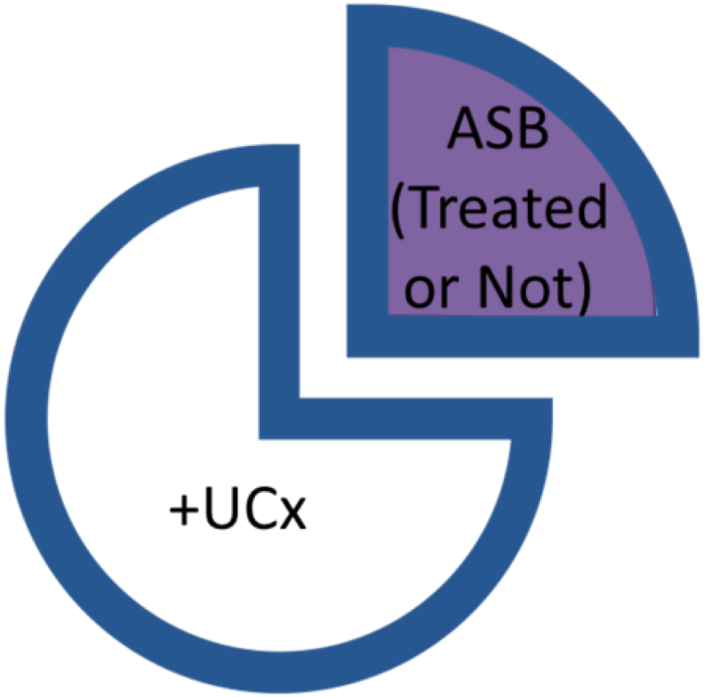


NQF endorsed metric (#3690)- https://mi-hms.org/inappropriate-diagnosis-urinary-tract-infection-uti-hospitalized-medical-patients

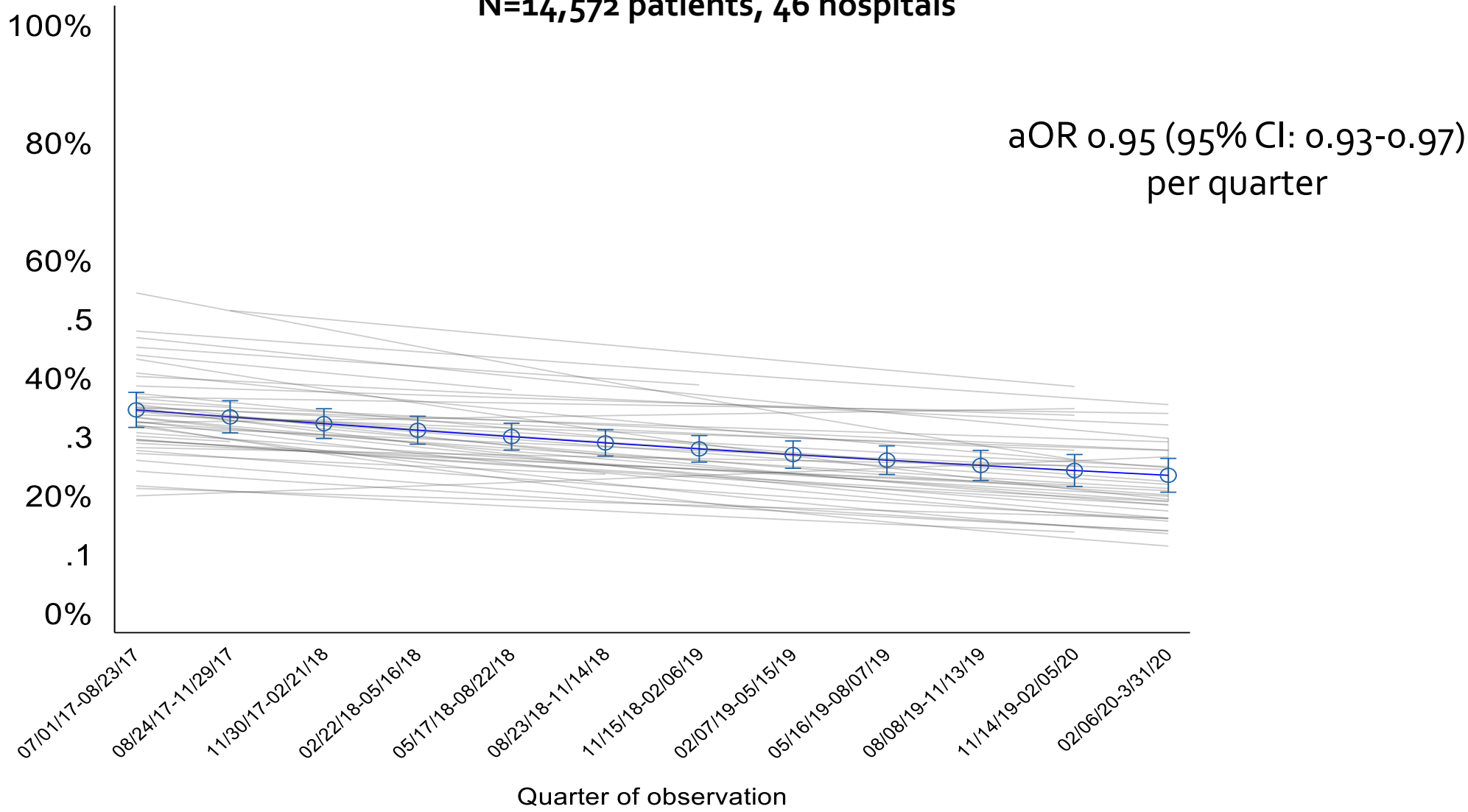

Breakdown of Patient Categories Over Time,
N=14,572 patients in 46 hospitals
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Q3 2017
Q4 2017
Q1 2018
Q2 2018
Q3 2018
Q4 2018
Q1 2019
Q2 2019
Q3 2019
Q4 2019
Q1 2020
Q2 2020
UTI
Treated ASB
Not Treated ASB

Diagnostic vs. Antibiotic Stewardship

Diagnostic Stewardship



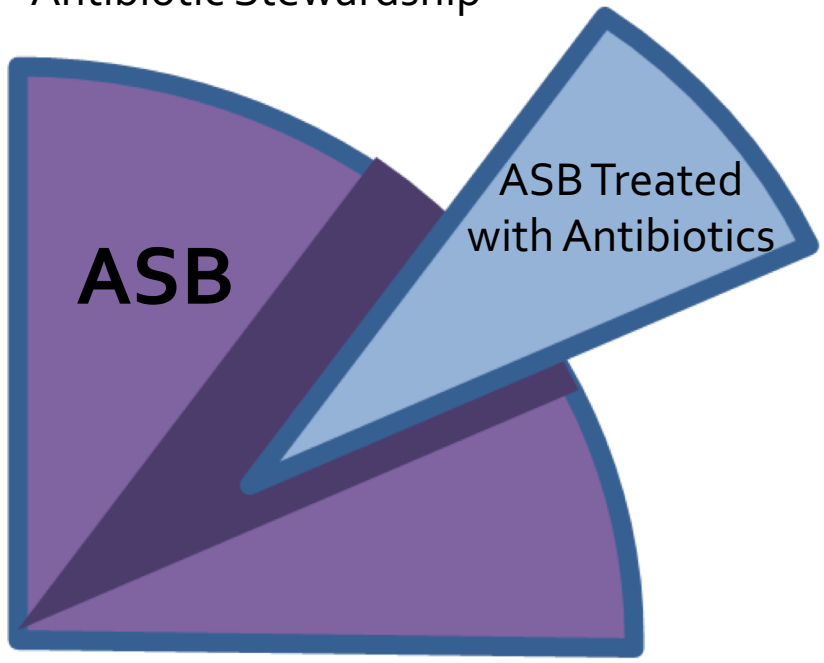
Percent of Patients with a Positive Urine Culture who Had ASB Over Time (Predicted Probability Over Time)
N=14,572 patients, 46 hospitals



aOR 0.95 (95% CI: 0.93-0.97) per quarter

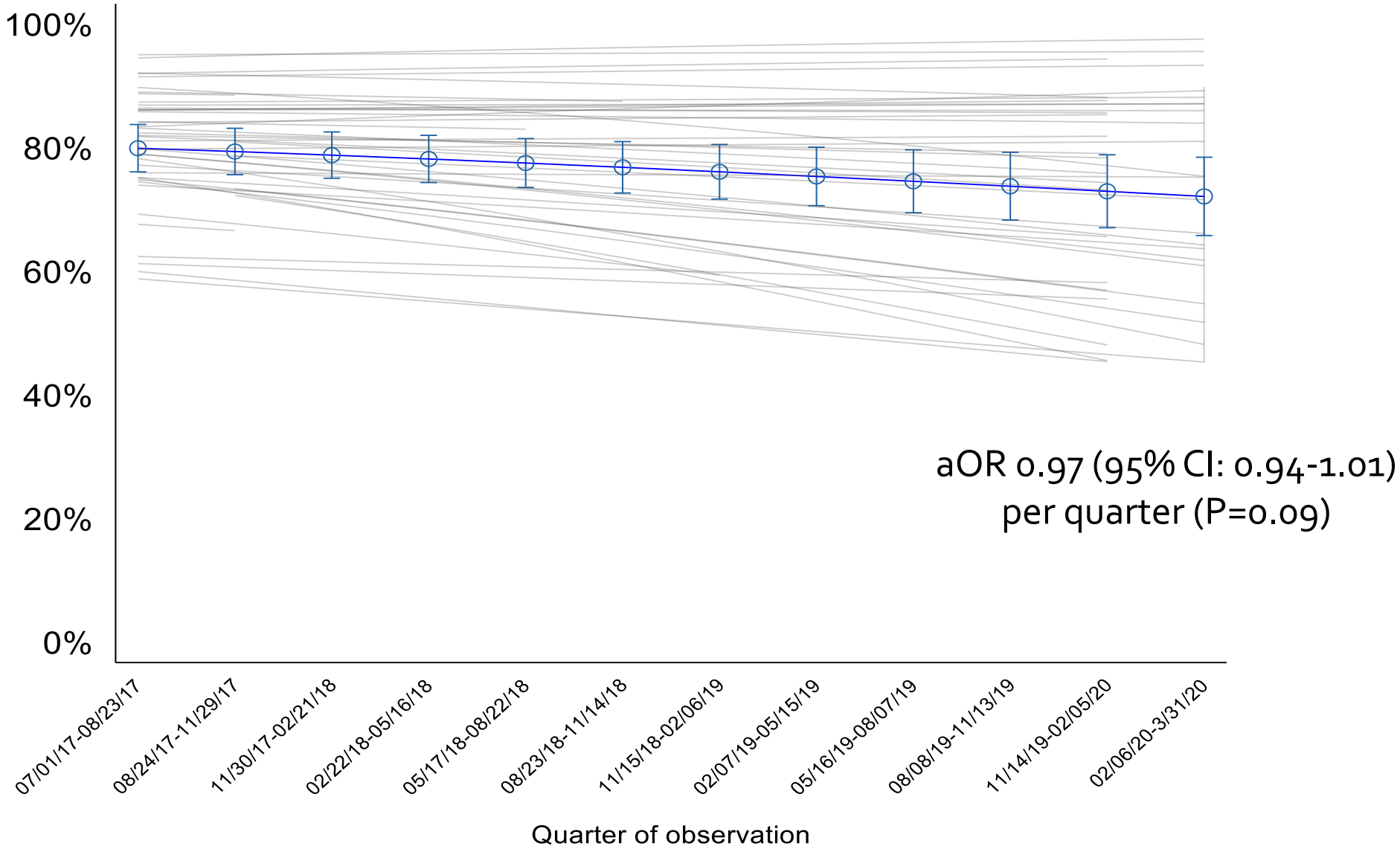
Diagnostic vs. Antibiotic Stewardship

Antibiotic Stewardship



AND

Percent of Patients with ASB who were Treated with Antibiotics (Predicted Probability Over Time)



aOR 0.97 (95% CI: 0.94-1.01)
per quarter (P=0.09)

ASB Treatment Duration

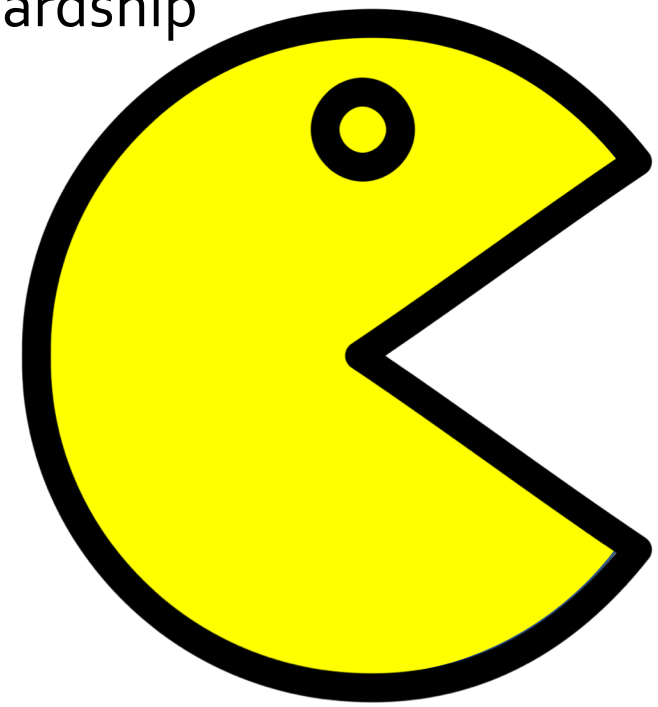
- In patients with ASB who received antibiotic therapy
  - Median (IQR) duration of therapy was 6 (4-8) days
    - Median at discharge: 2 (0-5) days
  - 84.3% received ≥3 days
- After adjusting for hospital clustering
  - Mean duration decreased only slightly—if at all
    - 6.38 days (95% CI: 6.00,6.78) to 5.93 (95% CI: 5.54,6.35)
  - aIRR 0.99 per quarter (95% CI: 0.99-1.00, P=0.045)

Summary

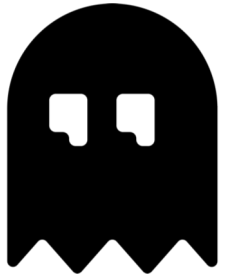
- Over time, HMS resulted in reduced treatment of ASB
  - Percent of patients treated for a UTI that actually had ASB (NQF/your Metric) decreased by ~ 1/3
- Reduction driven by diagnostic stewardship
  - % of + urine cultures that were ASB significantly decreased
    - aOR 0.95 (95% CI: 0.93-0.97)
  - % of ASB that was treated with antibiotics did NOT decrease
  - ASB duration marginally decreased (<0.5 days/3 years)

Conclusion

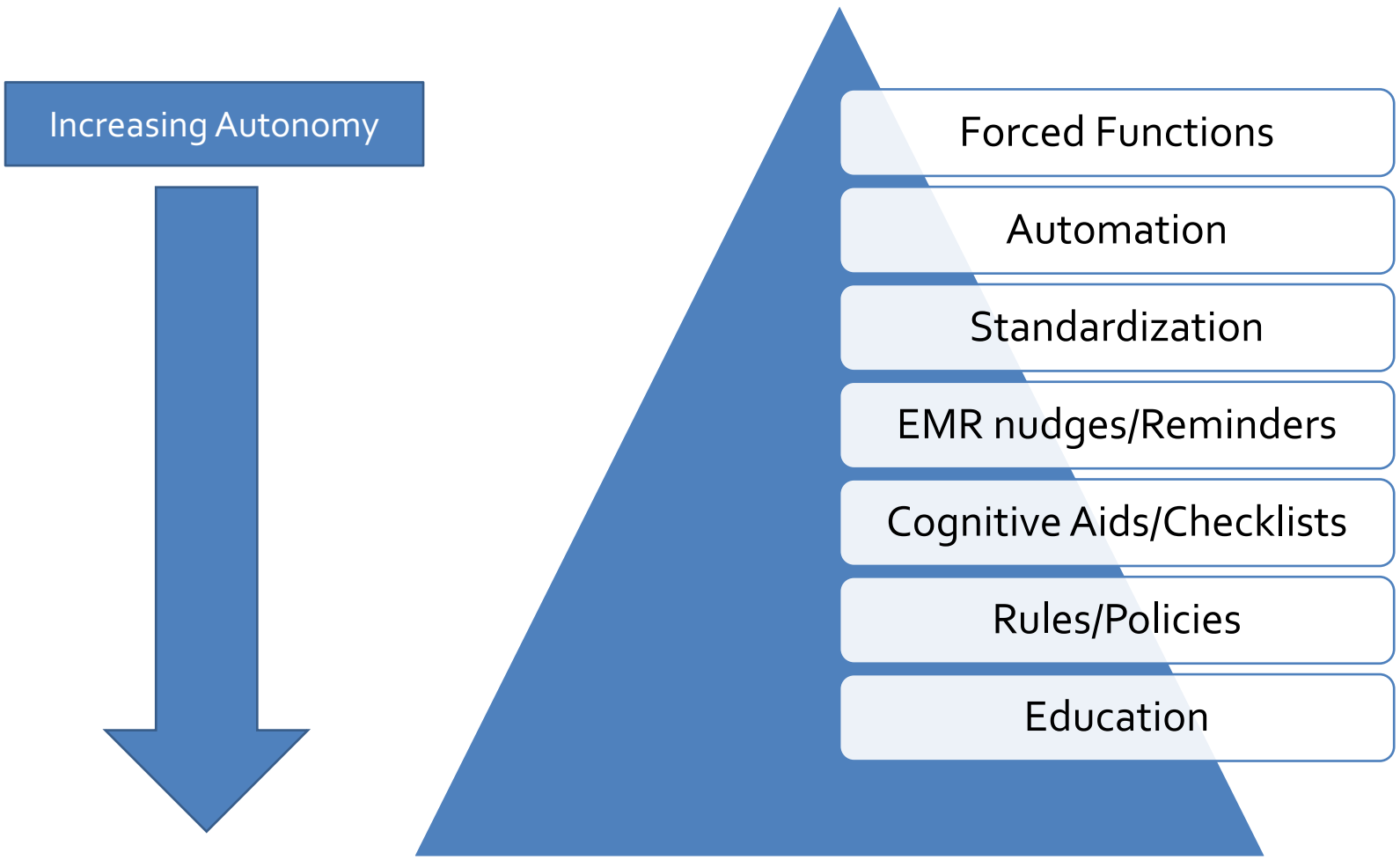
Diagnostic Stewardship



Antibiotic Stewardship

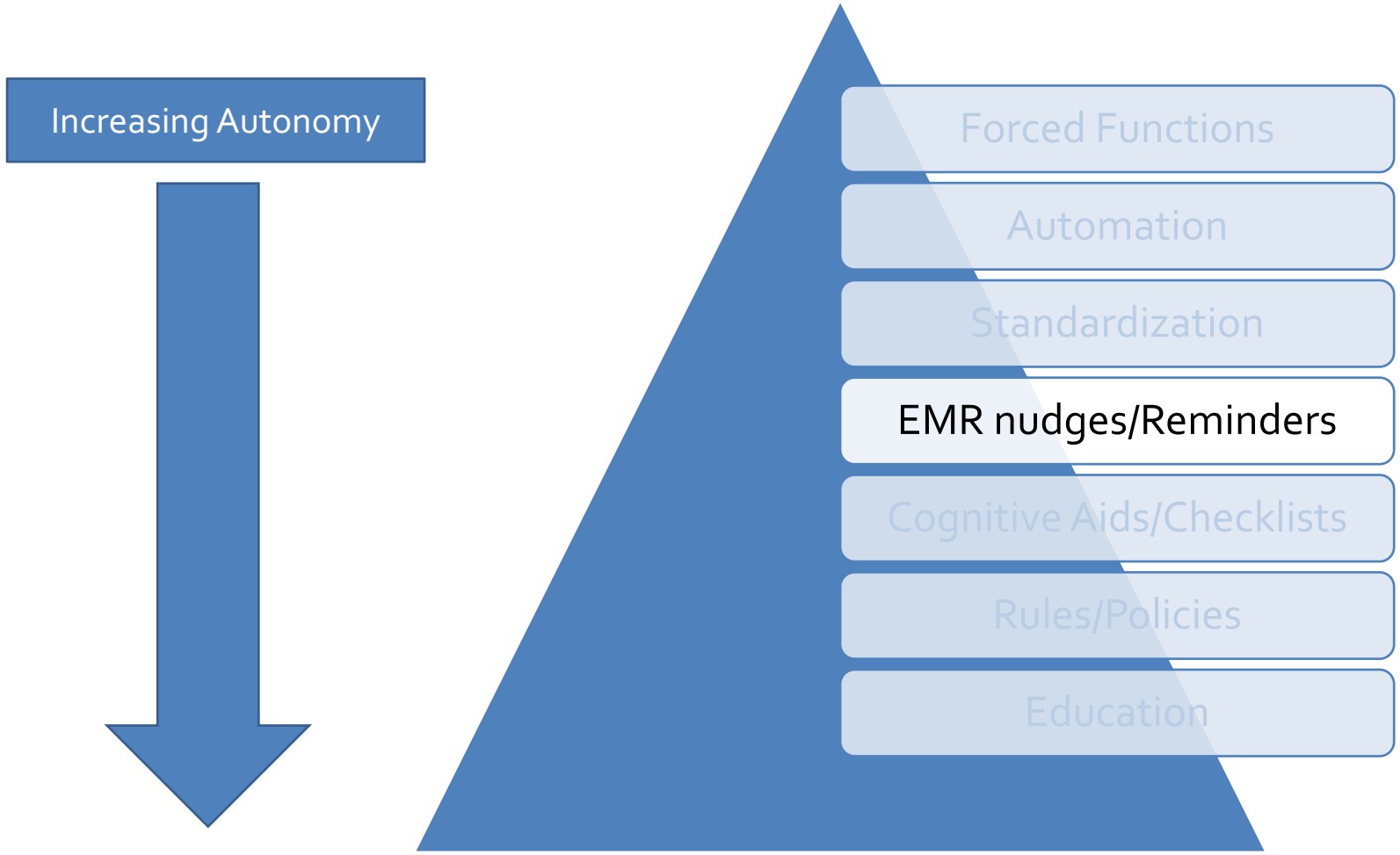


Now that we've said that…how do you do diagnostic stewardship?



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?



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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 urine 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 tests results→
    - "positive urine cultures in hospitalized patients often represent asymptomatic bacteriuria, only treat if patient has symptoms"

ED initiatives

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

What about reflex testing??

HMS Hospitals

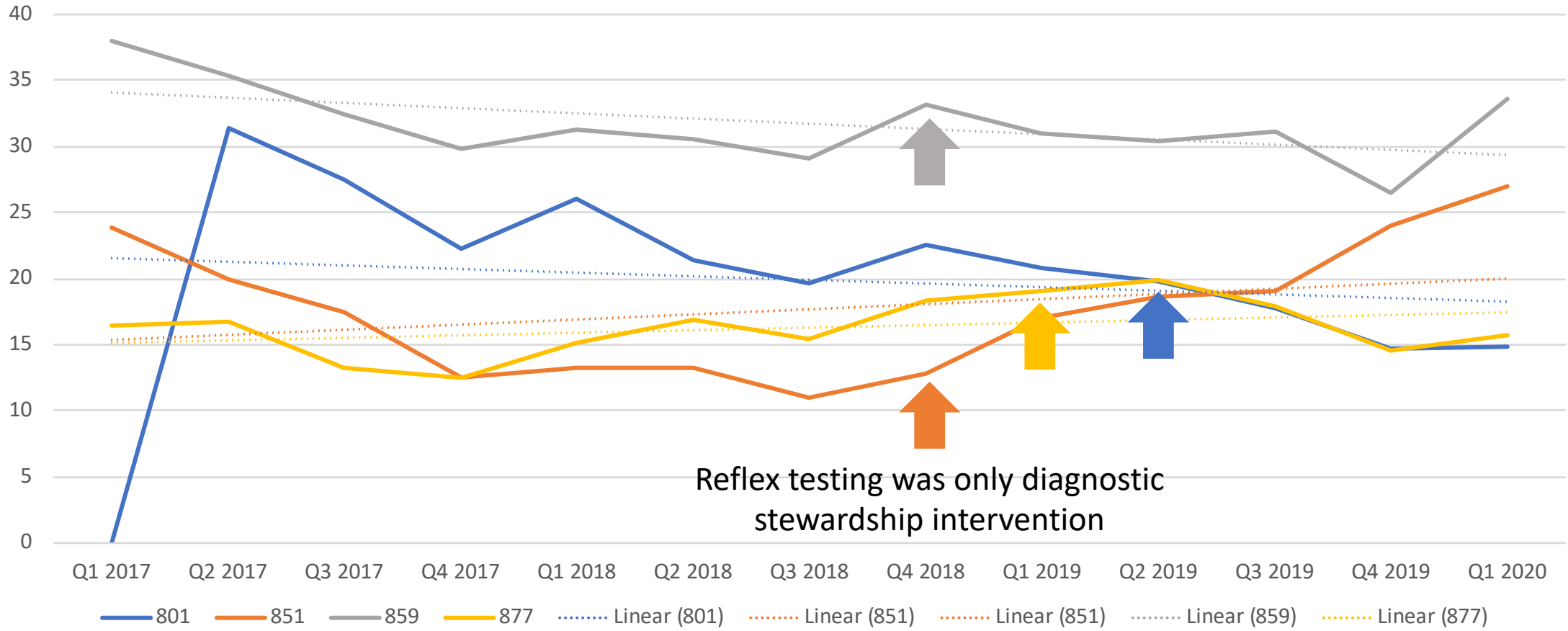
Added reflex testing

- N=4 (during our study time frame)

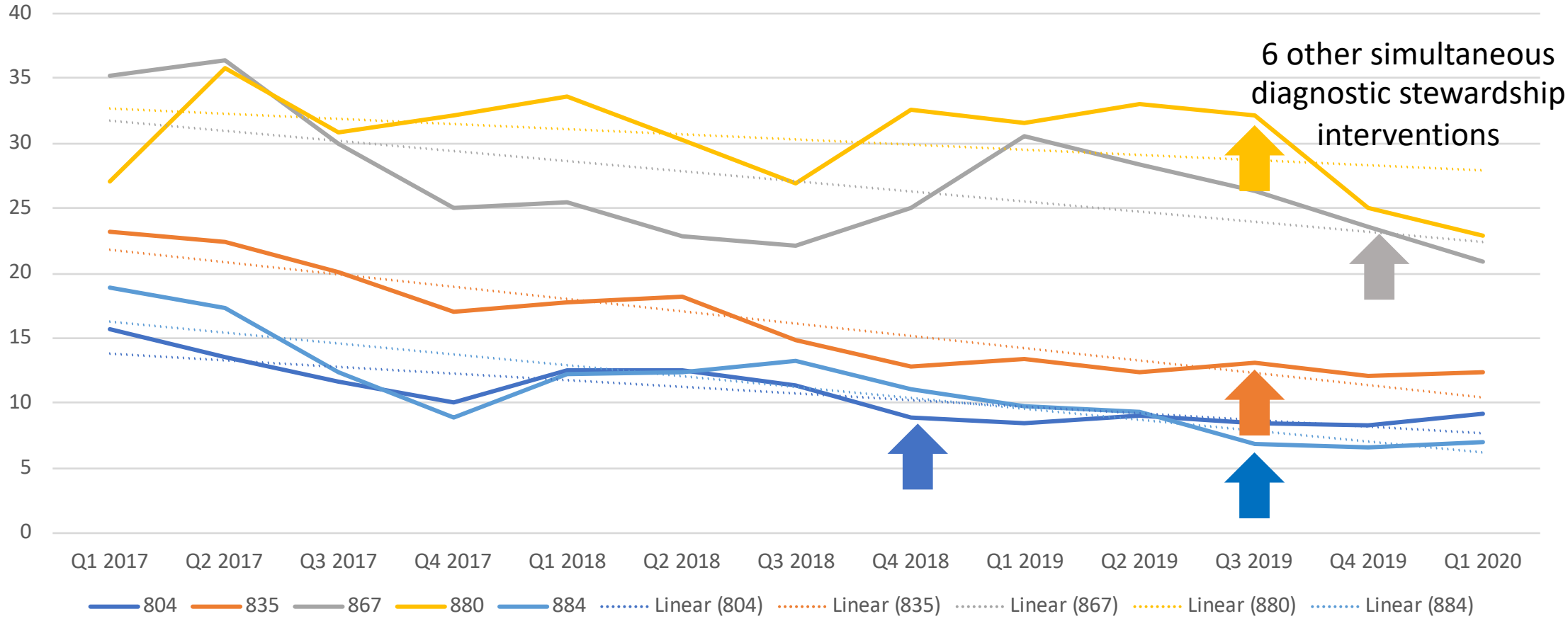
Removed reflex testing

- N=5 (during our study time frame)

Hospitals Adding Reflex Testing



Hospitals Removed Reflex Testing



Removing reflex testing

- Decrease after removing reflex testing in:
  - ASB treated/all ASB
    - 66% → 50%, P=0.002
  - ASB treated/all UTI (P<0.001)

Conclusion

1. UA isn't great at distinguishing ASB and UTI
2. Clinicians don't know that
   - +UA is the strongest predictor for treating ASB
3. Anything that makes a UA seem more reliable may increase inappropriate treatment of ASB
   - Adding reflex testing doesn't reduce ASB treatment and for some hospitals may worsen it
   - **Removing** reflex testing was associated with decreased ASB treatment
   - Other diagnostic stewardship interventions that reduce urine cultures/urinalyses better than reflex testing

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

Questions?

Keep In Touch!

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