Achieving Clinical Impact Through Interdisciplinary Teamwork

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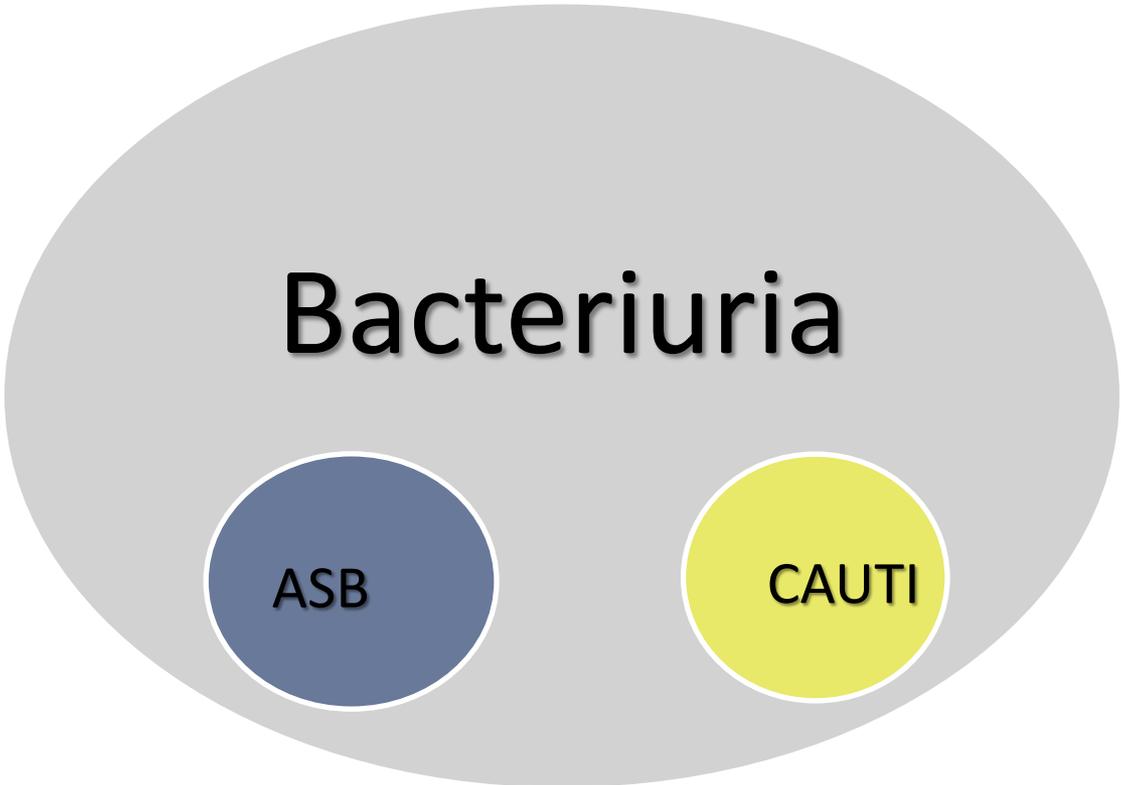Baylor College of Medicine

March 9, 2017

Kicking CAUTI
The No Knee-Jerk
Antibiotics Campaign

HSR&D IIR 09-104

Bacteriuria

ASB

CAUTI

Multiple guidelines endorse neither testing for nor treating ASB

What are the negative effects of overtreatment of ASB?

- Overtreatment hurts **all of us**
  - Costs
  - Spread of resistant organisms
- Overtreatment hurts **individuals**
  - From antibiotics
    - Gastrointestinal side effects
    - Risk of *Clostridium difficile* infection
    - Collateral damage
      - Induce resistant flora
      - Destroy healthy microbiome
  - Diagnostic delays

Overview

- Story of a team and a project
- Results and the science behind them
- Lessons learned
- Next steps

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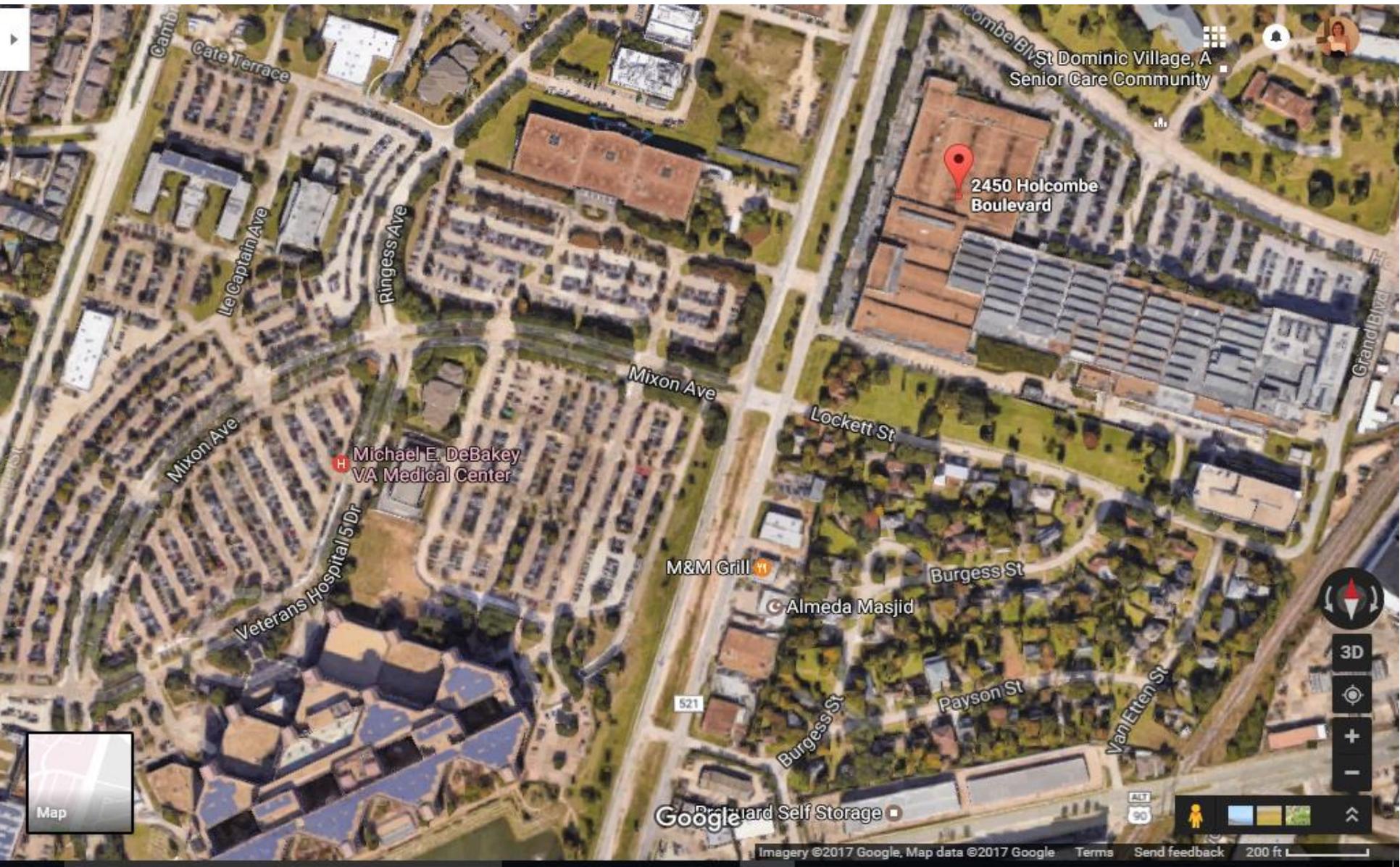- Lessons learned
- Next steps

Kicking CAUTI: The backstory

ASB is not CAUTI!

Kicking CAUTI project

Walking and thinking

Houston Center for Innovations in Quality, Effectiveness, and Safety (IQuESt)

Composition of the Team

Barbara Trautner, MD, PhD
Infectious Diseases

Sylvia Hysong, PhD
Industrial and Organizational
Psychologist

P. Adam Kelly, PhD
Psychometrician

Nancy Petersen, PhD
Senior Biostatistician

Larissa Grigoryan, MD, PhD
Epidemiologist and Analyst

Aanand Naik, MD
Geriatrician and Quality
Improvement Scientist

What's missing from our team?

- Omitted a key stakeholder from the planning team
- Related to physician hubris

Nurses!

Thinking and walking

Overview

- Story of a project and a team
- Results and the science behind them
  - Survey: cognitive biases
  - Algorithm: behavioral economics
  - Intervention: audit and feedback
  - Implementation: evidence integration triangle
- Lessons learned
- Next steps

Kicking CAUTI Campaign: Purpose

- Objective: for catheter-associated ASB
  - Reduce urine culture ordering
  - Reduce antimicrobial prescribing
- Design: pre/post intervention with a control
- Comparison: standard quality improvement

The Kicking CAUTI Campaign: Setting and Participants

- Two VA medical centers
  - Intervention: Houston
  - Comparison: San Antonio
- Acute and long term care wards (5 each)
- Focused on providers who order urine cultures and antibiotics
- Outcomes
  - Urine cultures ordered (primary)
  - Treatment of ASB with antibiotics (secondary)

The Kicking CAUTI Intervention: Key Components

1. Surveys: explore the knowledge gap
   - Identify cognitive biases
2. Algorithm: make the guidelines "actionable"
   - Applicable to specific patients
   - Provide step-by-step instructions
3. Audit and feedback: interactive educational component

Conceptual Model for Treatment of ASB and Patient Health Outcomes

Cabana et al. Why don't physicians follow clinical practice guidelines? JAMA 1999;282:1458
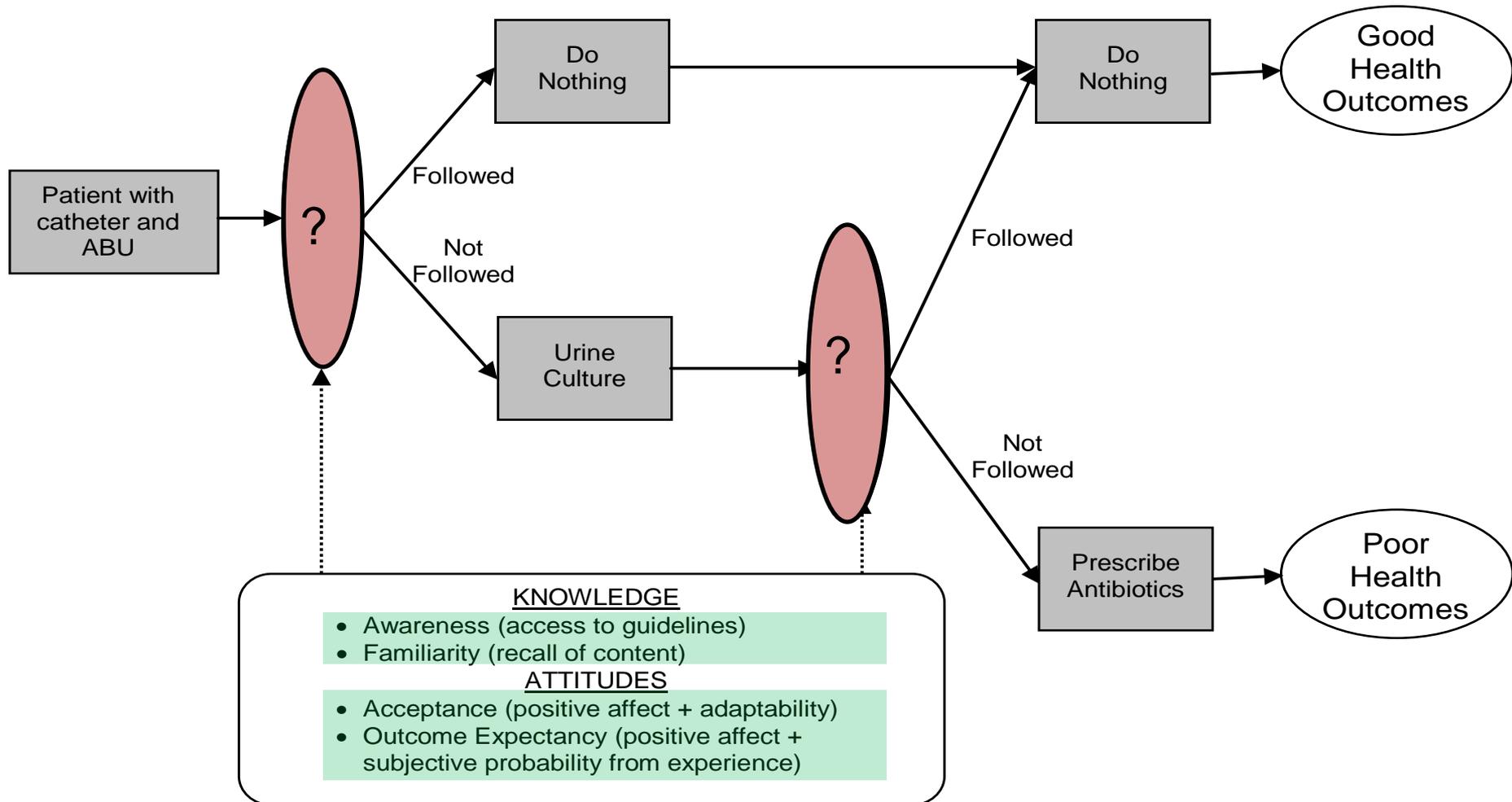
# Exploring the Gap:
ASB Survey Design

- Three parts
  - Knowledge questions
  - Constructs
  - Self-reported familiarity with ASB guidelines

- Questions probed suspected cognitive biases

- Piloted with infectious diseases fellows

- Administered prior to start of intervention

Baseline ASB Knowledge Score Varied with Years of Training

Characteristics	Number (%)	Knowledge score Mean (SD)	P value
All (n=169)		57.5 (18.8)	0.002
Staff	15 (9)	71.4 (22.2)	
Residents	154 (91)	56.1 (18.0)	
Level of Training (n=168)			<0.0001
PGY-1	76 (45)	50.1 (17.9)	
PGY-2	47 (28)	61.0 (16.1)	
PGY-3-4	29 (18)	63.5 (16.5)	
PGY-5+	16 (9)	71.3 (21.5)	
Comparisons by AVOVA			

Trautner et al, Am J Infect Control, 2014

58% reported minimal or less recall of ASB guidelines content
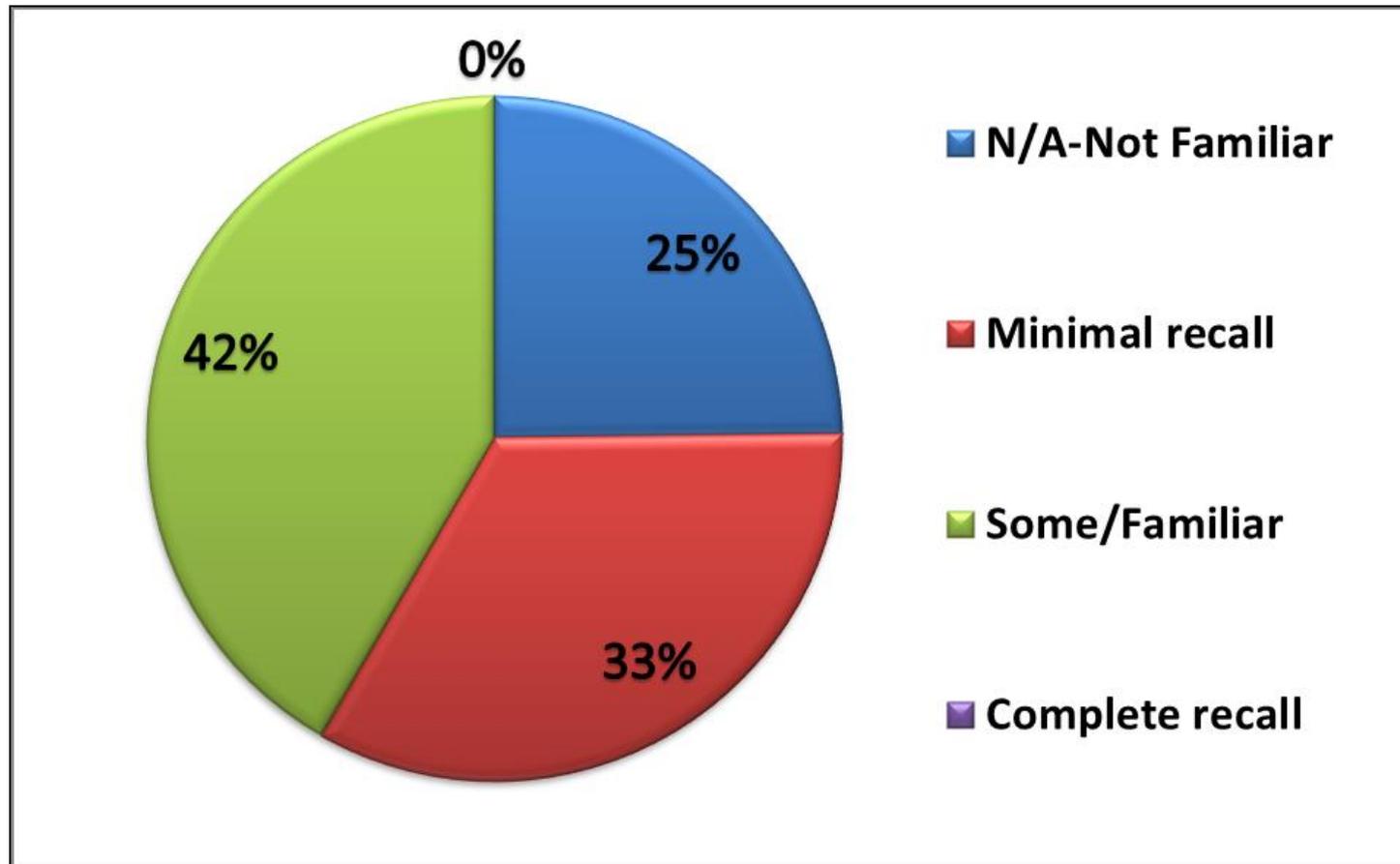
Guidelines familiarity differed significantly by year of training (p=0.02)

Organism type drives inappropriate antibiotic use for ASB
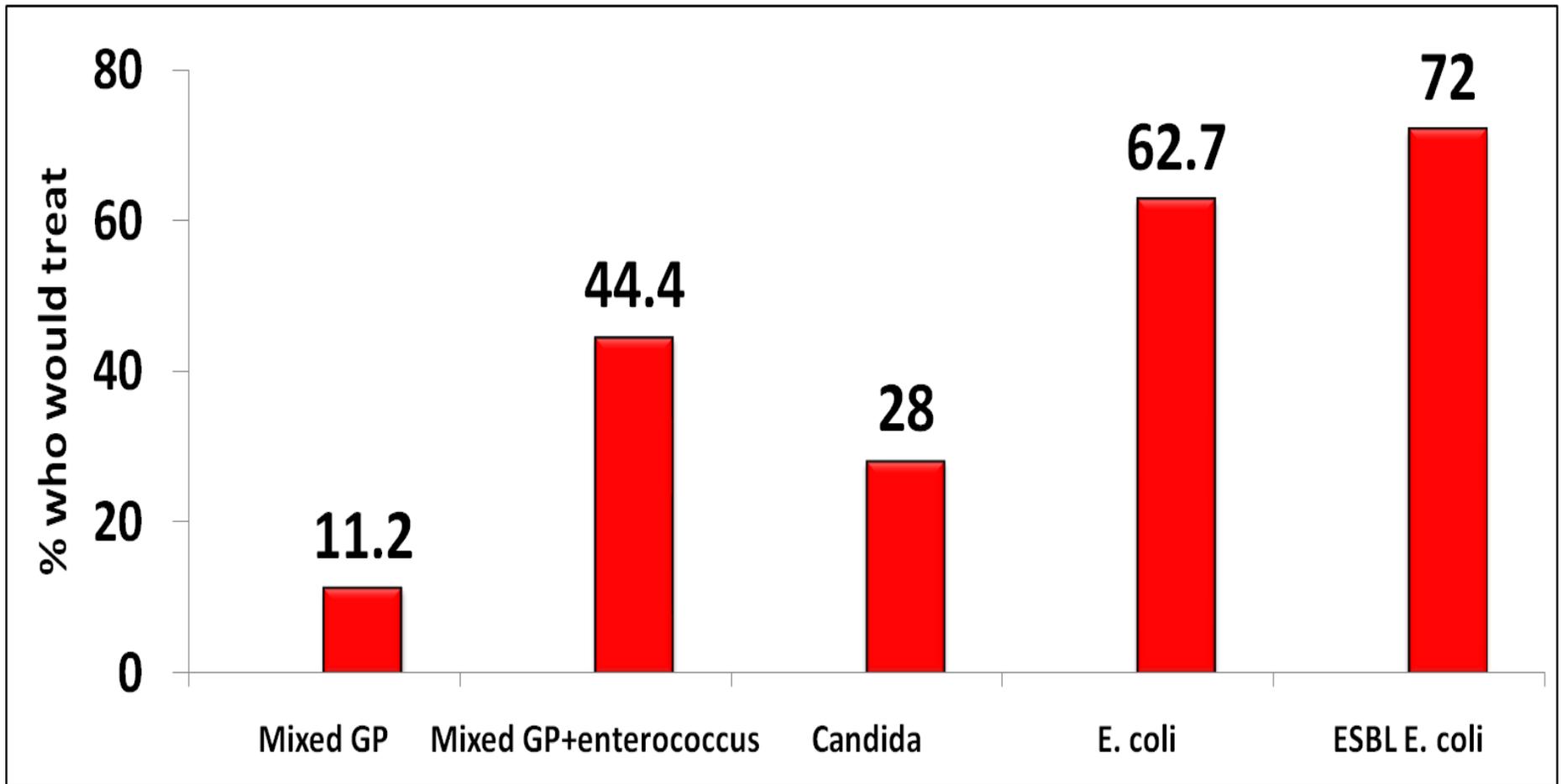
Staff providers were less likely than residents to treat enterococcus and ESBL *E. coli* (P<0.05, Fisher)

Solution: Diagnostic Algorithm

- Addresses biases
- Substitutes guidelines-compliant cues
- Makes the guidelines "actionable"
  - Applicable to specific patients
  - Provide step-by-step instructions

Guidelines Should be Actionable

recipe: favorite chocolate cake

ingredients

1 pkg. devil's food cake mix
1 pkg. instant chocolate pudding
4 large eggs
1 C. sour cream

1/2 C. warm water
1/2 C. oil
1 1/2 C. semi-sweet chocolate chips

instructions

Grease a fluted tube pan and preheat oven to 350 degrees.
Mix ingredients together except chocolate chips, using a mixer. Fold in chocolate chips.

Bake for 45 - 50 minutes, or until inserted toothpick comes out clean.
Cool for 20 minutes and then invert and remove from pan.

Dust with powdered sugar and serve with fresh whipped cream and strawberries or raspberries.

Applying Behavioral Economics

- Clinical practice guidelines difficult to implement
  - Most follow principles of <u>optimization</u>
    - Find optimal strategy given all available resources
    - Often includes algorithms for all available options and contingencies (usual and atypical cases)
  - Comprehensive and cumbersome (CAUTI - 51 pages)
    - Not ideal for the fast, frugal, and stressful setting of clinical decision making

Bounded Rationality

Human rational behavior is shaped by a scissors whose two blades are the structure of task environments and the computational capabilities of the actor.

-Herbert Simon
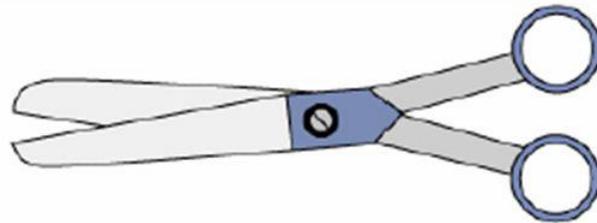
Simon, H. A., 1990, "Invariants of human behavior," *Annual Review of Psychology, 41,*1-19.

Satisficing Algorithms

- Decision making under uncertainty
  - Find options that satisfy and suffice to achieve solution adequate for the situation
- Fast and frugal heuristics
  - Best for decisions limited by time, knowledge, computational ability
  - Rely on simple search, stop and decision rules

Fast and Frugal Algorithms

- Take-the-best algorithms based on matching cues to a criterion standard

- Follow three simple rules:

  1. Search Rule: Search through cues in order of their validity

  2. Stop Rule: Stop after finding first cue that discriminates between alternatives

  3. Decision Rule: Alternative with positive cue value has highest criterion value

Catheter-Associated UTI (CAUTI) vs Asymptomatic Bacteriuria

(Patient with urinary catheter or catheter use within 48 hours)

Start

Fever   Pelvic Discomfort
Acute Hematuria   Urgency
Delirium   Frequency
Rigors   Dysuria
Flank Pain   Suprapubic Pain

WAIT

PYURIA, cloudy urine, foul smell or positive urinalysis are not symptoms of UTI and are not indications for antibiotics

Does the patient have any of CAUTI symptoms? —**NO**→ Do not send urine culture

YES

Does a non-UTI diagnosis likely account for the symptoms —**YES**→ Work-up other cause

NO

Send urine culture

Consider empiric antibiotics for CAUTI

Review urine culture results

Continue on other side

Kicking CAUTI
The No Knee-Jerk Antibiotics Campaign

MEDICAL CENTER
2005 IDSA GUIDELINES FOR ABU
2009 IDSA GUIDELINES FOR CAUTI

CAUTI Algorithm Development

- Turned guidelines into flowchart
- Flowchart reviewed by guidelines authors
  - Content validity
- Cognitive interviews with end-users
  - Face validity
- Revised version back to the authors
- Tested inter-rater reliability on case classification
  - Poor without algorithm: Kappa 0.35
  - Substantial agreement with algorithm: Kappa 0.76

Trautner et al, BMC Med Inform Decis Mak 2013

Using the Algorithm for
Audit and Feedback

- Characteristics that maximize impact of A&F
  - Contains the right answer
  - Graphical or written format
  - Neutral tone
    - "Guidelines non-compliant" rather than "wrong"

Hysong et al, BMJ Quality and Safety 2016

Decreasing CAUTI through correct diagnosis: Personalized case report

Dr. Barbara Trautner, Infectious Diseases

![Kicking CAUTI - The No Knee-Jerk Antibiotics Campaign logo]

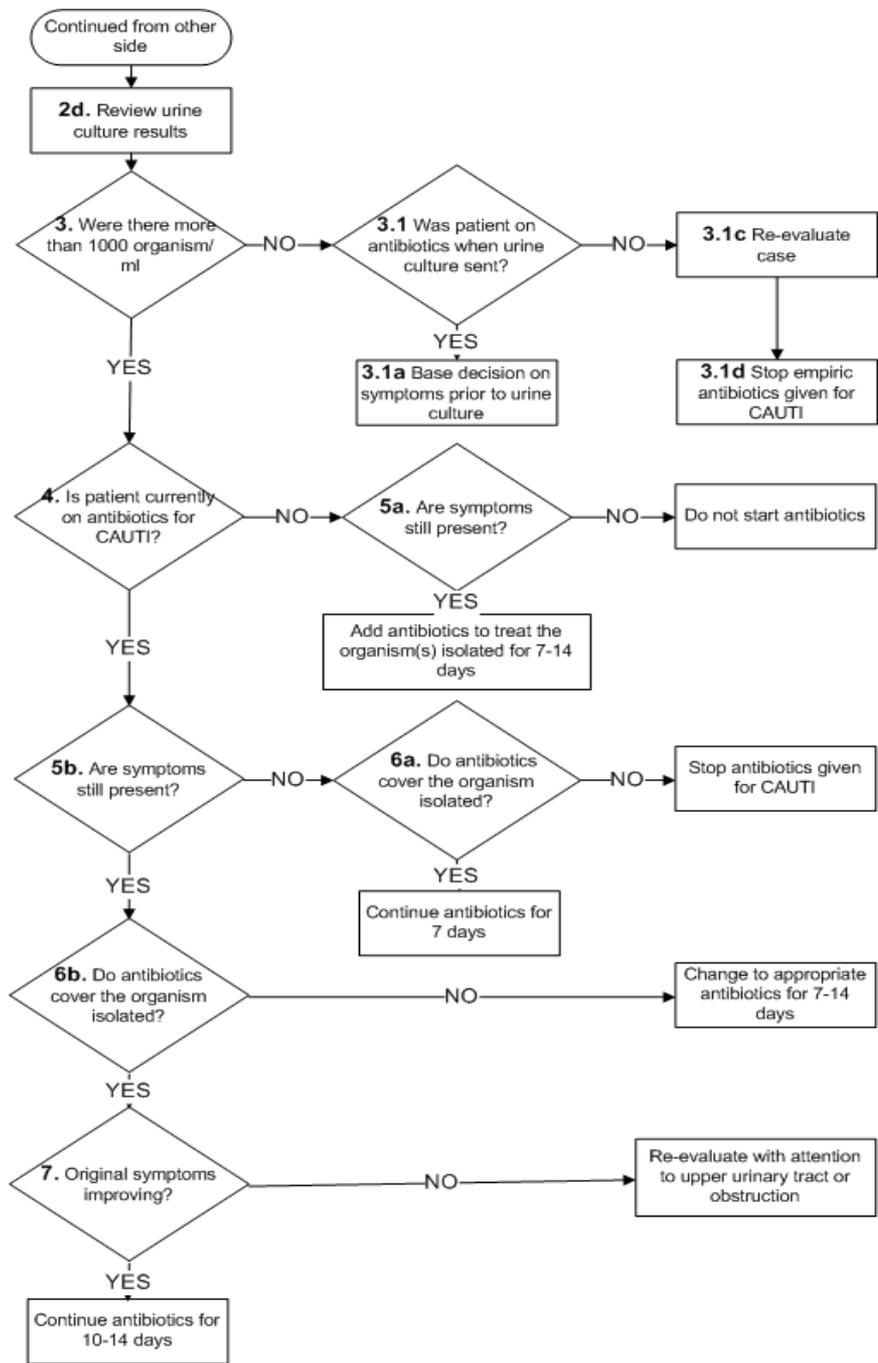**Catheter-Associated UTI (CAUTI) vs Asymptomatic Bacteriuria**

(Patient with urinary catheter or catheter use within 48 hours)

Fever	Pelvic Discomfort
Acute Hematuria	Urgency
Delirium	Frequency
Rigors	Dysuria
Flank Pain	Suprapubic Pain

Start

1. Does the patient have any of CAUTI symptoms?

→ NO → Do not send urine culture

↓ YES

2. Does a non-UTI diagnosis likely account for the symptoms

→ YES → Work-up other cause

↓ NO

2a. Send urine culture

↓

2b. Consider empiric antibiotics for CAUTI

↓

2c. Review urine culture results

↓

Continue on other side

Page 1

2005 IDSA GUIDELINES FOR ABU
2009 IDSA GUIDELINES FOR CAUTI

Continued from other side

2d. Review urine culture results

3. Were there more than 1000 organism/ml — NO → **3.1** Was patient on antibiotics when urine culture sent? — NO → **3.1c** Re-evaluate case

3.1 YES → **3.1a** Base decision on symptoms prior to urine culture

3.1c → **3.1d** Stop empiric antibiotics given for CAUTI

3. YES ↓

4. Is patient currently on antibiotics for CAUTI? — NO → **5a.** Are symptoms still present? — NO → Do not start antibiotics

5a. YES → Add antibiotics to treat the organism(s) isolated for 7-14 days

4. YES ↓

5b. Are symptoms still present? — NO → **6a.** Do antibiotics cover the organism isolated? — NO → Stop antibiotics given for CAUTI

6a. YES → Continue antibiotics for 7 days

5b. YES ↓

6b. Do antibiotics cover the organism isolated? — NO → Change to appropriate antibiotics for 7-14 days

6b. YES ↓

7. Original symptoms improving? — NO → Re-evaluate with attention to upper urinary tract or obstruction
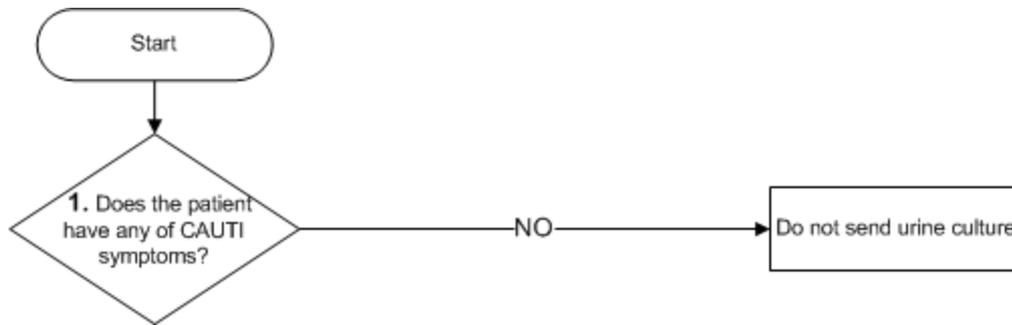
7. YES ↓

Continue antibiotics for 10-14 days

Page 2

1. According to the guidelines, the first thing to do is to check whether the patient had any of the following symptoms: fever, acute hematuria, delirium, rigors, flank pain, pelvic discomfort, urgency, frequency, dysuria, or suprapubic pain.
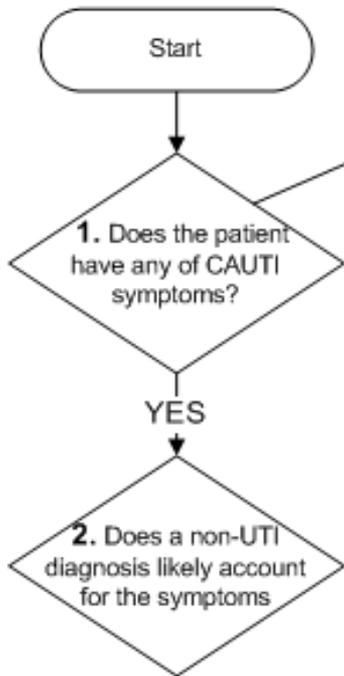
Correct: The decision to NOT send a urine culture was correct. Per chart review, the patient did not have any of the symptoms of CAUTI. Leukocytosis is not a specific symptom of CAUTI.

Feedback: Screening for asymptomatic bacteriuria (ABU) is not recommended. Unless a patient has symptoms consistent with CAUTI, a urine culture should not be sent in the first place. If the patient does have symptoms that could indicate CAUTI, a urine culture should be sent and then you should next consider whether another diagnosis could account for the symptoms.

CAUTI-related treatment of this patient stops here.

```
┌──────────────────────────────────────┐
│ Fever            Pelvic Discomfort   │
│ Acute Hematuria  Urgency             │
│ Delirium         Frequency           │
│ Rigors           Dysuria             │
│ Flank Pain       Suprapubic Pain     │
└──────────────────────────────────────┘
```

Start

1. Does the patient have any of CAUTI symptoms?

YES

2. Does a non-UTI diagnosis likely account for the symptoms

1. According to the guidelines, the first thing to do is to check whether the patient had any of the following symptoms: fever, acute hematuria, delirium, rigors, flank pain, pelvic discomfort, urgency, frequency, dysuria, or suprapubic pain.

Incorrect: You decided YES, the patient had symptoms. However, per chart review, the patient did not have any of the symptoms of CAUTI by IDSA guidelines Leukocytosis is not a specific symptom of CAUTI.

Next Step: If this patient had shown symptoms that could indicate CAUTI, then you would next consider whether another diagnosis could account for the symptoms.

2. Did a non-UTI diagnosis likely account for the symptoms?
 Yes: Although you treated the patient empirically for CAUTI without further workup, it seems likely that a non-UTI diagnosis accounted for the symptoms. This is because the patient also was receiving prednisone, which could account for the leukocytosis.

Were inappropriate antibiotics given?
YES: The patient did not have symptoms of CAUTI, or if another diagnosis likely accounted for the symptoms, antibiotics were not indicated. However, the patient received Ciprofloxacin on April 19th. Per IDSA guidelines, this treatment was unnecessary.

CAUTI-related treatment of this patient stops here.
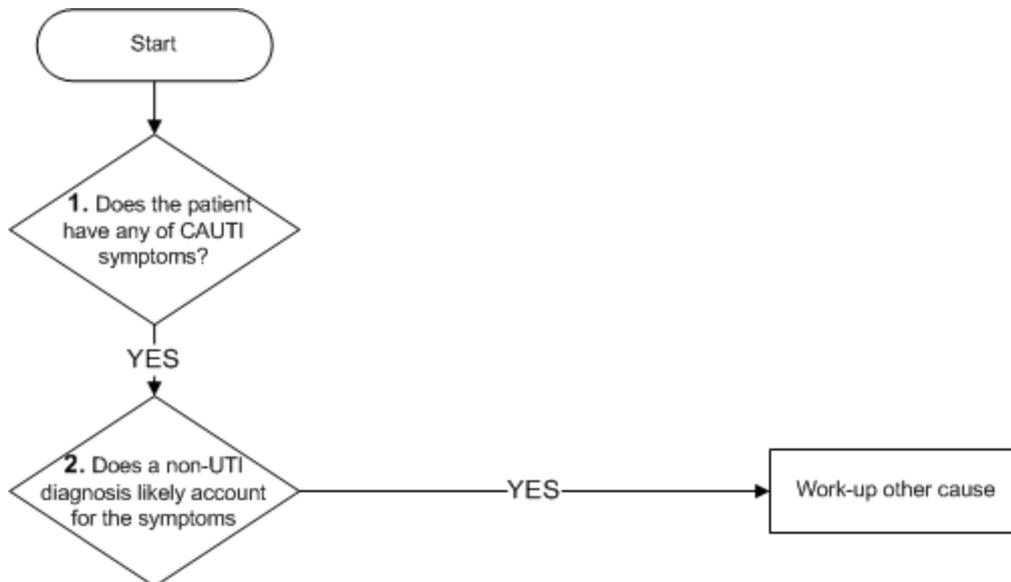
Conclusion

Thank you again for your time!
The Kicking CAUTI Campaign team hopes this feedback will be helpful to you when you encounter possible CAUTI cases in the future.

Here is a link to the IDSA guidelines:
http://www.idsociety.org/Organ_System/

Stethoscope Penlights

Results

- 289,754 total bed-days
- 11,188 urine cultures from catheterized patients
  - 4,076 (36.4%) positive
- Urine cultures ordered decreased by 71% (P<0.001)
- ASB over treatment
  - 1.6/1000 patient-days pre-intervention
  - 0.4/1000 patient-days post intervention
  - 75% decrease (P<0.001)
  - Biggest impact in long term care
- UTI under treatment did not change
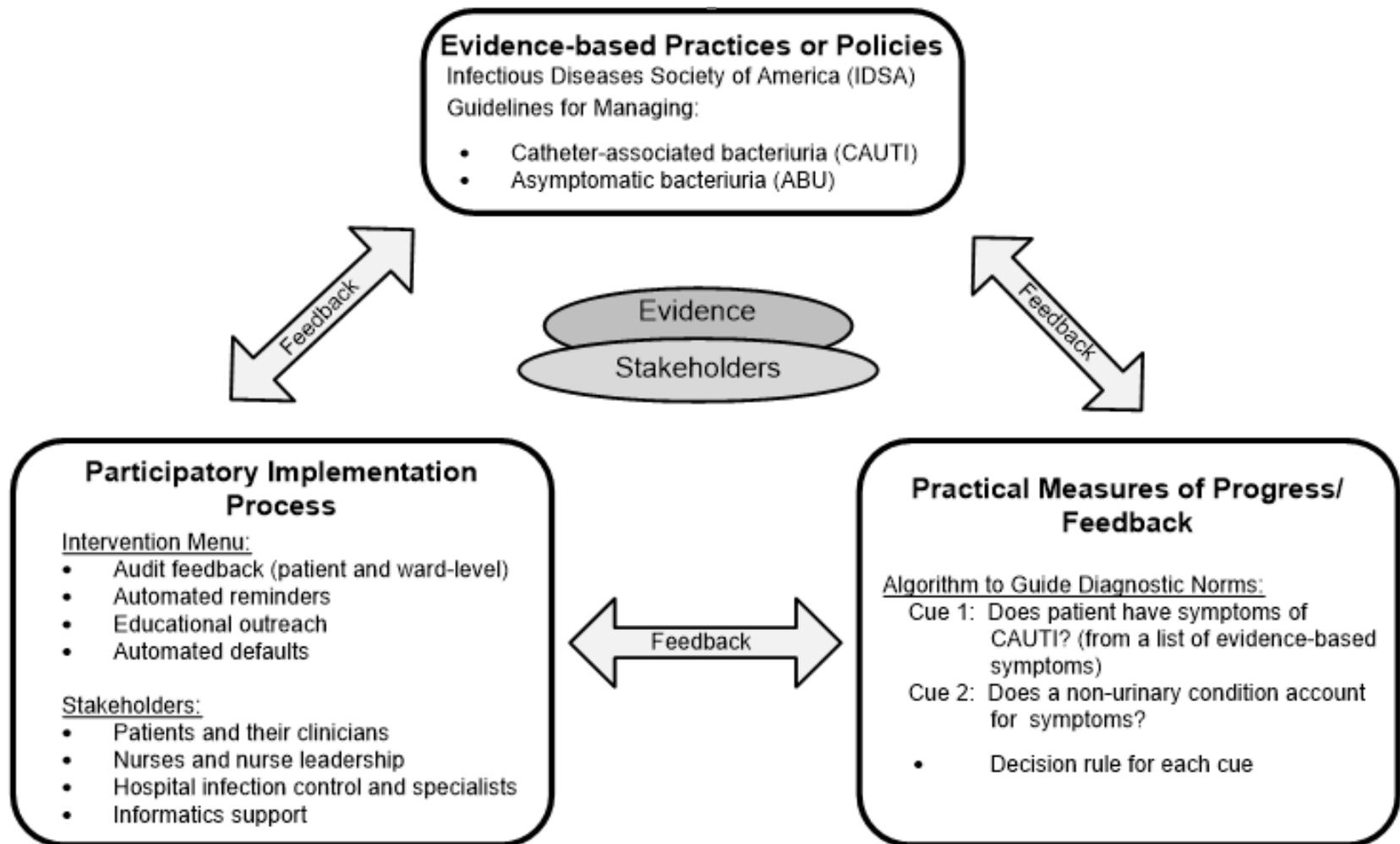
Effectiveness of an Antimicrobial Stewardship Approach for Urinary Catheter–Associated Asymptomatic Bacteriuria
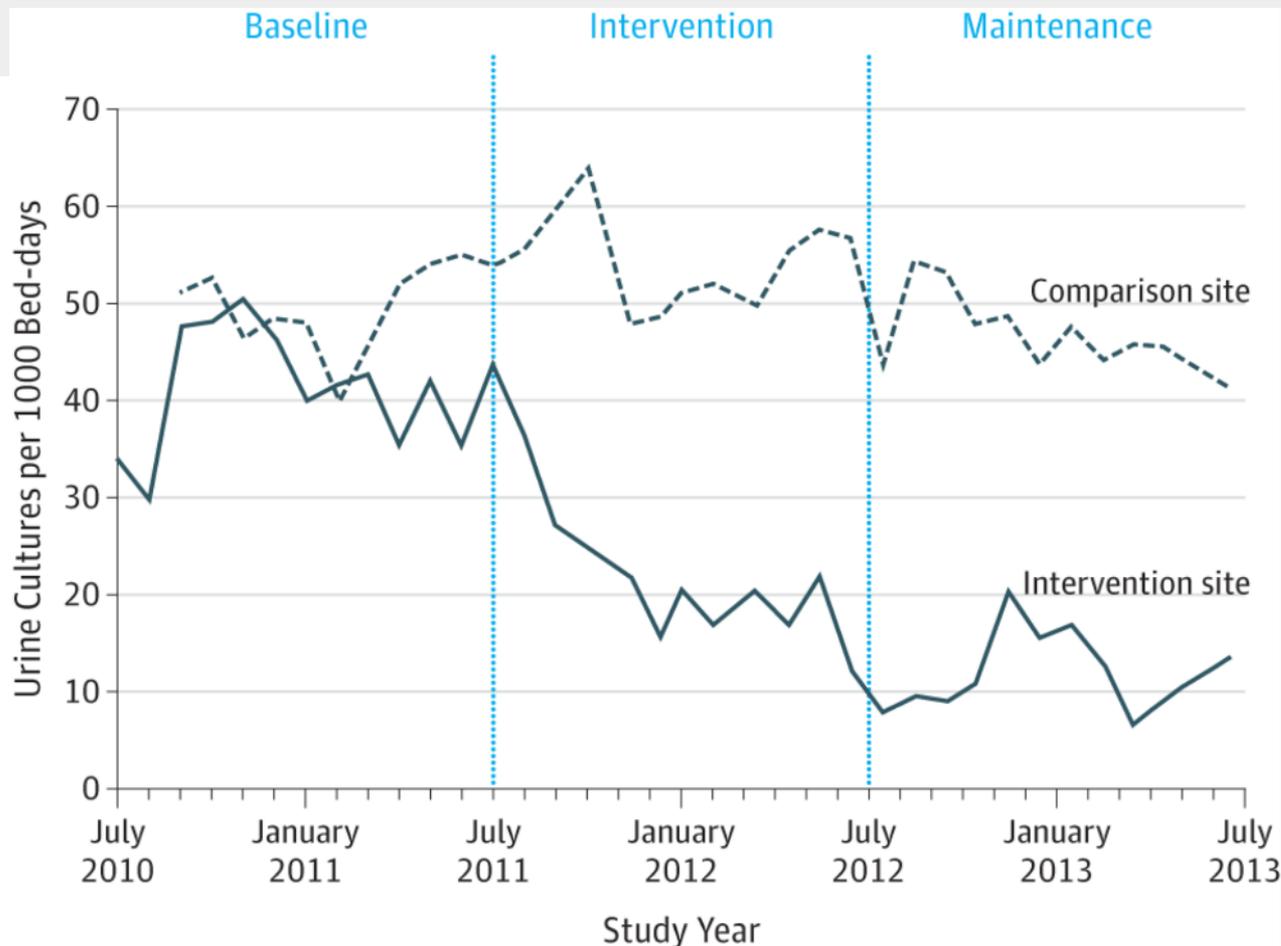
Monthly Rates of Urine Culture Orders per 1000 Bed-days

Intervention vs comparison sites across the 3 study periods (P < .001)

Evidence Integration Triangle Applied to Kicking CAUTI

Evidence-based Practices or Policies
Infectious Diseases Society of America (IDSA) Guidelines for Managing:

- Catheter-associated bacteriuria (CAUTI)
- Asymptomatic bacteriuria (ABU)

Evidence

Stakeholders

Feedback

Participatory Implementation Process

Intervention Menu:
- Audit feedback (patient and ward-level)
- Automated reminders
- Educational outreach
- Automated defaults

Stakeholders:
- Patients and their clinicians
- Nurses and nurse leadership
- Hospital infection control and specialists
- Informatics support

Feedback

Practical Measures of Progress/ Feedback

Algorithm to Guide Diagnostic Norms:
Cue 1: Does patient have symptoms of CAUTI? (from a list of evidence-based symptoms)
Cue 2: Does a non-urinary condition account for symptoms?

- Decision rule for each cue

Survey found improvements in knowledge, cognitive-behavioral constructs and guidelines familiarity

	Pre-intervention n=169	Post-intervention n=157	P value
Knowledge score, mean (SD)	57.5 (18.8)	69.9 (20.5)	<0.001
Self-efficacy, mean (SD)	3.9 (0.7)	4.1 (0.6)	0.001
Behavior, mean (SD)	2.5 (0.7)	3.4 (0.8)	<0.001
Social norms, mean (SD)	2.4 (0.8)	3.6 (0.7)	<0.001
Risk perceptions, mean (SD)	3.0 (0.6)	3.3 (0.6)	<0.001
Have heard of the IDSA guidelines	151/169 (89.3%)	150/152 (98.7%)	0.001

Respondents post-intervention were less likely to treat ASB

P < .01 for all comparisons
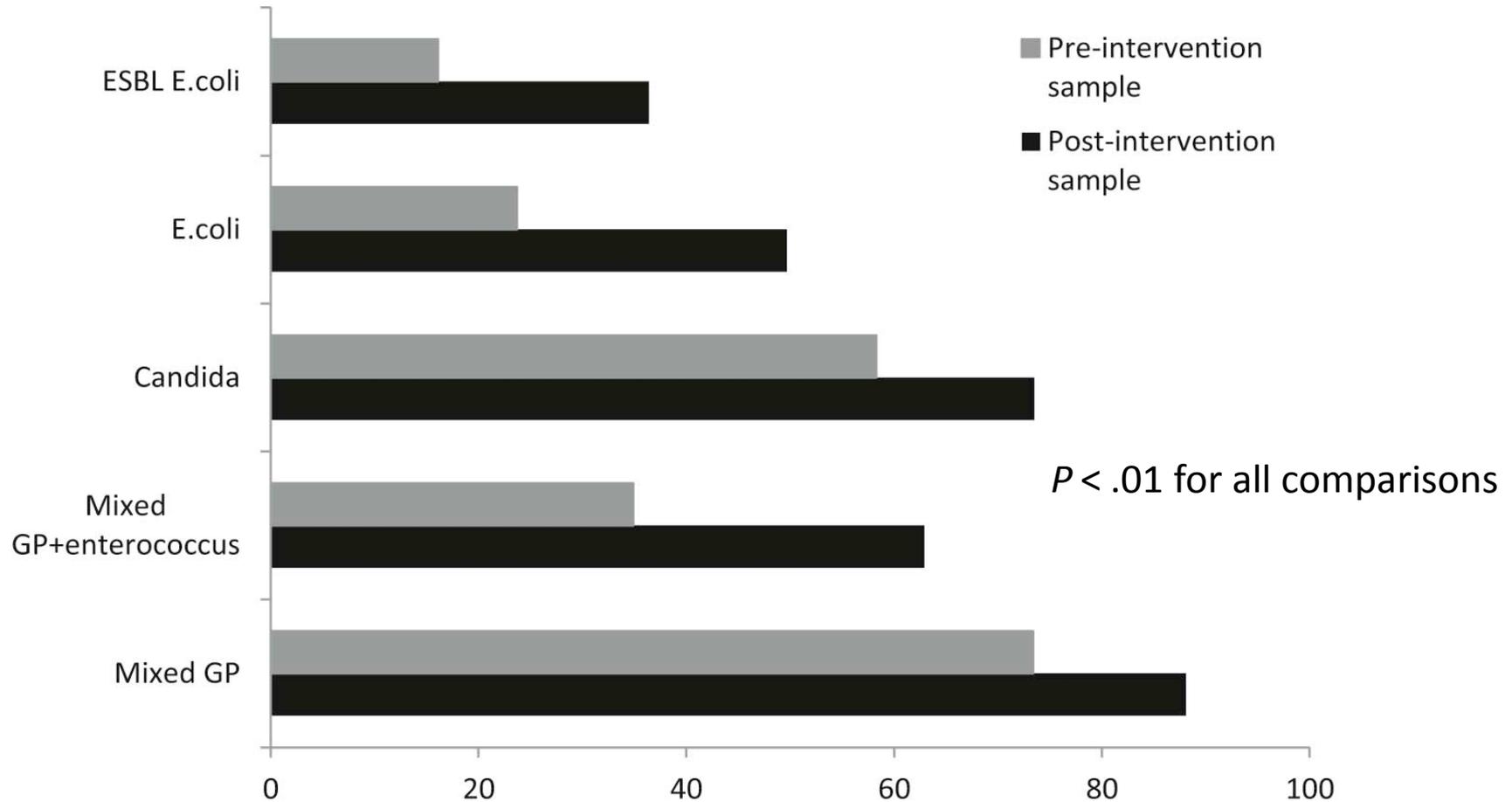
Percentage of respondents who would withhold antibiotics from treating ASB

Grigoryan, American Journal of Infection Control, 2016

Diagnostic Accuracy Improved Post-Intervention

	Intervention Site				Comparison Site			
	Pre-Intervention		Post-Intervention		Pre-Intervention		Post-Intervention	
	Positive Cultures N=129		Positive Cultures N=56		Positive Cultures N=67		Positive Cultures N=61	
	Sxs	No Sxs	Sxs	No Sxs	Sxs	No Sxs	Sxs	No Sxs
Antimicrobials prescribed	40	32	26	3	26	8	36	5
Antimicrobials not prescribed	8	49	2	25	3	30	1	19
Sensitivity (95% CI)	83% (.73-.94)		93% (.83-1.00)		90% (.79-1.00)		97% (.92-1.00)	
Specificity (95% CI)	60% (.50-.71)		89% (.78-1.00)		79% (.66-.92)		79% (.63-.95)	
Positive Likelihood Ratio	2.1		8.5		4.29		4.62	
Negative Likelihood Ratio	0.28		0.08		0.13		0.04	

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Diagnostic Accuracy Improved Post-Intervention

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Lessons Learned

- Three years of data collection requires 4+ years of work
  - On ramp and hiring, approvals, data access
  - Data cleaning and analyses
- Include key stakeholders in intervention
  - Nurses, clinical nurse assistants
- Multidisciplinary team was key to success
  - Both for study design and analyses
- Timing and timeliness are important

American Geriatrics Society

Ten Things Physicians and Patients Should Question

Released February 21, 2013 (1-5) and February 27, 2014 (6-10)

📄 Download PDF

AGS Geriatrics Healthcare Professionals

Leading Change. Improving Care for Older Adults.

1

Don't recommend percutaneous feeding tubes in patients with advanced dementia; instead offer oral assisted feeding.

Careful hand-feeding for patients with severe dementia is at least as good as tube-feeding for the outcomes of death, aspiration pneumonia, functional status and patient comfort. Food is the preferred nutrient. Tube-feeding is associated with agitation, increased use of physical and chemical restraints and worsening pressure ulcers.

Related Materials

- Additional information is available in the Resources section.

More patient-friendly materials are available from Consumer Reports at Consumer Health Choices

5

Don't use antimicrobials to treat bacteriuria in older adults unless specific urinary tract symptoms are present.

Cohort studies have found no adverse outcomes for older men or women associated with asymptomatic bacteriuria. Antimicrobial treatment studies for asymptomatic bacteriuria in older adults demonstrate no benefits and show increased adverse antimicrobial effects. Consensus criteria has been developed to characterize the specific clinical symptoms that, when associated with bacteriuria, define urinary tract infection. Screening for and treatment of asymptomatic bacteriuria is recommended before urologic procedures for which mucosal bleeding is anticipated.

Antibiotic Stewardship is:

- And yet everybody thinks it is cool
  - The White House
  - The Centers for Disease Control and Prevention
  - The World Health Organization

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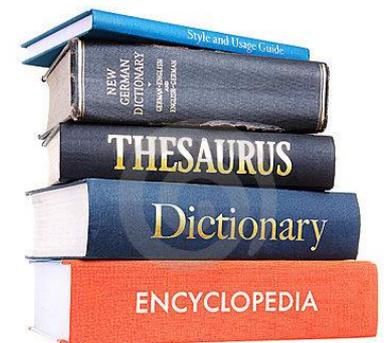- Lessons learned
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Dissemination: "Less is More" IIR

Summary

- Kicking CAUTI had a positive impact on clinical care
  - Decreased screening for and treatment of ASB
- Demonstrates the success of a theory-driven intervention in changing practice
  - Behavioral economics
  - Audit and feedback
  - Evidence integration triangle
- Lessons learned will be applied to "Less is More"

References

- Infectious Diseases Society of America Guidelines on CAUTI and ASB
  - http://www.idsociety.org/IDSA_Practice_Guidelines/
- US Preventive Services Task Force
  - http://www.uspreventiveservicestaskforce.org/Page/Topic/recommendation-summary/asymptomatic-bacteriuria-in-adults-screening
- Link to project publications
  - https://www.ncbi.nlm.nih.gov/pubmed/?term=trautner+and+naik

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