



Improving People's Lives Through Innovations in Personalized Health Care

Leveraging Technology to Prevent Catheter-Associated Urinary Tract Infections (CAUTI): Disrupting the Lifecycle of the Urinary Catheter

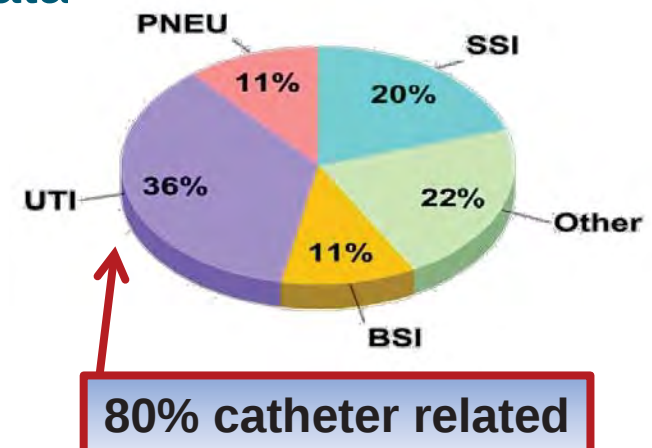
Zachary N Gordon, MD
ABMS Annual Conference
September 28, 2016



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CAUTIs: An Indicator of Quality & Safety

- 2008: CAUTI classified as a “never event”
- Mandatory Reporting to National Healthcare Safety Network (NHSN)
 - 2012: CAUTI rates in ICU settings required
 - 2015: CAUTI rates in ALL settings required
- CAUTI rates directly linked to reimbursement
 - CMS bases penalties on NHSN CAUTI data



Saint S. The potential clinical and economic benefits of silver allow urinary catheters in preventing urinary tract infection. Arch Intern med 2000;160:2670-75.

Trautner BW. Prevention of catheter-associated urinary tract infection. Curr Opin Infect Dis 2005;18:37-41.

Warren JW. A prospective microbiologic study of bacteruria in patients with chronic indwelling urinary catheters. J Infect Dis 1982;146:719-23.

Gould C. Guideline for prevention of CAUTI 2009.

Department of Health and Human Services, Action Plan To Prevent Healthcare-Associated Infection, 2009, US Department of Health and Human Services.

Klevens RM, Edwards JR, Richards CL, et al. Estimating healthcare-associated infections and deaths in U.S. hospitals, 2002. Public Health Rep. 2007; 122:160-167.



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Project Conclusions

- Ongoing audits are important to assess process measures and compliance with interventions
- Along with reducing catheter use, strategies and interventions to reduce CAUTIs MUST also focus on improving appropriate use of urine cultures
 - Avoid “culture-first” approach
 - Avoid “pan-culturing” for fever, especially in patients with an indwelling urinary catheter

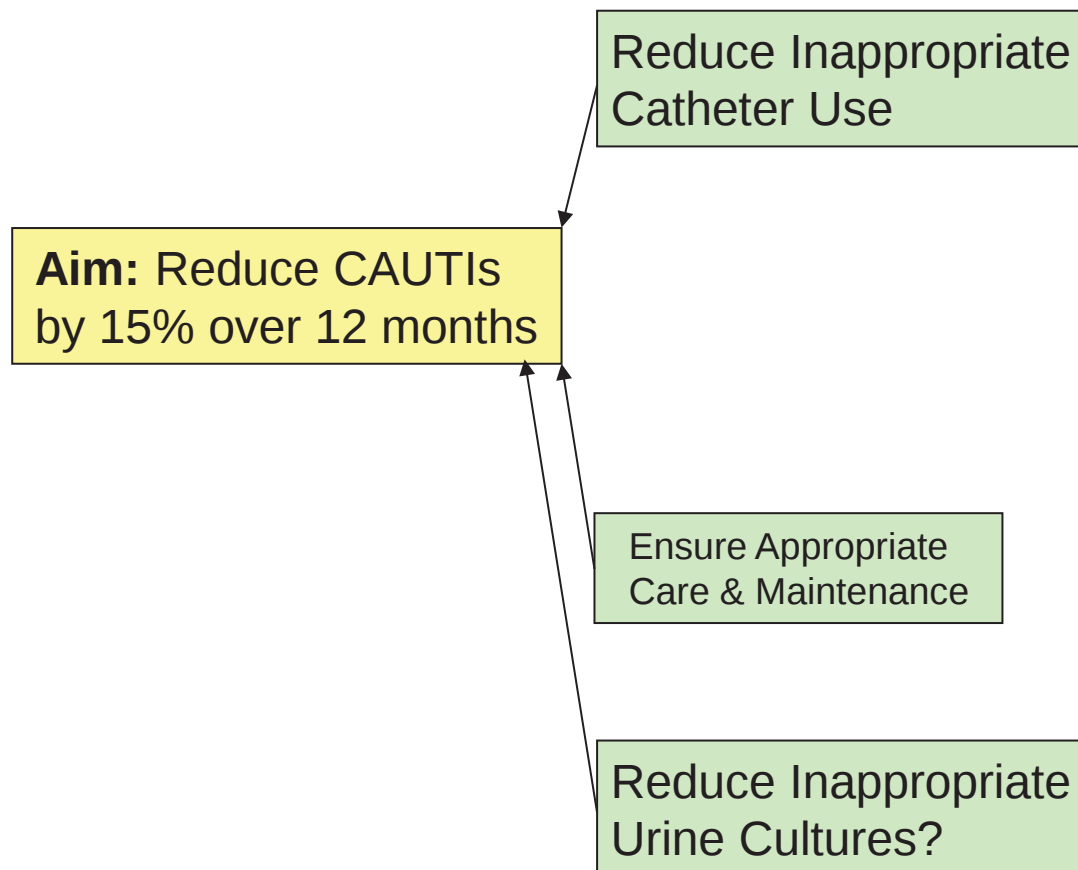


Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

Outcome

Primary Drivers



Measurement *Outcome Measures*

- **NHSN CAUTI Rate =**
 - Number of CAUTI per 1,000 catheter-days
- **Catheter Utilization Ratio =**
 - Catheter-days per Patient-days

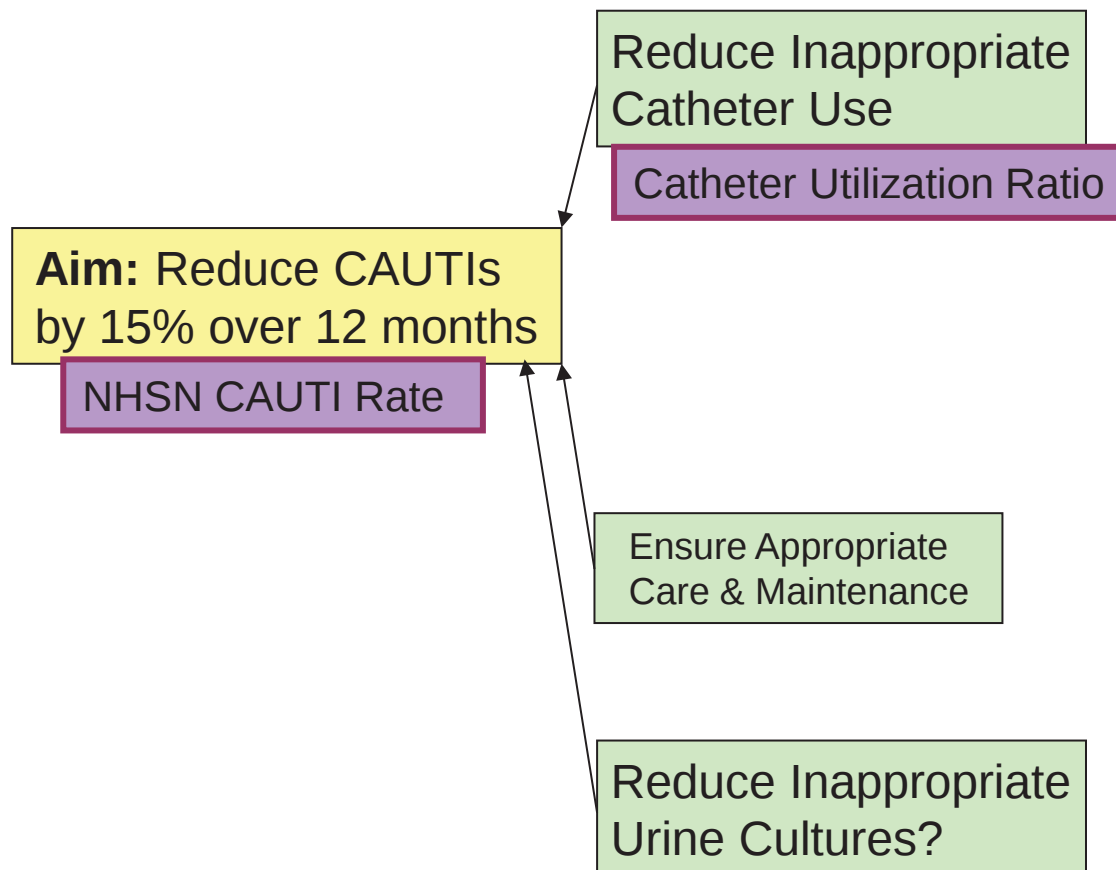


Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

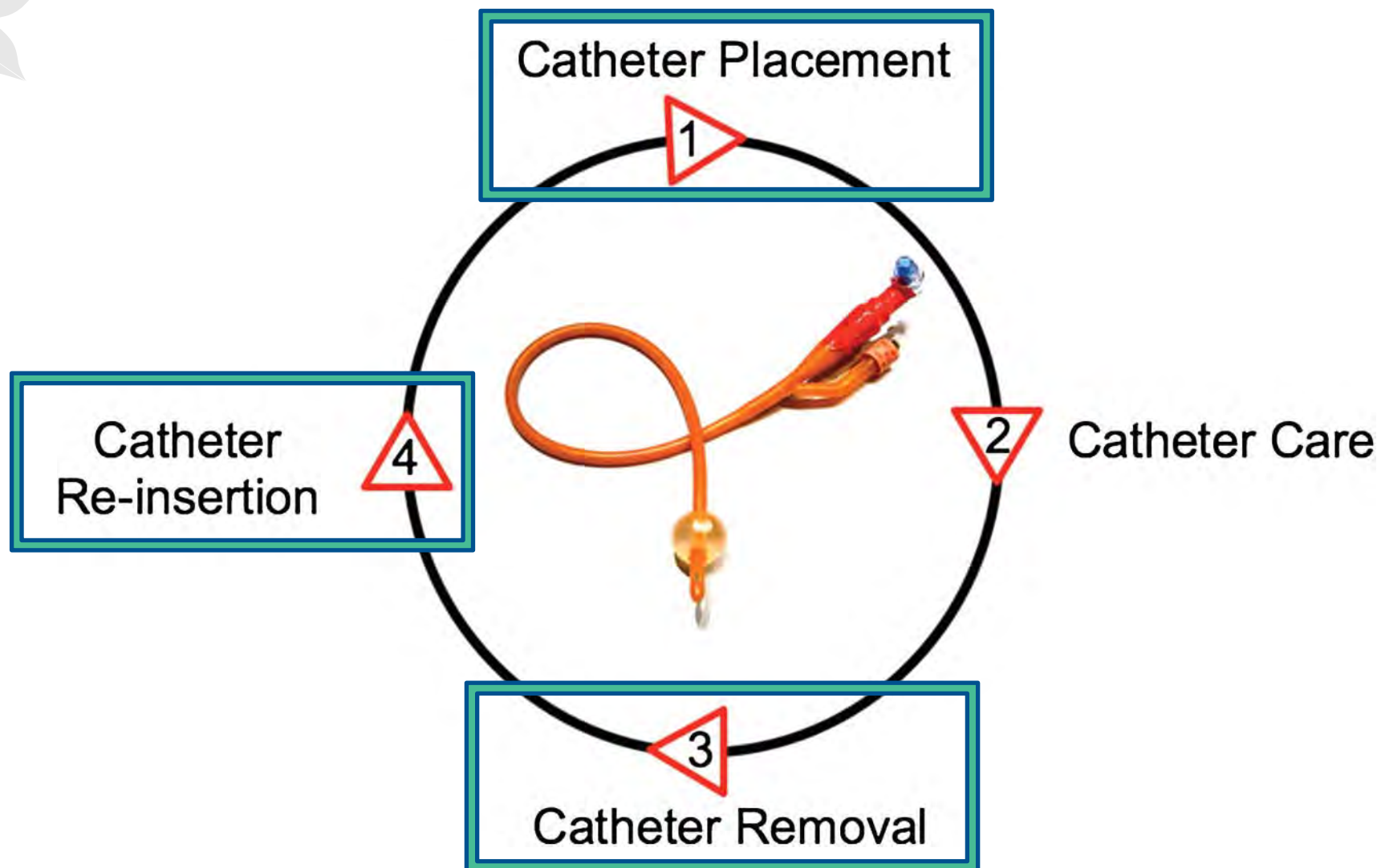
Outcome

Primary Drivers



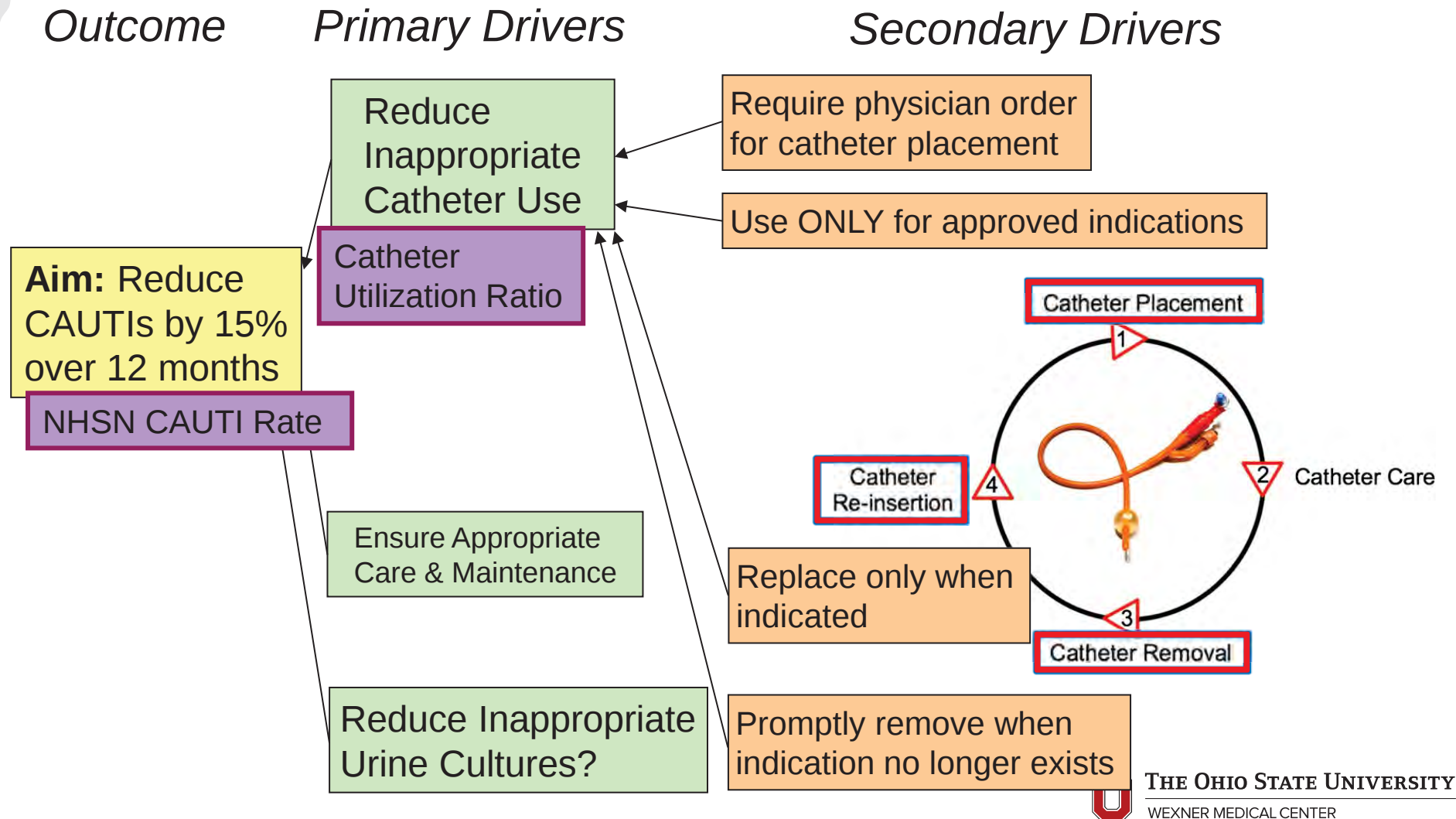
Primary Prevention Strategy

Reduce Catheter Use



Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections



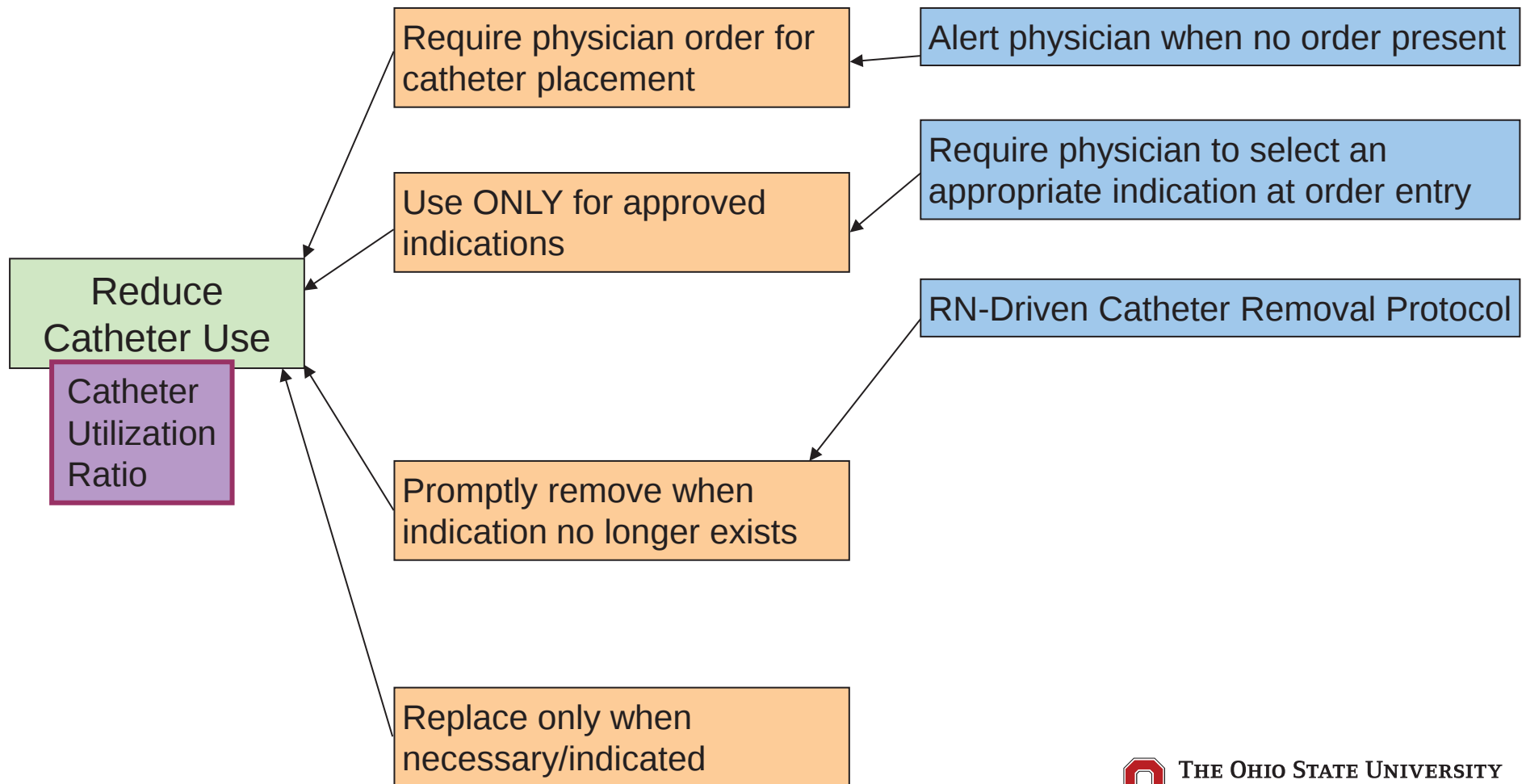
Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

Primary Drivers

Secondary Drivers

Process Changes



Clinical Implem

■ Appropriate

INSERT AND / OR MANAGE
Routine, CONTINUOUS starting f
Remove Indwelling Foley Catheter

Frequency: CONTINU

For: ☐

Starting: 4

Starting: Fr

Scheduled

! Questions:

Comments (F6): [Click to add text](#)

Reference

Links:

1. Algorithm for Removal of Indwelling Urinary Catheters (see page 2)

! Next Required

Link Order

✓ Accept

✗ Cancel

Item Select

Search:

Title

Acute urinary retention

Accuracy of urinary output in critically ill

Periop

Open sacral/perianal wound with incontinence

Prolonged immobilization

Improved comfort for end of life care

Other (see comments)

Accept

Cancel

Prompt

Answer

1. Indications for Foley: !



Open selection entry

2. Remove Indwelling Foley Catheter:

Per Nursing Urinary Catheter Removal Protocol

When ordered

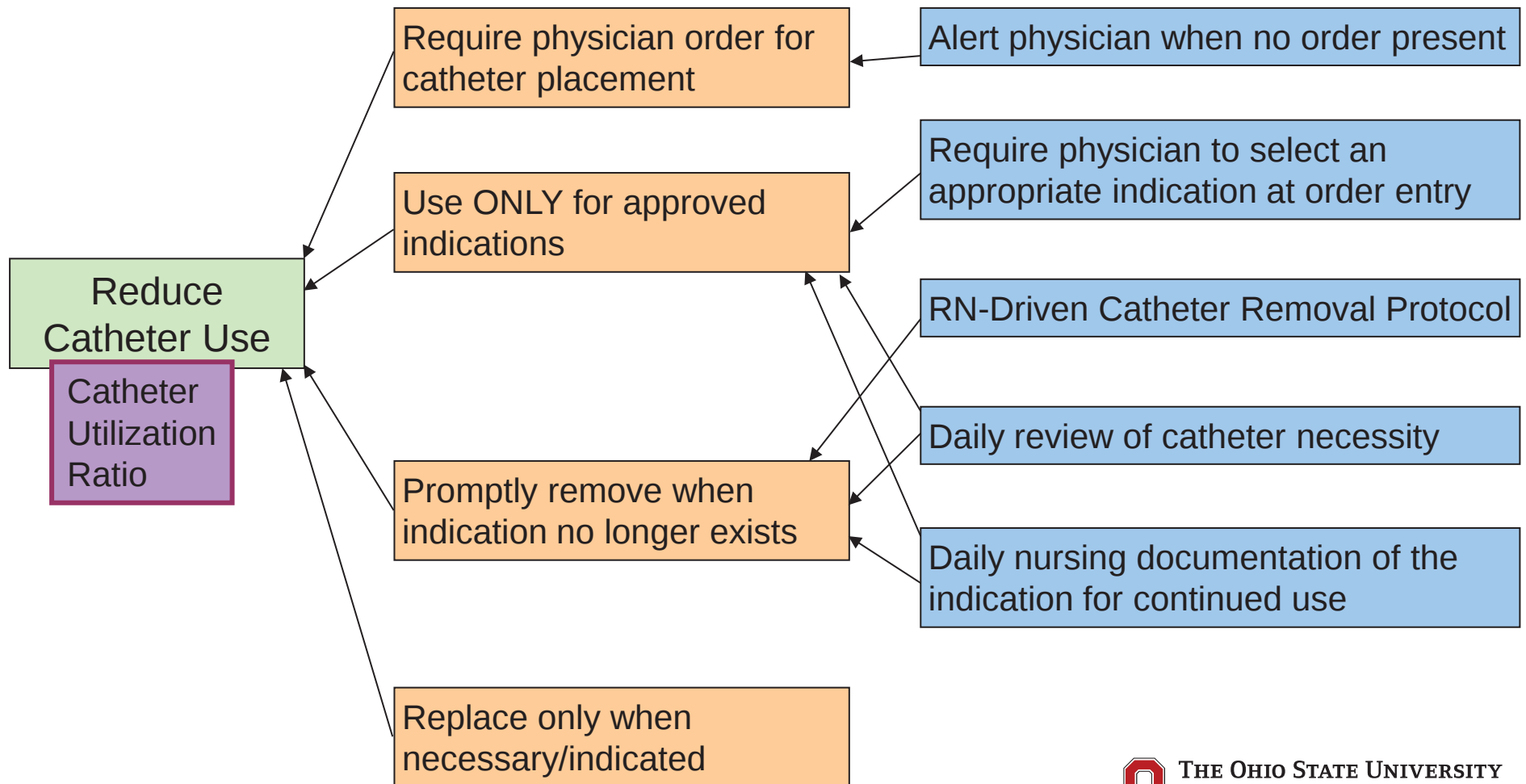
Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

Primary Drivers

Secondary Drivers

Process Changes



Clinical Decision Support Interventions: Implementation of Prevention Strategies

- **Automated RN-Directed Alerts/Reminders**
 - Daily Documentation of Indication for Continued Use

Indwelling Urethral Catheter 04/20/16 0600

Indwelling Urethral Catheter - Properties

Placement Date/Time: 04/20/16

Securement

Foreskin

Daily Review of Necessity

Urine Output (mL)



Open selection entry

 **Selection Form** ✕

acute urinary retention
accurate measurement of urinary output in the critically ill
aid healing of open sacral/perianal wound with incontinence
prolonged immobilization
improved comfort for end of life care
perioperative use

Accurate measurement of urinary output in the critically ill

Indwelling catheter

Indwelling catheter

Secure catheter

Foresight

Accept Cancel

Daily Review of Necessity

Urine Output (mL)



Open selection entry

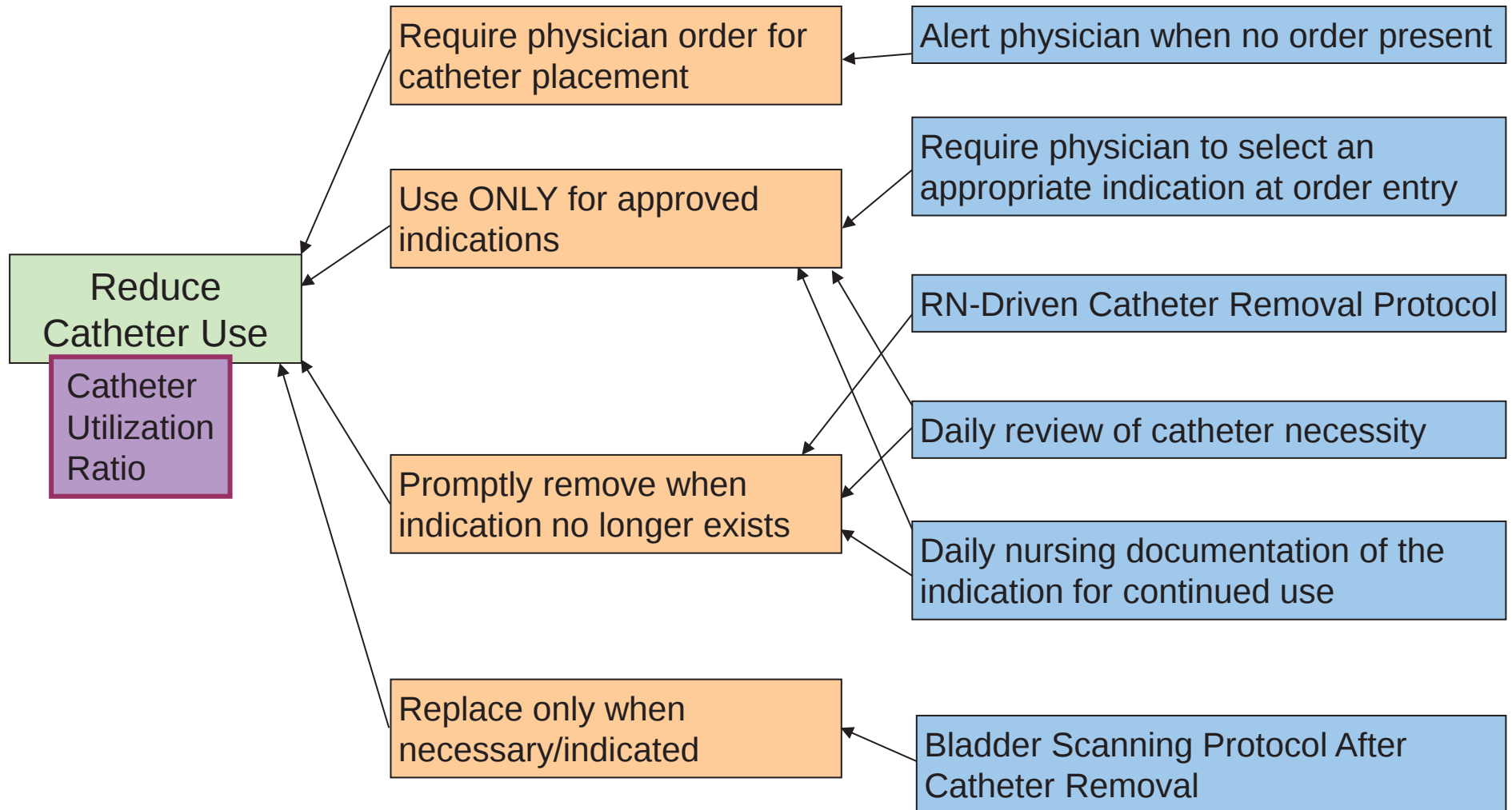
Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

Primary Drivers

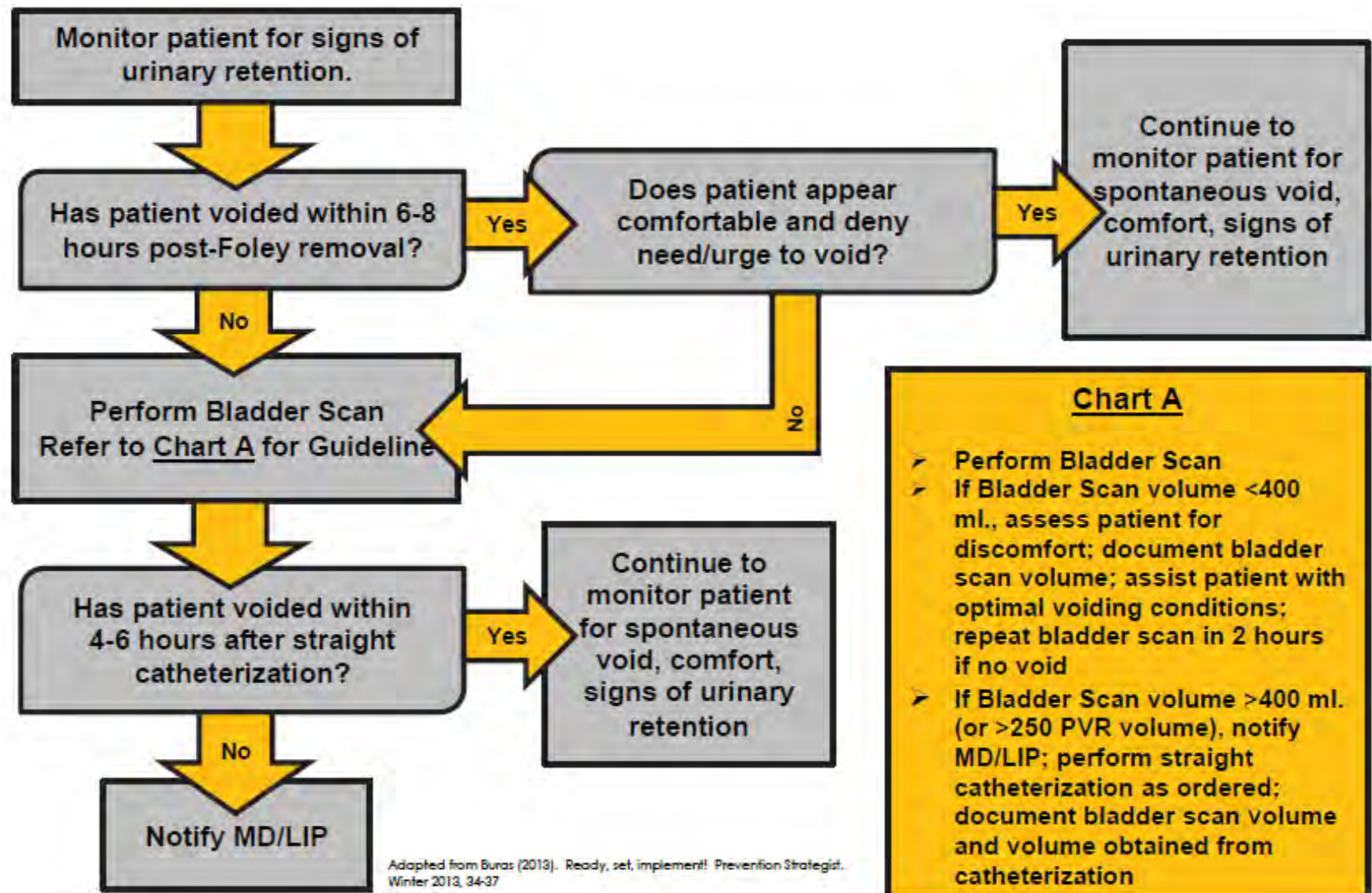
Secondary Drivers

Process Changes



Avoid Catheter Replacement After Removal

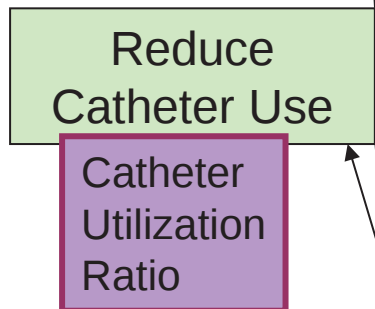
■ Bladder Scanning Protocol After Catheter Removal



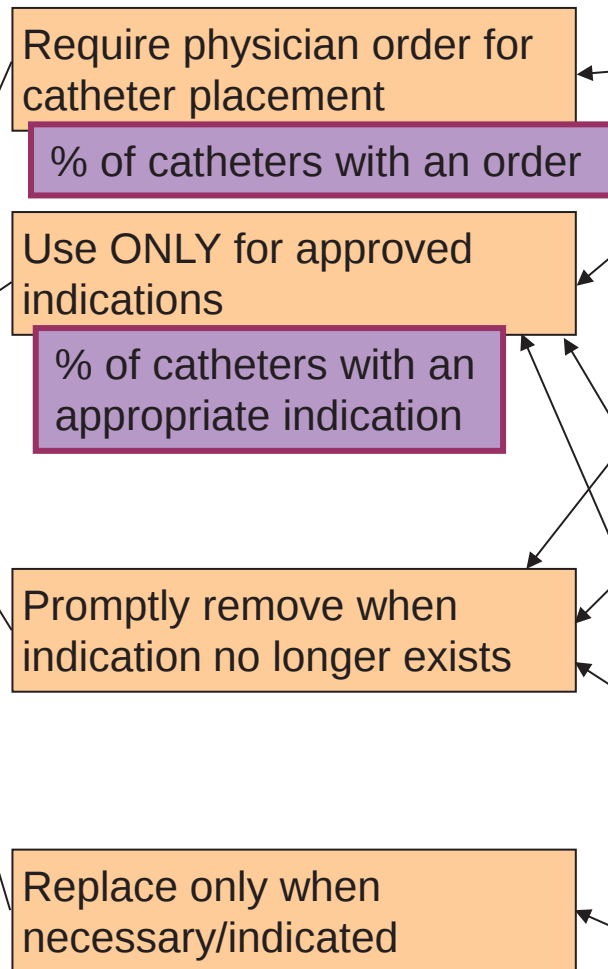
Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

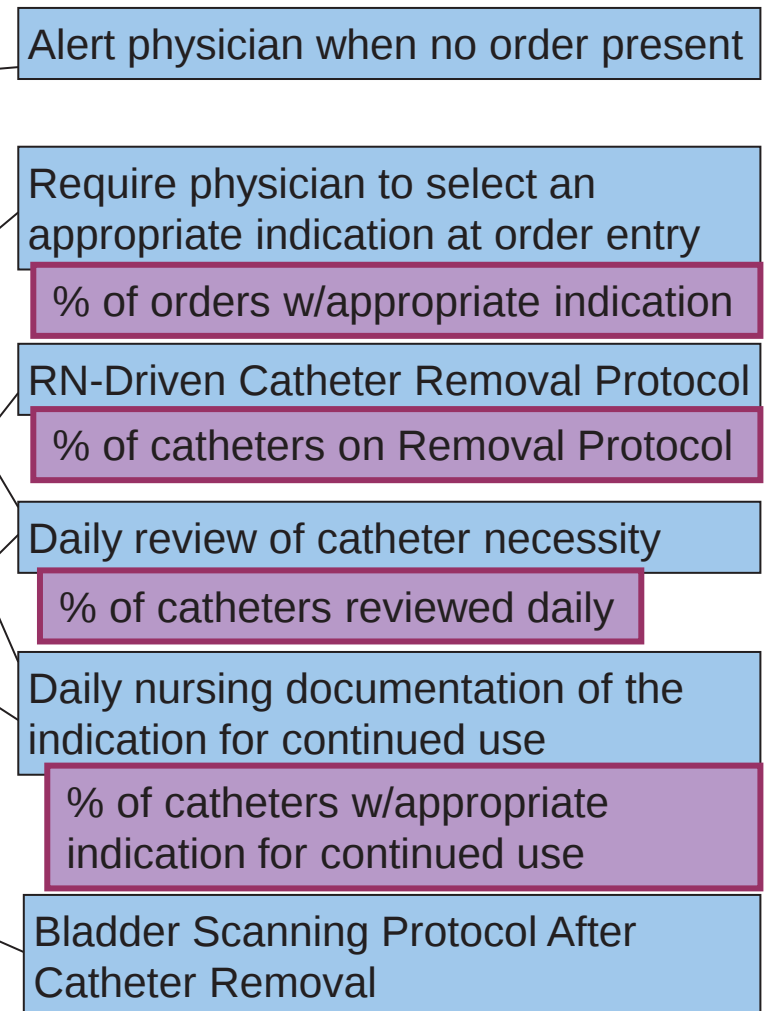
Primary Drivers



Secondary Drivers



Process Changes





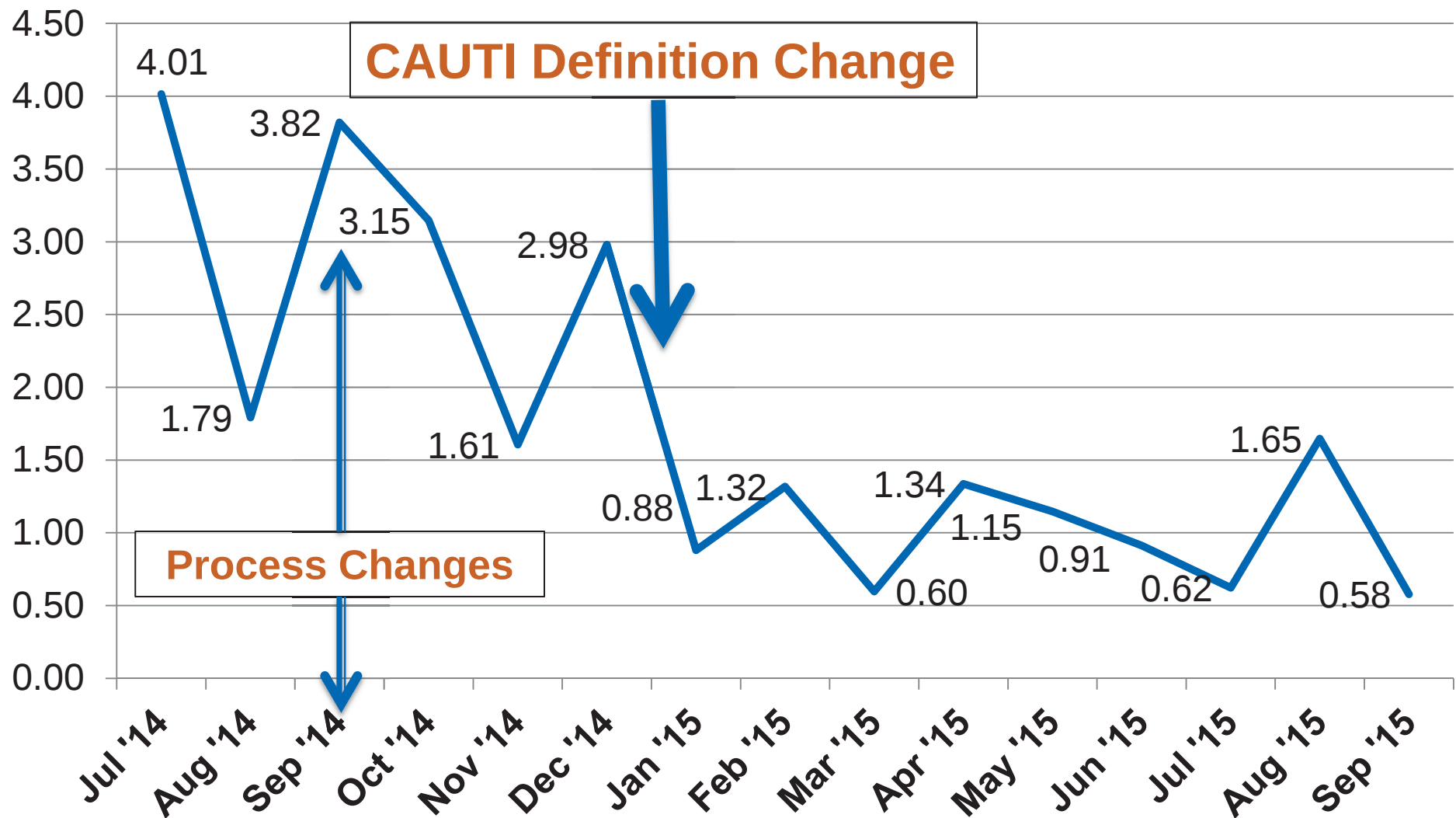
So Were These Interventions Effective?

- Reduction in CAUTI Rates?
- Reduction in Catheter Utilization?

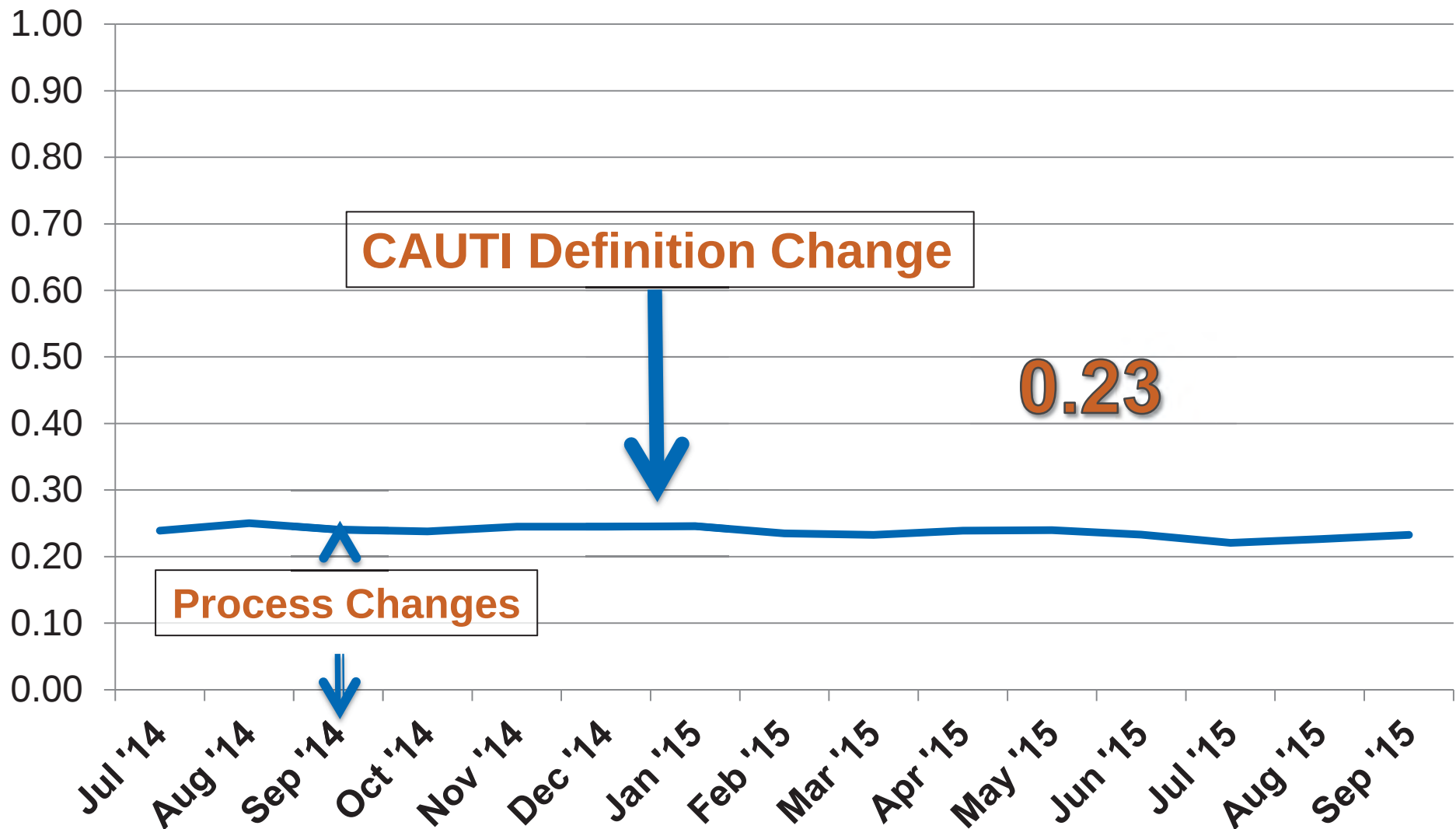


NHSN CAUTI Rate

= $CAUTIs / Catheter-Days \times 1000$



Catheter Utilization Ratio = Catheter-Days / Patient-Days

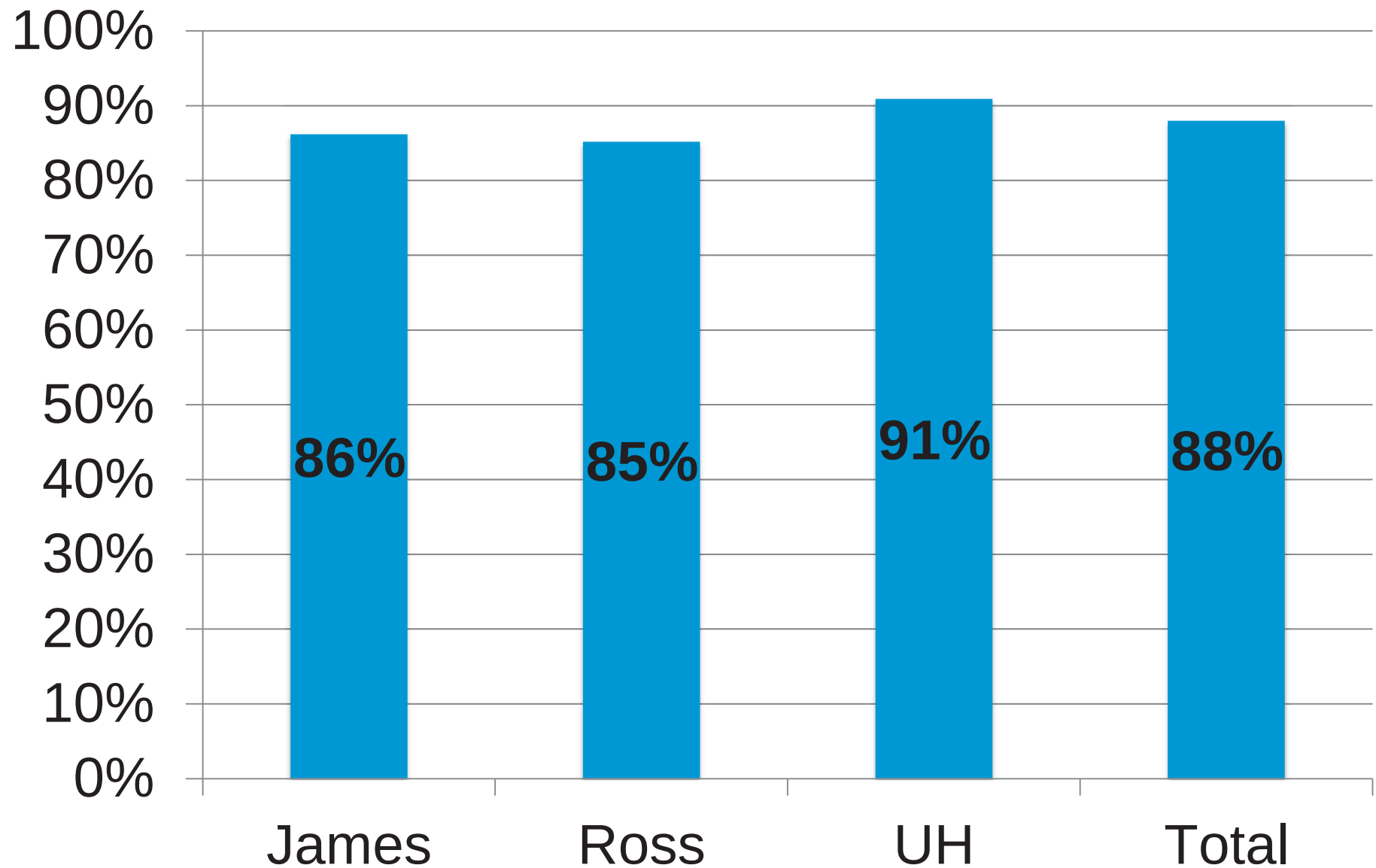


Why No Improvement in Outcome Measures?

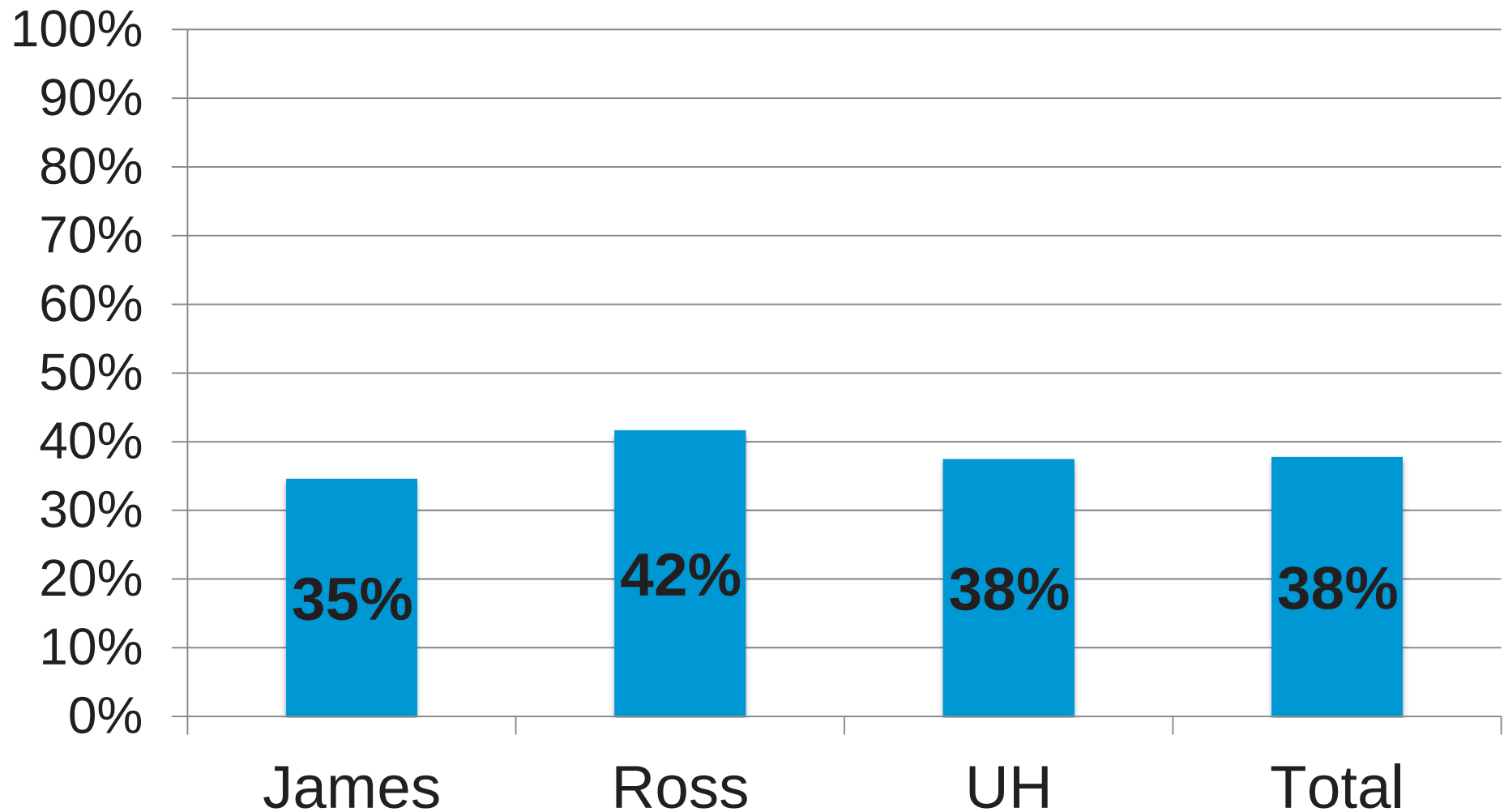
A Focused Review of the Process Measures

- **Audit of 100 consecutive patients w/ catheters in place**
- **3 Hospitals within OSU Wexner Medical Center**
 - University Hospital (UH)
 - James Cancer Hospital (James)
 - Ross Heart Hospital (Ross)
- **Only non-ICU units**
- **Focused Review of Process Measures:**
 - Do all catheters in place have orders in the EMR?
 - Appropriate indication per MD for catheter placement
 - Daily documentation of catheter necessity by RN
 - Appropriate indication per RN to continue catheter use

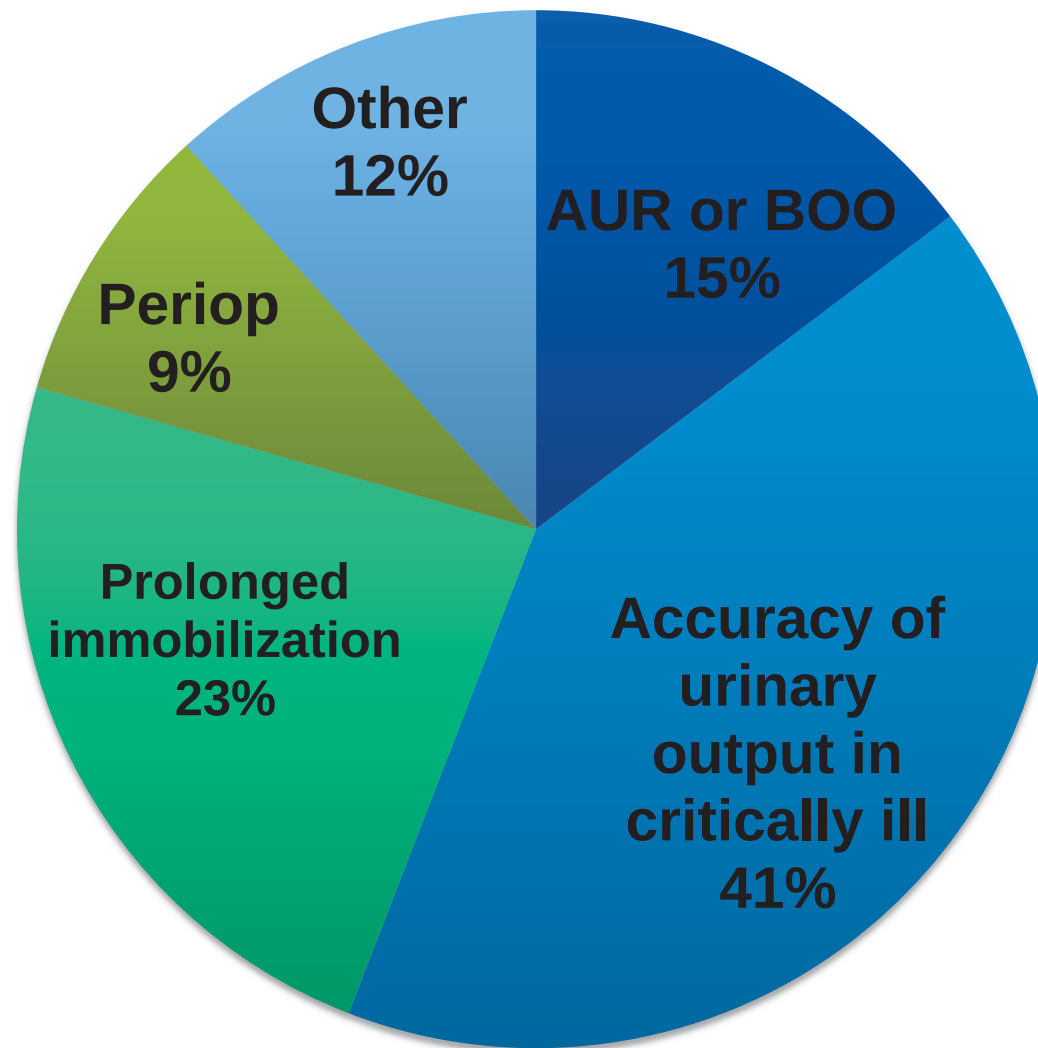
Catheter Order in EMR?



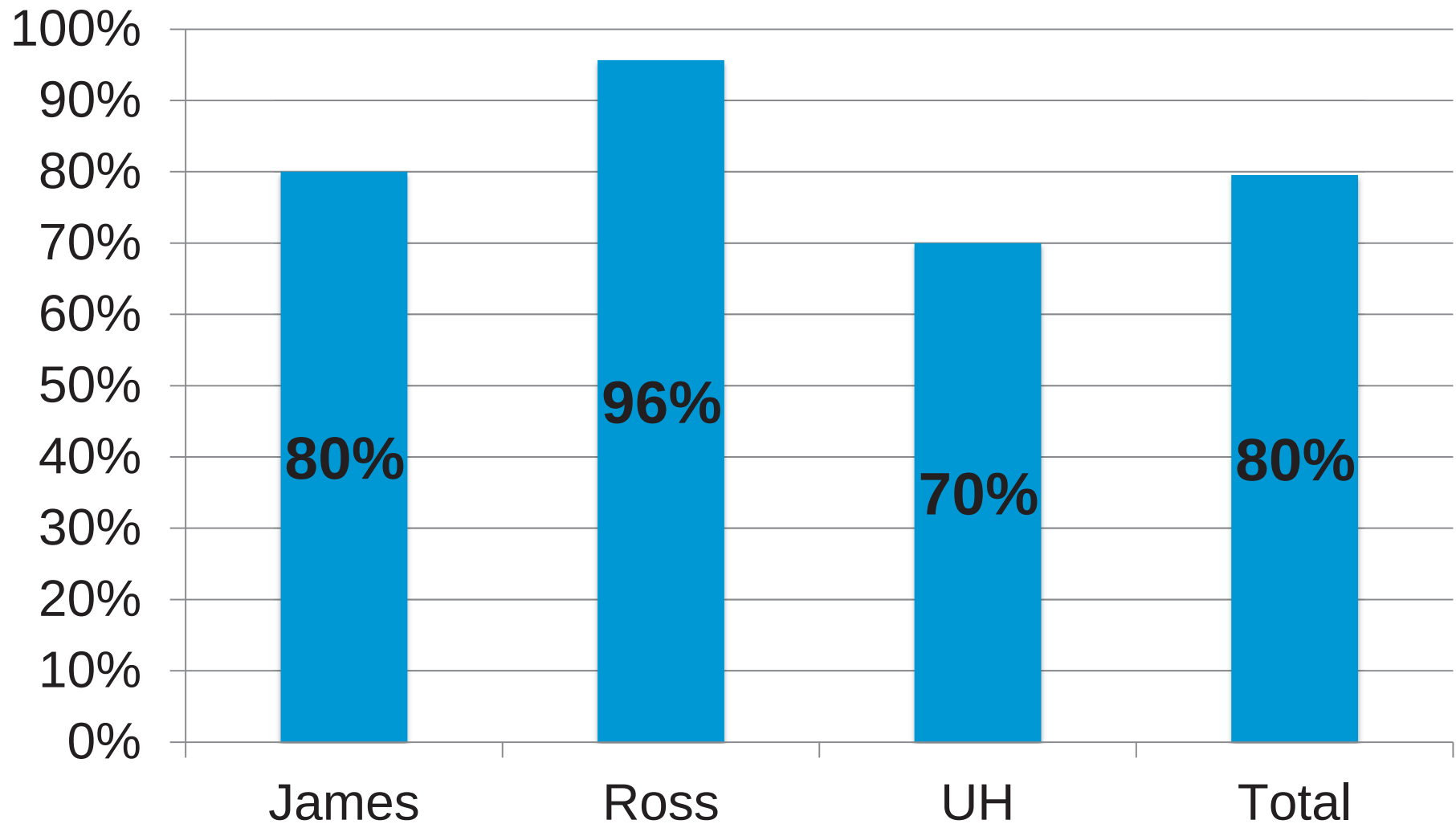
Inappropriate Indication Entered by Provider



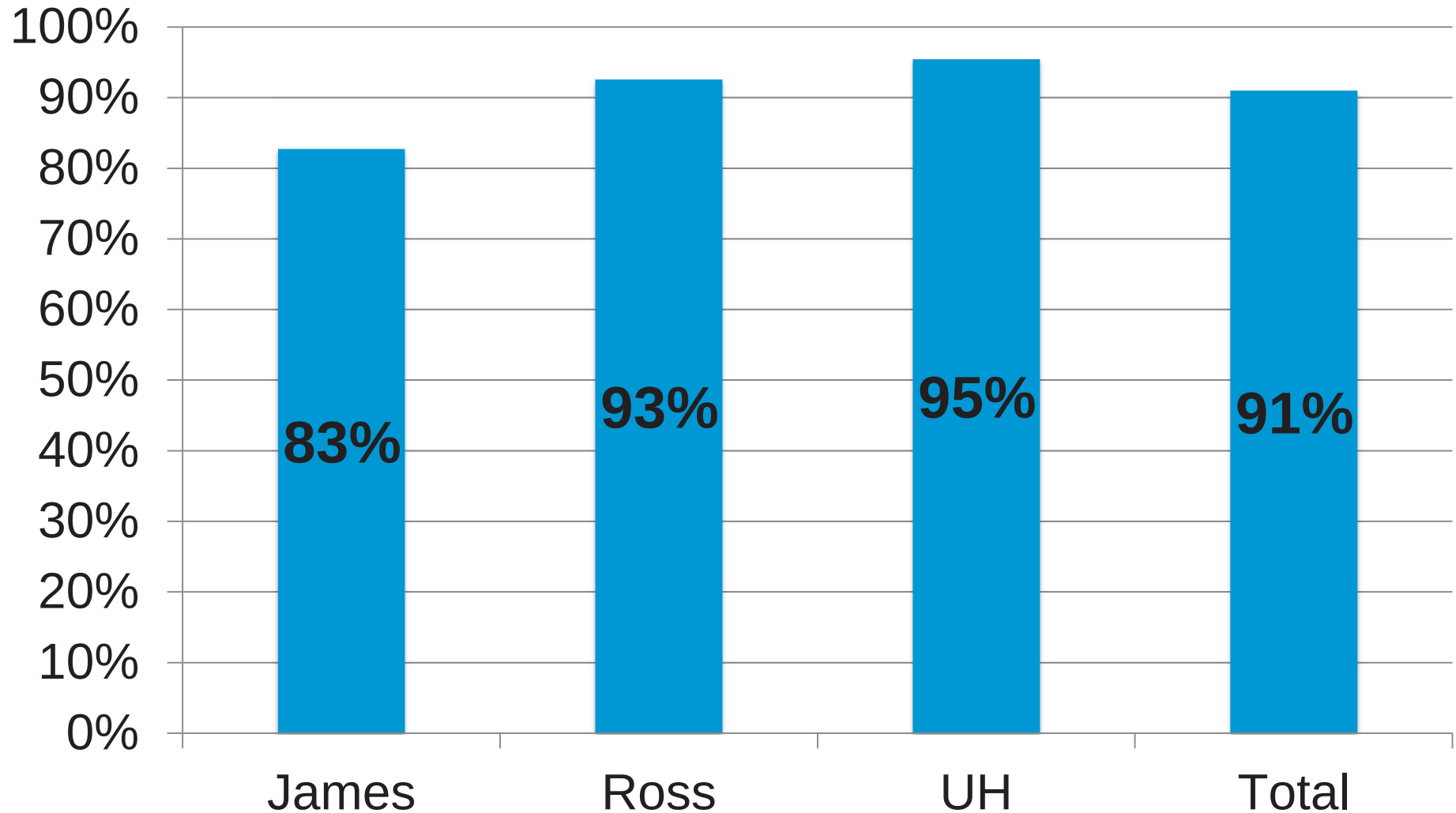
Inappropriate Indications Selected by Providers



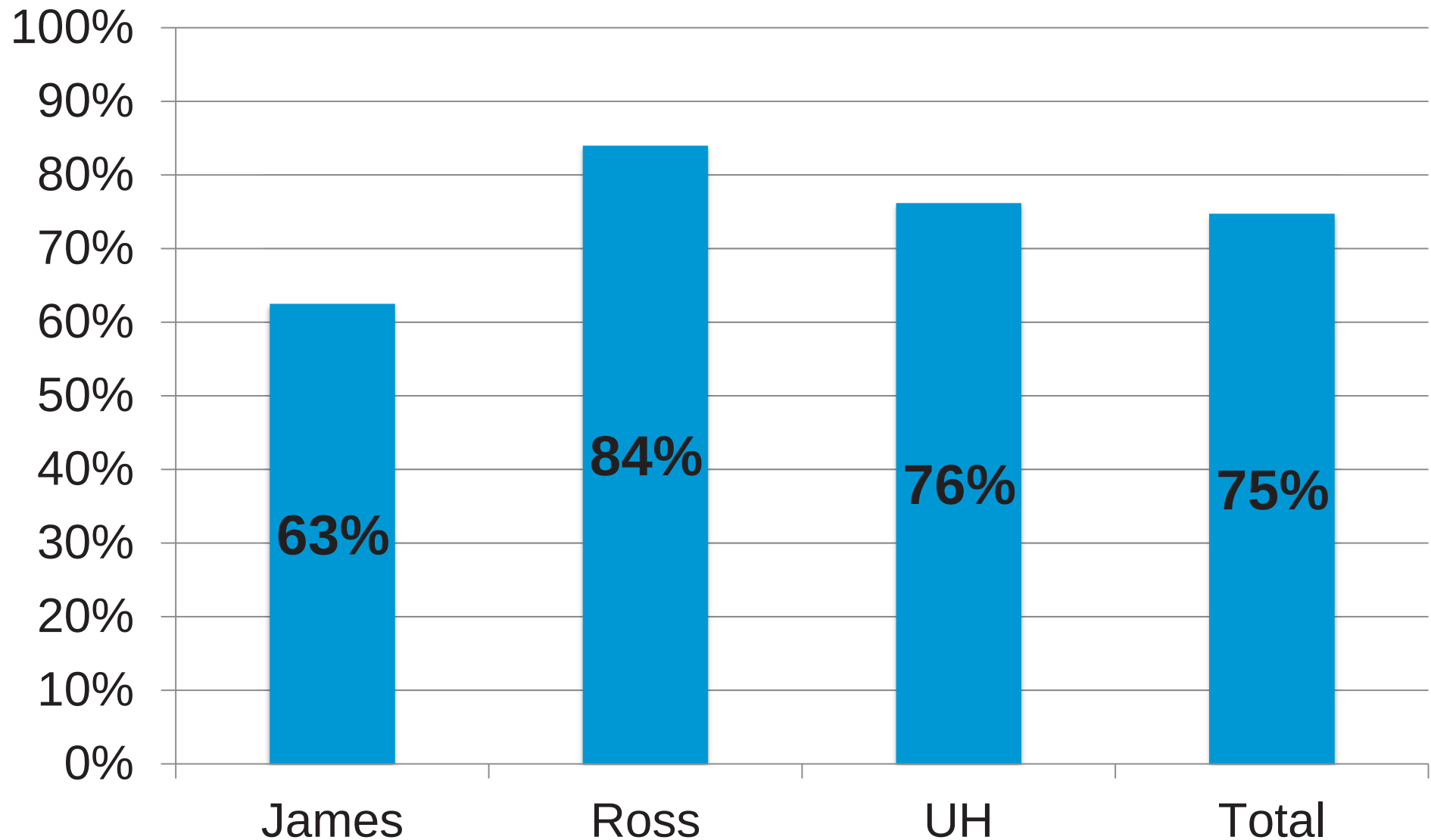
Catheters on RN-Driven Removal Protocol



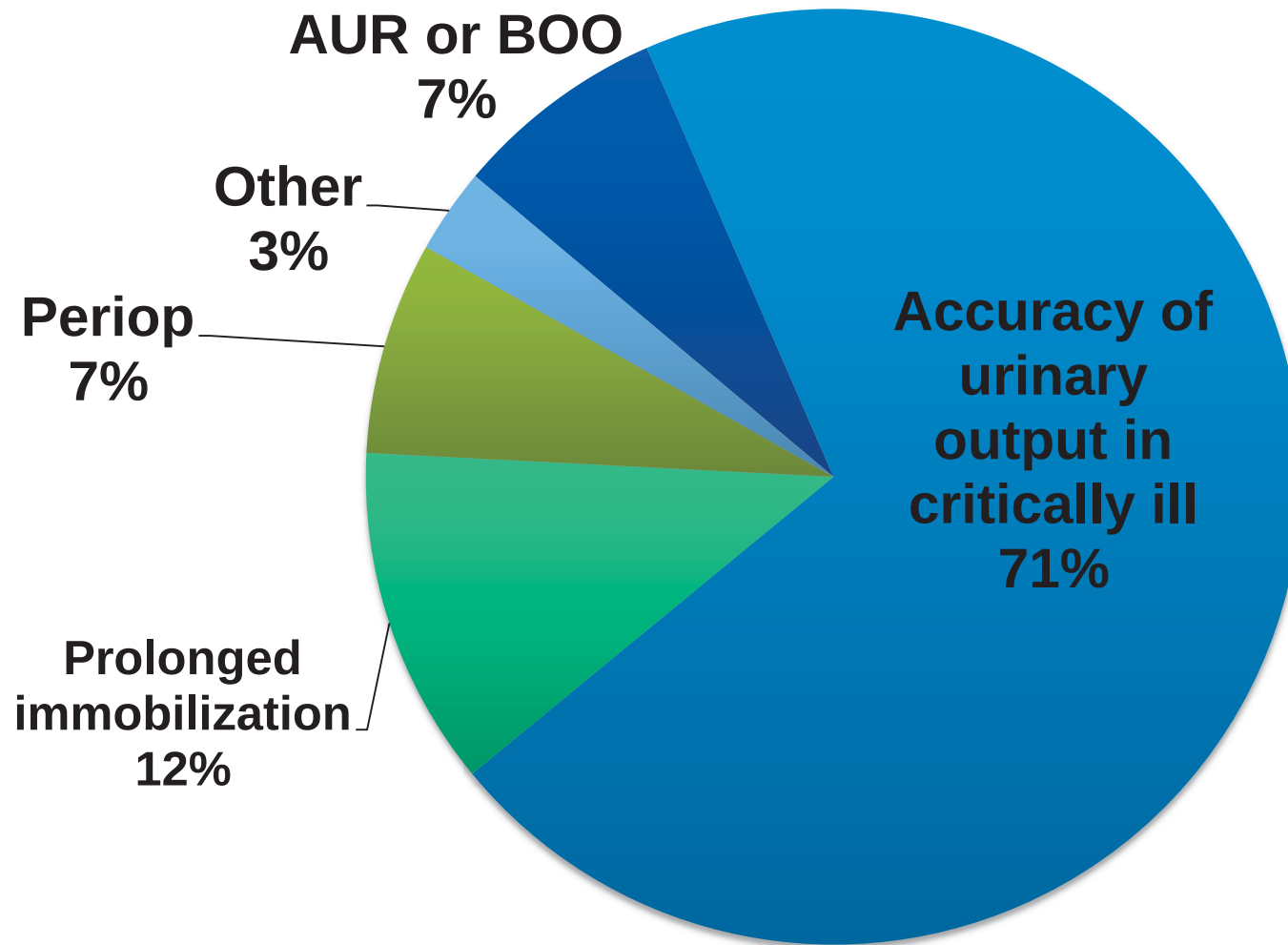
Daily Review of Catheter Necessity *Indication for Continued Use Documented by Nurse*



Inappropriate Indication Entered by Nurse



Inappropriate Indications Selected by Nurses

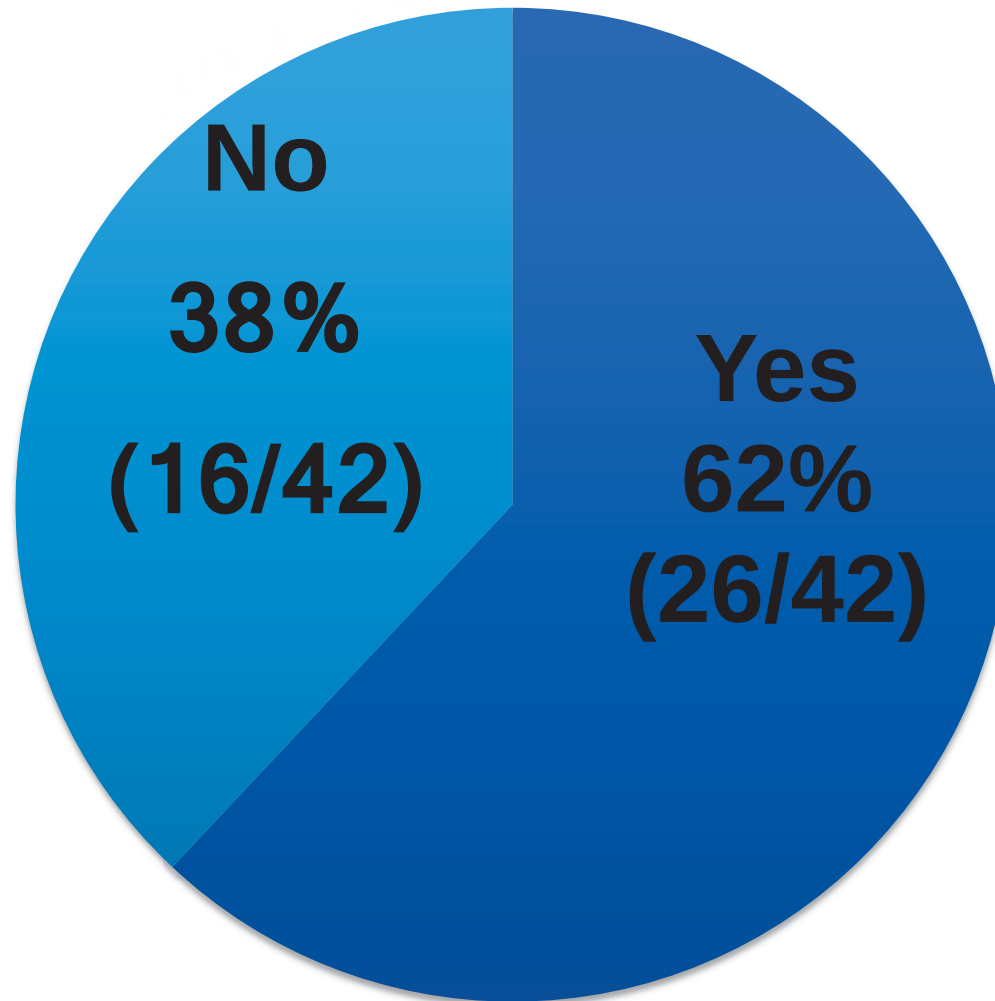


Our CAUTIs...

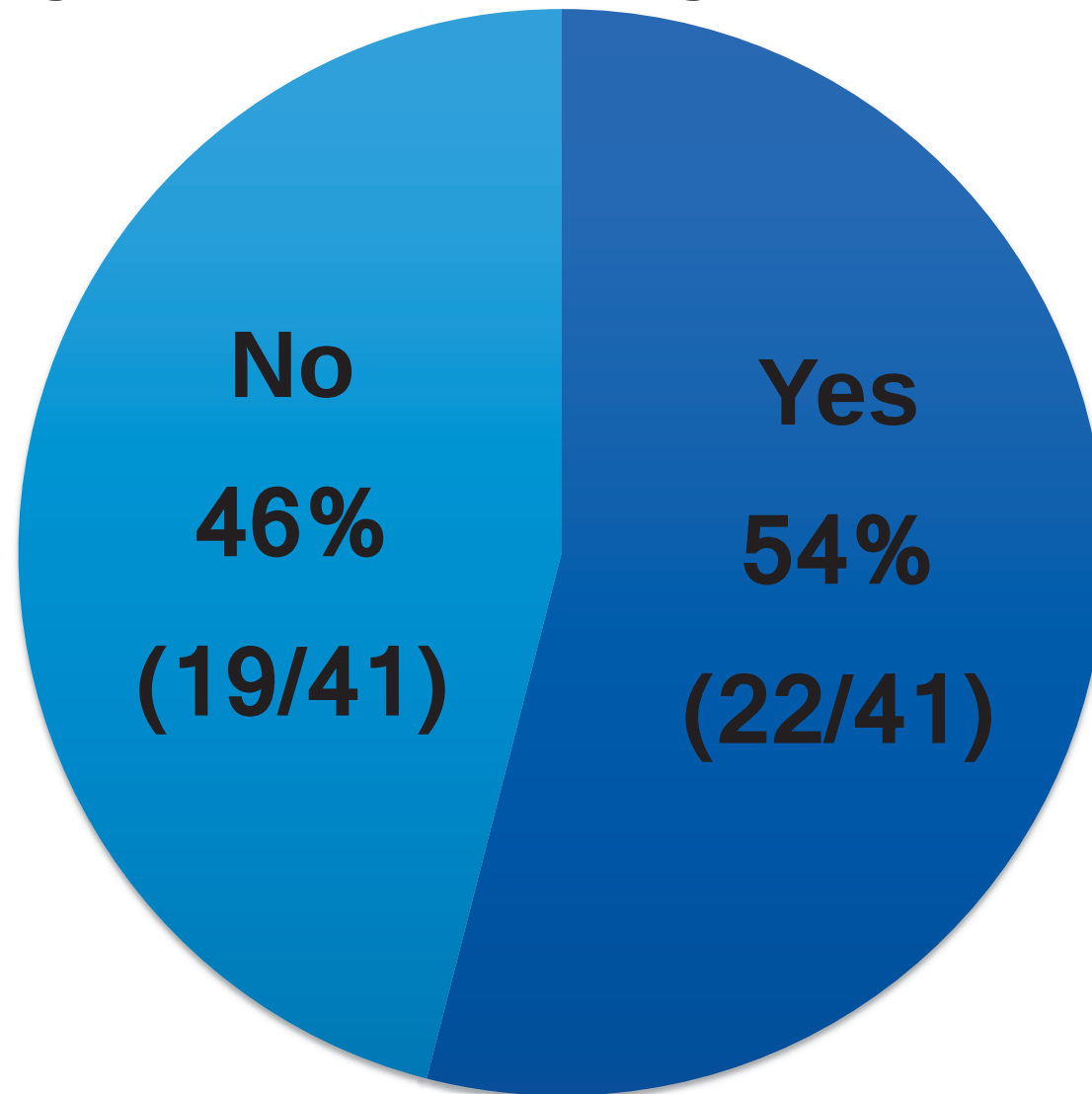
Analysis of CAUTIs over 6 months
(n = 42 CAUTIs)



Appropriate Indication For Catheter Placement?



Appropriate Indication Selected by Nurse on Day of CAUTI?



Conclusions of Audit

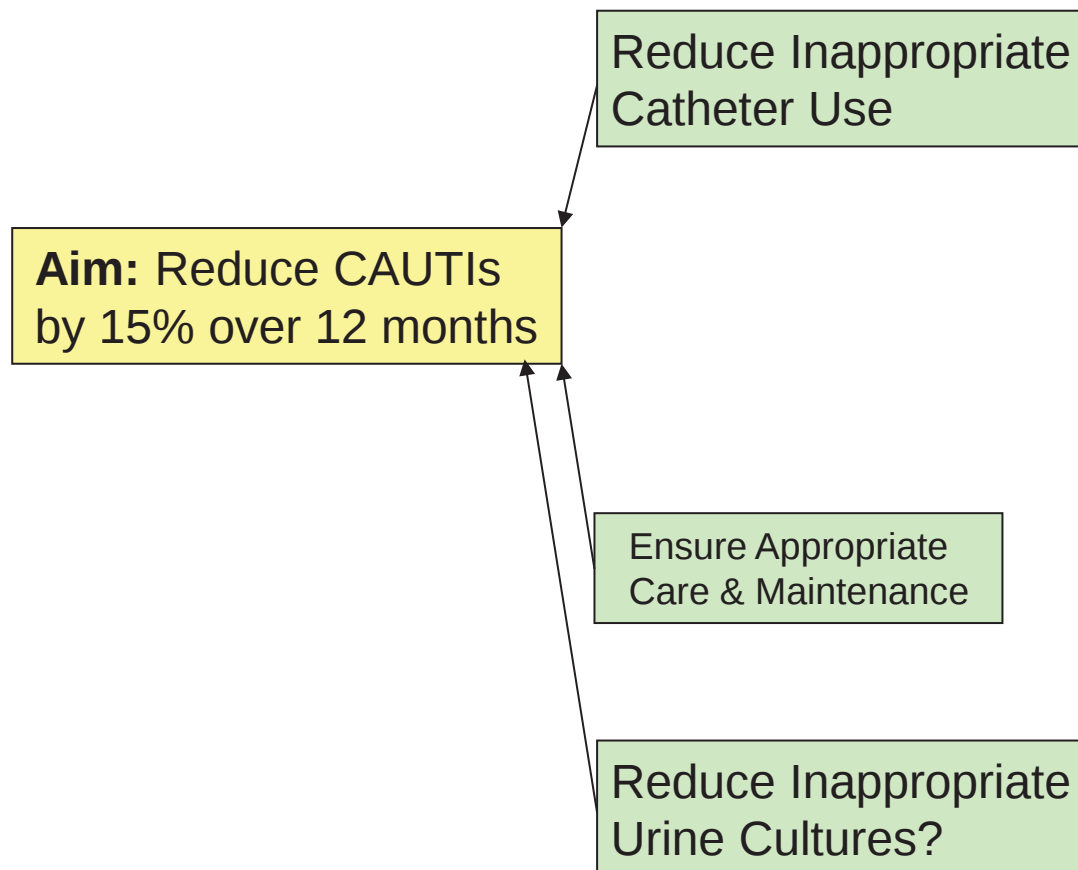
- “Accurate measurement of urinary output in the critically ill”
 - Intended to mean HOURLY monitoring in ICU pts
- Nonspecific wording likely resulted in inappropriate selection of this indication & unnecessary catheter use.
- Ongoing audits are useful to assess actual compliance with interventions followed by re-education to further optimize urinary catheter utilization.

Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

Outcome

Primary Drivers



Background on CAUTIs



CDC/NHSN Defines CAUTI by Non-Specific Criteria

1. Catheter in place > 2 days
2. Bacteriuria / Positive Urine Culture (>100,000 CFU/mL)
3. **Signs or Symptoms compatible with UTI (at least one):**
 - Suprapubic tenderness
 - Costovertebral angle pain/tenderness
 - **Fever > 100.4°F (> 38.0°C)**
 - **79.7% of ALL CAUTIs; > 95% of CAUTIs in ICU**
- Surveillance definition: depends heavily on presence of **fever**

But is CA-Bacteriuria really the cause of the fever?

Attributing Fever to CA-Bacteriuria?

- **IDSA Guideline CAUTI Definition:**
 - Fever is a compatible sign or symptom of CAUTI only if it is new onset or worsening **AND cannot be attributable to another cause/source**
- **NHSN CAUTI Definition:**
 - All fevers are attributed to the urinary tract as long as other criteria for CAUTI are met.



CAUTI Reduction Initiative: Quality Assessment

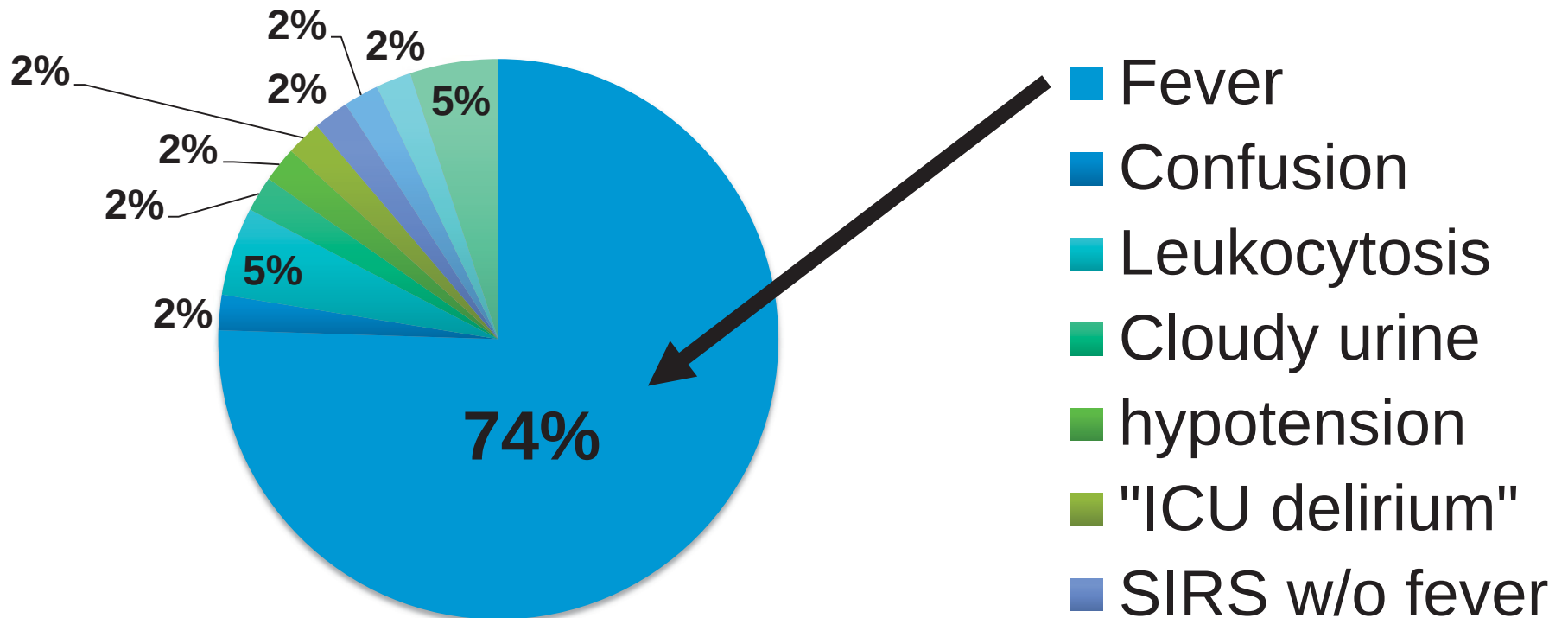
OBJECTIVES:

- Further investigate gap between surveillance and clinical definitions of CAUTI
- Better understand the value of urine cultures in the evaluation of a new fever

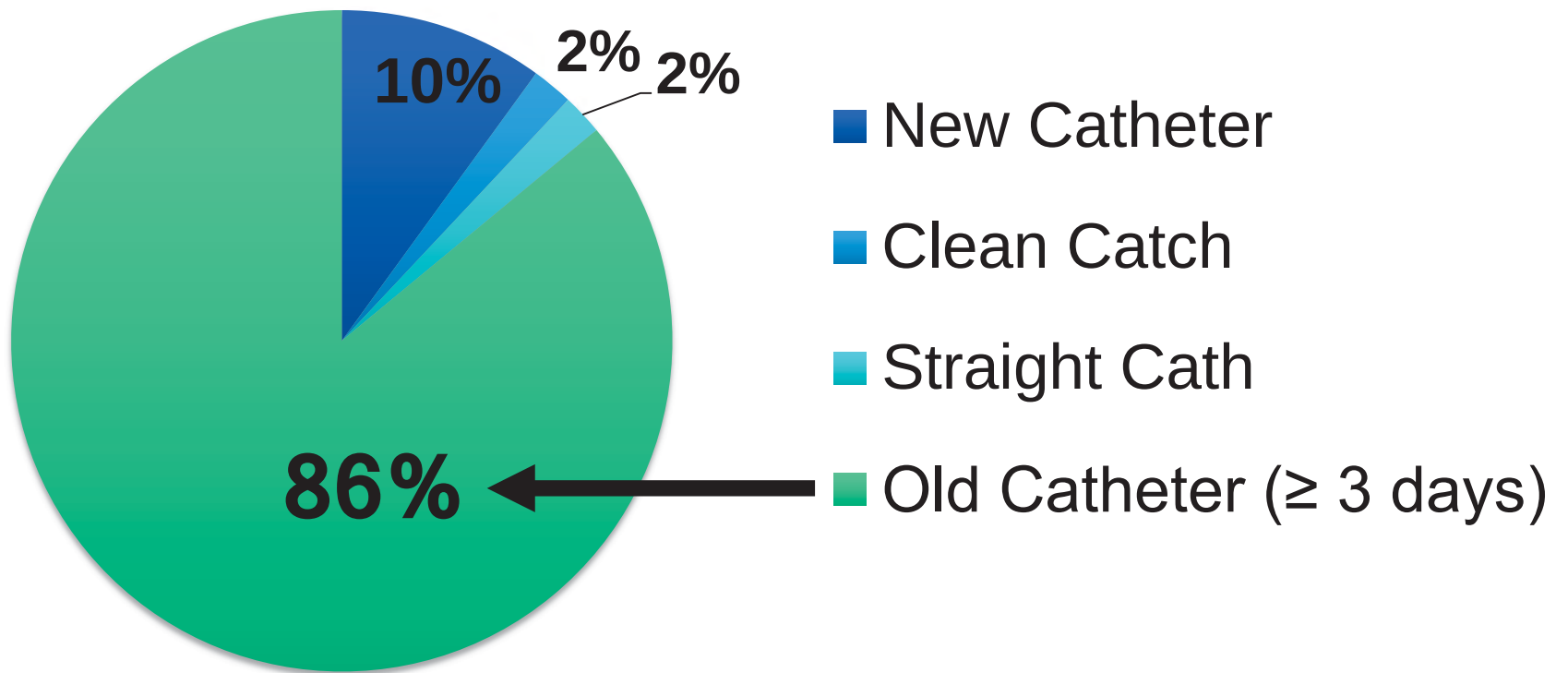
Methods

- All CAUTIs identified using the NHSN definition over a 6-month period were reviewed (n = 42)
- Data Recorded:
 - Indication for urine culture
 - Source of specimen (e.g. old vs new catheter)
 - Cause of fever (if present)
 - Bloodstream infections attributable to CAUTI
 - Treatment with antibiotics

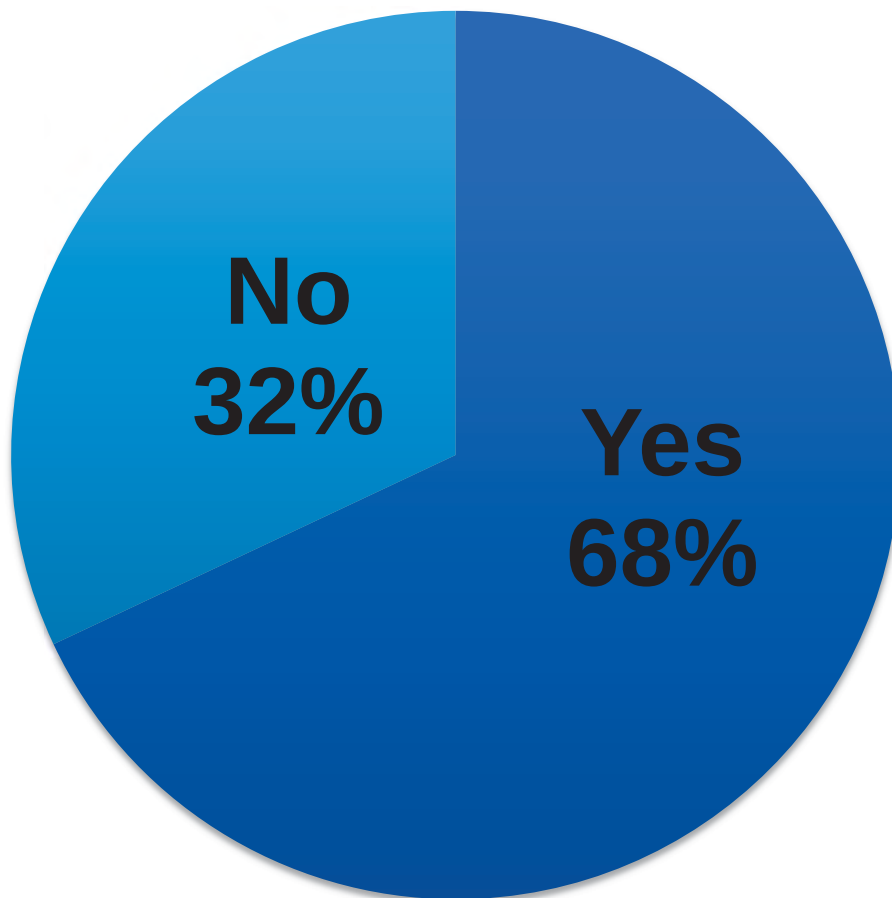
Indication for Urine Culture



Source of Culture Specimen

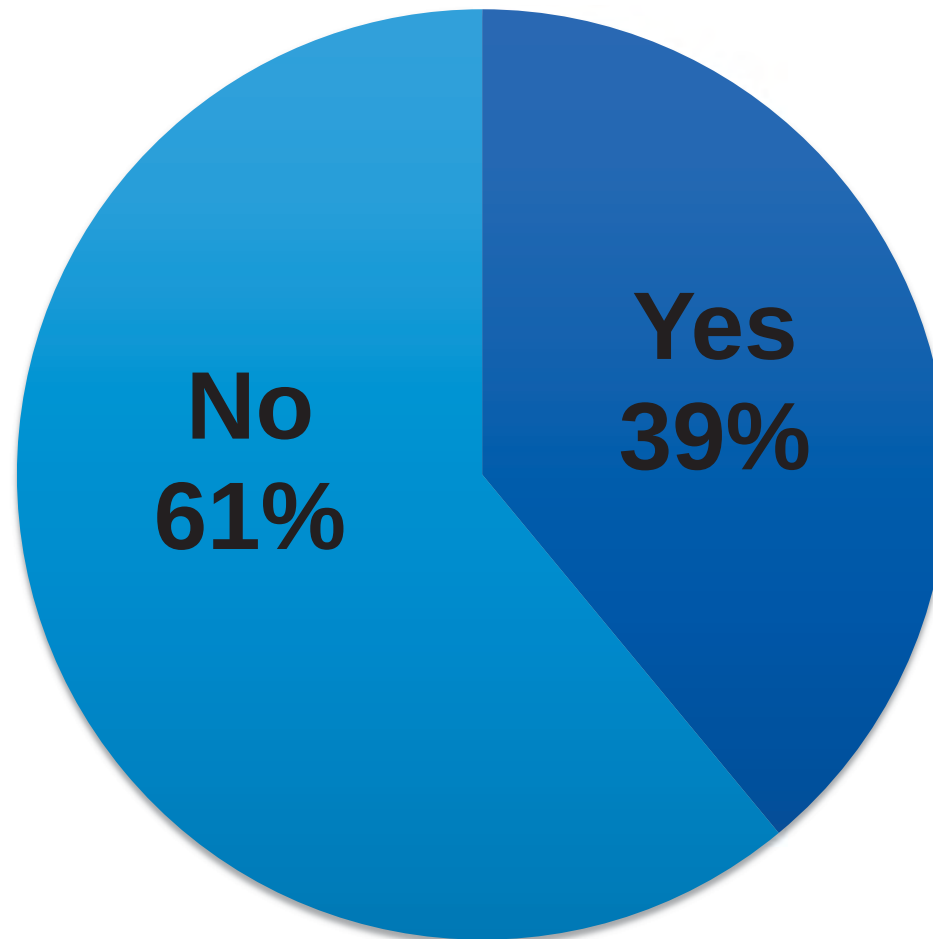


Alternative Infection to Explain Fever

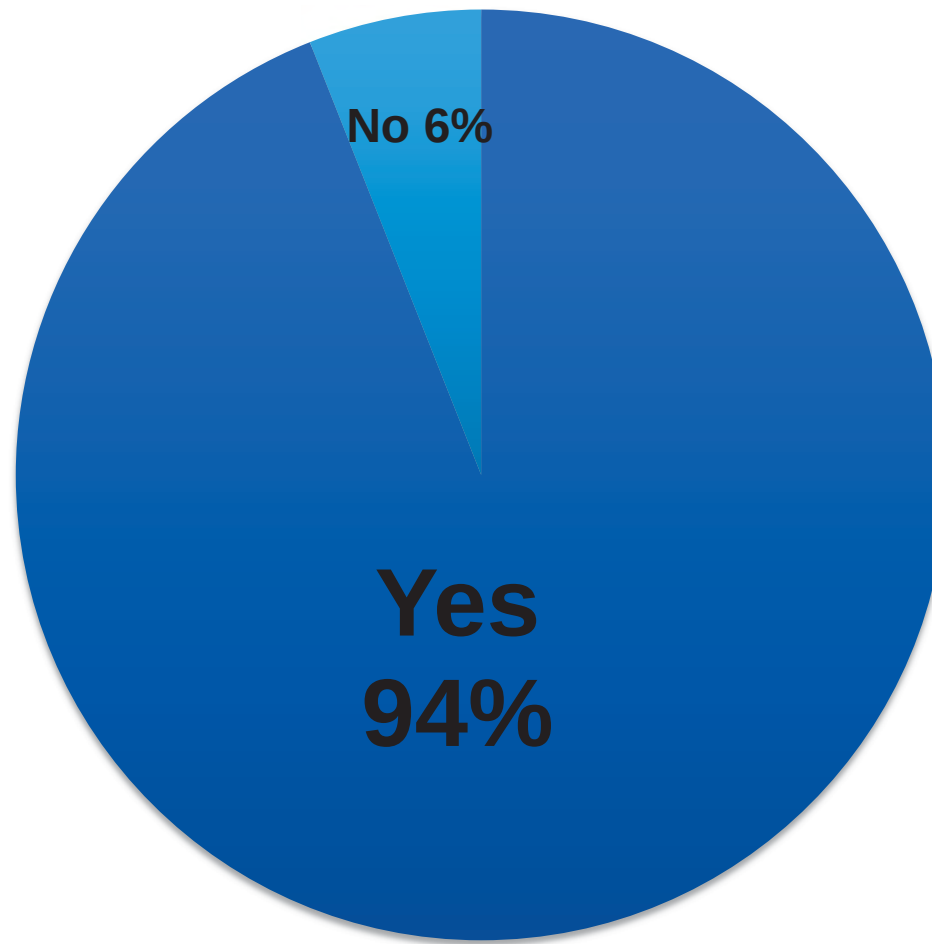


Alternative Infection (n=21)	
Pneumonia alone	48% (n=10)
Bacteremia alone	14% (n=3)
Wound Infection alone	5% (n=1)
Pneumonia & Bacteremia	19% (n=4)
Pneumonia & Wound Infection	10% (n=2)
Bacteremia & Wound Infection	5% (n=1)

Alternative Non-Infectious Cause to Explain Fever



Any Alternative Cause to Explain Fever



Other Data from Analysis

Treated for UTI <u>WITHOUT</u> Alternative Cause of Fever	50% (1/2)
Treated for UTI <u>WITH</u> Alternative Cause of Fever	86% (25/29)
% Bacteremia with Same Organism	5% (2/42)

Other Data from Analysis

Treated for UTI <u>WITHOUT</u> Alternative Cause of Fever	50% (1/2)
Treated for UTI <u>WITH</u> Alternative Cause of Fever	86% (25/29)
% Bacteremia with Same Organism	5% (2/42)

- Suggests a very high rate of overtreatment and unnecessary use of antibiotics
- Likely represent asymptomatic bacteriuria (i.e. colonization) rather than true infection

Study Conclusions

- Obtaining urine cultures due to fever explained by another source falsely increases CAUTI rates
 - Also results in inappropriate antibiotic use

CAUTIs Based on # Urine Cultures (n=1,000 pts)

(Fakih et al, Am J Infect Control. 2011 Aug 24; Wright et al, *Infect Control Hosp Epidemiol* 2011;32:635-640)

	Prevalence of Bacteriuria	% of Urine Cultures Obtained	Prevalence of Fever >38°C	Number of Symptomatic NHSN CAUTIs
Scenario1	30%	60%	20%	36
Scenario2	30%	30%	20%	18
Scenario3	30%	10%	20%	6

Increasing number of urine cultures leads to overestimating CAUTI rate



How to Reduce Unnecessary Urine Cultures

1. Provide education on the appropriate indications for obtaining urine cultures
2. Have periodic audits on urine culture use by unit
3. Avoid automatic triggers or screening cultures without appropriate indications
4. Avoid PAN culturing



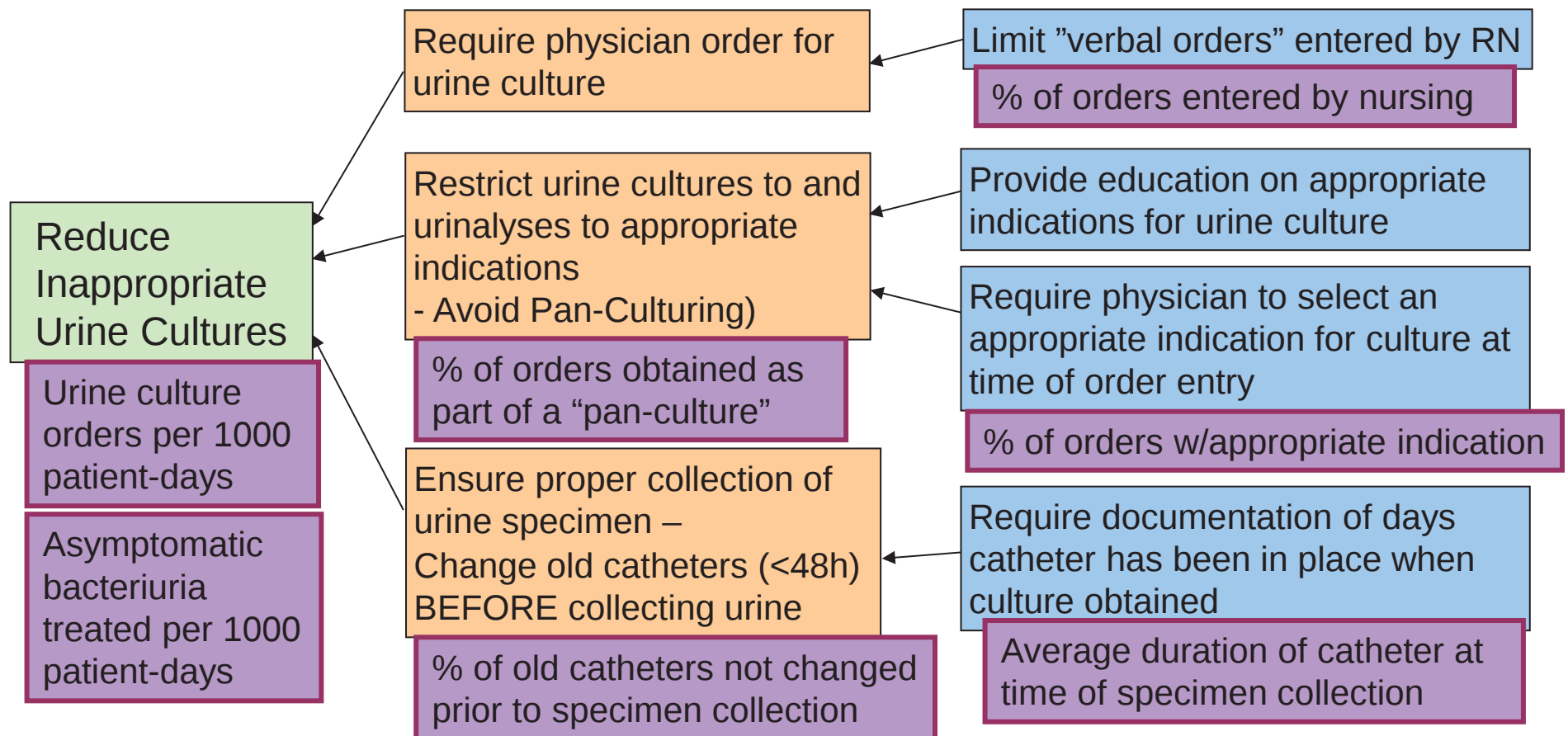
Cause-Effect Driver Diagram

Reducing Catheter-Associated Urinary Tract Infections

Primary Drivers

Secondary Drivers

Process Changes



Recommendations & Plan Moving Forward

1. Update CAUTI Prevention Guideline –

Change the wording of indications and expand indications list to improve compliance, clarity and simplify future measurements/audits

2. Re-Education Bundle –

RNs, NPs, MDs need clarification & education on appropriate & inappropriate indications for catheter use and urine cultures

Recommendations & Plan Moving Forward

3. Change our “Culture of Culturing”

- Avoid “culture-first” approach
- Avoid “pan-culturing” for fever
- **There MUST be an appropriate indication when ordering a urine culture or UA w/reflex to culture**
 - Orders in EMR are being revised to require an appropriate indication
 - Proposed indication list is based on published guidelines

Conclusions

- Ongoing audits are important to assess process measures and compliance with interventions
- Along with reducing catheter use, strategies and interventions to reduce CAUTIs MUST also focus on improving appropriate use of urine cultures
 - Avoid “culture-first” approach
 - Avoid “pan-culturing” for fever, especially in patients with an indwelling urinary catheter

Acknowledgments

- Susan Moffatt-Bruce, MD, PhD
- Julie Mangino, MD
- Daniel Eiferman, MD
- Iahn Gonsenhauser, MD
- ABMS Visiting Scholars Program

