Linking Accurate Urine Culture Results to Improve Patient Care Outcomes

A Lecture for the APIC Central Illinois IP Conference,
Bloomington, IL
November 17, 2017

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Disclosure

- Robert Garcia is Scientific Liaison for
  - BD
  - Sage Products
  - PDI
  - Cepheid
  - Magnolia Medical
Objectives

- Understand the extent and impact of improper collection and testing of urine specimens

- Upon completion, participants will be able to list published studies that examine adverse outcomes, antibiotic overuse, and potential effect on CAUTI rates incurred by healthcare institutions

- Describe best practices in urine culture ordering and preservation, and innovations in urine culture management
State of the Science Review

Promoting appropriate urine culture management to improve health care outcomes and the accuracy of catheter-associated urinary tract infections

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The Burden of UTIs

- Urinary tract infections are among the most common infections in adults
- Approx. 10 million health care visits and 100,000 hospitalizations annually
- CAUTIs account for up to 25% of healthcare associated infections with more than 35,600 events reported by acute care hospitals to the NHSN in 2013
- Unjustified ordering or improper collection has led to increased financial burdens, overreporting of CAUTIs, overtreatment of patients with antimicrobial agents, selection of multidrug-resistant organisms, and Clostridium difficile infection

Garcia R, Spitzer E. Promoting appropriate urine culture management to improve health care outcomes and the accuracy of catheter-associated urinary tract infections. AJIC 2017 (accepted for publication)
The Effects on Healthcare When Proper Urine Culture Management is Not Implemented

- Improper ordering
- Improper collection
- False-positive results, workloads
- Increased costs
- Ineffective antibiotic stewardship
- Inaccurate analysis
- Increased costs
- Adverse effects including *C. difficile*
Evidence of Inappropriate UC and UA Ordering
Reasons for Inappropriate UC and UA Ordering

- Multi-hospital survey of internal medicine resident physicians designed by 6 board-certified ID physicians
- 100 total responses, overall knowledge 48%

Table 2
Summary of clinical vignettes presented to 100 respondents and knowledge domain assessed, with the corresponding proportion of correct responses

<table>
<thead>
<tr>
<th>Summary of vignette, and question</th>
<th>Knowledge domain assessed</th>
<th>Correct responses/total responses (% correct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man with dementia aged 80 y, 1 day after being admitted with lethargy and confusion, but no urinary symptoms. Exam and laboratory results were consistent with dehydration. He is now alert and interactive, and with improvement in laboratory studies after rehydration. UA with pyuria, UC with growth of a gram-negative bacillus. Should antimicrobials be started?</td>
<td>Differentiating UTI from ASB</td>
<td>18/95 (19)</td>
</tr>
<tr>
<td>Same patient, 1 d later. Visiting family indicates he is at his baseline. UC with <em>Pseudomonas aeruginosa</em>, susceptible only to gentamicin and imipenem/colistatin. Should antimicrobials be started?</td>
<td>Differentiating UTI from ASB</td>
<td>22/95 (23)</td>
</tr>
<tr>
<td>Asymptomatic woman aged 70 y seen preoperatively before hip arthroplasty. A preoperative UC grew 70,000 cfu/mL of a gram-negative bacillus. Should further work-up or treatment be pursued?</td>
<td>Necessity for further testing</td>
<td>56/95 (59)</td>
</tr>
<tr>
<td>The same patient's surgeon calls with results of a repeat UC, which grew &gt;100,000 cfu/mL of a cefazolin-resistant <em>Escherichia coli</em>. Should antimicrobials be started, or prophylaxis (cefazolin) be altered?</td>
<td>Differentiating UTI from ASB</td>
<td>50/94 (53)</td>
</tr>
<tr>
<td>A thoracic surgeon requests that all preoperative evaluations include a preoperative UC, with treatment of any positive results. What procedure should be implemented?</td>
<td>Clinical significance of ASB</td>
<td>51/94 (54)</td>
</tr>
<tr>
<td>Man aged 58 y about to undergo transurethral resection of the prostate has a preoperative UC with &gt;100,000 cfu/mL of an <em>E.coli</em> susceptible only to gentamicin and imipenem/colistatin. What should be done in response to this UC result?</td>
<td>Management of ASB before urologic procedure</td>
<td>78/92 (85)</td>
</tr>
<tr>
<td>Patient with long-standing paraplegia and a grossly infected sacral decubitus ulcer has cloudy urine in the collection bag of his indwelling catheter. Should a UC be obtained?</td>
<td>Differentiating UTI from ASB</td>
<td>21/92 (23)</td>
</tr>
<tr>
<td>Man aged 60 y with fever and dysuria presents to clinic. UA shows pyuria, UC is pending. How should he be treated?</td>
<td>Male UTI management</td>
<td>74/92 (80)</td>
</tr>
<tr>
<td>Asymptomatic man aged 65 y seen for his annual physical exam, which was normal. Routine UA showed pyuria; UC grew &gt;100,000 cfu/mL of a susceptible Klebsiella species. Should further work-up or treatment be pursued?</td>
<td>Necessity for further testing</td>
<td>35/90 (39)</td>
</tr>
</tbody>
</table>

ASB, asymptomatic bacteriuria; UA, urinalysis; UC, urine culture; UTI, urinary tract infection.

Reasons for Inappropriate UC and UA Ordering

- Survey of 354 nurses at 5 hospitals
- Sample of incorrect responses: 58.4% observed others compliant with not obtaining specimen for culture from drainage bag; 78.4% would obtain sample in patients with chronic urinary catheter on admission; 3.1%-24.7% agreed with taking culture when patient has pyuria

Table 1

<table>
<thead>
<tr>
<th>Statement</th>
<th>Answered true</th>
<th>Answered false</th>
<th>Answered do not know</th>
<th>Statement is</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Foul-smelling urine</td>
<td>378/391 (96.7)</td>
<td>9/391 (2.3)</td>
<td>4/391 (1)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>2. Hematuria</td>
<td>268/394 (68.0)</td>
<td>91/384 (23.7)</td>
<td>25/384 (6.5)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>3. Cloudy urine</td>
<td>376/391 (96.2)</td>
<td>13/391 (3.3)</td>
<td>2/391 (0.5)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>4. Urine sediment</td>
<td>330/386 (86.4)</td>
<td>42/386 (10.8)</td>
<td>17/386 (4.4)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>5. Urine color becoming darker in color</td>
<td>297/392 (74.3)</td>
<td>140/382 (36.4)</td>
<td>35/382 (9.2)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>6. Urgency (sensation to urinate)</td>
<td>289/385 (75.3)</td>
<td>86/385 (20.8)</td>
<td>16/385 (4.2)</td>
<td>Correct</td>
</tr>
<tr>
<td>7. Catheter insertion routinely</td>
<td>174/378 (46)</td>
<td>176/378 (46.6)</td>
<td>28/378 (7.4)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>8. Catheter present for ~3 days</td>
<td>176/384 (45.8)</td>
<td>166/384 (43.2)</td>
<td>42/384 (10.9)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>9. Chronic urinary catheter on admission</td>
<td>305/389 (78.4)</td>
<td>58/389 (14.9)</td>
<td>26/389 (6.7)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>10. New onset lower abdominal pain</td>
<td>297/385 (77.1)</td>
<td>54/385 (14.6)</td>
<td>34/385 (8.8)</td>
<td>Correct</td>
</tr>
<tr>
<td>11. New onset confusion in an elderly patient (~65 y old)</td>
<td>361/391 (92.3)</td>
<td>23/391 (5.9)</td>
<td>7/391 (1.8)</td>
<td>Correct</td>
</tr>
<tr>
<td>12. Patient going for bladder tumor resection</td>
<td>194/386 (50.3)</td>
<td>84/386 (21.8)</td>
<td>108/386 (28)</td>
<td>Correct</td>
</tr>
<tr>
<td>13. Patient going for colon surgery</td>
<td>119/381 (31.2)</td>
<td>139/381 (36.0)</td>
<td>123/381 (32.2)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>14. Temperature of 38°C (100.4°F) with stable blood pressure and heart</td>
<td>287/386 (74.4)</td>
<td>69/386 (17.9)</td>
<td>30/386 (7.6)</td>
<td>Controversial</td>
</tr>
<tr>
<td>15. Temperature of 38°C (100.4°F) with hypotension without clear source</td>
<td>323/388 (85.2)</td>
<td>27/388 (7)</td>
<td>38/388 (9.8)</td>
<td>Correct</td>
</tr>
<tr>
<td>16. Temperature of 38°C (100.4°F) with hypotension in a patient with</td>
<td>185/383 (48.3)</td>
<td>134/383 (35)</td>
<td>64/383 (16.7)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>17. A urine WBC (unspun) of 25 cells</td>
<td>152/376 (39.9)</td>
<td>92/376 (24.7)</td>
<td>49/376 (13.2)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>18. A urine WBC (unspun) of 100 cells</td>
<td>225/378 (60.4)</td>
<td>22/378 (5.8)</td>
<td>130/378 (34.4)</td>
<td>Incorrect</td>
</tr>
<tr>
<td>19. A urine WBC (unspun) of 500 cells</td>
<td>265/384 (69)</td>
<td>12/384 (3.1)</td>
<td>107/384 (29.7)</td>
<td>Incorrect</td>
</tr>
</tbody>
</table>

NOTE: Values are n/N (%) or as otherwise indicated.

Evidence for Inappropriate Ordering of UC/UA Testing

- Randomized study of 208 newly admitted patients over 1 year at the University of Michigan Health System
  - 120 (57.7%) did not meet guideline-based criteria for a urine culture
  - Of these, 75 patients (62.5%) had a reason documented that was inconsistent with current guidelines, including for bacteriuria before an orthopedic procedure and altered mental status
  - No documented reason for ordering a UC was found in 37.5% of patients
  - Fever was the sole indication for obtaining a UC in nearly three-quarters

Emergency Departments: Target of Intervention Efforts

- 212 patients, UA orders: *84.4% lacked symptoms and 198 (79.2%) lacked UTI and acute kidney injury*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symptomatic Patients, No. (%)</th>
<th>Asymptomatic Patients, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive UA Result (n = 26)</td>
<td>Negative UA Result (n = 13)</td>
</tr>
<tr>
<td>UC ordered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>26 (100)</td>
<td>7 (53.8)</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>6 (46.2)</td>
</tr>
<tr>
<td>Empirical antibiotic therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>24 (92.3)</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>2 (7.7)</td>
<td>13 (100)</td>
</tr>
<tr>
<td>UC result</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>21 (80.8)</td>
<td>5 (71.4)</td>
</tr>
<tr>
<td>Negative</td>
<td>5 (19.2)</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>Antibiotic therapy based on UC result</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiated</td>
<td>2 (7.7)</td>
<td>2 (15.4)</td>
</tr>
<tr>
<td>Discontinued</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Abbreviations: UA, urinalysis; UC, urine culture.

* Symptoms of urinary tract infection were considered present based on guidelines for patients with and without urinary catheters."
Definitions: Clinical vs. Surveillance
Table 1
Definitions and diagnostic criteria for urinary tract infection (UTI)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definitions/diagnostic criteria</th>
<th>Source of definition</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminated Urine Culture</td>
<td>Defined as the presence of more than 2 isolates at ≥10,000 CFU/mL</td>
<td>Clinical laboratory</td>
<td>20</td>
</tr>
<tr>
<td>Symptomatic UTI</td>
<td>Defined as the presence of significant bacteriuria* in a patient with signs or symptoms referable to the urinary tract and no alternate source</td>
<td>Clinical</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Defined by clinical symptoms and a positive urine culture that demonstrates colony counts ≥10^3 CFU/mL</td>
<td>Clinical</td>
<td>10</td>
</tr>
<tr>
<td>Asymptomatic bacteriuria</td>
<td>Defined as the presence of significant bacteriuria in a patient without signs or symptoms referable to the urinary tract</td>
<td>Clinical</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Defined as the presence of bacteria within the urinary tract in the absence of symptoms and is generally not considered clinically significant except in pregnant women (because of the risk of later development of pyelonephritis), and patients who are to undergo an invasive procedure involving the urinary tract</td>
<td>Clinical laboratory</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Defined as the isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to urinary infection</td>
<td>Clinical</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>In women: 2 consecutive clean-catch midvoid specimens with same bacteria ≥10^5 CFU/mL</td>
<td>Clinical</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>In men: 1 clean-catch midvoid specimen with single bacteria ≥10^6 CFU/mL</td>
<td>Clinical</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Catheterized patients: A single straight catheter specimen with 1 bacterial species ≥10^3 CFU/mL</td>
<td>Clinical</td>
<td>15</td>
</tr>
<tr>
<td>Catheter-associated symptomatic bacteriuria</td>
<td>Catheter-associated symptomatic bacteriuria in patients with indwelling urethral, indwelling suprapubic, or intermittent catheterization is defined by the presence of ≥10^5 CFU/mL of ≥1 bacterial species in a single catheter urine specimen in a patient without symptoms compatible with UTI</td>
<td>Clinical</td>
<td>15</td>
</tr>
<tr>
<td>Acute uncomplicated cystitis</td>
<td>Term applied to UTI presumed to be confined to the bladder and characterized by symptoms suggesting bladder involvement, such as dysuria or urinary frequency</td>
<td>Clinical laboratory</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>A symptomatic bladder infection characterized by frequency, urgency, dysuria, or suprapubic pain in a woman with a normal genitourinary tract and it is associated with both genetic and behavioral determinants</td>
<td>Clinical</td>
<td>18</td>
</tr>
<tr>
<td>Acute pyelonephritis</td>
<td>A clinical diagnosis of infection that involves the kidney and renal pelvis and is often associated with signs and symptoms of systemic infection, such as fever and rigors. Other findings can include back pain or tenderness and nausea.</td>
<td>Clinical laboratory</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>A renal infection characterized by costovertebral angle pain and tenderness, often with fever; it occurs in the same population that experiences acute uncomplicated urinary infection</td>
<td>Clinical</td>
<td>15</td>
</tr>
</tbody>
</table>

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Complicated UTI

An infection that occurs in patients with a structural or functional abnormality impeding urine flow or in a host with altered defenses that predispose the patient to a higher risk of treatment failure and/or complications. The existence of complicated UTI may predispose the patient to multidrug-resistant organisms and make treatment more difficult. Complicated UTIs occur in <5% of patients who have a UTI.

May involve the bladder or the kidneys, and is a symptomatic urinary infection in individuals with functional or structural abnormalities of the genitourinary tract. Uncomplicated UTI rarely occurs in men, and urinary infection in men is usually considered complicated.

Catheter-associated UTI

Catheter-associated UTI in patients with indwelling urethral, indwelling suprapubic, or intermittent catheterization is defined by the presence of symptoms or signs compatible with UTI with no other identified source of infection along with ≥10^3 CFU/ml of ≥1 bacterial species in a single catheter urine specimen or in a midstream collected urine specimen from a patient whose urethral, suprapubic, or condom catheter has been removed within the previous 48 h.

A UTI where an indwelling urinary catheter was in place for >2 calendar days on the date of the event, with day of device placement being day 1, and an indwelling urinary catheter was in place on the date of event or the day before. If an indwelling urinary catheter was in place for >2 calendar days and then removed, the date of event for the UTI must be the day of discontinuation or the next day for the UTI to be catheter-associated.

Symptomatic UTI, symptomatic UTI 1a, catheter-associated UTI—patient must meet 1, 2, and 3 below:

1. Patient had an indwelling urinary catheter that had been in place for >2 d on the date of event (day of device placement – day 1) and was either:
   a. Present for any portion of the calendar day on the date of event, or
   b. Removed the day before the date of event
2. Patient has at least 1 of the following signs or symptoms:
   a. Fever (>38°C), suprapubic tenderness, costovertebral angle pain or tenderness, urinary urgency, urinary frequency, dysuria
3. Patient has a urine culture with no more than 2 species of organisms identified, at least 1 of which is a bacterium of ≥10^5 CFU/mL

*Significant bacteriuria is the quantitative level of bacteriuria consistent with bladder bacteriuria, rather than contamination, determined on the basis of growth from a urine specimen collected in a manner to minimize contamination and transported to a laboratory in a timely fashion to limit bacterial growth.

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Appropriate and Inappropriate Indications for Urine Cultures
Table 2
Appropriate and inappropriate indications for urine cultures (UC) in asymptomatic and symptomatic patients\(^{1,13,14,24,32,33}\)

<table>
<thead>
<tr>
<th>Asymptomatic patients to screen for bacteriuria</th>
<th>Symptomatic patients to screen for a UTI</th>
<th>Asymptomatic patients to avoid screening for bacteriuria</th>
<th>Avoid UC collection or antimicrobial treatment if basing decision solely on 1 or more of the following findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before transurethral resection of the prostate</td>
<td>In acute uncomplicated UTI, persons exhibiting:</td>
<td>Premenopausal, nonpregnant women</td>
<td>Pyuria</td>
</tr>
<tr>
<td>Before urologic procedures for which mucosal bleeding is anticipated</td>
<td>Frequency</td>
<td>Patients with diabetes</td>
<td>Odorous urine</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>Urgency</td>
<td>Elderly patients (community or institutionalized)</td>
<td>Cloudy urine</td>
</tr>
<tr>
<td></td>
<td>Dysuria</td>
<td>Patients with spinal cord injuries</td>
<td>Change in color</td>
</tr>
<tr>
<td></td>
<td>Suprapubic pain</td>
<td>Patients with an indwelling urinary catheter</td>
<td>Sediments</td>
</tr>
<tr>
<td></td>
<td>In acute nonobstructive pyelonephritis, persons exhibiting costovertebral angle pain and tenderness</td>
<td>On admission for a patient with a chronic urinary catheter</td>
<td>Turbidity</td>
</tr>
<tr>
<td></td>
<td>Complicated UTI: involves bladder or kidneys, and is symptomatic in individuals with functional or structural abnormalities of the genitourinary tract</td>
<td></td>
<td>Screening urine cultures such as on admission</td>
</tr>
<tr>
<td></td>
<td>Catheterized patients exhibiting</td>
<td></td>
<td>Standing orders for urinalysis or urine culture without an appropriate indication</td>
</tr>
<tr>
<td></td>
<td>New-onset of or worsening of fever, rigors, altered mental status, malaise, or lethargy with no other identified cause</td>
<td></td>
<td>Punculturing</td>
</tr>
<tr>
<td></td>
<td>Flank pain</td>
<td>Spinal cord injury patients: increased spasticity, autonomic dysreflexia, or sense of unease</td>
<td>Repeat urine culture to document clearing of bacteriuria</td>
</tr>
<tr>
<td></td>
<td>Costovertebral angle tenderness</td>
<td>As part of an evaluation for sepsis without a clear source</td>
<td>Upon routine catheter insertion</td>
</tr>
<tr>
<td></td>
<td>Acute hematuria</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pelvic discomfort</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In those whose catheters have been removed the day before any of the following events: dysuria, urgent or frequent urination, or suprapubic pain or tenderness

Catheterized patients who have had a catheter in place for >2 wk and have symptoms of catheter-associated UTI with no other recognized source. Urine culture should be obtained only when the catheter has been replaced (if required). If a catheter is not required, obtain a voided midstream urine specimen

Spinal cord injury patients: increased spasticity, autonomic dysreflexia, or sense of unease

As part of an evaluation for sepsis without a clear source

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Table references:


Clinical Indications for Urine Cultures

**Appropriate Indications**
- **Patients w/o indwelling urinary catheter:**
  - Elderly patient with new-onset acute mental status changes
  - Urgency or sensation to urinate
  - Gross hematuria
  - Suprapubic pain
- **Patient with indwelling urinary catheter:**
  - New onset or worsening of fever, rigors, altered mental status, malaise, or lethargy with no other identified cause; flank pain; costovertebral angle pain; acute hematuria; pelvic discomfort; and in those whose catheters have been removed, dysuria, urgent or frequent urination, or suprapubic pain or tenderness

**Inappropriate Indications**
- Foul smelling urine
- Cloudy urine
- On admission, for an asymptomatic patient with a chronic urinary catheter
- Urine becoming darker in color
- Upon routine catheter insertion
- At set intervals
- Screening
- Repeat urine culture to document clearing of bacteriuria

Intervention: Modifying the EMR

- Incorporated mandatory selection of standardized indications in EMR for ordering a UC in catheterized patients:
  - Suprapubic pain/tenderness
  - Acute gross hematuria
  - Costovertebral angle tenderness
  - New fever/rigors with clinical assessment negative for more likely etiology
  - Acute alteration of mental status with clinical assessment negative for more likely etiology
  - Alteration in medical condition with clinical assessment negative for more likely etiology in patient whom fever may not be a reliable sign
  - Increased spasticity or autonomic dysreflexia in patients with altered neurologic sensation

Asymptomatic Bacteriuria (ASB)
Asymptomatic Bacteriuria

- IDSA defines ASB as “isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to urinary infection”
- ASB occurs in more than 30% of nursing home patients and 100% of those who are chronically catheterized
- 23% to 50% of antibiotic days for UTI are unnecessary treatment of ASB
- ASB is a benign condition that generally does not require treatment
- When patient symptoms are not considered or when non-urinary symptoms are attributed to bacteriuria, “…unwarranted events may occur including unnecessary urine testing….leading to false-positive results…followed by over-treatment with antibiotics”

Trautner BW. Asymptomatic bacteriuria: when the treatment is worse than the disease. Not Rev Urol 2012;9:85-93
Garcia R, Spitzer E. Promoting appropriate urine culture management to improve health care outcomes and the accuracy of catheter-associated urinary tract infections. AJIC 2017 (pending publication)
“…don’t perform urinalysis [or] urine culture….unless patients have signs and symptoms of infection….tests can be falsely positive leading to overdiagnosis and overtreatment.”
Overuse of Antibiotics

Those goals include:

**GOAL 1:** Slow the Emergence of Resistant Bacteria and Prevent the Spread of Resistant Infections. Judicious use of antibiotics in healthcare and agricultural settings is essential to slow the emergence of resistance and extend the useful lifetime of effective antibiotics. Antibiotics are a precious resource, and preserving their usefulness will require cooperation and engagement by healthcare providers, healthcare leaders, pharmaceutical companies, veterinarians, the agricultural industry, and patients. Goal 1 activities include the optimal use of vaccines to prevent infections, implementation of healthcare policies and antibiotic stewardship programs that improve patient outcomes, and efforts to minimize the development of resistance by ensuring that each patient receives the right antibiotic at the right time for the right duration.

Prevention of resistance also requires rapid detection and control of outbreaks and regional efforts to control transmission across community and healthcare settings.

Available at: https://www.whitehouse.gov/sites/default/files/docs/national_action_plan_for_combating_antibiotic-resistant_bacteria.pdf

Available at: http://www.cdc.gov/vitalsigns/pdf/2014-03-vitalsigns.pdf
Inappropriate Treatment of Catheter-associated ASB

- Veterans Affairs Hospital, all UC over 3-months, patients with indwelling urinary catheter
- Determined Catheter-associated Asymptomatic Bacteriuria (CAABU) vs. CAUTI
- Results: 164 CAABU vs. 116 CAUTI
- Of 164 CAABU, 32% inappropriate Rx w/antibiotics
Complications Stemming From Inappropriate Treatment of ASB

- Increase adverse events, e.g., diarrhea, rash, dizziness, candidiasis, swollen mouth, vertigo
- Development of antibiotic resistant bacterial strains
- \textit{Clostridium difficile} infection
- Increased healthcare and laboratory costs
- Increased laboratory workload

Garcia R, Spitzer E. Promoting appropriate urine culture management to improve health care outcomes and the accuracy of catheter-associated urinary tract infections. AJIC 2017 (pending publication)
UC Contamination and Preservation
Nerd Alert!

Early microscope
Laboratory References Addressing UCs


Major Guidelines Addressing UCs

- **SUNA**: Clinical Practice Guidelines, Care of the Patient with an Indwelling catheter, Society of Urologic Nurses and Associates. 2015.
Targeted Assessment for Prevention (TAP) Strategy

Available at https://www.cdc.gov/hai/prevent/tap/resources.html
Key Reference

- Physician education
- Outlines general principles on when and when not to order UCs
- Principal author on many publications on the subject

Fakih M. Improving the Culture of Culturing. Ascension Health 2014.
Contamination of the Sample

- If the gold standard for diagnosis of a UTI is identification of a pathogen in a freshly collected specimen of urine, then...
- ...it’s critical to avoid contamination by organisms from the urethra, skin, genitals, fecal flora or from the hands of the collector

Goals of UC Specimen Collection:
- Identify a causative pathogen if present
- Preserve the organism at a colony count that reflects the patient’s clinical condition at the time of collection
- Avoid introduction of a contaminant that may overgrow or be interpreted as a pathogen
Urine Culture Contamination

- The College of American Pathologists Q-Probes Studies
- Contamination rates:
  - 1998 study: high of 36.8% (906 institutions)
  - 2008 study: high of 41.7% (14,739 specimens, mean rate of 15.0%)

<table>
<thead>
<tr>
<th>Laboratory Practices</th>
<th>No. of Institutions</th>
<th>Percentage of Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigeration of urine specimens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, most sites (&gt;75%)</td>
<td>62</td>
<td>50.4</td>
</tr>
<tr>
<td>Yes, some sites (25%-75%)</td>
<td>11</td>
<td>8.9</td>
</tr>
<tr>
<td>Yes, few sites (&lt;25%)</td>
<td>3</td>
<td>2.4</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>7.3</td>
</tr>
<tr>
<td>Not applicable</td>
<td>7</td>
<td>5.7</td>
</tr>
<tr>
<td>Unknown</td>
<td>31</td>
<td>25.2</td>
</tr>
<tr>
<td>Preservatives, stabilizers, or preservation devices used &gt;25% of the time*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boric acid solution</td>
<td>52</td>
<td>42.6</td>
</tr>
<tr>
<td>Media paddle dipped and removed from urine specimen</td>
<td>4</td>
<td>3.3</td>
</tr>
<tr>
<td>Other, not including refrigeration</td>
<td>4</td>
<td>3.3</td>
</tr>
<tr>
<td>None of the above used &gt;25% of the time</td>
<td>65</td>
<td>53.3</td>
</tr>
<tr>
<td>Laboratory provides instructions on how to collect uncontaminated urine culture specimens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>101</td>
<td>84.9</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>15.1</td>
</tr>
<tr>
<td>Urine culture specimens transported by courier to laboratory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>111</td>
<td>93.3</td>
</tr>
<tr>
<td>No</td>
<td>8</td>
<td>6.7</td>
</tr>
<tr>
<td>Thermally insulated containers used if urine culture specimens are transported by courier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>100</td>
<td>90.9</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>9.1</td>
</tr>
</tbody>
</table>

* Multiple responses allowed.

Effects of UC Contamination

- 1-year randomized, retrospective ED or inpatient study with contaminated UCs (>2 organisms at ≥10,000 CFU/ml)

- 139 complications in 64 of 131 patients:
  - Initiation of antibiotics – 48.8%
  - Urinary catheter removal – 13%
  - Placement of a new catheter – 12%
  - Collection of additional UC – 8.4%

- 1-year extrapolation: 869 unnecessary interventions

Urine Handling after Collection (w/in 2 hrs. of collection)

- Refrigeration (2°C-8°C)
- Preservation

Limitations: designated refrigerators not always available; temperature monitoring requirements; space; funding

Preservative maintains original organism load for 72h at room temperature
Delayed Urine Cultures, Refrigeration, & Preservation: Effect on Growth

- Johns Hopkins study, 110 urine specimens
- Specimens received in sterile cups, divided into 3 samples:
  1. room temp, no preservative
  2. refrigerated, no preservative
  3. tube with preservative
- Cultures at 2, 4, 24, 48 hrs

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### Table 5

Comparison of the Effects of Various Urine Transport/Storage Conditions Over 48 Hours on the Colony Counts for Select Organisms

<table>
<thead>
<tr>
<th>Organism Identification and Number of Isolates</th>
<th>Initial Culture (Reference)</th>
<th>RT-NPU&lt;sup&gt;c&lt;/sup&gt;</th>
<th>R-NPU&lt;sup&gt;a&lt;/sup&gt;</th>
<th>BDU&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[T&lt;sub&gt;i&lt;/sub&gt; (SD)]</td>
<td>T&lt;sub&gt;1&lt;/sub&gt; (2 h)</td>
<td>T&lt;sub&gt;2&lt;/sub&gt; (4 h)</td>
<td>T&lt;sub&gt;3&lt;/sub&gt; (24 h)</td>
</tr>
<tr>
<td>Any gram-negative (n = 50)</td>
<td>5.681</td>
<td>5.528</td>
<td>5.888</td>
<td>7.193</td>
</tr>
<tr>
<td>Escherichia coli (n = 25)</td>
<td>5.574</td>
<td>5.352</td>
<td>5.725</td>
<td>6.942</td>
</tr>
<tr>
<td>Klebsiella pneumoniae (n = 13)</td>
<td>5.958</td>
<td>5.943</td>
<td>6.319</td>
<td>7.263</td>
</tr>
</tbody>
</table>

BDU, BD preservative urine sample; CFU, colony-forming unit; NS, not significant; R-NPU, refrigerated nonpreservative urine sample; RT-NPU, room temperature nonpreservative urine sample.

<sup>a</sup>BD Vacutainer Urine Collection Cup.

<sup>b</sup>Each value is the mean of the isolates in this group.

<sup>c</sup>BD Vacutainer Urinalysis Plus Conical Urine Tube, No Additive.

<sup>d</sup>BD Vacutainer Plus Urine C&S Preservative Tube.

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## Table 5. Distribution of Rank Order of Selected Pathogens Associated with Healthcare-Associated Infections (HAIs) Reported to the National Healthcare Safety Network, by Type of HAI, 2009–2010

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Overall</th>
<th>CLABSI</th>
<th>CAUTI</th>
<th>VAP</th>
<th>SSI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%) of pathogens</td>
<td>Rank</td>
<td>No. (%) of pathogens</td>
<td>Rank</td>
<td>No. (%) of pathogens</td>
</tr>
<tr>
<td><strong>Staphylococcus aureus</strong></td>
<td>12,635 (15.6)</td>
<td>1</td>
<td>3,735 (12.3)</td>
<td>2</td>
<td>442 (2.1)</td>
</tr>
<tr>
<td><strong>Escherichia coli</strong></td>
<td>9,351 (11.5)</td>
<td>2</td>
<td>1,206 (4.0)</td>
<td>9</td>
<td>5,660 (26.8)</td>
</tr>
<tr>
<td><strong>Coagulase-negative staphylococci</strong></td>
<td>9,261 (11.4)</td>
<td>3</td>
<td>6,245 (20.5)</td>
<td>1</td>
<td>467 (2.2)</td>
</tr>
<tr>
<td><strong>Klebsiella (pneumoniae/oxytoca)</strong></td>
<td>6,470 (8.0)</td>
<td>4</td>
<td>2,407 (7.9)</td>
<td>5</td>
<td>2,381 (11.3)</td>
</tr>
<tr>
<td><strong>Pseudomonas aeruginosa</strong></td>
<td>6,111 (7.5)</td>
<td>5</td>
<td>1,166 (3.8)</td>
<td>10</td>
<td>1,519 (7.2)</td>
</tr>
<tr>
<td><strong>Enterococcus faecalis</strong></td>
<td>5,484 (6.8)</td>
<td>6</td>
<td>2,680 (8.8)</td>
<td>3</td>
<td>1,887 (8.9)</td>
</tr>
<tr>
<td><strong>Candida albicans</strong></td>
<td>4,275 (5.3)</td>
<td>7</td>
<td>1,974 (6.5)</td>
<td>7</td>
<td>880 (4.2)</td>
</tr>
<tr>
<td><strong>Enterobacter spp.</strong></td>
<td>3,821 (4.7)</td>
<td>8</td>
<td>1,365 (4.5)</td>
<td>8</td>
<td>811 (3.8)</td>
</tr>
<tr>
<td><strong>Other Candida spp. or NOS</strong></td>
<td>3,408 (4.2)</td>
<td>9</td>
<td>2,465 (8.1)</td>
<td>4</td>
<td>654 (3.1)</td>
</tr>
<tr>
<td><strong>Enterococcus faecium</strong></td>
<td>3,314 (4.1)</td>
<td>10</td>
<td>2,118 (7.0)</td>
<td>6</td>
<td>1,010 (4.8)</td>
</tr>
<tr>
<td><strong>Enterococcus spp.</strong></td>
<td>2,409 (3.0)</td>
<td>11</td>
<td>703 (2.3)</td>
<td>12</td>
<td>1,013 (4.8)</td>
</tr>
<tr>
<td><strong>Proteus spp.</strong></td>
<td>2,031 (2.5)</td>
<td>12</td>
<td>232 (0.8)</td>
<td>...</td>
<td>204 (1.0)</td>
</tr>
<tr>
<td><strong>Serratia spp.</strong></td>
<td>1,737 (2.1)</td>
<td>13</td>
<td>762 (2.5)</td>
<td>11</td>
<td>185 (0.9)</td>
</tr>
<tr>
<td><strong>Acinetobacter baumannii</strong></td>
<td>1,490 (1.8)</td>
<td>14</td>
<td>629 (2.1)</td>
<td>13</td>
<td>1,633 (7.7)</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>9,304 (11.5)</td>
<td>...</td>
<td>2,762 (9.1)</td>
<td>...</td>
<td>1,633 (7.7)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>81,139 (100)</td>
<td>...</td>
<td>30,454 (100)</td>
<td>...</td>
<td>21,111 (100)</td>
</tr>
</tbody>
</table>

**Note.** CAUTI, catheter-associated urinary tract infection; CLABSI, central line–associated bloodstream infection; NOS, not otherwise specified; SSI, surgical site infection; VAP, ventilator-associated pneumonia.

* A rank is not given if pathogen is not in the top 14 reported for the specific HAI type listed in Table 3 of the supplemental report on the CDC website (http://www.cdc.gov/nhsn/dataStat.html).

Sivert DM. Antimicrobial-resistant associated with HAIs: Summary of data reported to the NHSN a the CDC, 2009-2010. ICHE 2013;34;1-14.
How long does it take to receive specimens from outpatient and inpatient areas?
Urinalysis Collection Points

- 4 basic tests used for UTI diagnosis:
  - Leucocyte esterase
  - Nitrite
  - Leucocytes (WBC)
  - Bacteria
- In order to provide *accurate* UA results, CLSI recommends performing a urinalysis within 2 hrs of collection of specimen
- In order to prevent WBC lysis, bacterial overgrowth, and degradation of cells and casts, use alternate handling method
  - Refrigeration
  - Preservative tube (sample integrity for 72hrs)

CLSI Urinalysis and collection, transportation, and preservation of urine specimens; approved guideline. GP 16-A3, Feb 2009
Patient has a urine culture with no more than two species of organisms, at least one of which is a bacteria of $\geq 10^5$ CFU/ml.

$10^5$ CFU/ml = $>100,000$ colony forming units/1 milliliter of urine.

CFU = 1000 cells per colony
100 colonies per plate = $>100,000$ cells per ml

https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf
Proper Collection and Handling of Urine
Unlike intravascular catheters, there is no replaceable connector on indwelling urinary catheters.

The Triad:
- Correct site
- Proper disinfection
- Correct collection

Advantage:
- Direct draw
- Fewest steps
- Fewest items
- Minimizes risk of contamination

Best Practice Triad for Urinary Catheter Specimen Collection

Scrub-the-Hub: 5 secs

“If a small volume of fresh urine is needed for examination (i.e. urinalysis or culture), aspirate the urine from the needleless sampling port with a sterile syringe/cannula adaptor after cleansing the port with a disinfectant.”
Educate All Collectors on Best Practice

Available at: http://www.bd.com/vacutainer/pdfs/LLAD_wall_chart_foley_catheter_collection.pdf
Modification of UA and UC Testing Protocols
Reflex Testing

- Reflex or confirmatory testing is a protocol whereby additional laboratory testing may be performed on a patient sample based on the results of the initial test.

- Example: A urinalysis with elevated WBC signals the potential for a bacterial infection and a confirmatory urine culture is ordered on the same or complimentary specimen.

- Ordering: UA with reflex

- Triggers for reflexive urine cultures:
  - Leukocyte Esterase – moderate to large
  - Nitrite – positive
  - WBC - ≥5-10 per hpf
  - Bacteria - positive
## Reflex Urine Testing Studies (retrospective)

<table>
<thead>
<tr>
<th>Author / Yr</th>
<th>Unit</th>
<th># Pts</th>
<th>LE</th>
<th>WBC/hpf</th>
<th>Bact</th>
<th>Nitrite</th>
<th>UA-, UC- (%)</th>
<th>UA-, UC+ (%)</th>
<th>Source</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones 2014</td>
<td>ED</td>
<td>1546</td>
<td>Y</td>
<td>&gt;10</td>
<td>Y</td>
<td>Y</td>
<td>39.0</td>
<td>3.5</td>
<td>Clean catch Catheterized</td>
<td>Pts w/both UA &amp; UC Pts &gt;5 yrs old UC= ≥10,000 CFU/ml</td>
</tr>
<tr>
<td>Hertz 2015</td>
<td>ED</td>
<td>4849</td>
<td>Y</td>
<td>&gt;10</td>
<td>Y</td>
<td>Y</td>
<td>34.6</td>
<td>4.7</td>
<td>NS</td>
<td>Pts w/both UA &amp; UC Pts &gt;18 yrs old UC= ≥10,000 CFU/ml</td>
</tr>
<tr>
<td>Foc 2010</td>
<td>Male Urology Clinic</td>
<td>874</td>
<td>N</td>
<td>&gt;5</td>
<td>N</td>
<td>N</td>
<td>69.0</td>
<td>7.0</td>
<td>Clean catch</td>
<td>Pts w/both UA &amp; UC UC= ≥10,000 CFU/ml</td>
</tr>
<tr>
<td>Kaylap 2013</td>
<td>Hospital &amp; outpatient</td>
<td>32,998</td>
<td>Y</td>
<td>&gt;4</td>
<td>Y</td>
<td>Y</td>
<td>97.7</td>
<td>---</td>
<td>Clean catch</td>
<td>Pts w/both UA &amp; UC</td>
</tr>
</tbody>
</table>

## Reflex Urine Testing Studies (prospective)

<table>
<thead>
<tr>
<th>Author / Yr</th>
<th>Unit</th>
<th># Pts</th>
<th>LE</th>
<th>WBC/hpf</th>
<th>Bact</th>
<th>Nitrite</th>
<th>Urine Cultures (%)</th>
<th>Other (%)</th>
<th>Source</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarg 2016</td>
<td>Hospital (7 adult ICUs)</td>
<td>500</td>
<td>N</td>
<td>&gt;10</td>
<td>N</td>
<td>N</td>
<td>-30</td>
<td>ASB -28</td>
<td>Catheterized</td>
<td>1st yr: Pts w/both UA &amp; UC; 2nd yr: Reflex Pts &gt;18 yrs old Decrease from 449 DOT/1000 PD to 425 DOT/1000 PD</td>
</tr>
<tr>
<td>Epstein 2016</td>
<td>Hospital (5 adult ICUs)</td>
<td>NS</td>
<td>N</td>
<td>&gt;10</td>
<td>N</td>
<td>N</td>
<td>Decreased (p = .0012)</td>
<td>Decrease CAUTI (p = .04)</td>
<td>Catheterized</td>
<td>Pts w/both UA &amp; UC Pt ages NS</td>
</tr>
</tbody>
</table>


---

**What do all these Reflex Urine studies omit?**
Reflex Urine Study, Sarg 2016

Criteria: urine WBC count >10 per hpf

<table>
<thead>
<tr>
<th>Antibiotic changes in response to index urine culture, No. (%)</th>
<th>Pre-intervention (n=250)</th>
<th>Post-intervention (n=250)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not on antibiotic, new antibiotic started</td>
<td>55 (22)</td>
<td>28 (11)</td>
<td>.002</td>
</tr>
<tr>
<td>Not on antibiotic, no new antibiotic started</td>
<td>79 (32)</td>
<td>95 (38)</td>
<td></td>
</tr>
<tr>
<td>On antibiotic, changed based on culture result</td>
<td>41 (16)</td>
<td>37 (15)</td>
<td>.30</td>
</tr>
<tr>
<td>On antibiotic, no change</td>
<td>75 (30)</td>
<td>90 (36)</td>
<td></td>
</tr>
</tbody>
</table>

Reflex Urine Study, Epstein 2016

- Maryland Hospital with CDC assistance; 5 ICUs; >10 WBC/hpf

Urine culturing

CAUTI rates

Alternate Approach: Focus on Ordering Not Test Result (Pts w/IUC)

- KICKING CAUTI Campaign, study at 2 Veterans Affairs health systems
- One multifaceted intervention vs one comparison site

Results of Study Addressing UC Ordering

**Urine Cultures Decreased 71%**

**ASB Rx decreased 75%, CAUTI Rx decreased 89%**

Figure. Monthly rate of urine culture orders per 1000 bed-days

Process Flow For Reflex Urine Culture Ordering – Pts w/o IUC

- Clinician orders a Urine Culture
  - Order screen lists **appropriate indications for urine culture** for patients without indwelling catheter (CHECK):
    - Elderly patient with new-onset acute mental status changes
    - Urgency or sensation to urinate
    - Gross hematuria
    - Suprapubic pain

- Is the patient pregnant, awaiting urologic procedure, neutropenic, or ≤12 mths of age?
  - N: Does the patient have an indwelling urinary catheter?
    - N: Clinician orders a Urine Culture
    - S: See “Process Flow for Reflex Culture Ordering – Pts w/ IUC”
  - Y: UA and urine culture sent – both specimens run regardless of UA results

- UA negative – No urine culture processed
- Proceed to Urine Culture – Specimen processed

- UA and Urine culture sent – UA run first

- Is the UA abnormal – at least one of the following:
  - +Nitrite
  - +LE
  - ≥5 WBCs


Talbot T. Preventing CAUTI, Partnership for Patients lecture, 1/25/16
Process Flow For Reflex Urine Culture Ordering – Pts w/IUC

Is the patient pregnant, awaiting urologic procedure, neutropenic, or ≤12 mths of age?

- **NO**
- **YES**

Does the patient have an indwelling urinary catheter?

- **NO**
- **YES**

Clinician orders a Urine Culture

Order screen lists appropriate indications for urine culture for patients with indwelling catheter (CHECK):
- New onset or worsening of fever, rigors, altered mental status, malaise or lethargy with no other identified cause
- Flank pain
- Costovertebral angle pain
- Acute hematuria
- Pelvic discomfort

UA and urine culture sent – both specimens run regardless of UA results

See "Process Flow for Reflex Culture Ordering – Pts w/o IUC"

UA and Urine culture sent – UA run first

Is the UA abnormal – at least one of the following:
- +Nitrite
- +LE
- ≥5 WBCs

- **NO**
- **YES**

Directed to test: UA with Reflexive Culture

UA negative – No urine culture processed

Proceed to Urine Culture – Specimen processed

Nicolle LE, et al. IDSA Guidelines for Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults
Talbot T. Preventing CAUTI, Partnership for Patients lecture, 1/25/16
Inappropriate UC Collection & CAUTI
Clarification on Obtaining Urine Cultures

Available at:
http://www.apic.org/Resource_/TinyMceFileManager/APIC_Q_and_A_CDC_CMS_communique_10_7_15.pdf,
CDC/CMS Statement on Testing

- **Ordering diagnostic tests in absence of clinical symptoms.** It has been reported that in some instances, when patients are admitted to a hospital, diagnostic microbiology tests are ordered even in the absence of clinical indications for testing, such as obtaining urine specimens for culture and sensitivity testing from patients who have no symptoms of a urinary tract infection. Many negative culture results are generated by this practice subjecting the patient to potentially unnecessary tests. On the occasion that a culture result is positive, the results are then used to assert that infections that first manifested themselves clinically many days later during hospitalization were present on admission and hence not reportable to NHSN.

- **Discouraging the ordering of diagnostic tests in the presence of clinical symptoms.** It has been reported that in some instances clinicians responsible for inpatient care in some hospitals may be discouraged from ordering diagnostic microbiology tests recommended by best medical practices (or standards of care) to avoid test results that would make infections reportable to NHSN.

Available at: http://www.cdc.gov/nhsn/pdfs/cms/nhsn-reporting-signed.pdf
Catheter Replacement & Obtaining UCs

- CDC: “changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather, it is suggested to change catheters and drainage bags based on clinical indications such as infection, obstruction, or when the closed system is compromised “(Cat II)

- IDSA: “A urine specimen for culture should be obtained prior to initiating antimicrobial therapy for presumed CAUTI because of the wide spectrum of potential infecting organisms and the increased likelihood of antimicrobial resistance (A-III)

- “If an indwelling catheter has been in place for >2 weeks at the onset of CAUTI and is still indicated, the catheter should be replaced to hasten resolution of symptoms and to reduce the risk of subsequent CA-bacteriuria and CAUTI” (A-1)

- “the urine culture should be obtained from the freshly placed catheter prior to the initiation of antimicrobial therapy to help guide treatment” (A-II)

- “if use of the catheter can be discontinued, a culture of a voided midstream urine specimen should be obtained prior to the initiation of antimicrobial therapy to help guide treatment” (A-III)

- Reasoning: a mature biofilm has usually formed once the catheter has been in situ for longer than 2 weeks. Urine collected through these catheters are contaminated by organisms present in biofilm.

Gould CV, Guideline for Prevention of CAUTI. CDC, 2009
Reducing CAUTI with UC Intervention

- Intervention study, Mayo Clinic (Rochester, MN)
- 2015 John M. Eisenberg Patient Safety Award
- Used 6 C’s of CAUTI reduction including “Culture urine only when indication is clear” with modification of EMR and “Scrub-the-Urine-Port”
- CAUTI reduced by 70%

Eliminate Automatic Orders

- Many hospitals have automatic orders for UA/UC built into electronic care plans.
- European study designed to measure effect of eliminating automatic screening urine cultures from care plans for patients undergoing elective joint arthroplasty.

“Discontinuing routine processing of screening urine cultures from a preoperative orthopedic clinic resulted in a substantial reduction in UCs performed and antibiotics prescribed for ASB without significant increase in [infection]”

Reducing CAUTI with UC Intervention

- Intervention study, Cleveland Clinic, 7 adult, pediatric, neonatal ICUs
- Effort to reduce CAUTI using guideline for evaluating fever along with a "stewardship of culturing"
- UCs reduced by 47.7% and CAUTI by 36.7%


CAUTIs without UA

- Retrospective study of ICU patients identified with CAUTI
- 2,973/14,743 (20.2%) of UCs w/o UAs
- 31/61 CAUTIs (50.8%) were identified as “isolated cultures”

“...because the diagnosis of UTI relies on clinical and laboratory findings, a positive urine culture alone is insufficient.”

Carlson AL, et al. Inpatient urine cultures are frequently performed without urinalysis or microscopy: findings from a large academic medical center. ICHE 2017;38:455-60.
Recommendations on Urine Culture Management

1. Establish a preculture strategy that directs efforts at how cultures are ordered rather than solely addressing issues after a UA or UC test is finalized:

   - Modify the electronic medical record to include appropriate and inappropriate indications for UAs/UCs that address patient symptomology
   - Eliminate automatic orders in care plans where appropriate
   - Provide education for all clinicians who order UCs with emphasis on appropriate indications for UCs and UTI symptoms in catheterized and noncatheterized patients
   - Carefully evaluate patients with fever and order UCs as appropriate
   - Reflex urine testing should be considered only if used in conjunction with careful clinical evaluation for signs and symptoms of UTI
Recommendations on Urine Culture Management

2. Ensure proper collection and handling of urine specimens:

- Replace catheters in symptomatic patients before collecting a specimen
- Delineate policies and procedures and educate personnel on the proper methods to collect UCs, particularly for catheterized patients, emphasizing disinfection of the sampling port and limiting collection of specimens from the port and never from the collection bag
- Standardize the use of refrigeration or preservative tubes in all health care settings, including ambulatory clinics and EDs.
Recommendations on Urine Culture Management

3. Incorporate into the facility’s quality monitoring process adherence to UC ordering and collection policies

- number of UCs ordered per month
- adherence to protocol on proper indications for ordering UCs
- ASB and antibiotic treatment
- adherence to protocol on UC handling, i.e. proper refrigeration or preservative use
Thank you!

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