Urine Culturing Stewardship in the ICU Setting

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Case Study: To Culture or Not To Culture…

- Ms. Allen, a 65-year-old woman, has atrial fibrillation on warfarin, and multiple sclerosis complicated by urine retention with a chronic indwelling urinary catheter. She was admitted to telemetry 4 days ago due to elevated INR and to adjust her cardiac meds for better HR control. Ms. Allen was well until 3 hours ago when she had an upper GI bleed, while her INR is 5.3.
- She is admitted to the ICU; her temp is 100.8˚F during blood transfusion, HR 130, RR 22, BP 97/42. WBC is 11/mcL and her Hgb is now 7.6 g/dL.
- Exam shows cloudy urine in her catheter tubing.

Should she have a urinalysis and urine culture?

Abbreviations: BP = blood pressure; GI = gastrointestinal; Hgb = hemoglobin; HR = heart rate; ICU = intensive care unit; INR = international normalized ratio; RR = respiration rate; WBC = white blood cell.

What Is Urine Culture Stewardship?[1-5]

Ordering urine cultures thoughtfully, so they inform (not misinform) the care of individual patients

Ordering
- Indication for urine based on patient evaluation?

Collecting
- Standardization of specimen collection

Intervening
- Treatment decision: Provide providers with guidance around test interpretation and treatment?

Why Is Appropriate Urine Testing Important?[2,6-10]

Urinalysis and culture are only meaningful in the presence of signs or symptoms of infection

- WBCs can be found in the urine for many reasons besides infection
- Bacteriuria in catheterized patients increases 3 to 8% daily
- Asymptomatic bacteriuria (ASB) is the bacterial colonization of the urine, which does not typically lead to infection or require treatment
- ASB occurs as much as 50% of the time in patients with an indwelling urinary catheter.
- Practitioners may unnecessarily treat a positive urinalysis or urine culture

Urinalysis can rule out CAUTI but cannot rule in CAUTI

Note: There are some exceptions to rules about treating ASB, such as pregnancy and urologic procedures, but they are rare in the ICU.

CAUTI Signs and Symptoms[6,11-12]

- Presence of symptoms suggestive of a urinary tract infection (UTI). For example:
  - Flank pain or costovertebral angle tenderness
  - acute hematuria
  - new pelvic discomfort
- Fever/rigors
- New-onset or worsening sepsis without evidence of another source on history, physical examination, or laboratory testing
- Fever or altered mental status without evidence of another source on history, physical examination, or laboratory testing
- In spinal cord injury patients: increased spasticity, autonomic dysreflexia, sense of unease

Inappropriate Triggers for Culturing Urine in Catheterized Patients Without Other Symptoms[3,6]

- Urine characteristics
  - Foul odor
  - Cloudy urine
  - Dark urine
  - Urine sediment
- Pyuria (pus in the urine)
- Urinary catheter present on admission
- During catheter insertion

Survey of Doctors and Nurses for Indications to Urine Culture[13]

Order Indication	Physicians	Nurses
Appearance	23%	61%
Odor	42%	74%
Dysuria	54%	35%
Pan culture	38%	45%
UA > 100 WBCs/hpf	58%	43%

Patient Evaluation Before Urine Culturing in the Presence of a New Fever in an ICU Patient[1]

Questions to ask before culturing urine	Yes	No
Are there clear signs/symptoms of a UTI?		
Is sepsis suspected and without a clear source?		
Is there a current urinary obstruction?		
Has the patient had recent urologic manipulation such as trauma to the GU tract or surgery?		
Is the patient granulocytopenic?		

Abbreviations: GU = genitourinary; UTI = urinary tract infection.

If "**YES**" to any of these and the patient is without another reasonable cause for fever, a urine culture is appropriate[1]

Technical & Socio-Adaptive Strategies for Diagnostic Stewardship[4,14-16]

Intervention Type	Diagnostic Stewardship Interventions for Urine Culturing
Treatment guidelines coupled with provider education	• Develop institution-specific guidelines based on evidence for correct urine culturing technique and treatment of CAUTI's • Provide education to providers & nurses • Actively review urine culture orders and peer feedback
Require clinical indication when placing order	• Build hard stops in EHR that require entering indications before ordering culture
Correct specimen collection technique	• Nurse training on correct technique • Urine culture specimens with preservative
Provide providers with guidance around test interpretation	• EHR comment that with positive culture advise providers about management of ASB
Restrict reporting of urine culture results	• Report urine culture as mixed if > 3 organisms with no further information • Release details of urine culture results only upon request • Selectively suppress antimicrobial results or use cascade reporting

Adapted from Claeys KC, Blanco N, Morgan DJ, et al. Advances and challenges in the diagnosis and treatment of urinary tract infections: the need for diagnostic stewardship. Curr Infect Dis Rep. 2019;21(4):11.

The Educational Campaign[4-5,14,17-18]

- Educate physicians
- Educate nurses
- Create unitwide tools
- Target new staff
- Create periodic reminders

Massachusetts Infection Prevention Partnership. Treating asymptomatic bacteriuria: all harm, no benefit. 2013. Used with permission.

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Making the EHR Work for You[3,15,19-24]

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

- Modify the electronic medical record to include appropriate indications for urine cultures in catheterized patients that address patient symptomology
  - 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 in whom fever may not be a reliable sign
  - Increased spasticity or autonomic dysreflexia in patients with altered neurologic sensation
- Eliminate automatic orders in care plans where appropriate
- Three-day hard stop on reordering a culture
- **Reflex urine testing should be considered only if used in conjunction with careful clinical evaluation for signs and symptoms of UTI**

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Collection & Transport To Reduce Contamination[3,24-27]

- If a catheter placed > 2 weeks, change the catheter before collecting a specimen.
- Kink tubing 12 inches below sample port, allowing urine to fill the tube. Scrub the hub with antiseptic aspiration from the sampling port. Follow by unkinking the tube.
- If specimen can't be transported and plated on culture medium within 2 hours of collection, specimen should be refrigerated, or consider not using.
  - Consider using preservative in the tube!
- To overcome logistic barriers: use urine collection tubes with preservatives.

Contaminated urine cultures lead to additional diagnostic evaluation and inappropriate antibiotic administration > 40%[24]

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Current Status of Urine Stewardship[20]

- Survey: 122 acute care facilities in the United States
- Urine culture diagnostic stewardship practices

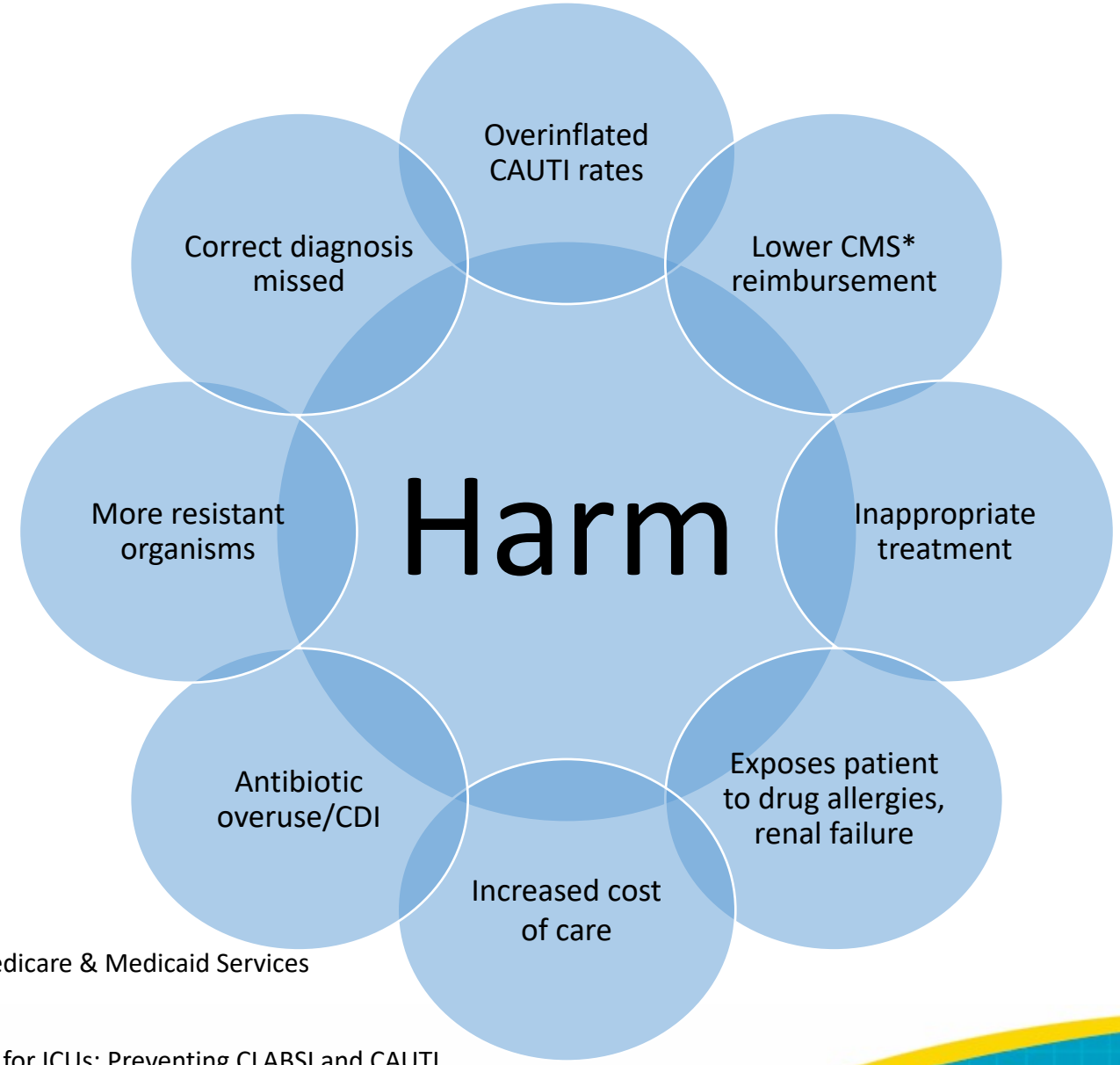
Intervention	% Present
Published indications for ordering urine cultures	44%
Indications entered into EHR	17%
Labs offered reflex cultures at the top of the order or prechecked	66%
Ordered urine culture without your analysis	96%
Labs proceed with culture even with the delay in transport	39%
Use preservatives in urine collection tubes	35%
Report mixture urine culture with no organism workup with three or more pathogens	90%

“It’s a Harmless Urine Culture”

Klebsiella Pneumoniae (ESBL)	
Ampicillin	R
Ampicillin-sulbactam	R
Piperacillin-tazobactam	R
Trimethoprim-sulfamethoxazole	R
Cefazolin	R
Ceftriaxone	R
Ceftazidime	R
Cefepime	R
Ciprofloxacin	R
Gentamicin	R
Tobramicin	R
Ertapenem	S
Meropenem	S

Abbreviations: R = resistant; S = susceptible

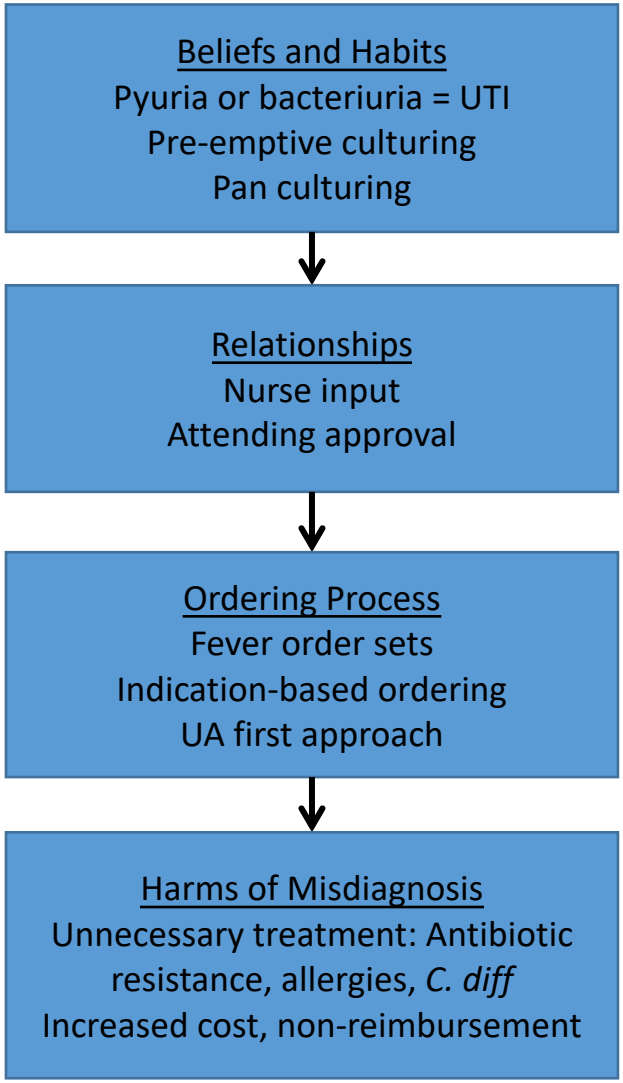
Why Is Inappropriate Culturing of Urine a Problem?



*CMS = Centers for Medicare & Medicaid Services

AHRQ Safety Program for ICUs: Preventing CLABSI and CAUTI

Implementing Culturing Stewardship[28]



- Target with education, use of peer-to-peer feedback audits

- Involve nurse in decisions
- Promote "speak up" culture and collaboration
- Require attending approval of urine cultures
- Include infection preventionist on team rounds
- Connect with lab on how cultures are reported

- Improve CPOE order sets to require indication
- "Guidance at point of care"

- Publicize adverse events to increase engagement; keep personal

Abbreviations: *C. diff* = *Clostridium difficile;* CPOE = computerized physician order entry

Additional Solutions

- Periodically audit urine culturing practices
  - Follow up with ordering provider if culture was inappropriate
- Avoid reflexive screening
  - Urine cultures upon admission
  - Automatic urine tests when catheters are inserted
  - Pan culture fever workups
  - Reflex culture performed without patient symptoms
- Write a proper fever protocol

Communication Pearls

- Encourage a real patient evaluation for fever and thoughtful culturing
  - If a provider wants orders followed without discussion—
    - “[provider name], the CAUTI committee, chaired by your partner, met and developed this new practice pathway around the culture of culturing and shows the best evidence for culturing to protect our ICU patients from drug-resistant bacteria."
  - If skeptical staff think it is just about avoiding penalties—
    - “Yes, this does help us avoid penalties, but more importantly, it’s what is best to prevent harm to the patient.”

Back to the Case[2]

What about Ms. Allen, who was admitted for an upper GI bleed from warfarin with a chronic indwelling urinary catheter and cloudy urine?

- She should NOT have had a culture, because her findings were due to bleeding, and screening urine tests on admission are inappropriate, even with an indwelling urinary catheter.[2] Cloudy urine does not predict CAUTI.
- However, a urinalysis was sent, and this hospital performs reflex cultures.

Disclaimer: All case studies are hypothetical and not based on any actual patient or hospital information. Any similarity between a case study and actual patient or hospital experience is purely coincidental.

Take-Home Points

- Do not order a urine culture if the patient is asymptomatic
- Educate staff on potential harms of inappropriate culturing and how to assess urine culture need
- Incorporate cues for culturing practices into the EHR
- Assess urine culturing practices in your unit through audits and evaluation
- If the catheter is in place less than 2 weeks, change out prior to obtaining a culture
- Ensure all staff feel free to speak up and share accountability for responsible urine culturing

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