



# Urinary Tract Infection 101 For Nurses

## **Nurses Take Antibiotic Stewardship Action Initiative**

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Disclaimer: The conclusions in this presentation are those of the JHU authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.





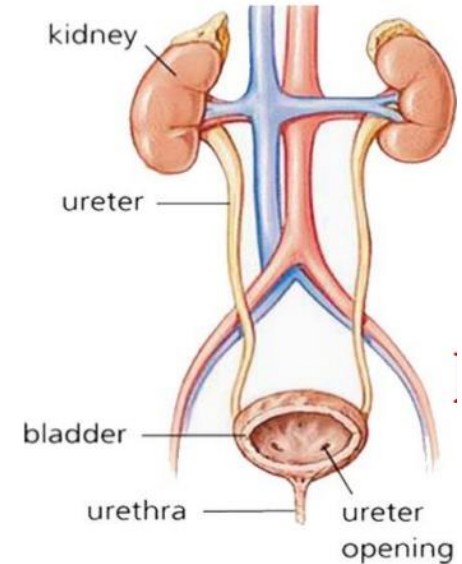
# Urinary Tract Infections

## Consists of an infection of:

- Kidneys (Pyelonephritis, renal abscess)

**OR**

- Bladder (Cystitis)



To make a diagnosis of UTI, the following 3 elements are needed:

**Symptoms** + **White cells in the urine** (except in neutropenic patients) + **Positive urine culture** (bacterial growth in urine culture)



1. **CYSTITIS:** Dysuria, frequency, urgency
2. **PYELONEPHRITIS:** Fever and flank pain
3. **CATHETER-ASSOCIATED UTI:** Fever and suprapubic tenderness



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# What Does It Mean To Have Bacteria In The Urine Without Urinary Symptoms?

- This is called **asymptomatic bacteriuria (ASB)** and is defined as isolation of significant growth of bacteria\* in the urine of a person **WITHOUT** symptoms of UTI
- There are only **TWO** situations in which searching for ASB is recommended:
  - **Pregnant women**
  - **Patients undergoing a traumatic urologic procedure where mucosal bleeding is expected** (e.g., transrectal prostate biopsy)

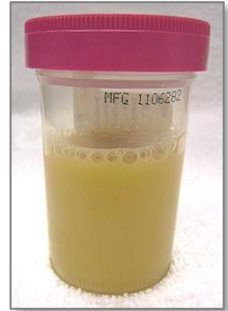
**\*Significant bacterial growth is defined as:**

- **No catheter present:  $\geq 100,000$  ( $10^5$ ) CFU/mL of a urinary pathogen**
- **Catheter present:  $\geq 1,000$  ( $10^3$ ) CFU/mL of a urinary pathogen**





# What Does It Mean To Have White Cells In The Urine?



- White cells in the urine, or **pyuria**, is defined as:
  - $\geq 10$  white cells/mm<sup>3</sup>
  - $\geq 3$  white cells/HPF of unspun urine
  - Positive leukocyte esterase
- White cells may be present in the urine due to non-infectious causes
  - Examples of non-infectious cases of pyuria
- **Pyuria with or without bacteriuria is NOT an indication for a urine culture or antibiotic therapy if the patient is ASYMPTOMATIC (exceptions already discussed)**

- Presence of urinary catheter
- Recent urologic procedure
- NSAIDs (e.g., ibuprofen)
- Steroids
- Proton pump inhibitors
- Antibiotics (e.g., vancomycin, penicillin)
- Pelvic irradiation due to cancer
- Urinary tract stones
- Renal-vein thrombosis
- Interstitial cystitis/nephritis
- Systemic lupus erythematosus





# Asymptomatic Bacteriuria And Pyuria Are Common In Certain Patient Populations

- **Patients with very high prevalence of ASB and pyuria ( $\geq 90\%$ ):**
  - Dialysis patients
  - Patients with long-term indwelling catheters
- **Patients with moderate (30-50%) prevalence of ASB and high (90%) prevalence of pyuria:**
  - Elderly women
  - Long-term care residents
- **Patients with lower ( $< 10\%$ ) prevalence of ASB and moderate (30-50%) prevalence of pyuria:**
  - Short-term catheters (in place for  $< 30$  days)
  - Pre-menopausal women



# Treatment Of ASB: Why Not?

- Treatment of asymptomatic bacteriuria is not recommended in most patients (exceptions mentioned earlier) because of the potential harm associated with antibiotics and the lack of clinical benefit.
  - Some studies have shown an increase in UTIs when asymptomatic bacteriuria was treated, suggesting a protective effect of these urinary bacteria.
  - Adverse events associated with antibiotic use may occur in 1/5 of patients receiving antibiotics.
    - e.g., renal failure, *C. difficile* colitis, cardiac arrhythmias, inflammation/rupture of tendons, anemia, liver inflammation



# Special Populations

- **Elderly patients**

- Bacteriuria and delirium are independently common in elderly patients.
- Delirium or fall should not prompt a urine culture if there are no local genitourinary symptoms (e.g., suprapubic pain) or other signs of infection (e.g., fever or hemodynamic instability).








- **Spinal cord injury patients**

- Clinical signs and symptoms of a UTI may differ from persons with normal sensation (presenting symptoms may include increased spasticity, leaking around the catheter, malaise).
- **Both of these patient groups are at a higher risk of inappropriate antibiotic treatment as their urine is frequently cultured for non-specific symptoms.**





# The Color Does *NOT* Tell

- Many non-infectious causes may alter the appearance of the urine.
  -  **Pale yellow/clear:** good hydration
  -  **Bright yellow:** B vitamins
  -  **Red:** blood, beets, blackberries
  -  **Orange:** dehydration, carrots, rifampin
  -  **Green:** phenol drugs, antidepressants, dyes in food, bile
  -  **Brown:** anti-psychotics, laxatives, muscle relaxants, muscle injury
  -  **Purple:** porphyria
- Isolated urine color changes (“dark”, “murky”, “cloudy”) do not correlate well with UTI and should not prompt urine cultures in the absence of other signs and symptoms of infection.





# The Smell Does *NOT*, Either!

- Strong urine smell is thought to be secondary to ammonia production.
- Reasons for odorous urine:
  - Uncontrolled diabetes
  - Diet (e.g., asparagus)
  - Vitamins
  - Concentrated urine (dehydration)
- Urine odor (including foul smell) is not an accurate predictor of UTIs.
- Smell of urine is often a misleading symptom of UTIs and results in error.





# Common Reasons For Inappropriate Culture/Decision To Treat ASB

- Pyuria
- Foul smelling urine
- Dark urine
- Sediment in urine
- Prior UTI diagnosis
- Test of cure
- Resistant organisms in urine
- Vague malaise/weakness
- Fall
- Admission or transfer to a new unit/hospital
- Leukocytosis (increased white blood cell count in blood)





# Treatment



- If a patient is able to take oral medications, oral options are preferred for cystitis and recommended for pyelonephritis once the patient has improved (to avoid complications of intravenous access such as phlebitis, bacteremia, and thrombosis).
- Duration:
  - Cystitis: 3-7 days depending on antibiotics
  - Pyelonephritis: 5-14 days depending on antibiotics
  - CAUTI: Remove catheter (this alone may resolve the infection). Duration depends on location and severity of illness (3-14 days).
  - Longer courses for cases with urinary obstruction
- If an antibiotic was started for a suspected UTI and subsequently an alternative diagnosis is identified, antibiotics should be stopped.





# Urine Culture Collection DON'Ts

## Indwelling catheter urine:

- Do not collect urine from the drainage bag because growth of bacteria outside the catheter may have occurred at this site.
- Urine catheter tip cultures are not acceptable.





# Urine Collection DO's

## Indwelling catheter urine:

1. Clean the catheter with an alcohol pad. →
2. Use a sterile needle and syringe to puncture the tubing or use the urine vacutainer. →
3. Aspirate the urine directly from the tubing. →
4. Transfer the urine to a sterile specimen container or appropriate transport media.



## Midstream urine (instructions to patients):

1. Wash hands.
2. Clean area with towelette.
3. Void ~20 mL into toilet and catch portion of the remaining urine in cup without stopping the stream.



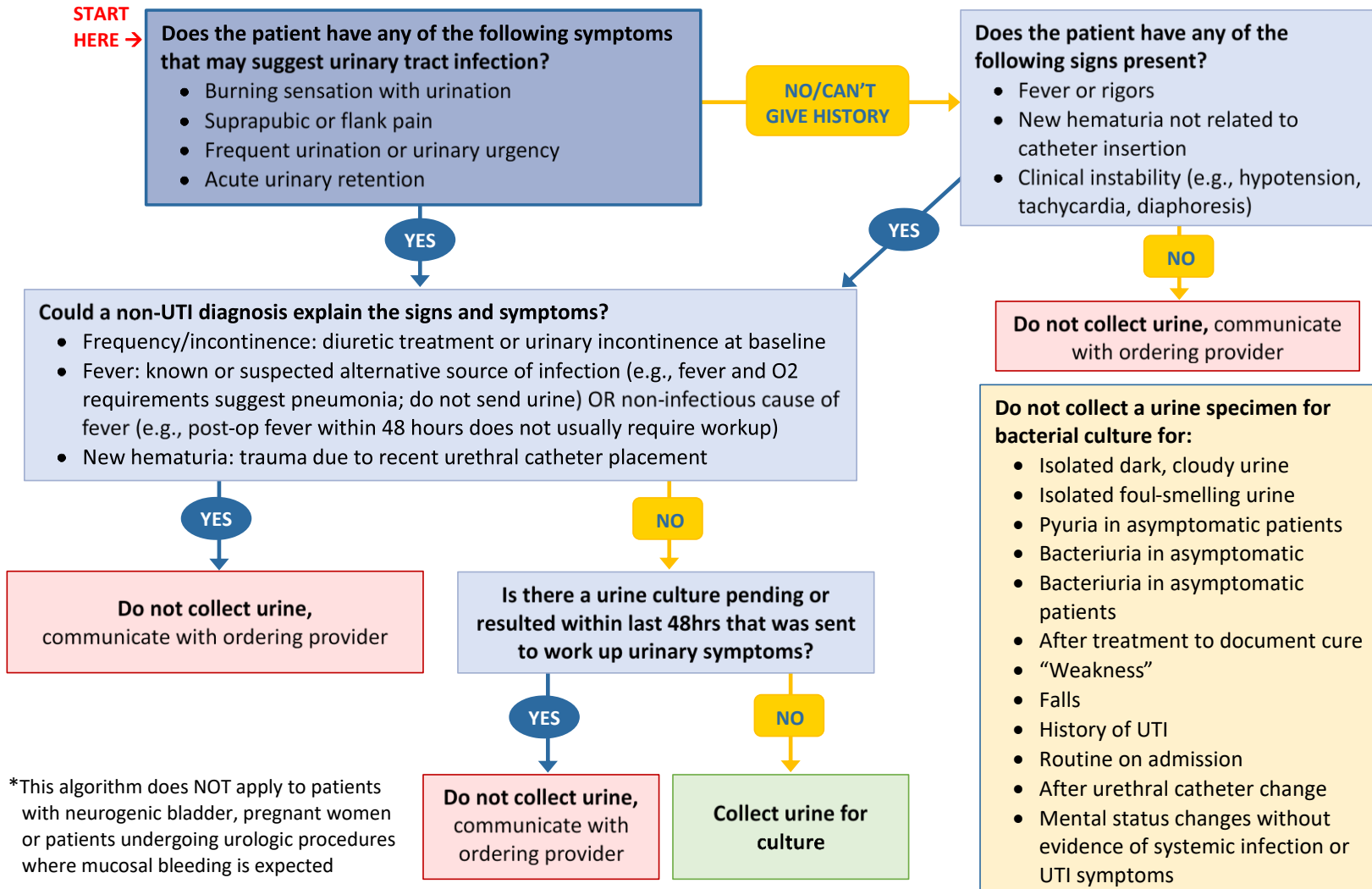
# When To Order A UA Versus A UA With A Urine Culture?

- If a UTI is suspected based on signs and symptoms of UTI (not a fall, not fatigue) either a UA with reflex or a UA plus a urine culture can be ordered
- If a UA with reflex is ordered, the clinical laboratory will set the urine culture if predefined criteria are met (usually based on pyuria, nitrite [comes from some urinary bacteria], or leukocyte esterase [comes from white cells])



# Should I Collect Urine for Bacterial Culture? Algorithm for Inpatients with or without a Urethral Catheter\*

Developed by The Johns Hopkins Hospital Department of Antimicrobial Stewardship



\*This algorithm does NOT apply to patients with neurogenic bladder, pregnant women or patients undergoing urologic procedures where mucosal bleeding is expected





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## Slide 3

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