HMS

MICHIGAN HOSPITAL MEDICINE SAFETY CONSORTIUM

Guidelines for Treatment of Urinary Tract Infections

Introduction

This document details the Michigan Hospital Medicine Safety (HMS) Consortium preferred antibiotic choices for the treatment of uncomplicated urinary tract infections localized to the bladder, and complicated urinary tract infections (catheter-associated UTI and infections extending beyond the bladder, e.g., fever or sepsis, bacteremia, pyelonephritis). The treatment recommendations highlighted in this document are not meant to be a comprehensive guideline. This guideline also addresses the appropriate management of asymptomatic bacteriuria which accounts for a substantial burden of unnecessary antimicrobial use.

Intended Use

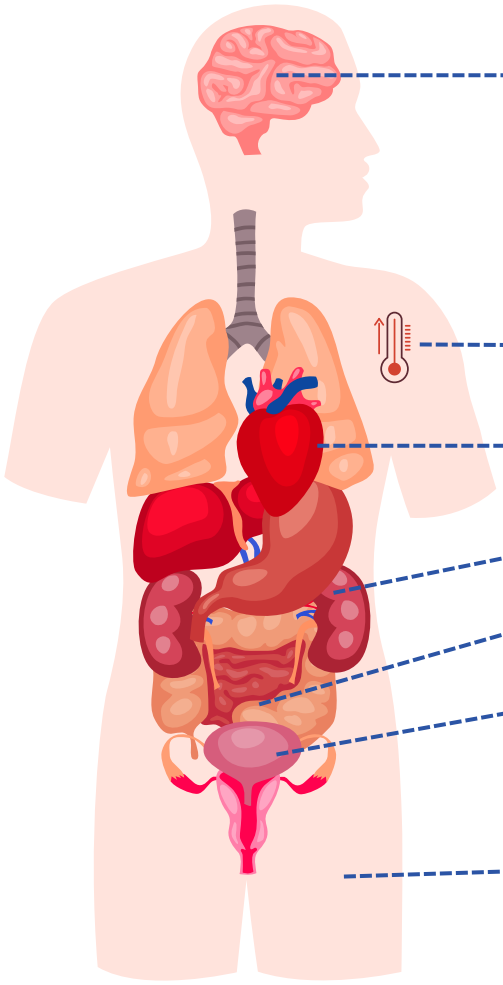
The recommendations within this guideline are intended to address the management of positive urine cultures in hospitalized **non-pregnant** patients in a **non-ICU** setting.

This guideline is **NOT intended** for patients experiencing the following:

- Urologic procedure during hospitalization (or in 30 days prior)
- History of urinary diversion surgery and renal transplant
- Urinary stents or percutaneous nephrostomy tubes in place
- Active urologic malignancy
- Urologic obstruction during hospitalization (or in 30 days prior)
- Septic shock or febrile neutropenia

Hospital choice of preferred antibiotic among options provided should also be based on antimicrobial stewardship/infectious diseases recommendations, hospital formulary restrictions, and hospital antibiograms (especially urine antibiograms when available).

Signs/Symptoms of UTI



New onset mental status changes with leukocytosis (>10,000 cells/mm^3), hypotension (< 90 SBP), or ≥ 2 SIRS criteria)

Fever* or rigors

Autonomic dysreflexia^

Costovertebral angle/flank pain or tenderness

Suprapubic pain or tenderness

Urgency, frequency, dysuria, acute hematuria

Increased spasticity^

***Fever in age 65+: >37.8C, Fever in age 18-64: >38.0C*
^In patients with spinal cord injury

Symptoms that are **NOT** indicative of a UTI include: Cloudy/dirty urine, foul-smelling urine, sediment in urine, etc.[12]

SIRS Criteria

- Heart rate > 90 beats/min
- Respiratory rate > 20 breaths/min
- Temperature < 36C or >38C
- White blood cell count < 4,000 or >12,000 cells/mm^3

Asymptomatic Bacteriuria

The term asymptomatic bacteriuria refers to isolation of bacteria in a urine culture from an individual without symptoms of urinary tract infection (UTI). Asymptomatic bacteriuria is common, especially in older patients and those admitted to the hospital or in long-term care. However, most patients with asymptomatic bacteriuria have no adverse consequences and derive no benefit from antibiotic therapy.[12]

National guidelines recommend **AGAINST** testing for asymptomatic bacteriuria, except in select circumstances. Do **NOT** send a urinalysis or urine culture if no urinary signs/symptoms are present *or* there is an alternative cause for the sign/symptom*.

If a Urine Test is Sent in the Absence of Signs/Symptoms...

Patients with a positive urine culture and/or pyuria **SHOULD NOT** be treated with antibiotics irrespective of high bacterial colony count or a multi-drug resistant organism.[12]

Altered mental status without signs of systemic infection **SHOULD NOT** be treated empirically with antibiotics for 48-72 hours while working up alternative causes (e.g., medication side effects, dehydration, constipation, etc.).[10] See Appendix B for algorithm regarding these patients.

**Please use clinical judgment regarding sending urine testing in patients with severe sepsis or with baseline cognitive/functional impairment with new functional decline or falls who are hemodynamically unstable without alternative etiology.*

Urinary Tract Infection Definitions

Uncomplicated Urinary Tract Infection[11]

Infection limited to the bladder in male or female patients not meeting criteria for complicated UTI or CA-UTI

Catheter-Associated Urinary Tract Infection (CA-UTI)

Urinary tract infection in patients **with a urinary catheter** who **do not** have symptoms indicating infection beyond the bladder (fevers, severe sepsis, pyelonephritis, bacteremia)

- Includes indwelling foley, suprapubic catheter, and intermittent straight catheter
- This is considered a Complicated Urinary Tract Infection, but antibiotic selection is different when there are no symptoms beyond the bladder

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Complicated Urinary Tract Infection[11]

Patients with urinary tract infections (with or without a urinary catheter) who have symptoms indicating infection beyond the bladder, including:

- Pyelonephritis
- Bacteremia
- Signs of systemic infection (e.g., fever, severe sepsis)

Urinary Tract Infection
Antibiotic Treatment

Recommendations for Empiric Antibiotic Choice

- **Empiric antibiotic choice** should take into consideration:
  - Previous culture results
  - Prior antibiotic use
  - Antibiotic allergies
  - Local antibiograms
  - Severity of illness
- Empiric antibiotic choice **cannot** take into account scenarios that are outside the scope of these guidelines.

Recommendations for Final Antibiotic Choice

- **Final antibiotic choice** should be based on antibiotic susceptibilities of the pathogen and take into consideration patient allergies.
- For Cystitis, **avoid fluoroquinolones** when alternative agents are available. [15]

Important Reminders:

- Recommended **duration of treatment** is for an effective antibiotic based on culture results.
- Remember **good documentation practices at discharge**, including:
  - Start/stop dates
  - Days of therapy already completed
  - Total duration, including inpatient and outpatient therapy
  - Education for patients on their antibiotic treatment

Uncomplicated UTI Treatment Recommendations

Empiric Antibiotic Selection	Effective Duration
Preferred	
Nitrofurantoin[6,11]	5 days[11]
Trimethoprim-sulfamethoxazole	3 days[11]
IV beta-lactam transitioned to any oral agent	≤ 5 days
Alternative	
Fosfomycin[6]	1 dose
Exclusively oral beta-lactam	≤ 7 days

Specific Antibiotic Considerations:

- Nitrofurantoin should be avoided in patients >65 with a creatinine clearance of < 30ml/min.[1]
- There is increasing trimethoprim-sulfamethoxazole resistance among *E. coli.*[9] Consult your local antibiogram for resistance patterns.
- Fosfomycin cost per dose is high and may not be available at some retail pharmacies.[8] Additionally, Fosfomycin susceptibilities may not be routinely available as part of standard antimicrobial susceptibility testing. Fosfomycin susceptibilities have only been established for *E.coli* and *Enterococcus* species.[3]
- Fluoroquinolones should be reserved for uncomplicated UTI when other oral antibiotic options are not feasible because of their propensity for collateral damage (e.g., antibiotic resistance, *C.diff* infection, other adverse effects).[16] In 2016, the Federal Drug Administration placed a Black Box warning to limit fluoroquinolone use in uncomplicated UTIs due to these potential side effects.[15]
    - When a fluoroquinolone must be used, the duration of treatment is 3 days.[11]
- Examples of oral beta-lactams include (but are not limited to): amoxicillin-clavulanate, cephalexin, cefdinir, cefuroxime, and cefpodoxime.
- Examples of IV beta-lactams include (but are not limited to): cefazolin, ceftriaxone, cefuroxime, piperacillin-tazobactam, and cefepime.

CA-UTI*
Treatment Recommendations

Empiric Antibiotic Selection	Effective Duration
Ceftriaxone	**7 days**[5,11] *For patients with recurrent or relapsed UTIs or who are slow/delayed to respond to treatment, use clinical judgement for duration, as longer durations may be appropriate in those scenarios.*
Nitrofurantoin	
Trimethoprim-sulfamethoxazole	
IV beta-lactam transition to any oral agent	

Reminder: The term CA-UTI throughout this guideline refers to a UTI in a patient who has a urinary catheter who **does not have signs/symptoms that indicate infection beyond the bladder.*

Complicated UTI
Treatment Recommendations

Clinical Scenario	Empiric Antibiotic Selection
UTI without known prior resistance or septic shock	Ceftriaxone[11]
UTI with septic shock/in critically ill patients	Defer to local hospital selections. Consider prior hospital cultures for empiric antibiotic selection.
Duration	

• **7 days** of antibiotic therapy is appropriate for most patients with rapid clinical improvement.[11]
• Oral stepdown therapy should be tailored to culture results.
• Use clinical judgement for duration in the following patients where longer durations may be appropriate:
  ◦ Relapsed complicated UTI or delayed symptom resolution
  ◦ Urinary diversion/anatomic abnormalities or recent urologic surgery	

Complicated UTI Treatment Considerations

Fluoroquinolone Usage

- When a fluoroquinolone is used, the **duration of treatment is 5-7 days** unless there is a delayed response to therapy.[11]
- Due to potential complications from PICC lines (e.g., deep vein thrombosis, catheter-associated blood stream infection),[2] **oral fluoroquinolones are preferred over PICC line placement for IV antibiotics** when the urinary pathogen is susceptible and there are no contraindications to fluoroquinolones.

Specific Antibiotic Considerations

- **Nitrofurantoin and Fosfomycin** should not be used for pyelonephritis, upper urinary tract infection, or in patients with bacteremia.[7]
- **Oral beta-lactams** in some studies are associated with lower efficacy and higher relapse rates compared to trimethoprim-sulfamethoxazole and fluoroquinolones in Complicated UTI.[4,11,13] If a beta-lactam is used, the initial therapy should be IV followed by oral beta-lactam stepdown (assuming uropathogen is susceptible).

Specific Pathogen Considerations

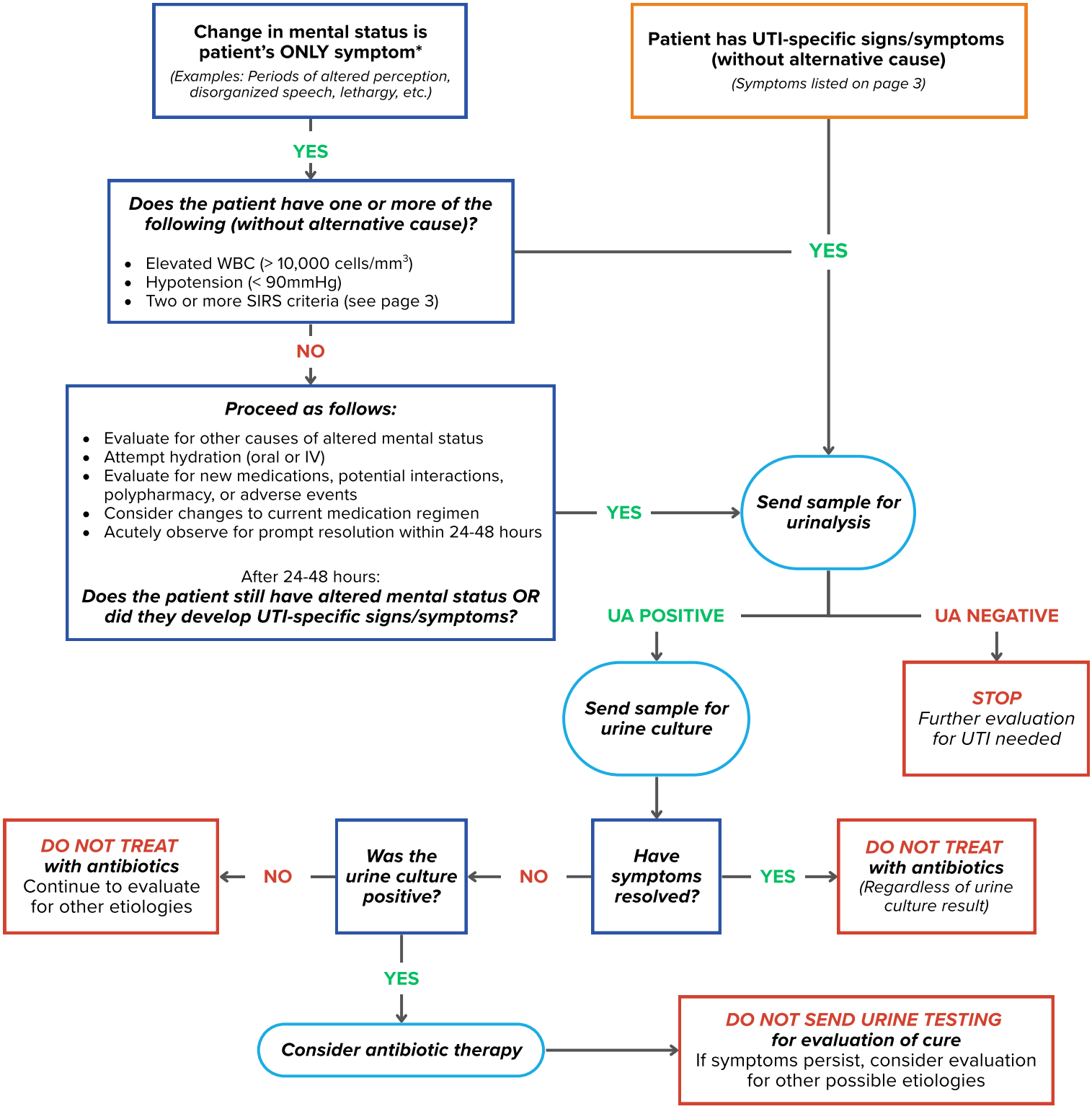
- A shorter course of therapy (< 14 days) is not appropriate for **Staphylococcus aureus bacteremia,**[14] and another source of infection (outside of the genitourinary tract) should be considered.

Appendix A
Antibiotic Dosage

Antibiotic	Dose
Amoxicillin-clavulanate*	Complicated UTI: 875mg by mouth three times daily Uncomplicated UTI: 500mg by mouth twice daily
Cefazolin*	*Defer to local institutional guidelines*
Cefdinir*	300mg by mouth twice daily
Cefpodoxime*	Complicated UTI: 400mg by mouth twice daily Uncomplicated UTI: 100-200mg by mouth twice daily
Cephalexin*	1g by mouth three times daily *(This is the suggested dose but for Uncomplicated UTI, 1-3g divided 2-4 times daily may be appropriate in certain scenarios)*
Ceftriaxone	*Defer to local institutional guidelines*
Cefuroxime*	Complicated UTI: 500mg by mouth twice daily Uncomplicated UTI: 250-500mg by mouth twice daily
Ciprofloxacin*	Complicated UTI: 750mg by mouth twice daily Uncomplicated UTI: 500mg by mouth twice daily
Fosfomycin	One 3g dose
Gepotidacin	Uncomplicated UTI: 1500mg by mouth twice daily for 5 days
Levofloxacin*	Complicated UTI: 750mg by mouth once daily Uncomplicated UTI: 500mg by mouth once daily
Nitrofurantoin**	100mg by mouth twice daily
Trimethoprim-sulfamethoxazole	Complicated UTI: 1-2 DS tablet (160mg/800mg) by mouth twice daily Uncomplicated UTI: 1 DS tablet (160mg/800mg) by mouth twice daily

**Dose adjustment needed based on renal function*
***Dose depends on disease state (Uncomplicated UTI, Complicated UTI, Pyelonephritis), severity of presentation (e.g., septic shock, severe sepsis), presence of bacteremia, and susceptibilities of the pathogen*

Appendix B:
Assessing for UTI in Elderly Patients with Acutely Altered Mental Status (AMS)[10]



*Please use your clinical judgement in patients with baseline cognitive or functional impairment with new functional decline or falls who are hemodynamically unstable without alternative etiology.

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