

Guidelines for the Diagnosis and Management of Urinary Tract Infections

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When to treat with antibiotics:

BOTH symptoms **and** microbiologic criteria must be present in order to diagnose UTI¹. (See algorithm for diagnosis and treatment of UTI at end of document)

	Microbiologic criteria	Symptom criteria*
No indwelling catheter	Positive urinalysis (WBC ≥ 10/HPF) and Positive urine culture [‡] (≥10 ⁵ cfu/mL in voided specimen)	Acute dysuria --OR-- Fever [†] + at least 1 of following (new or worsening):* If no fever, 2 of the following (new or worsening) <ul style="list-style-type: none"> • Urinary urgency • Frequency • Suprapubic pain • Gross hematuria • Costovertebral angle tenderness • Urinary incontinence
Indwelling catheter [‡]	Positive urinalysis (WBC ≥ 10/HPF) and Positive urine culture (≥10 ³ cfu/mL)	At least 1 of the following (new or worsening): <ul style="list-style-type: none"> • Fever[†] • Costovertebral angle (CVA) tenderness • Rigors (shaking chills) • Delirium • Flank pain (back, side pain) • pelvic discomfort • Acute hematuria • Malaise or lethargy with no other cause

*New onset delirium is **NOT** a symptomatic criterion of a UTI for patients without an indwelling catheter

† Fever: >37.9°C [100°F] or 1.5°C [2.4°F] increase above baseline temperature

‡ Some use a lower colony count cut off of 10²CFU/mL in a specimen collected by in and out catheter

‡ If catheter in place for >2 weeks, change catheter before obtaining a urine sample for culture

Treatment:

Definitions

- Uncomplicated UTI – infection in a structurally/functionally normal urinary tract.
- Complicated UTI – patients with a structural or functional abnormality of the urinary tract.
- Lower UTI – UTI without involvement of the kidneys (whether complicated or uncomplicated)
- Upper UTI/pyelonephritis – infection of the kidney. Signs/symptoms = flank pain, fever.

Empiric therapy

- Local antibiotic resistance should guide empiric treatment choice; a use of a facility specific antibiogram recommended.
- *E. coli* is the most common organism isolated from urine cultures in the nursing home population.
- Consider resident's prior urine culture results when starting empiric treatment.

Severely ill patients (high fever, shaking chills, hypotension, etc.)		
	Agent	Notes
1 st line	Ceftriaxone	<ul style="list-style-type: none"> Can be used safely in patients with mild penicillin allergy (i.e. rash), cross-reactivity very low²
2 nd line	Gentamicin	<ul style="list-style-type: none"> ONLY in patients who need parenteral therapy and have severe IgE mediated penicillin allergy Significant nephrotoxicity/ototoxicity concerns
Cystitis*/Lower UTI (complicated or uncomplicated)		
	Agent	Notes
1 st line	Nitrofurantoin	<ul style="list-style-type: none"> Most active agent against <i>E. coli</i> Avoid if CrCl < 30 mL/min Avoid if systemic signs of infection/suspicion of pyelonephritis or prostatitis Does not cover Proteus
	TMP-SMX	<ul style="list-style-type: none"> Do not use for empiric treatment if resistance >20% Drug-drug interactions with warfarin Monitor potassium level if concomitant use of spironolactone, angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs) Renal dose adjustments, avoid if CrCl < 15 mL/min
2 nd line	Cephalexin	<ul style="list-style-type: none"> Active against <i>E. coli</i>, <i>Proteus</i>, and <i>Klebsiella</i>
3 rd line	Fosfomycin [†]	<ul style="list-style-type: none"> Active against <i>E. coli</i>, Enterococcus. Is also active against ESBL positive <i>E. coli</i>. Fosfomycin susceptibility tests recommended.
Pyelonephritis/ Upper UTI		
	Agent	Notes
1 st line	TMP-SMX	<ul style="list-style-type: none"> Patient should receive 1 dose of IV/IM ceftriaxone prior to starting oral therapy Do not use for empiric treatment if resistance >20%
2 nd line	Ciprofloxacin	<ul style="list-style-type: none"> If patient unable to tolerate Bactrim
3 rd line	Beta-lactams	<ul style="list-style-type: none"> Data suggests that oral beta-lactams are inferior to Bactrim or fluoroquinolones for pyelonephritis³ Initial dose of IV/IM ceftriaxone and longer treatment duration of 10-14 days are recommended

*Due to high levels of resistance in *E. coli* and high risk of *C. diff* infection, fluoroquinolones should be avoided for empiric therapy of cystitis

†Fosfomycin has poor insurance coverage

Streamlined therapy (pending susceptibility results)

Organism	Recommended antimicrobials
<i>Candida</i>	Usually responds to replacement of urinary catheter without antifungal therapy
<i>Citrobacter</i>	Nitrofurantoin, TMP-SMX
<i>E. coli</i>	Nitrofurantoin, TMP-SMX
<i>Enterobacter</i>	TMP-SMX, ciprofloxacin
<i>Enterococcus</i>	Nitrofurantoin, amoxicillin
<i>Klebsiella</i>	TMP-SMX, cephalexin
<i>Proteus</i>	TMP-SMX, cephalexin
<i>Pseudomonas</i>	Ciprofloxacin

Targeted therapy

- Most narrow agent to which the organism is susceptible should be selected
- Above empiric agents are still preferred if organism is susceptible
- Fluoroquinolones should be avoided for uncomplicated cystitis unless there are no other options
- Empiric antibiotics should be discontinued if urine culture is negative.

Dosing

Drug	Dose	Renal adjustment
Amoxicillin	500mg PO TID	CrCl 10-50 mL/min: 500mg BID CrCl < 10 mL/min: 500mg once daily
Ceftriaxone	1g IM/IV q24h	None
Cefpodoxime	100mg PO BID (cystitis) 200mg PO BID (pyelonephritis)	CrCl < 30 mL/min: Administer once daily
Cephalexin	500mg PO BID (cystitis) 500mg PO QID (complicated)	CrCl 10-50 mL/min: max dose 500mg TID CrCl < 10 mL/min: 500mg once daily
Ciprofloxacin	250mg PO BID (uncomplicated cystitis) 500mg PO BID (pyelonephritis) 400mg IV BID (severely ill)	CrCl < 30 mL/min: Administer once daily
Doxycycline	100mg PO BID	None
Fluconazole	200mg PO once daily	CrCl < 50 mL/min: 100mg once daily
Gentamicin*	≤ 60kg: 60mg IM/IV q24h 61-80kg: 80mg IM/IV q24h ≥81kg: 100-120mg IM/IV q24h (1 mg/kg)	CrCl < 30 mL/min: use caution, may need prolonged dosing intervals
Levofloxacin	250mg PO q24h (cystitis) 750mg PO p 24hrs (pyelonephritis)	None CrCl < 20-49 mL/min 750 mg q 48 hrs CrCl 10-20 mL 750 mg then 500 mg q 48 hrs
Nitrofurantoin (Macrobid)	100mg PO BID	CrCl < 30 mL/min: avoid ⁴⁻⁵
TMP-SMX	1 SS tab bid (preferred in older adults) 1 DS tab (800-160mg) PO BID (for normal CrCL)	CrCl 15-30 mL/min: 1 DS tab once daily --OR-- 1 SS tab BID CrCl < 15 mL/min: avoid
Fosfomycin	3-g sachet in a single dose 3 g sachet every 48-72 hours for complicated UTI	None

Duration of therapy

- Lower UTI/Cystitis^{3,6}:
 - Bactrim or fluoroquinolones: 3 days
 - Nitrofurantoin, β lactam: 5 days
- Upper UTI/Pyelonephritis^{6,7}:
 - 7 days if patient improves rapidly
 - 10-14 days if patient has delayed response
- Catheter related UTI²:
 - 7 days if rapid improvement
 - 10-14 days if delayed response

References

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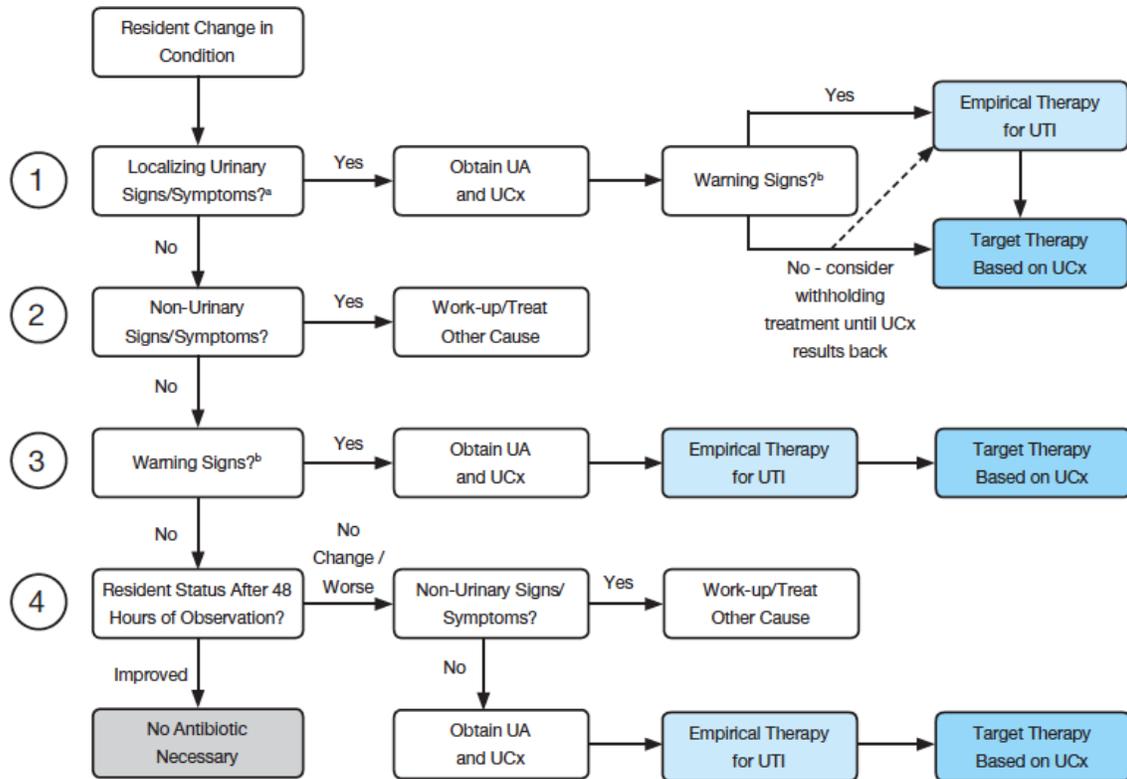


Figure. Unified algorithm for the diagnostic evaluation and treatment of suspected UTIs in nursing homes.

Abbreviations: UA, urinalysis; UCx, urine culture; UTI, urinary tract infection.

*Localizing urinary signs/symptoms: (1) acute dysuria; (2) new urgency, frequency, or incontinence; (3) acute gross hematuria; (4) costovertebral (flank) tenderness; (5) suprapubic pain; (6) new scrotal/prostate tenderness; or (7) purulent urethral discharge.

^bWarning signs include (1) fever, defined as single temperature >100°F [37.9°C] or repeated temperatures >99°F [37.2°C] or increase from baseline temperature of 2°F [1.1°C]; (2) rigors; (3) acute delirium (excludes mild cognitive changes); or (4) unstable vital signs.

Crnich CJ et al. (reference 8)