Non-Catheter Associated Urinary Tract Infections

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www.webbertraining.com

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Disclosures

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- Janssen
- Abbott

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3) ANA Project Firstline. PP PPE Roadshow.

Jefferson Health – New Jersey

- **Three hospitals and 33 outpatient sites (primary and specialty care) across Camden, Gloucester, and Burlington Counties.**
- **Many have bilingual staff and all offer medical translation services.**

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Objectives

- Compare and contrast non-catheter-associated urinary tract infections with catheter-associated urinary tract infections.
- Describe how to prevent non-catheter-associated urinary tract infections.
- Review diagnosis and treatment of non-catheter associated urinary tract infections

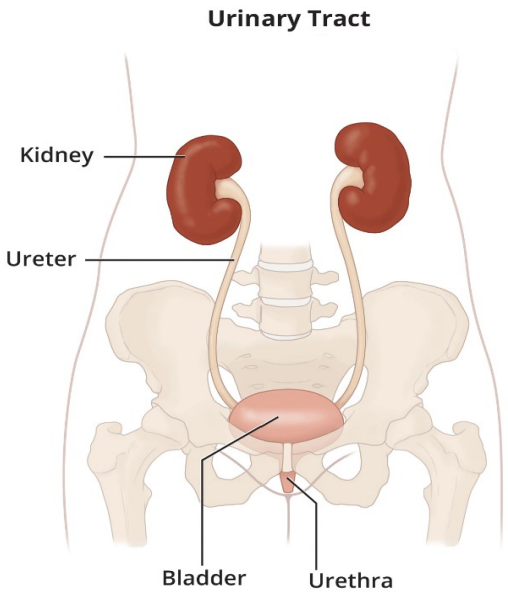
Urinary Tract

Urinary Tract

What is the urinary tract?

The urinary tract is your body's drainage system for removing wastes and extra fluids. The urinary tract includes two kidneys, two ureters, a bladder, and a urethra.

The kidneys filter wastes and fluids to produce urine. The urine travels from the kidneys down two narrow tubes called the ureters. The urine is then stored in a hollow, muscular, balloon-shaped organ called the bladder. When the bladder empties, urine flows out of the body through a tube called the urethra at the bottom of the bladder.



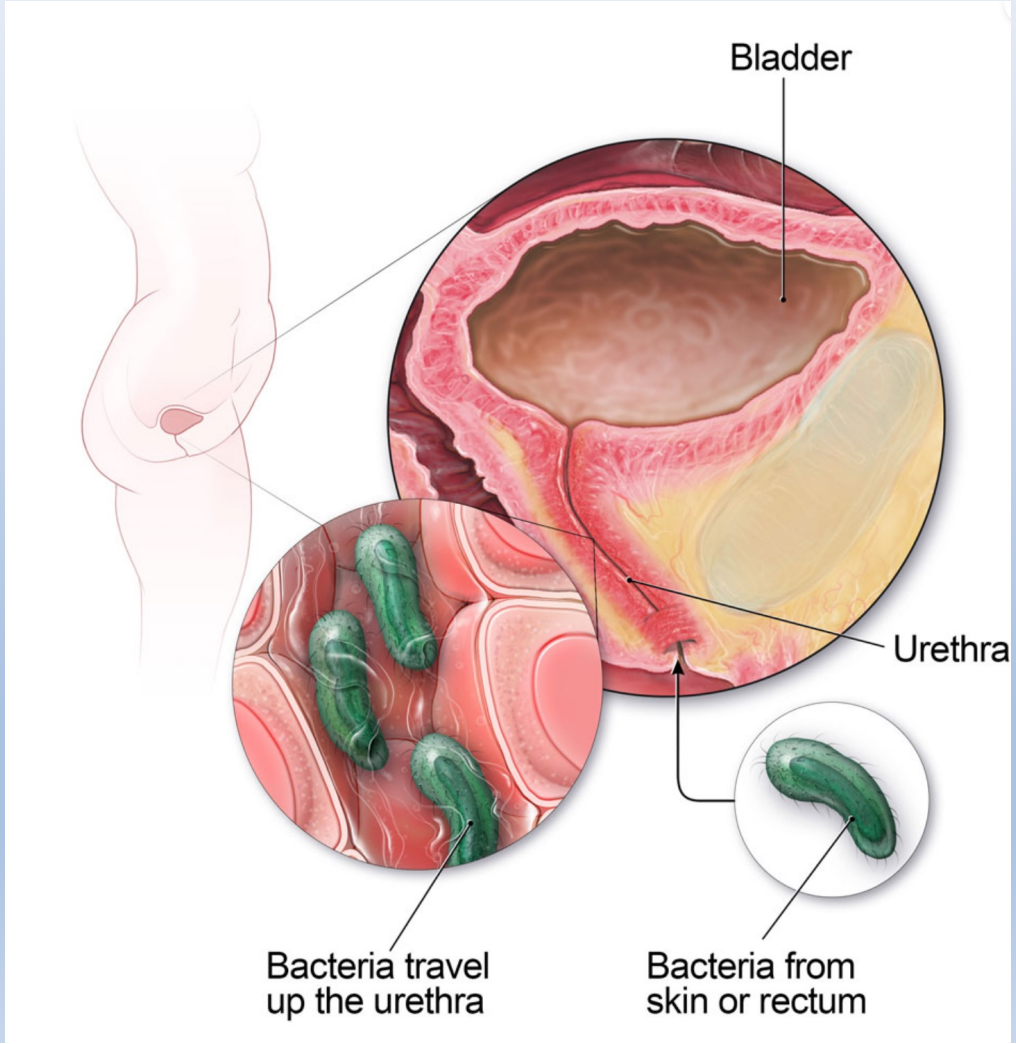
All parts of the urinary tract—the kidneys, ureters, bladder, and urethra—must work together to urinate normally.

Catheter

Non-catheter

https://www.niddk.nih.gov/health-information/diagnostic-tests/urinary-tract-imaging

Schematic – in Women



https://www.cdc.gov/antibiotic-use/community/images/uti-lg.jpg?_=05502?noicon

All must function

All parts of the urinary tract—the kidneys, ureters, bladder, and urethra—must work together to urinate normally.

The urinary tract includes two sets of muscles that work together as a sphincter, closing off the urethra to keep urine in the bladder between your trips to the bathroom.

- The **internal sphincter muscles** of the bladder neck and urethra stay closed until your brain sends signals to urinate.
- The **external sphincter muscles** surround the internal sphincter and provide extra pressure to keep the urethra closed. You can consciously squeeze the external sphincter and the pelvic floor muscles to keep urine from leaking out.

https://www.niddk.nih.gov/health-information/urologic-diseases/urinary-tract-how-it-works

Urinary Tract Infections (UTIs)

Urinary tract infections

- Catheter associated urinary tract infection (CAUTI).
- Non-catheter associated urinary tract infection.

- Most UTI from general public are non-catheter associated.

UTI, defined

What is a bladder infection?

A bladder infection is an illness caused by bacteria. Bladder infections are the most common type of urinary tract infection (UTI).[1] A UTI can develop in any part of your urinary tract, including your urethra, bladder, ureters, or kidneys.

Your body has ways to defend against infection in the urinary tract. For example, urine normally flows from your kidneys, through the ureters to your bladder. Bacteria that enter your urinary tract are flushed out when you urinate. This one-way flow of urine helps to keep bacteria from infecting your urinary tract. Learn more about your urinary tract and how it works.

Sometimes your body's defenses fail and the bacteria may cause a bladder infection. If you have bladder infection symptoms, see a health care professional.

https://www.niddk.nih.gov/health-information/urologic-diseases/bladder-infection-uti-in-adults/definition-facts

Symptoms

Symptoms & Causes of Bladder Infection in Adults

What are the symptoms of a bladder infection?

Symptoms of a bladder infection may include

- a burning feeling when you urinate
- frequent or intense urges to urinate, even when you have little urine to pass

Seek care right away

If you have symptoms of a bladder infection, see a health care professional right away, especially if you have severe pain in your back near your ribs or in your lower abdomen, along with vomiting and nausea, fever, or other symptoms that may indicate a kidney infection.

Kidney infections are often very painful and can cause serious health problems, so it's best to get early treatment.

Dysuria
Urgency
Frequency

https://www.niddk.nih.gov/health-information/urologic-diseases/bladder-infection-uti-in-adults/symptoms-causes

UTI/cystitis

Is there another name for a bladder infection?

Bladder infections are also called cystitis. Sometimes people use the more general term, urinary tract infection (UTI), to mean a bladder infection, although UTIs can occur in other parts of the urinary system. UTIs that occur in the urethra only are called urethritis. A kidney infection is called pyelonephritis.

How common are bladder infections?

Bladder infections are common, especially among women. Research suggests that at least 40 to 60 percent of women develop a UTI during their lifetime, and most of these infections are bladder infections. One in 4 women is likely to have a repeat infection.[1]

https://www.niddk.nih.gov/health-information/urologic-diseases/bladder-infection-uti-in-adults/definition-facts

Complicated vs. Uncomplicated Cystitis

Patients with cystitis can generally be separated into two clinical groups: *complicated* and *uncomplicated.* Uncomplicated UTI's are typically defined as episodes of acute cystitis occurring in healthy, nonpregnant women with no history suggestive of urinary tract abnormalities. In patients with uncomplicated UTIs, *E. coli* is responsible for 75-95% of infections and empiric therapy should be directed at this pathogen.

Those not meeting the above simple criteria of uncomplicated cystitis should not automatically be classified as complicated, however.

Complicated UTIs are those that occur in patients who have urinary tract abnormalities, instrumentation or immune function that predisposes them to treatment failure. According to the American Urological Association some of the most common factors include:

Anatomic or functional abnormality of urinary tract	• Male gender, pregnancy, outlet obstruction, stone disease, neurogenic bladder, vesicoureteral reflux
Urinary instrumentation or foreign bodies	• Catheters, stents, nephrostomy tubes
Systemic disease / immunosuppresion	• Diabetes, organ transplantation, renal failure

https://www.unmc.edu/intmed/_documents/id/asp/clinicpath-nm-updated-uti-guidance_final-1.pdf

Risk for UTI

Who is more likely to develop a bladder infection?

People of any age or sex can develop bladder infections, but women are at higher risk than men. Some people are more prone to getting these infections than others, especially those who have certain medical conditions or lifestyle factors.

You are more likely to develop a bladder infection if you

- are sexually active
- are a woman who has gone through menopause NIH
- are a woman who uses certain types of birth control, such as diaphragms or spermicide
- have trouble emptying your bladder completely, like people with a spinal cord injury or nerve damage around the bladder
- have a problem in your urinary tract that blocks, or obstructs, the normal flow of urine, such as a kidney stone or enlarged prostate
- have an abnormality of the urinary tract, such as vesicoureteral reflux (VUR)
- have diabetes or problems with your body's immune, or natural defense, system
- recently used a urinary catheter
- had a UTI in the past

Women are more likely to develop a bladder infection than men, mainly due to differences in anatomy:

- Women have a shorter urethra than men, which means bacteria have a shorter distance to travel to reach and infect a woman's bladder.
- In women, the opening to the urethra is closer to the rectum, where the bacteria that cause bladder infections live.

https://www.niddk.nih.gov/health-information/urologic-diseases/bladder-infection-uti-in-adults/definition-facts

Diagnosis

Diagnosis

- History
- Physical examination
  - Assess for catheters

  - Catheter-associated
  - Non-catheter-associated

https://www.niddk.nih.gov/health-information/urologic-diseases/bladder-infection-uti-in-adults/diagnosis

Urine tests

- Urinalysis
- Urine culture

- Imaging

- Assess for symptoms

https://www.niddk.nih.gov/health-information/urologic-diseases/bladder-infection-uti-in-adults/diagnosis

Urine Culture Stewardship

Ordering of Urine Culture: Urine cultures should only be obtained when a significant suspicion for a UTI exists based on patient symptoms. Urine culture data should always be interpreted taking into account the results of the urinalysis and patient symptoms. In the urinalysis, the presence of leukocyte esterase suggests WBC are present while nitrites suggest that gram-negative organisms are present. Neither of these findings is diagnostic of a UTI. **Before obtaining a urine culture, it is important to replace any existing urinary catheter and do not draw cultures from a urine drainage bag.**

UTI Evaluation Order Panel

Assess symptoms

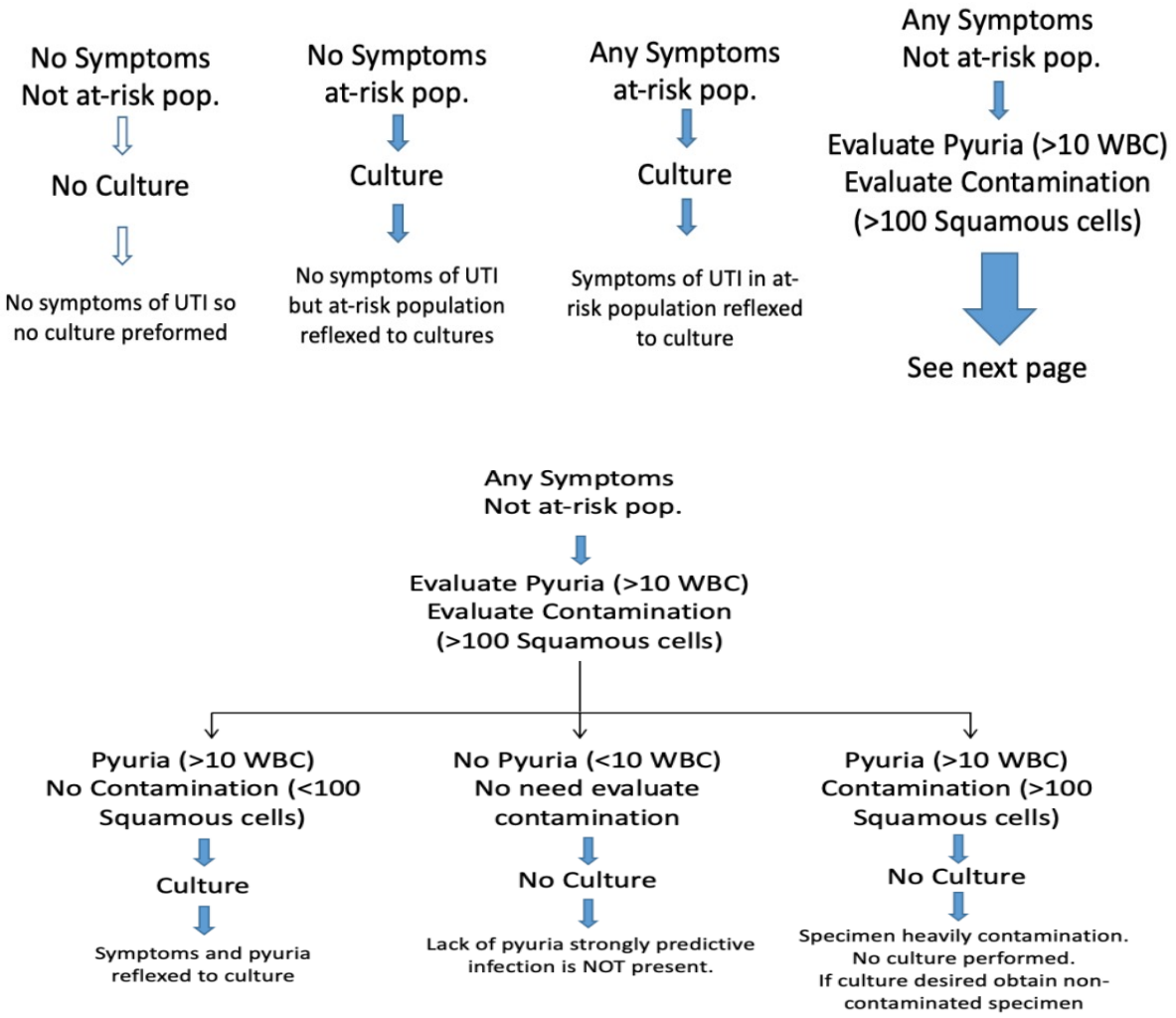
- No symptoms
- Symptoms are typical (dysuria, new onset frequency or urgency, suprapubic or CVA tenderness) or atypical (fever and unable to assess UTI symptoms, acute hematuria, etc.)

Assess if "at-risk" population

- Pregnant, impending urologic surgery with risk of mucosal bleeding

https://www.unmc.edu/intmed/_documents/id/asp/clinicpath-nm-updated-uti-guidance_final-1.pdf

Urine Cultures



https://www.unmc.edu/intmed/_documents/id/asp/clinicpath-nm-updated-uti-guidance_final-1.pdf

Urine Culture

Indication for urinalysis with reflex culture:

- When signs or symptoms of a urinary tract infection are present
- In patients who cannot provide history (e.g., intubated) **and** have sepsis without an explainable source (should always be paired with urinalysis)

Urine analysis/culture NOT recommended:

- Change in urine color, odor, or turbidity – these are typically due to patient hydration and not indicators of infection
- Patient lacks symptoms of UTI
- Automatically in workup of fever or sepsis – patients who can provide a history should not have a urine culture obtained as part of fever evaluation unless symptoms suggest a UTI is present
- Pre-operatively except in urologic surgery where mucosal bleeding is anticipated
- When a urinary catheter is placed or changed
- Upon admission without signs of infection
- After treatment of UTI to document cure

https://www.unmc.edu/intmed/_documents/id/asp/clinicpath-nm-updated-uti-guidance_final-1.pdf

Surveillance Definitions for CAUTI vs Non-Catheter Associated UTI

Catheter-Associated UTI

Table 1. Urinary Tract Infection Criteria

Criterion	Urinary Tract Infection (UTI)
	Symptomatic UTI (SUTI) Must meet at least ***one*** of the following criteria:
SUTI 1a **Catheter-associated Urinary Tract Infection (CAUTI) in any age patient**	Patient must meet 1, 2, and 3 below: 1. Patient had an indwelling urinary catheter that had been in place for more than 2 consecutive days in an inpatient location on the date of event AND was either: • Present for any portion of the calendar day on the date of event†, **OR** • Removed the day before the date of event‡ 2. Patient has at least ***one*** of the following signs or symptoms: • fever (>38.0°C) • suprapubic tenderness* • costovertebral angle pain or tenderness* • urinary urgency ^ • urinary frequency ^ • dysuria ^ 3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥10^5 CFU/ml (See Comments). All elements of the SUTI criterion must occur during the IWP (See IWP Definition Chapter 2 Identifying HAIs in NHSN). † When entering event into NHSN choose "INPLACE" for Risk Factor for IUC ‡ When entering event into NHSN choose "REMOVE" for Risk Factor for IUC *With no other recognized cause (see Comments) ^ These symptoms cannot be used when catheter is in place. An IUC in place could cause patient complaints of "frequency" "urgency" or "dysuria". **Note:** • Fever is a non-specific symptom of infection and cannot be excluded from UTI determination because it is clinically deemed due to another recognized cause.

IWP – infection window period

https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf

CAUTI - NHSN

Table 3. CAUTI Measures Available in NHSN

Measure	Calculation	Application
CAUTI SIR	$\frac{\text{Number of Observed CAUTIs}}{\text{Number of Predicted CAUTIs}}$	Both location specific and summarized measure
CAUTI Rates	$\frac{\text{Number of CAUTIs per locaiton}}{\text{Number of Urinary Catheter Days per location}} * 1000$	Location specific measure only
Urinary Catheter SUR	$\frac{\text{Number of Observed Catheter Days}}{\text{Number of Predicted Catheter Days}}$	Both location specific and summarized measure
DUR	$\frac{\text{Number of Catheter Days for a location}}{\text{Number of Patient Days for a location}}$	Location specific measure only

https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf

Non-Catheter Associated UTI

SUTI 1b

Non-Catheter-associated Urinary Tract Infection (Non-CAUTI) in any age patient

Patient must meet 1, 2, and 3 below:

1. One of the following is true:
   - Patient has/had an indwelling urinary catheter, but it has/had not been in place for more than two consecutive days in an inpatient location on the date of event[†]
     OR
   - Patient did not have an indwelling urinary catheter in place on the date of event nor the day before the date of event [†]

2. Patient has at least ***one*** of the following signs or symptoms:
   - fever (>38°C)
   - suprapubic tenderness*
   - costovertebral angle pain or tenderness*
   - urinary frequency ^
   - urinary urgency ^
   - dysuria ^

3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥10^5 CFU/ml. (See Comments) All elements of the SUTI criterion must occur during the IWP (See IWP Definition Chapter 2 Identifying HAIs in NHSN).

[†] When entering event into NHSN choose "NEITHER" for Risk Factor for IUC
*With no other recognized cause (see Comments)
^These symptoms cannot be used when IUC is in place. An IUC in place could cause patient complaints of "frequency" "urgency" or "dysuria".

Note:
- Fever is a non-specific symptom of infection and cannot be excluded from UTI determination because it is clinically deemed due to another recognized cause.

https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf

Comments

Comments	"Mixed flora" is not available in the pathogen list within NSHN. Therefore, it cannot be reported as a pathogen to meet the NHSN UTI criteria. Additionally, "mixed flora" represent at least two species of organisms. Therefore, an additional organism recovered from the same culture would represent more than two species of microorganisms. Such a specimen also cannot be used to meet the UTI criteria. The following excluded organisms cannot be used to meet the UTI definition: ➢ Any *Candida* species as well as a report of "yeast" that is not otherwise specified ➢ mold ➢ dimorphic fungi or ➢ parasites An acceptable urine specimen may include these organisms if one bacterium of ≥ 100,000 CFU/ml is also present. Additionally, these non-bacterial organisms identified from blood cannot be deemed secondary to a UTI since they are excluded as organisms in the UTI definition.

https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf

Comments

- Suprapubic tenderness whether elicited by palpation (tenderness-sign) or provided as a subjective complaint of suprapubic pain (pain-symptom), documentation of either found in the medical record is acceptable as a part of SUTI criterion if documented in the medical record during the Infection Window Period.

- Lower abdominal pain or bladder or pelvic discomfort are examples of symptoms that can be used as suprapubic tenderness. Generalized “abdominal pain” in the medical record is not to be interpreted as suprapubic tenderness as there are many causes of abdominal pain and this symptom is too general.

- Left or right lower back or flank pain are examples of symptoms that can be used as costovertebral angle pain or tenderness. Generalized "low back pain" is not to be interpreted as costovertebral angle pain or tenderness.

https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf

UNC Study

UNC hospital patients had 1,453 healthcare-associated symptomatic UTIs, of which 1,068 (72.2%) were CAUTI and 411 (27.8%) were non-catheter-associated UTI from 2006 through 2009 (Table 1). Overall, 45.2% of CAUTI occurred among ICU patients, while only 22.3% of non-catheter-associated UTI occurred among ICU patients. The rates of CAUTI were higher in the surgery and pediatric services compared to the medicine service. However, the rates of CAUTI did not differ markedly between patients in an ICU versus a non-ICU setting. For almost all hospital locations and services, the rate of CAUTI was significantly higher than the rate of non-catheter-associated UTI, based on nonoverlapping 95% confidence intervals. The only exception was in the medicine ICU, where the number of UTIs and patient-days at risk were both low, resulting in a wide confidence interval that was nonoverlapping with the CAUTI rate. The service with the highest combined rate of both CAUTI and non-catheter-associated UTI was the rehabilitation service. The rate of CAUTI in home health was 1.08 (20 infections/18,444 catheter-days) and in hospice was 2.85 (11 infections/3,864 catheter-days).

University of North Carolina (UNC)

Non-catheter-associated UTI from 2006-2009 = 27.8% (411) healthcare associated vs. 72.2% (1,067) CAUTI.

Most CAUTI and non-catheter-associated UTI outside of ICU.

Rehab – CAUTI and non-catheter-associated UTI

Weber, D., Sickbert-Bennett, E., Gould, C., Brown, V., Huslage, K., & Rutala, W. (2011). Incidence of Catheter-Associated and Non-Catheter-Associated Urinary Tract Infections in a Healthcare System. Infection Control & Hospital Epidemiology, 32(8), 822-823. doi:10.1086/661107

Pathogens

The 5 most frequent pathogens were *Escherichia coli*, *Candida* sp., *Enterococcus* sp., *Pseudomonas aeruginosa*, and *Klebsiella* sp. for both CAUTI and non-catheter-associated UTI. The relative frequency of pathogens causing CAUTI and non-catheter-associated UTI were similar, except for *Candida* sp., which was responsible for 17.0% of CAUTI but only 6.8% of non-catheter-associated UTI (data not shown).

CAUTI and non-catheter-associated UTI

Escherichia coli.
Candida sp. (lower in non-catheter associated UTI)
Enterococcus sp.
Pseudomonas aeruginosa
Klebsiella sp.

Weber, D., Sickbert-Bennett, E., Gould, C., Brown, V., Huslage, K., & Rutala, W. (2011). Incidence of Catheter-Associated and Non-Catheter-Associated Urinary Tract Infections in a Healthcare System. Infection Control & Hospital Epidemiology, 32(8), 822-823. doi:10.1086/661107

Prevention of Non-Catheter-Associated UTI

Keeping the urinary tract healthy

How can you keep your urinary tract healthy?

You can help keep your urinary tract healthy by following some basic tips.

Drink enough liquids, especially water. If you're healthy, try to drink six to eight 8-ounce glasses of liquid each day. You may need to drink more if you have kidney stones or bladder stones. At least half of your liquid intake should be water. You might need to drink less water if you have certain conditions, such as kidney failure or heart disease. Ask your health care professional how much liquid is healthy for you.

Keep your bowels regular. Regular bowel movements are important to your bladder health. You can promote both bowel health and bladder health by

- **making healthy food choices**. You can keep your urinary tract healthy by sticking to an eating plan that includes lean proteins, whole grains, fiber-rich breads, nuts, colorful berries, fruits, and vegetables to promote regular bowel movements.
- **living a healthy lifestyle**. Get regular physical activity, limit your alcohol intake, cut down on caffeinated food and drinks, and don't smoke.

Go whenever you need to. Often, people will hold their urine because it's not a good time to go to the bathroom. However, holding in your urine for too long can weaken your bladder muscles and make it harder for your bladder to empty completely. Urine left in your bladder can allow bacteria to grow and makes you more likely to develop a urinary tract infection (UTI).

https://www.niddk.nih.gov/health-information/urologic-diseases/urinary-tract-how-it-works

Keeping the urinary tract healthy

Develop healthy bathroom habits. Take enough time to fully empty your bladder when urinating—don't rush it. Urinate after sex to flush away bacteria that may have entered the urethra during sex. Clean the genital area before and after sex. If you're a woman, wipe from front to back, especially after a bowel movement, to keep bacteria from getting into the urethra.

Stay in tune with your body. Pay attention to how often you feel the urge to urinate. Take note if you need to urinate more often than usual, if your urine leaks, if it becomes more difficult for you to begin urinating, or if you feel you're not able to completely empty your bladder. These changes may be early signs of different urinary tract problems. Talk with your health care professional if you notice any of these signs. You may be able to prevent a condition from becoming more severe if you get help early on.

Do pelvic floor muscle exercises. Pelvic floor exercises, also called Kegel exercises, can keep your pelvic floor muscles strong and maintain healthy bladder and bowel function. Both men and women can benefit from pelvic floor muscle exercises.

Including lean proteins, whole grains, fiber-rich breads, nuts, fruits, and vegetables in your eating plan can keep your urinary tract healthy by promoting regular bowel movements.

https://www.niddk.nih.gov/health-information/urologic-diseases/urinary-tract-how-it-works

IDSA Abstract

YOUR HEALTH

To Reduce Risk Of Recurring Bladder Infection, Try Drinking More Water

October 20, 2017 · 1:20 PM ET

By Greta Jochem

The study specifically looked at 140 premenopausal women in Bulgaria with recurring urinary tract infections, defined as more than three in the previous year, who drank less than a liter and a half of water (about six cups) each day. For an entire year, half the participants upped their daily water intake by one and a half liters, while the other half didn't change their water intake. The women who drank more water cut their UTI rates nearly in half — getting an average of 1.6 infections versus the control group's 3.1 infections.

https://www.npr.org/sections/health-shots/2017/10/20/558912620/to-reduce-risk-of-recurring-bladder-infection-try-drinking-more-water

Water!

JAMA Internal Medicine | Original Investigation

Effect of Increased Daily Water Intake in Premenopausal Women With Recurrent Urinary Tract Infections
A Randomized Clinical Trial

Thomas M. Hooton, MD; Mariacristina Vecchio, PharmD; Alison Iroz, PhD; Ivan Tack, MD, PhD; Quentin Dornic, MSc; Isabelle Seksek, PhD; Yair Lotan, MD

Hooton TM, Vecchio M, Iroz A, et al. Effect of Increased Daily Water Intake in Premenopausal Women With Recurrent Urinary Tract Infections: A Randomized Clinical Trial. JAMA Intern Med. 2018;178(11):1509-1515. doi:10.1001/jamainternmed.2018.4204

Abstract

IMPORTANCE Increased hydration is often recommended as a preventive measure for women with recurrent cystitis, but supportive data are sparse.

OBJECTIVE To assess the efficacy of increased daily water intake on the frequency of recurrent cystitis in premenopausal women.

DESIGN, SETTING, AND PARTICIPANTS Randomized, open-label, controlled, 12-month trial at a clinical research center (years 2013-2016). Among 163 healthy women with recurrent cystitis (≥3 episodes in past year) drinking less than 1.5 L of fluid daily assessed for eligibility, 23 were excluded and 140 assigned to water or control group. Assessments of daily fluid intake, urinary hydration, and cystitis symptoms were performed at baseline, 6- and 12-month visits, and monthly telephone calls.

INTERVENTIONS Participants were randomly assigned to drink, in addition to their usual fluid intake, 1.5 L of water daily (water group) or no additional fluids (control group) for 12 months.

MAIN OUTCOMES AND MEASURES Primary outcome measure was frequency of recurrent cystitis over 12 months. Secondary outcomes were number of antimicrobial regimens used, mean time interval between cystitis episodes, and 24-hour urinary hydration measurements.

Hooton TM, Vecchio M, Iroz A, et al. Effect of Increased Daily Water Intake in Premenopausal Women With Recurrent Urinary Tract Infections: A Randomized Clinical Trial. JAMA Intern Med. 2018;178(11):1509-1515. doi:10.1001/jamainternmed.2018.4204

Abstract - Results

RESULTS The mean (SD) age of the 140 participants was 35.7 (8.4) years, and the mean (SD) number of cystitis episodes in the previous year was 3.3 (0.6). During the 12-month study period, the mean (SD) number of cystitis episodes was 1.7 (95% CI, 1.5-1.8) in the water group compared with 3.2 (95% CI, 3.0-3.4) in the control group, with a difference in means of 1.5 (95% CI, 1.2-1.8; *P* < .001). Overall, there were 327 cystitis episodes, 111 in the water group and 216 in the control group. The mean number of antimicrobial regimens used to treat cystitis episodes was 1.9 (95% CI, 1.7-2.2) and 3.6 (95% CI, 3.3-4.0), respectively, with a difference in means of 1.7 (95% CI, 1.3-2.1; *P* < .001). The mean time interval between cystitis episodes was 142.8 (95% CI, 127.4-160.1) and 84.4 (95% CI, 75.4-94.5) days, respectively, with a difference in means of 58.4 (95% CI, 39.4-77.4; *P* < .001). Between baseline and 12 months, participants in the water group, compared with those in the control group, had increased mean (SD) urine volume (1.4 [0.04] vs 0.1 [0.04] L; *P* < .001) and voids (2.4 [0.2] vs −0.1 [0.2]; *P* < .001) and decreased urine osmolality (−402.8 [19.6] vs −24.0 [19.5] mOsm/kg; *P* < .001).

CONCLUSIONS AND RELEVANCE Increased water intake is an effective antimicrobial-sparing strategy to prevent recurrent cystitis in premenopausal women at high risk for recurrence who drink low volumes of fluid daily.

TRIAL REGISTRATION ClinicalTrials.gov identifier: NCT02444975

Hooton TM, Vecchio M, Iroz A, et al. Effect of Increased Daily Water Intake in Premenopausal Women With Recurrent Urinary Tract Infections: A Randomized Clinical Trial. JAMA Intern Med. 2018;178(11):1509-1515. doi:10.1001/jamainternmed.2018.4204

Drink more water

ers. We did not perform a dose-response study, so we do not know what increment in daily water intake is sufficient for reducing risk of UTI. In addition, we do not know whether increased water intake is beneficial in women who are at lower risk for recurrent cystitis or who regularly drink higher quantities of fluid than women in this study. Of note, there are no published data on the proportion of women with recurrent UTI who are low-volume drinkers. Nevertheless, it seems appropriate for clinicians who counsel healthy women with recurrent cystitis to routinely ask about daily fluid intake and to recommend increased intake of water, especially in those who drink no more than 1.5 L of fluids daily, as a safe and inexpensive alternative to strategies that employ antimicrobials. The resulting reduction in antimicrobial use for treatment and prevention of cystitis in women is likely to have an important beneficial effect on antimicrobial resistance.[42]

Key Points

Question Does increased daily water intake prevent cystitis in premenopausal women experiencing recurrent cystitis who drink low volumes of total fluid daily?

Findings In this randomized clinical trial of 140 premenopausal women experiencing recurrent cystitis who report drinking less than 1.5 L of total fluid daily, cystitis episodes were significantly less frequent in women who drank more water for 12 months compared with women who maintained their usual fluid intake.

Meaning Increasing daily water intake protects against recurrent cystitis in premenopausal women experiencing recurrent cystitis who drink low volumes of total fluid daily.

Hooton TM, Vecchio M, Iroz A, et al. Effect of Increased Daily Water Intake in Premenopausal Women With Recurrent Urinary Tract Infections: A Randomized Clinical Trial. JAMA Intern Med. 2018;178(11):1509-1515. doi:10.1001/jamainternmed.2018.4204

Urinary Catheter Life Cycle

EDITORIAL COMMENTARY

Disrupting the Life Cycle of the Urinary Catheter

Jennifer Meddings[1] and Sanjay Saint[2,1]

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(See the article by Knoll et al, on pages 1283–1290.)

Jennifer Meddings, Sanjay Saint, Disrupting the Life Cycle of the Urinary Catheter, Clinical Infectious Diseases, Volume 52, Issue 11, 1 June 2011, Pages 1291–1293, https://doi.org/10.1093/cid/cir195

Catheter Lifecycle

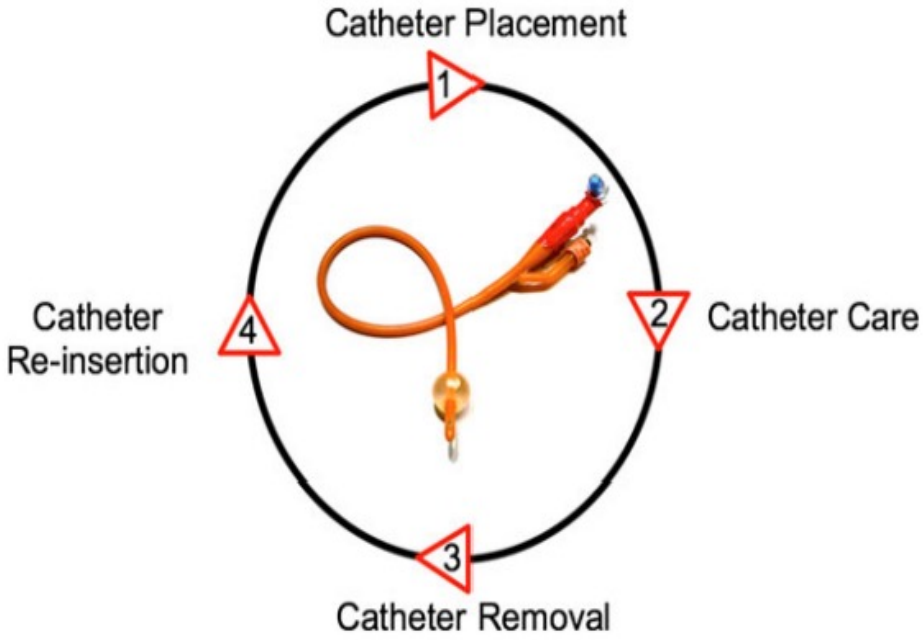

Figure 1. Lifecycle of the urinary catheter. This conceptual model illustrates 4 stages of the urinary catheter lifecycle as targets for intervention to decrease catheter use and subsequent catheter-associated urinary tract infection.

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Treatment

Treatment

- Assess for symptoms.
- Perform history/physical exam.
- Diagnostics – urinalysis, urine culture.

- Of utmost importance to distinguish whether truly needs antibiotics versus if this is asymptomatic bacteriuria.

- Develop institutional/regional/local guidelines.
- One example that is used is from Nebraska.

Interpretation of urine culture

Interpretation of Urine Culture: Bacteria are frequently noted on urinalysis and cultured from urine specimens. The presence of bacteria in the urine may indicate one of three conditions: 1) specimen contamination; 2) urinary tract infection (UTI); or 3) asymptomatic bacteriuria (ASBU). When evaluating the clinical significance of a urine culture, these three conditions must each be considered and classification should be based upon history and exam findings coupled with urine findings. Specimen contamination should always be considered, as this is common, particularly in female patients. High numbers of squamous cells on the urinalysis (>100) suggests contamination and results of the culture should generally be ignored. Samples with squamous cells 20-100 should be interpreted with caution.

https://www.unmc.edu/intmed/_documents/id/asp/clinicpath-nm-updated-uti-guidance_final-1.pdf

Pyuria

It is important to recognize that pyuria is not an indication for treatment. Pyuria is the presence of an increased number of polymorphonuclear leukocytes in the urine (generally >10 WBC/hpf) and is evidence for genitourinary tract inflammation. Pyuria can be seen in patients with catheter use, sexually transmitted diseases, interstitial nephritis, or ASBU. The absence of pyuria is a strong indicator that a UTI is not present and is useful in ruling out a UTI.

In patients with a positive urine culture, where no contamination exists, clinicians must determine if the patient is exhibiting **symptoms** of a UTI. Symptoms typical of a UTI are urinary frequency or urgency, dysuria, new onset hematuria, suprapubic pain, costovertebral tenderness or fever. Patients with a urinary catheter in place may have more vague symptoms such as new onset or worsening fever, chills, pelvic discomfort, unexplained leukocytosis, or acute hematuria.

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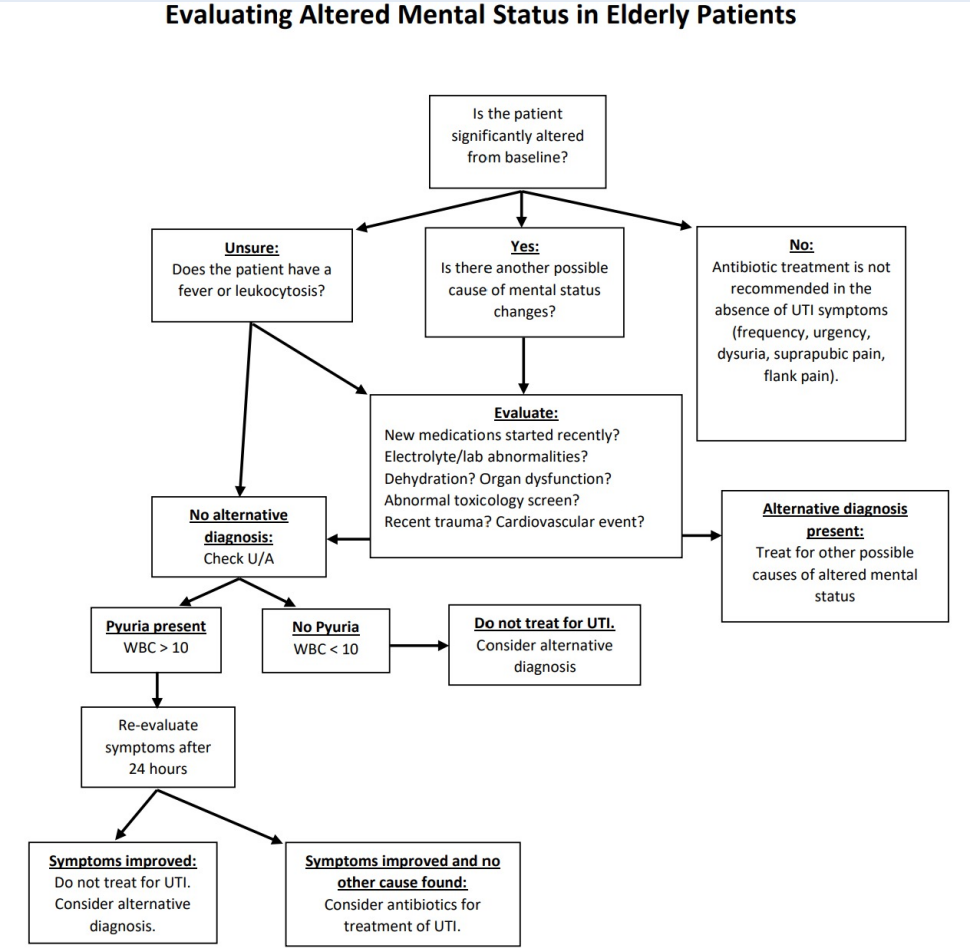
Algorithm – Altered Mental Status



Adapted from: Management of UTI and Asymptomatic Bacteriuria. Northwestern Memorial Antimicrobial Stewardship Program https://asp.nm.org/uploads/9/0/7/8/90789983/management-of-urinary-tract-infections-and-asymptomatic-bacteriu.pdf

https://www.unmc.edu/intmed/_documents/id/asp/clinicpath-nm-updated-uti-guidance_final-1.pdf

Asymptomatic Bacteriuria

1. **Pregnant women** should be screened and treated for ASBU, as they have a significantly increased risk of developing pyelonephritis as well as experiencing a premature delivery and delivering a low birth weight infant.
2. **Prior to transurethral resection of the prostate (TURP) or any other urologic procedure with a risk of mucosal bleeding**, patients should be screened for bacteriuria, as it has been associated with a major increase in the risk for post-procedure bacteremia and sepsis. Treatment of ASBU in both these situations has been demonstrated to prevent these complications.

Table 2: IDSA Guideline Recommended Indications for the Screening and Treatment of ASBU[2]

Screen and Treat	DO NOT Screen and Treat

• Pregnant women (at least once in early pregnancy)
  ○ 4-7 days; shortest effective course should be used
• Prior to urologic procedure with risk of mucosal bleeding (e.g., TURP, etc.)
  ○ 1-2 dose short course started 30-60 mins prior to procedure
	• Children
	• Healthy, nonpregnant women
	• Healthy, postmenopausal women
	• Older persons living in the community
	• Elderly residents of long-term care facilities
	• Patients with diabetes
	• Kidney transplant recipient with surgery >2 months prior
	• Any other solid organ transplant
	• Spinal cord injury
	• Indwelling urethral catheter
	• Elective non-urologic surgery
	• Placement or presence of artificial urine sphincters or penile prostheses
	• Asymptomatic funguria

Unfortunately, many patients with ASBU receive treatment from which they do not benefit and by which they are likely harmed. The unnecessary treatment of ASBU can lead to antibiotic resistance, adverse drug effects, *C. difficile* infection, and unnecessary costs of medical care. Gandhi and colleagues

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Nebraska Medicine Guidelines

Treatment of Urinary Tract Infections in Adults

Uncomplicated vs. Complicated UTIs

If it is determined that a patient has a urinary tract infection based on symptoms, UA, and urine culture, a decision must be made on how to treat the infection. Multiple factors play a role deciding on the most appropriate therapy choice and duration including: clinical classification of UTI (cystitis or pyelonephritis), severity and complexity of UTI (complicated or uncomplicated), patient allergies, location of patient (hospital, community, or long-term care facility), recent history of UTI or antibiotic exposure, previous urinary pathogens isolated, and cost of agent to be prescribed.

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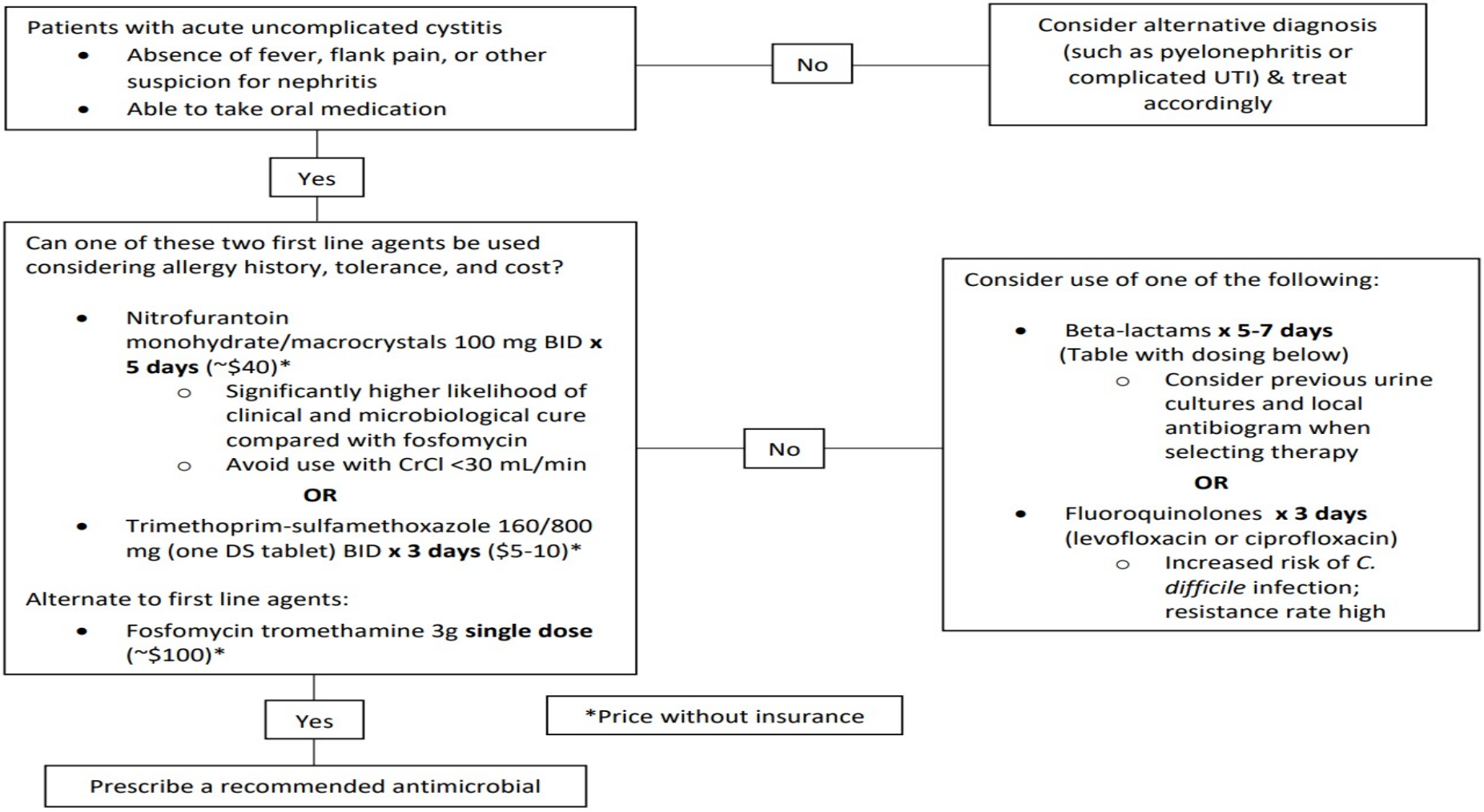
Treatment of Uncomplicated Cystitis at Nebraska Medicine

Uncomplicated cystitis is defined by the presence of typical lower urinary tract symptoms (dysuria, frequency, urgency, hematuria) and lack of upper tract symptoms (see "Treatment of Pyelonephritis" below) in an otherwise healthy female without urogenital abnormalities.



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Nebraska Guidelines - Uncomplicated

Table 3: Specific Beta-Lactam Treatment Regimens for Acute Uncomplicated Cystitis

Agent and Regimen	Duration
Cephalexin 500 mg BID	5-7 days[1]
Cefuroxime 250 mg BID	5-7 days[1]
Cefdinir 300 mg BID	5-7 days[1,9]
Cefpodoxime-proxetil 100 mg BID	*5-7 days[7]
Amoxicillin-clavulanate 500 mg BID	5-7 days[1,8]

**Limited data suggest that 3 days of cefpodoxime may be sufficient for uncomplicated UTI, but conflicting data exist. Use clinical judgment when determining duration of therapy with this agent.*

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Caveats on Treatment Duration
Nebraska Guidelines

Treatment duration has traditionally been 10-14 days, but recent data suggest that 7 days of therapy for complicated UTI's, even in men, is adequate and not associated with increased risk of recurrence.[6,10] Recent data also suggest that durations of 5-7 days are non-inferior to longer courses with regards to both clinical and microbiological cure rates, even in bacteremic patients.[11] This data is especially strong with fluoroquinolones.[12-14] The main exception to these shorter courses is in patients with complex urogenital abnormalities, who appear to need longer courses to prevent microbiological failure.[11] Based on these data, treatment durations **of 7 days** are generally recommended. Patients with known kidney stones that have not been removed or those not responding to therapy may require 10-14 days.

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Complicated UTI

Treatment of Complicated UTI at Nebraska Medicine

Table 4: Outpatient Management

Complicated Cystitis
1. Trimethoprim-sulfamethoxazole 160/800 mg (one DS tablet) BID **x 7 days** OR 2. Levofloxacin 500 mg PO daily or ciprofloxacin 500 mg PO BID x **5-7 days**
Alternatives with less data or less activity:
1. Nitrofurantoin 100 mg PO BID **x 7-10 days** a. Not recommended in patients with concern for pyelonephritis or CrCl <30 mL/min 2. Oral beta-lactams **x 7 days** a. Cephalexin 500 mg BID b. Cefdinir 300 mg BID c. Amoxicillin-clavulanate 500 mg BID

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Inpatient – Nebraska Guidelines

Table 5: Inpatient Management

Complicated Cystitis
Parenteral Beta-Lactams x 5-7 days 1. Ceftriaxone 1g daily (2g if ≥80 kg) OR 2. Ertapenem 1g IV q24h (Use if patient has history of an ESBL-producing organism) 3. Piperacillin/tazobactam 4.5g IV q8h (Use if patient has history of *Pseudomonas aeruginosa*)
Alternatives/Step-down agents:
1. Nitrofurantoin 100 mg PO BID x 7-10d a. Not recommended in patients with concern for pyelonephritis or CrCl <30 mL/min 2. Trimethoprim-sulfamethoxazole 160/800 mg (one DS tablet) BID x 7 days 3. Oral beta-lactams (based on susceptibility results) 7d a. Cephalexin 500 mg BID b. Cefdinir 300 mg BID c. Amoxicillin-clavulanate 500 mg BID

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Pyelonephritis

Treatment of Pyelonephritis at Nebraska Medicine

The presence of pyelonephritis is suggested by the presence of upper urinary tract symptoms such as fever, CVA tenderness, nausea, vomiting, and signs of severe sepsis. Patients with pyelonephritis should be evaluated for hospitalization and a decision made on the site of care based on severity of illness and host factors (ability to take oral agents, allergies, history of antimicrobial resistance, home support, etc.).

An important factor to consider when choosing therapy for pyelonephritis is the likelihood of bacterial resistance to common therapies. Numerous studies have been published evaluating risk factors for resistance in UTI pathogens and common **risk factors associated with the presence of multi-drug resistant (MDR) pathogens have generally included**:

- Residence in a long-term care facility
- Greater than 5 days of antibiotics in the previous 90 days
- History of recurrent UTIs
- History of having an MDR urinary pathogen
- Greater than 5 days in a hospital within the last 90 days

These risk factors particularly identify patients at risk for resistance to fluoroquinolones and/or 3rd-generation cephalosporins (typically via production of an extended-spectrum beta-lactamase (ESBL)). It should be noted that baseline *E. coli* resistance to quinolones at TNMC is roughly 25% while resistance to 3rd-generation cephalosporins such as ceftriaxone is much less (around 10%).

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Nebraska Treatment Guidelines: Pyelonephritis

Non-hospitalized/early pyelonephritis:

- Oral Levofloxacin 750mg daily or ciprofloxacin 500 mg BID OR
- Oral trimethoprim-sulfamethoxazole (TMP-SMX) 160/800 mg (1 double-strength tab) BID

Due to high resistance rates in *E. coli*, **all** patients should receive an initial one-time intravenous dose of ceftriaxone 1 gram or a consolidated 24-hour dose of an aminoglycoside (i.e. gentamicin 5 mg/kg)

Patients requiring hospitalization: Fluoroquinolones and TMP/SMX are not recommended for empiric treatment in patients admitted with pyelonephritis due to high rates of resistance (~25%). When susceptibilities results return, patients may be de-escalated to a FQ or TMP/SMX if they are susceptible.

No risk factors for multi-drug resistant organisms:

1. Ceftriaxone 1g IV q24h (2g if ≥80kg)
2. **Severe allergy to the above**: Refer to Nebraska Medicine allergy guidance document.

https://www.unmc.edu/intmed/divisions/id/asp/clinical-pathways/docs/penicillin-allergy-guidance.pdf

Risk factors for multi-drug resistant organisms:

1. Piperacillin/tazobactam 4.5g IV q8h, infused over 4 hours **OR**
2. Ertapenem 1g IV q24h (Use if patient has history of an ESBL-producing organism) **OR**
3. Cefepime 1g q6h
4. **Severe allergy to all the above**: Refer to Nebraska Medicine allergy guidance

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Nebraska Treatment Guidelines

In patients with septic shock, consider the addition of:

1. Gentamicin 7 mg/kg IV q24h (extended-interval dosing)
2. Vancomycin per pharmacy consult (sepsis from a urinary source is rarely due to a Gram positive pathogen)

The addition of other antimicrobials (gentamicin, vancomycin) should be based upon severity of illness and likelihood of resistance.

In the treatment of stable patients with pyelonephritis, studies have demonstrated that oral antibiotics are just as effective as intravenous antibiotics**. Intravenous antibiotic use should be reviewed at 48 hours and transitioned to oral therapy if possible**, based on patient response to therapy and susceptibility pattern of microbe.

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Treatment Duration - Nebraska

Treatment Duration: Traditionally pyelonephritis has been treated for 10-14 days, but several recent studies have demonstrated that patients treated with fluoroquinolones for 5-7 days had similar cure rates to those treated for 14 days.[11-14,19] When patients are initially treated with an IV beta-lactam and the isolate is susceptible, a total treatment course of 7 days is adequate if parenteral therapy is continued or transitioned to oral fluoroquinolones after culture results are known.[18] When transitioning to an oral beta-lactam, less is known about the optimal duration and therefore 10 days of total therapy is typically used. TMP/SMX has historically been used for 14 days in pyelonephritis; however, limited data suggest that 7 days of TMP/SMX may have similar rates of reoccurrence to 7 days of ciprofloxacin in patients with pyelonephritis due to *E coli*.[15]

Table 5: Treatment Duration for Pyelonephritis

Agent	Duration of Therapy
Fluoroquinolones (levofloxacin, ciprofloxacin)	5-7 days
Beta-lactams	Parenteral: 7 days Oral: 10-14 days
TMP/SMX	10-14 days

https://www.unmc.edu/intmed/_documents/id/asp/clinicpath-nm-updated-uti-guidance_final-1.pdf

https://www.idsociety.org/practice-guideline/alphabetical-guidelines/

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Alphabetical Guidelines

Uncomplicated Cystitis and Pyelonephritis (UTI) (Archived, In Development)

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