



Reviewed By
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Urinary Tract Infections in Pregnancy

Objectives:

- Define symptomatic UTI and asymptomatic bacteriuria in pregnancy.
- Describe the incidence, causes and epidemiology of urinary tract infection (UTI) including pyelonephritis and asymptomatic bacteriuria in pregnancy.
- Describe a diagnostic approach to a patient presenting with UTI.
- Outline the plan of management for UTI in pregnancy.
- Describe the Impact and complications of UTI on pregnancy and on maternal health.



- Slides
- **Important**
- **Golden notes**
- Extra
- **Doctor's notes**
- **Previous Doctor's notes**
- **Reference**

Kaplan Video

Editing File

Urinary Tract Infections in Pregnancy

Introduction:

- Common medical complication of pregnancy (2 - 10%).
- Second most common infection.
- Generally common in females, but more in pregnancy, due to anatomically short urethra - urine stenosis - proximity of vagina to anal canal.
- **Incidence of bacteriuria:** pregnant women ≈ nonpregnant women.
- **Incidence of recurrent bacteriuria:** pregnant women > nonpregnant women.
- **Incidence of pyelonephritis:** pregnant women > general population.
 - **Cause:** physiologic changes in the urinary tract during pregnancy.
- **Incidence of asymptomatic bacteriuria:** 2 - 7% of pregnant women.
 - **Early pregnancy:** 75%.
 - **Second & third trimesters:** ≈ 25%.
 - **Without treatment:** 20 - 35% of pregnant women with asymptomatic bacteriuria → symptomatic UTI (including pyelonephritis) during pregnancy.
 - **Treatment (eradicated bacteriuria):** ↓ 70 - 80% risk of asymptomatic bacteriuria → symptomatic UTI.
- Incidence same in both, but pregnant is more prone to infections.
- **Incidence of acute cystitis:** ≈ 1 - 2% of pregnant women.
- **Incidence of acute pyelonephritis:** 0.5 - 2% of pregnant women..
 - Most cases of pyelonephritis occur during the second and third trimesters.

Risk Factors:

- History of prior urinary tract infection.
- Preexisting diabetes mellitus.
- Low socioeconomic status.
- Female Gender.
- **Favored mediums:** blood - glucose.
- **Mechanical obstruction:** ureteropelvic junction - urethral / ureteral stenosis & calculi.
 - Bacteria can enter into stone → harder for macrophages to attack.
 - **Best & most sensitive investigation modality:** CT urogram.
- **Functional obstruction:** **pregnancy** - vesicoureteral reflux - **anatomical malformation**.
- **Systemic diseases:** **DM** - sickle cell trait/disease - gout - cystic renal disease - any kidney disease.
 - **DM alter pregnancy outcomes significantly:** glucose excreted in urine → attract bacteria & candidiasis → recurrent infection.
 - **Sickle cell trait/disease:** heme excretion.
 - **Gout:** uric acid & crystals build up.
 - **Kidney disease:** cystic renal disease - **SLE nephritis** - any kidney disease.

Pathophysiology:

- UTI may involve either lower tract (bladder - urethra) or upper tract (kidney).
- **Most common UTI route of infection:** ascending bacteria/**infection** from vagina and rectum.
 - Ascending (back forward not upright).
- Pregnancy → smooth muscle relaxation + subsequent ureteral dilatation → easy ascent of bacteria from bladder to kidney → ↑ propensity for bacteriuria to progress to pyelonephritis.
- Enlarging uterus → pressure on bladder and ureters → ↑ progression to pyelonephritis risk.
- Pregnancy → immunosuppression → ↑ progression to pyelonephritis risk.

Diagnosis:

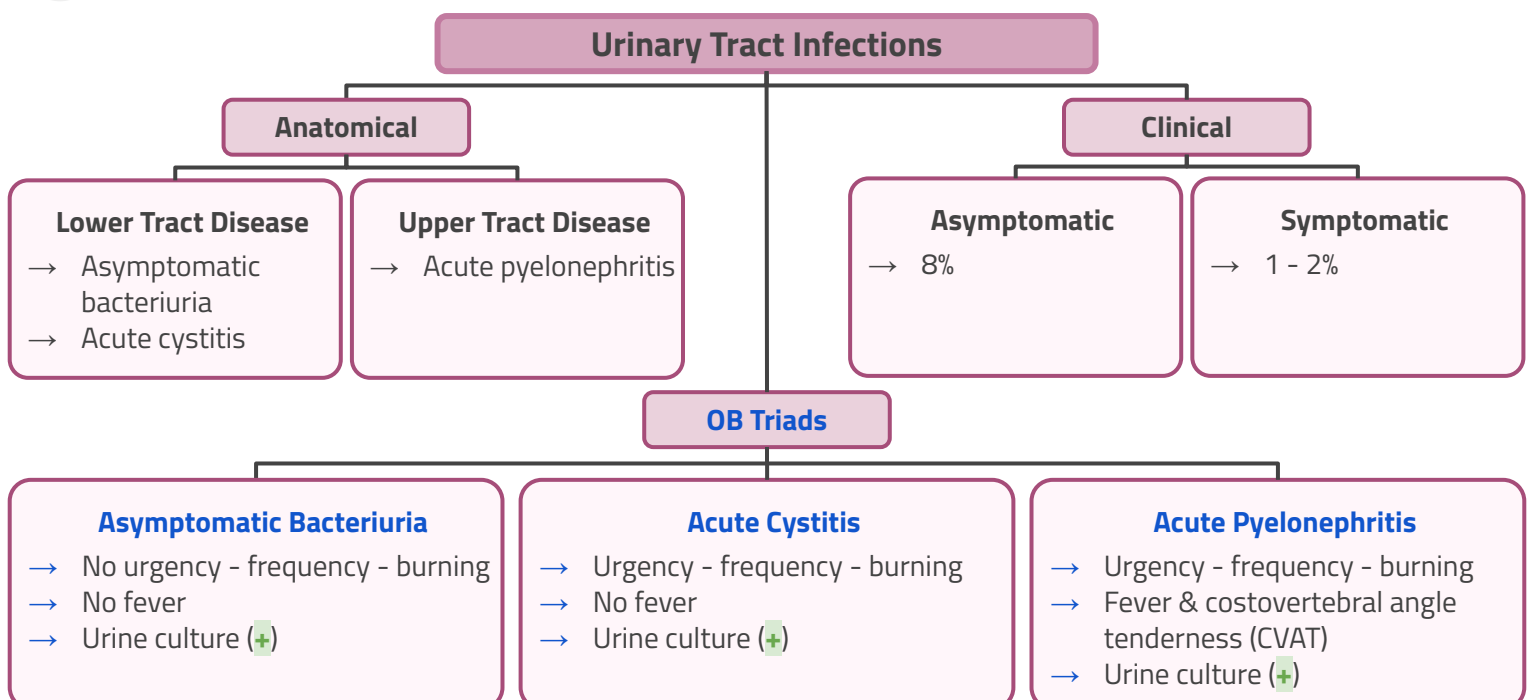
- **Confirm diagnosis:** culture (*before giving antibiotics*), not only urine analysis or signs & symptoms.
- **Urinalysis:**
 - Leukocytes esterase + nitrates (*bacterial waste products*) → immediate antibiotics.
 - Pus + WBCs + protein + blood → not enough for UTI diagnosis.
 - Ketone bodies → dehydration / DM / keto diet.

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Causative Organisms:

- Organisms that cause bacteriuria and UTI in pregnant women are the same and have similar virulence factors as in nonpregnant women.
- **Most common:** GI / enteric bacteria.
- **Predominant uropathogen in asymptomatic bacteriuria & UTI (60-80% - 70% - $\frac{2}{3}$):** E. coli.
 - Same as nonpregnant.
 - Some are multi resistant to antibiotics.
- **Gram-negative enteric bacteria:** E. Coli - Proteus - K. Pneumoniae - Pseudomonas (*less common*).
- **Gram-positive organisms (10%):** Group B Streptococcus (*GBS - S. agalactiae - β -hemolytic B*) + Group A Streptococcus (*GAS - S. pyogenes - β -hemolytic A*)
 - Universal screening of GBS via vaginal swab at the end of pregnancy is done.
 - Both must be treated & eradicated during labor or → infect baby → encephalitis & pneumonia.
 - GBS is less virulent + can be found in the vaginal normal flora.
 - GAS is more aggressive than GBS especially in immunocompromised → can cause sepsis.
- **Klebsiella (*K. Pneumoniae* - 3%).**
- **Enterobacterspecies (3%).**
- **Proteus (2%).**
- **Extended-spectrum beta-lactamase (ESBL)-producingstrains:** increasing in number.
- Isolation of more than one species or the presence of **Lactobacillus** or Cutibacterium (*Propionibacterium acnes*) → contaminated specimen by vaginal or skin flora.
 - **Vaginal normal flora:** Lactobacilli → **doesn't cause UTI.**
 - **Essential for genital health:** ↓ Lactobacilli → organisms grow (*gardnerella vaginalis* → *bacterial vaginosis*).
 - Can be given as vaginal/oral capsules to treat recurrent infections.
 - **Skin normal flora:** S. Aureus + streptococcus.
- Viruses have no role in UTI.
- No defense mechanism in urine to fight bacterial growth except acidity → infection = bacteria makes urine more alkaline.

Classification of UTI:



Urinary Tract Infections in Pregnancy

Changes in Pregnancy Causing Urinary Stasis:

Kidneys

- ↑ 1 - 1.5 in length + ↑ weight and pelvis size.
- **Physiologic hydronephrosis:** ↑ progesterone + mechanical compression of the ureters at pelvic brim → dilated renal pelvises & calyceal systems.
- ↑ renal vascular and interstitial volume → ↑ kidney volume by 30%.
- Right kidney is affected more than the left.

Ureter

- **Hydroureter & hydronephrosis:** dilated ureter & renal pelvis (uterus is more oriented towards the right → right side affected more than left).
 - Precipitate to pyelonephritis.
 - **Incidence:** up to 80% of pregnant patients.
- **Urinary stasis** (most common cause) → no urine circulation → media for bacterial growth (reservoir for bacteria) → ↑ pyelonephritis risk in pregnancy.
 - Continuous flush ↓ growth chance.
- **Changes can be visualized on US:** 2nd trimester → 6 - 12 weeks postpartum.
- Dilated collecting system hold 200 - 300 mL of urine.

Mechanisms

- **Mechanism:** improper emptying function.
- 1. Hormonal:**
 - Hormonal effects + external compression + intrinsic changes in ureteral wall → hydroureter + hydronephrosis.
 - ↑ **progesterone levels** → soften & relax smooth muscles → ↓ ureteral tone + peristalsis + contraction pressure (that's why sometimes they give synthetic progesterone).
- 2. Mechanical:** mechanical pressure of enlarged uterus.
 - More prominent involvement of right ureter due to: uterus dextrorotation by sigmoid colon + ureter kinking as it crosses right iliac artery + proximity to right ovarian vein.
- **Consequences:** urinary stasis → ↑ urinary tract infections risk.

Clinical Point:

- We can't accept any type of bacteria in urine (should be sterile).
- **Investigations:** urine microscopic urinalysis.
- How to instruct patients to collect a clean catch urine?
 - Clean area with water or wipes, around the vulva.
 - Big labia → separate skin (*labia minora*) → avoid skin flora contamination.
 - Release first then catch **midstream**.

Terminologies:

- **Bacteriuria:** bacteria in urine.
- **Significant bacteriuria:** $\geq 10^5$ (10^4) CFU/mL of urine.
- Asymptomatic bacteriuria.
- **Lower UTI:** cystitis.
- **Upper UTI:** pyelonephritis.

Urinary Tract Infections in Pregnancy

> Types of UTI Recurrences:

01 Relapse

- **Relapse:** infection by the **same organism** within **2 - 3 weeks**.
- **Cause:** perineal colonization or **inadequate** treatment.
- **Treatment:** given antibiotics before getting a sensitivity test.

02 Re-infection

- **Re-infection:** recurrent infection by a **new organism** within 12 weeks.
- Bladder bacteriuria.
- **Treatment:** fully but got infected (again) within 3 months.

03 Superinfection

- **Superinfection:** infection by a **new organism** while on **treatment**.
- **Could be two types of infections:** fungal + bacteria.

04 Recurrent UTI

- **Recurrent UTI:** **2** infections in **6 months** or **3 ≥** infections in **1 year**.
- Must be culture proven → cultures collected (*each time*) to see infection pattern
→ give prophylaxis to prevent infection pattern → no antibiotic resistance.
- **Treatment:** Lactobacili capsules.

Urinary Tract Infections in Pregnancy

OB Triad: *Asymptomatic Bacteriuria*

Introduction	<ul style="list-style-type: none"> → Most common UTI in pregnancy. → Incidence: 2 - 7% of pregnant women (<i>as in sexually active women</i>). <ul style="list-style-type: none"> → Early pregnancy: 75%. → Second & third trimesters: ≈ 25%.
Consequences¹	<ul style="list-style-type: none"> → Without treatment: 20 - 35% asymptomatic bacteriuria → symptomatic UTI (including <i>pyelonephritis</i>). → Treatment (eradicated bacteriuria): ↓ 70 - 80% risk of asymptomatic bacteriuria → symptomatic UTI.
Clinical Presentation	<ul style="list-style-type: none"> → Asymptomatic.
Diagnosis	<ul style="list-style-type: none"> → Urine microscopic analysis. → Urine culture and sensitivity (48 - 72 hours). → Asymptomatic: <ul style="list-style-type: none"> → 2 consecutive voided urine specimens with isolation of same bacterial strain in quantitative counts of $\geq 10^5$ cfu/mL . → 1 catheterized urine specimen with one bacterial species isolated in a quantitative count of $\geq 10^2$ cfu/mL. → In clinical practice: 1 voided urine specimen is obtained with $\geq 10^5$ cfu/mL → diagnosis & treatment initiation (no confirmatory repeat culture). → Atypical uropathogens / bacteria (such as lactobacillus) → treatment reserved for patients who have the organism grows as a single isolate on consecutive cultures. → Made with a positive urine culture showing >100K (10^4 or 10^5) cfu/mL of a single organism or just any bacteria.
Screening	<ul style="list-style-type: none"> → Guidelines: screen all pregnant women for asymptomatic bacteriuria at least once in early pregnancy (first prenatal visit). → Screening type: urine culture → Low-risk woman + no bacteriuria on initial test → generally no rescreening. → High-risk woman (history of UTI - urinary tract anomalies - diabetes mellitus, hemoglobin S - preterm labor) → rescreen.
Management	<ul style="list-style-type: none"> → An antibiotic tailored to the susceptibility pattern of the isolated organism → generally available at time of diagnosis. <ul style="list-style-type: none"> → Options: <ul style="list-style-type: none"> → β-lactams → Nitrofurantoin: appropriate alternative if others can't be used - avoided during 1st trimester. → Fosfomycin → Amoxicillin (Amoxil). → Amoxicillin-clavulanate → 1st generation cephalosporins. → Optimal duration: uncertain, typically 5 - 7 days of therapy. <ul style="list-style-type: none"> → Short courses are preferred → minimize antimicrobial exposure to fetus. → Outpatient → oral antibiotics.

Antibiotic	Dose	Duration	Notes
Amoxicillin	500 mg PO q8h	7-10 days	Amoxicillin-clavulanate preferred if beta-lactamase-producing organisms are suspected.
Nitrofurantoin	50 mg PO q6h	5-7 days	Avoided in 1st trimester. Contraindicated in renal impairment and G6PD deficiency.
Fosfomycin	3 gm PO	1 dose	Single-dose therapy. Contraindicated in renal impairment.
Cephalexin	500 mg PO q6h	7-10 days	First-generation cephalosporin. Contraindicated in severe renal impairment.

Urinary Tract Infections in Pregnancy



OB Triad: Acute Cystitis & Acute Pyelonephritis

	Acute Cystitis	Acute Pyelonephritis
Introduction	<ul style="list-style-type: none"> → Acute cystitis: UTI localized to bladder without systemic findings. → Acute cystitis: symptomatic infection of bladder. → Incidence: 1 - 2% of pregnant women. 	<ul style="list-style-type: none"> → Acute pyelonephritis: UTI of upper urinary tract with systemic findings. → Acute pyelonephritis: a manifestation of upper urinary tract & kidney infection. → One of the most common serious complications of pregnancy. → Incidence: 0.5 - 2% of pregnant women. → Most commonly: 2nd & 3rd trimesters.
Consequences¹	<ul style="list-style-type: none"> → Without treatment: 30% of cases → develop acute pyelonephritis. 	<ul style="list-style-type: none"> → Septic shock syndrome or its variants: acute respiratory distress syndrome (ARDS) - 20%. <ul style="list-style-type: none"> → Leading cause of ARDS & septic shock in pregnancy. → Anemia: 23%. → Bacteremia: 17%. → Respiratory insufficiency: 7%. → Renal dysfunction: 2%. → Preterm labor → Pulmonary dysfunction → sometimes ICU & intubation.
Clinical Presentation	<ul style="list-style-type: none"> → Suprapubic pain. → Dysuria / burning: sudden onset. → Frequency - urgency: sudden onset. → Hematuria: frequent in urinalysis. → Pyuria: frequent in urinalysis. → Urge incontinence. → No fevers or chills. 	<ul style="list-style-type: none"> → Pyuria: typical finding. → Fever - Chills: >38°C or 100.4°F. → Flank pain: not always present. → Costovertebral angle (CVA) tenderness → Nausea - vomiting – anorexia. → Dysuria: not always present. → Tachycardia.
Diagnosis	<ul style="list-style-type: none"> → Urine culture: bacterial growth of >100K cfu of 1 organism. → Urinalysis: pyuria + hematuria. → Consistent symptoms + pyuria on urinalysis → initiate empiric treatment before diagnosis confirmation. 	<ul style="list-style-type: none"> → + flank pain + nausea/vomiting + fever ± CVA tenderness ± cystitis symptoms bacteriuria → confirmed. → Leukocytosis → Urine culture: >100K cfu of 1 organism. → Blood culture: +ve in 10%
Management²	<p>Empiric regimen / therapy: pregnancy safe + broad spectrum:</p> <ul style="list-style-type: none"> → Cefpodoxime. → Amoxicillin-clavulanate. → Fosfomycin. <p>Antimicrobial / Antibiotic³ treatment: often empiric:</p> <ul style="list-style-type: none"> → Start: time of complaints of dysuria. → Stop: susceptibility pattern of isolated organism if cultures return. → Outpatient → 2nd generation cephalosporin. → Nitrofurantoin → + analgesics. → After antibiotic course → re-culture. → Duration: 7 - 10 days (5 - 7 days). 	<p>Site of care:</p> <ul style="list-style-type: none"> → Pregnancy → ↑ complications risk → hospitalization⁴ / admission + IV antibiotics. <ul style="list-style-type: none"> → Ampicillin / cephalosporin/ceftriaxone. → Antipyretic⁵ + IV hydration + Tocolysis as needed. → Afebrile for 24 - 48 hours (<i>generally have definite improvement</i>) + symptoms improved → dismiss + oral therapy. <p>Empiric antibiotics: parenteral, broad spectrum β-lactams.</p> <ul style="list-style-type: none"> → Ceftriaxone. → Piperacillin-tazobactam. <p>Directed antibiotic therapy & follow-up:</p> <ul style="list-style-type: none"> → 48 hours afebrile → oral therapy guided by culture susceptibility results. → Duration: 7 - 10 days.

Antibiotic	Dose, interval
Mild to moderate pyelonephritis	
Ceftriaxone	1 g every 24 hours
Cefepime	1 g every 12 hours
Aztreonam*	1 g every 8 hours
Ampicillin	2 g every 6 hours
Flucloxacillin	500 mg every 6 hours
Severe pyelonephritis with an impaired immune system and/or septicemic urinary drainage	
Piperacillin-tazobactam	3.375 g every 4 hours
Meropenem	1 g every 8 hours
Ertapenem	1 g every 24 hours
Doripenem	500 mg every 8 hours

Doses are for patients with normal renal function.
 * Intravenous treatment is usually preferred in severe or complicated, and treatment regimens outlined separately in topics addressing renal management.
 † Alternative in the setting of beta-lactam allergy.
 ‡ Antipseudomonal have been associated with renal deterioration; this regimen should be used only if resistance precludes the use of non-beta-lactams.

Urinary Tract Infections in Pregnancy

Comments on OB Triad: *Previous slide*

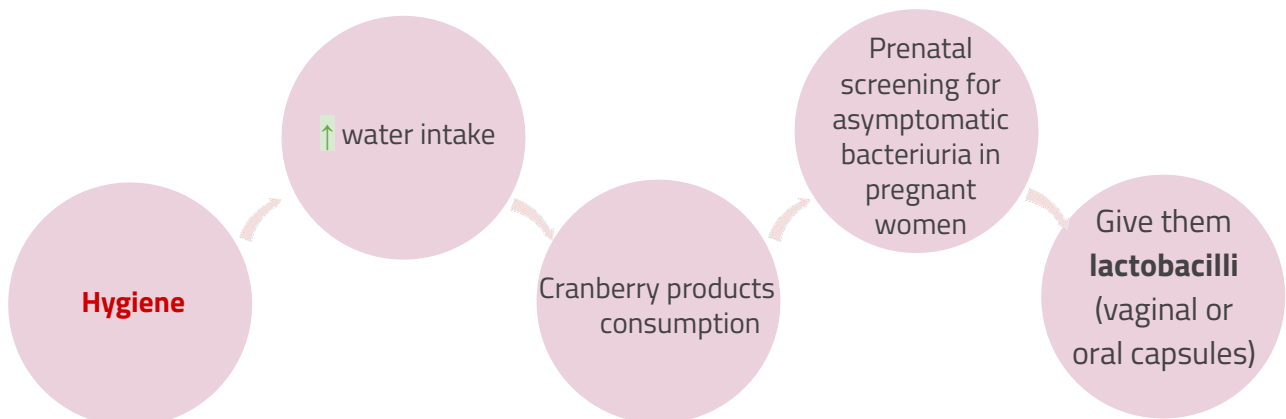
1. Most important consequence we worry about is preterm labor (continues pain induce uterus cramps).
2. Antibiotics are contraindicated in cases of allergies or resistance.
3. **Empirical therapy for uncomplicated cystitis:** nitrofurantoin (*macrocrystals, 100 mg orally twice daily for 5 days*) or trimethoprim-sulfamethoxazole (*160/800 mg orally twice daily for 3 days*).
4. Now even IV can be given outpatient.
5. Most used is Paracetamol, we don't usually give NSAIDs because high risk on the mother & the baby kidneys and risk of oligohydramnios.

Antibiotics:

- **Oral antibiotics given for UTI in pregnancy:**
 - Cephalosporins
 - Amoxicillin-clavulanic acid
 - Nitrofurantoin (in 2nd and 3rd trimesters)
 - Ciprofloxacin (restricted use)
 - Levofloxacin
- **IV antibiotics given for UTI in pregnancy:**
 - Cephalosporins (2nd and 3rd gen)
 - Gentamicin
 - Impenems

Prevention:

- **Most importantly is to control risk factors.**



439 Summary

UTI & Anemia in pregnancy

UTIs

- Infections of the bladder, urethra, ureters, or kidneys
- **Causative agents:**
 - Enteric bacteria e.g. **E.coli** (most common)
 - Beta hemolytic A: more aggressive
 - Beta hemolytic B:
 - **Lactobacilli does not cause UTI**, it's considered as normal flora. Can be given as vaginal/oral capsules to treat recurrent infection
- **Classification**
 - By clinical presentation:
 - Asymptomatic bacteriuria
 - Urinary tract infection
 - By location:
 - Lower UTI: urethritis and cystitis
 - Upper UTI: pyelonephritis
 - By severity:
 - Complicated: pregnancy, male gender, etc...
 - Uncomplicated
- **Risk factors:**
 - **Female gender** (due to shorter urethra)
 - Anemia
 - Functional obstruction:
 - **Pregnancy**
 - **Physiologic hydronephrosis** (right kidney is more affected than left since uterus is more oriented towards the right)
 - **Hydroureters** (right ureter is more affected than left)
 - Urinary stasis in the bladder (mechanical compression of uterus)
 - ↑ GFR: more glucose is filtered (welcoming environment for bacteria)
 - Hormonal changes: ↑ **progesterone** → smooth muscle relaxant → dilation & urinary stasis
 - Vesicoureteral reflux
 - Mechanical obstruction:
 - Ureteropelvic junction, urethral or ureteral stenosis.
 - Calculi or tumors

- Others/Systemic diseases:
 - DM: glucose will be excreted in urine which will attract bacteria
 - **Sickle cell trait/disease**: due to Heme excretion (note that two mediums are favored; blood and glucose)
 - Gout: due to uric acid build up
 - Cystic renal disease, any kidney disease i.e. SLE Nephritis
 - Indwelling urinary catheters
 - Anatomical abnormalities of the urinary tract
- **UTI recurrence:**
 - Relapse:
 - Infection by the same organism within 2-3 weeks.
 - Secondary to perineal colonization or inadequate treatment.
 - Given antibiotics before getting a sensitivity test
 - Reinfection:
 - Fully treated patient but got infected by a new organism within 12 weeks
 - **Bladder bacteriuria**
 - Superinfection:
 - Infection by a new organism while on treatment
 - Recurrent UTI:
 - Two infections in 6 months or Three or more infections in 1 year
 - Must be "culture proven" and are given prophylaxis accordingly
 - Cultures must be collected (each time) to see the pattern of infection to prevent antibiotics resistance
 - Renal US is recommended in investigating recurrent UTI in pregnancy

OB triads:

Infection	Asymptomatic Bacteriuria	Acute Cystitis	Acute Pyelonephritis
About	<ul style="list-style-type: none"> • Most common UTI in pregnancy 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Most commonly occur in 2nd trimester
Consequences	<ul style="list-style-type: none"> • If not treated, 30% will develop acute pyelonephritis 		<ul style="list-style-type: none"> • The leading cause of ARDS and septic shock in pregnancy. • Anemia, renal failure, preterm labor, and pulmonary dysfunction
Clinical presentation	<ul style="list-style-type: none"> • Asymptomatic patient 	<ul style="list-style-type: none"> • Suprapubic pain • Dysuria • Hematuria • Frequency, urgency 	<ul style="list-style-type: none"> • Fever & chills • Costovertebral angle (CVA) tenderness/ Flank pain • Anorexia, tachycardia • N&V
Diagnosis	<ul style="list-style-type: none"> • Screening for asymptomatic bacteriuria during pregnancy is done with a urine culture at 12 to 16 weeks of gestation or at the first prenatal visit. • Urinalysis: presence of $\geq 100,000$ CFU/mL in at least two voided urine samples • Urine culture and sensitivity 	<ul style="list-style-type: none"> • Urinalysis • Urine culture and sensitivity 	<ul style="list-style-type: none"> • Signs & symptoms • Urinalysis: leukocytosis • Urine culture • Blood culture +ve in 10% of cases
Management	Outpatient & oral abx: (3-7 days) <ul style="list-style-type: none"> • Nitrofurantoin • Amoxi/clav • 1st generation cephalosporin (cephalexin) 	Outpatient (7-10 days) <ul style="list-style-type: none"> • Nitrofurantoin • Amoxi/clav • 3rd gen cephalosporin (cefotaxime/ceftriaxone) • Analgesics 	Admission & IV abx: <ul style="list-style-type: none"> • IV ampicillin or 3rd gen cephalosporin (cefotaxime/ceftriaxone) then PO antipyretic agent. • IV hydration • Analgesics

Safe antibiotics in pregnancy:

- Oral antibiotics given for UTI in pregnancy:
 - Cephalosporins
 - Amoxicillin-clavulanic acid
 - Nitrofurantoin (in 2nd and 3rd trimesters)
 - Ciprofloxacin (restricted use)
 - Levofloxacin
- IV antibiotics given for UTI in pregnancy:
 - Cephalosporins (2nd and 3rd gen)
 - Gentamicin
 - Imipenems
- **Prevention:**
 - Hygiene
 - Increased intake of water
 - Cranberry juice
 - Prenatal screening for asymptomatic bacteriuria in 1st trimester
 - Lactobacilli

Quiz

Question 1:

- A 27-year-old woman, gravida 2, para 1, at 37 weeks' gestation is admitted to the hospital in active labor. Her current pregnancy has been complicated by iron deficiency anemia treated with iron tablets. She has received routine prenatal care, but she has not been tested for group B streptococcal (GBS) colonization. Pregnancy and delivery of her first child were complicated by an infection with GBS that resulted in sepsis in the newborn. The patient has no history of serious illness. Current medications include folic acid and a multivitamin. Vital signs are within normal limits. The abdomen is nontender and contractions are felt every 4 minutes. There is clear amniotic fluid pooling in the vagina. The fetus is in a cephalic presentation. The fetal heart rate is 140/min. Which of the following is the most appropriate next step in management?
- A. Obtain swab for GBS culture and I.v penicillin administration
 - B. Intrapartum administration of intravenous penicillin G immediately
 - C. Reassurance

Question 2:

- What is the most common cause of asymptomatic bacteriuria?
- A. Alpha Haemolytic streptococcus
 - B. E. Coli
 - C. Beta Hemolytic Streptococcus

Question 3:

- Your patient wants to know if they are to considered to have recurrent UTIs because they have had 2 UTIs within the past year, one being in January and the other in September. What is your best response as a nurse practitioner?
- A. Yes, you have had two UTIs this year.
 - B. No, you would need 3 or more UTI's within the past year.
 - C. No, a recurrent UTI is a second UTI caused by the same pathogen within 2 weeks of the original treatment.
 - D. No, a recurrent UTI is a UTI that occurs more than 2 weeks after the completion of treatment for the same or different pathogen.

Question 4:

- Which of the following scenarios of patients is least likely to acquire a UTI?
- A. A 24 year old male with poor hygiene.
 - B. An immunocompromised individual receiving chemotherapy.
 - C. A post-menopausal woman with a history of diabetes mellitus.
 - D. A 52 year old female who had a urinary catheter placed for surgery

A	B	B	B
7	3	2	1

Reference

Urinary Tract Infections

ACUTE CYSTITIS

Women with acute cystitis generally have an abrupt onset of multiple, severe urinary tract symptoms including dysuria, frequency, and urgency associated with suprapubic or low-back pain. Suprapubic tenderness may be noted on physical examination. Urinalysis reveals pyuria and sometimes hematuria. **Several factors increase the risk for cystitis, including sexual intercourse, the use of a diaphragm and a spermicide, delayed postcoital micturition, and a history of a recent urinary tract infection.**

Escherichia coli is present in the urine of 80% of young women with acute cystitis and *Staphylococcus saprophyticus* is present in an additional 5-15% of patients. The pathophysiology of cystitis in women involves the colonization of the vagina and urethra with coliform bacteria from the rectum. For this reason, the effects of an antimicrobial agent on the vaginal flora play a role in the eradication of bacteriuria.

High concentrations of trimethoprim and fluoroquinolone in vaginal secretions can eradicate *E. coli* while minimally altering normal anaerobic and

and flank pain persist after 72 hours of therapy, ultrasonography or computed tomography should be considered to rule out a perinephric or intrarenal abscess or ureteral obstruction. A follow-up culture should be obtained 2 weeks after the completion of therapy.

testing. Urine culture is not necessary, and a short course of antimicrobial therapy should be given. No follow-up visit or culture is necessary unless symptoms persist or recur.

RECURRENT CYSTITIS

About 20% of premenopausal women have recurrent episodes of cystitis. More than 90% of these recurrences are caused by exogenous reinfection. **Recurrent cystitis should be documented by culture to rule out resistant microorganisms.** Patients may be treated by one of three strategies: (1) continuous prophylaxis, (2) postcoital prophylaxis, or (3) therapy initiated by the patient when symptoms are first noted.

Postmenopausal women may have frequent reinfections. Hormonal therapy or topically applied estrogen cream, along with antimicrobial prophylaxis, is helpful in these patients.

URETHRITIS

Women with dysuria caused by urethritis have a more gradual onset of mild symptoms, which may be associated with abnormal vaginal discharge or bleeding related to concurrent cervicitis. Patients may have a new sexual partner or experience lower abdominal pain. Physical examination may reveal the presence of mucopurulent cervicitis or vulvovaginal herpetic lesions. *C. trachomatis*, *N. gonorrhoeae*, or genital herpes may cause acute urethritis. Pyuria is present on urinalysis, but hematuria is rarely seen.

ACUTE PYELONEPHRITIS

The clinical spectrum of acute, uncomplicated pyelonephritis in young women ranges from gram-negative septicemia to a cystitis-like illness with mild flank pain. *E. coli* accounts for more than 80% of these cases. Microscopy of unspun urine reveals pyuria and gram-negative bacteria. A urine culture should be obtained in all women with suspected pyelonephritis; blood cultures should be performed in those who are hospitalized, because results are positive in 15-20% of cases. In the absence of nausea and vomiting and severe illness, outpatient oral therapy can be given safely. Patients who have nausea and vomiting, and are moderately to severely ill, should be hospitalized. **Pyelonephritis in a pregnant patient can cause premature labor and preterm delivery if not treated promptly.**

Outpatient treatment regimens include trimethoprim-sulfamethoxazole (160/800 mg every 12 hours for 14 days) or a quinolone (e.g., levofloxacin 750 mg daily for 7 days). Inpatient treatment regimens include the use of parenteral levofloxacin (750 mg daily), ceftriaxone (1 to 2 g daily), ampicillin (1 g every 6 hours), and gentamicin (especially if *Enterococcus* species are suspected) or aztreonam (1 g every 8 to 12 hours). Symptoms should resolve after 48 to 72 hours. If fever

TABLE 22-7

TREATMENT OF GENITAL (VULVAR) ULCERATIVE INFECTIONS

Disease	Microorganism(s) Involved	Preferred Treatment	Alternative Treatment
Herpes	Herpes simplex virus	First Episode Acyclovir 400 mg PO three times daily OR Famciclovir 250 mg PO three times daily OR Valacyclovir 1 g PO twice daily for 7-10 days	Recurrent Episode Acyclovir 400 mg PO twice daily OR Famciclovir 250 mg PO twice daily OR Valacyclovir 1 g PO daily
Syphilis	<i>Treponema pallidum</i>	Primary, Secondary, and Early* Latent Disease Benzathine Penicillin G 2.4 million units IM in a single dose Late Latent Syphilis Benzathine Penicillin G 2.4 million units IM weekly × three doses	ALL immunocompromised patients with a penicillin allergy must be desensitized and given penicillin Doxycycline 100 mg PO twice daily for 28 days
Chancroid	<i>Haemophilus ducreyi</i>	Azithromycin 1 g PO × 1 dose	Ceftriaxone 250 mg IM × 1 dose Ciprofloxacin 500 mg PO twice daily for 3 days Erythromycin base 500 mg PO four times daily for 7 days
Granuloma inguinale (donovanosis)	<i>Klebsiella granulomatis</i> (<i>Calymmatobacterium granulomatis</i>)	Azithromycin 1 g PO once a week for 3 weeks	Doxycycline 100 mg PO twice daily for 3 weeks Ciprofloxacin 750 mg PO twice daily for 3 weeks Erythromycin base 500 mg PO four times daily for 3 weeks Sulfamethoxazole (800 mg), Trimethoprim (160 mg), Bactrim (double strength) 1 PO twice daily for 3 weeks
Lymphogranuloma venereum (LGV)	<i>Chlamydia trachomatis</i> Serovars: L1, L2, L3	Doxycycline 100 mg PO twice daily for 21 days or until signs and symptoms have resolved	Erythromycin base 500 mg PO four times daily for 21 days until signs and symptoms have resolved
Condylomata acuminata	<i>Human papillomavirus</i>	Excision of warts using either: Trichloroacetic acid Electrocauterization Cautery Laser	Cryotherapy OR Imiquimod 5% cream OR Sinecatechins 15% ointment OR Podofilox 0.5%

From Centers for Disease Control and Prevention. The sexually transmitted infections treatment guidelines. *MMWR Morb Mortal Wkly Rep* 2015.

IM, Intramuscularly; IV, intravenously; PO, orally.

*Early latent syphilis—defined as the first year of latent syphilis.

†Late latent syphilis—defined as beyond 1 year of latent syphilis.

microaerophilic vaginal flora. **There has been an increasing linear trend in the prevalence of resistance of *E. coli* (>10%) to the fluoroquinolones (e.g., ciprofloxacin).** Despite a similar increase in *E. coli* resistance (9-18%) to trimethoprim-sulfamethoxazole, therapeutic efficacy remains stable. In contrast, no such increase in resistance has been noted with nitrofurantoin. **Nitrofurantoin** (macrocrystals, 100 mg orally twice

daily for 5 days) or trimethoprim-sulfamethoxazole (160/800 mg orally twice daily for 3 days) are the optimal choices for empirical therapy for uncomplicated cystitis.

In patients with typical symptoms, an abbreviated laboratory workup followed by empirical therapy is recommended. The diagnosis can be presumed if pyuria is detected by microscopy or leukocyte esterase



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Good Luck!



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