Urinary Tract Infections

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UG Module
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Definitions

- urinary system is composed of the kidneys, ureters, bladder and urethra. Any part of urinary system can become infected,
- most infections involve the lower urinary tract — the bladder and the urethra.
- The upper UTI includes pyelonephritis and the source may be from urethra or blood borne infections
- In both types of UTI the most common cause is E coli, 2nd most is *Staphylococcus saprophyticus.*
- *Klebsiella, Proteus, Pseudomonas, and Enterobacter are uncommon and typically related to abnormalities of the urinary system or urinary catheterization.*
- *Urinary tract infections due to Staphylococcus aureus typically occurs secondary to blood born infections*

Risk factors

- Female >male because close proximity of urethral opening to anus and vagina, shorter urethra, and in menopause there is a decrease in vaginal estrogen levels that are important for protective vaginal normal flora
  - Honeymoon cystitis, frequent UTI in female during early marriage
- Catheterization so use aseptic technique
- In children, UT abnormalities as vesicoureteral reflux (an abnormal movement of urine from the bladder into ureters or kidneys)
- Diabetes,
- Blockage to UT prostate enlargement, uncircumcision or kidney stones
- During pregnancy, high progesterone levels elevate the risk of decreased muscle tone of the ureters and bladder, which leads to a greater likelihood of urine reflux. Thus if urine testing shows signs of an infection—even in the absence of symptoms—treatment is recommended

Symptoms

Part of urinary tract affected	Signs and symptoms
Kidneys (acute pyelonephritis	○ Upper back and side (flank) pain ○ High fever ○ Shaking and chills ○ Nausea ○ Vomiting
Bladder (cystitis	○ Pelvic pressure ○ Lower abdomen discomfort ○ Frequent (night), painful urination ○ Blood in urine
Urethra (urethritis)	;Burning with urination (dysurea)

Follow symptoms

- Infants may feed poorly, vomit, sleep less, or show signs of jaundice.
- In older children, new onset urinary incontinence (loss of bladder control) may occur
- Urinary tract symptoms are frequently lacking in the elderly. The presentations may be vague with incontinence, a change in mental status, or fatigue as the only symptoms. While some present to a health care provider with sepsis, an infection of the blood, as the first symptoms.

Uncomplicated (simple) Cystitis

- Definition
  - Healthy adult woman (over age 12)
  - Non-pregnant
  - No fever, nausea, vomiting, flank pain
- Diagnosis
  - Dipstick urinalysis (no culture or lab tests needed)
- Treatment
  - Trimethroprim/Sulfamethoxazole for **3 days**
  - May use fluoroquinolone (ciprofoxacin or levofloxacin) in patient with sulfa allergy, areas with high rates of bactrim-resistance
- Risk factors:
  - Sexual intercourse
    - May recommend post-coital voiding or prophylactic antibiotic use.

Complicated Cystitis

- Definition
  - Females with comorbid medical conditions
  - All male patients
  - Indwelling foley catheters
  - Urosepsis/hospitalization
- Diagnosis
  - Urinalysis, Urine culture
  - Further labs, if appropriate.
- Treatment
  - Fluoroquinolone (or other broad spectrum antibiotic)
  - **7-14 days** of treatment (depending on severity)
  - May treat even longer (2-4 weeks) in males with UTI

Special cases of Complicated cystitis

- Indwelling foley catheter
  - Try to get rid of foley if possible!
  - Only treat patient when symptomatic (fever, dysuria)
    - Leukocytes on urinalysis
    - Patient's with indwelling catheters are frequently colonized with great deal of bacteria.
  - Should change foley before obtaining culture results, if possible
- Candiduria
  - Frequently occurs in patients with indwelling foley.
  - If grows in urine, try to get rid of foley!
  - Treat only if symptomatic.
  - If need to treat, give fluconazole (amphotericin if resistance)

Recurrent Cystitis

- Want to make sure urine culture and sensitivity obtained.
- May consider urologic work-up to evaluate for anatomical abnormality.
- Treat for 7-14 days.

- **Pyelonephritis**;
  - Most cases of "community-acquired" pyelonephritis are due to bowel organisms that enter the urinary tract. Common organisms are *E. coli* (70–80%).
  - Hospital-acquired infections may be due to coliform bacteria and enterococci, as well as other organisms uncommon in the community (e.g. *Pseudomonas aeruginosa* and various species of *Klebsiella*).

Pyelonephritis

- Associated with constitutional symptoms – fever, nausea, vomiting, headache
- Diagnosis:
  - Urinalysis, urine culture, CBC, Chemistry
- Treatment:
  - **2-weeks** of Trimethroprim/sulfamethoxazole or fluoroquinolone
  - Hospitalization and IV antibiotics if patient unable to take orally.
- Complications:
  - Perinephric/Renal abscess:
    - Suspect in patient who is not improving on antibiotic therapy.
    - Diagnosis: CT with contrast, renal ultrasound
    - May need surgical drainage.
  - Nephrolithiasis with UTI
    - Suspect in patient with severe flank pain
    - Need urology consult for treatment of kidney stone

Prostatitis

- Symptoms:
  - Pain in the perineum, lower abdomen, testicles, and with ejaculation. Bladder irritation, bladder outlet obstruction, and sometimes blood in the semen
- Diagnosis:
  - Typical clinical history (fevers, chills, dysuria, malaise, myalgias, pelvic/perineal pain, cloudy urine)
  - The finding of an edematous and tender prostate on physical examination
  - Will have an increased Prostate-specific antigen (PSA)
  - Urinalysis, urine culture
- Treatment:
  - Trimethoprim/sulfamethoxazole, fluroquinolone or other broad spectrum antibiotic
  - **4-6 weeks of treatment**
- Risk Factors:
  - Trauma
  - Dehydration

Urethritis

Etiology

- Infectious causes-

- Gonococcal – Neisseria gonorrhoea (50-90%)
- Non gonococcal –
  - -Chlamydia trachomatis. (20- 50%)
  - -Ureaplasma urealyticum. (20-80%)
  - -Mycoplasma genitalium. (10- 30%)
  - -Trichomonas vaginalis. (1- 70%)
  - - Yeast.
  - - HSV.

Non-Infectious causes

- Trauma
- Urethral stricture.
- Catheterization.
- Chemical irritants.
- Dehydration.

Urethritis

- *More in Men*
- *Chlamydia trachomatis (NGU)*
  - *STD*
  - NGU is more common in men than women. Men or Women might have less copious and less purulent discharge, burning or pain when urinating, Send UA, Urine culture (if pyuria seen, but no bacteria, suspect Chlamydia)
  - Pelvic exam – send discharge from cervical or urethral for chlamydia PCR
  - Treatment:
    - Azithromycin – 1 g po x 1
    - Doxycycline – 100 mg po BID x 7 days
- *Neisseria gonorrhoeae (GU)*
  - *STD*
  - May present with dysuria, purulent discharge, PID
  - Pelvic exam – send discharge samples for Gram-stained smear showing leukocytes with intracellular gram-negative diplococci , and made definitively when it is identified by culture or NAAT
  - Treatment:
    - Ceftriaxone, Levofloxacin, Spectinomycin
    - ***You should always also treat for chlamydia when treating for gonorrhea!***

non-specific urethritis

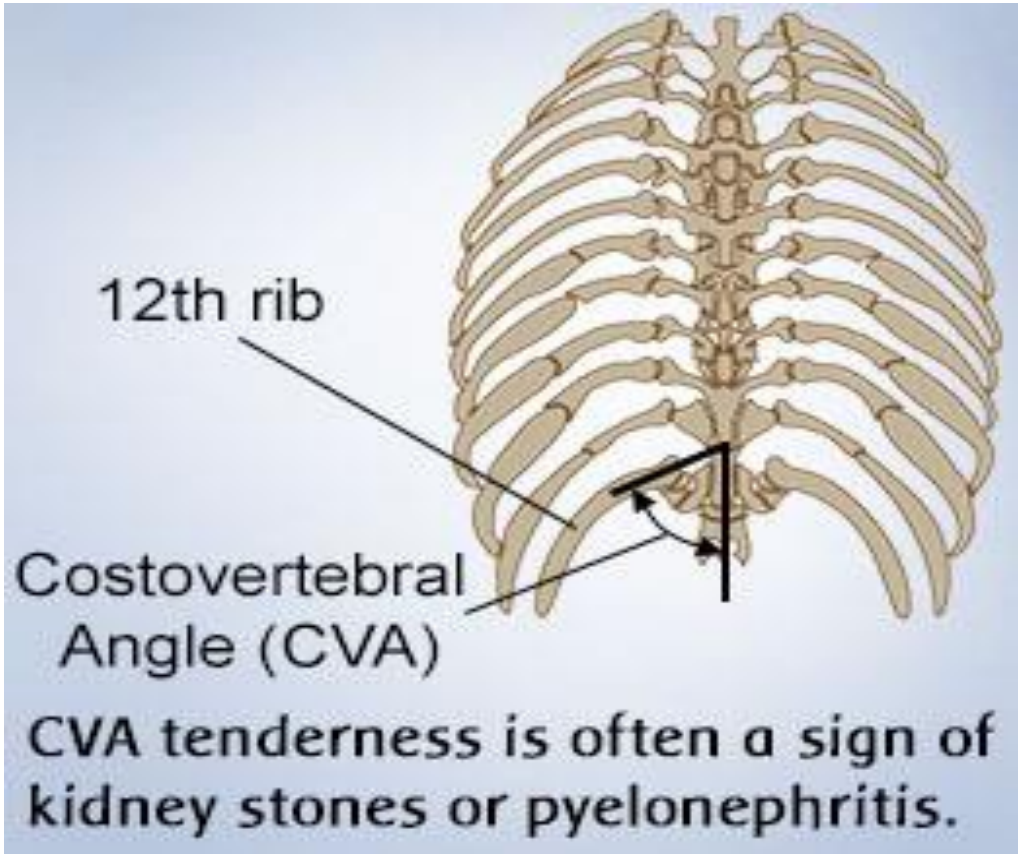
-Non-specific urethritis (NSU) when no specific pathogen is identified. Non-specific urethritis is a diagnosis of exclusion.

-Some times NGU is the same as NSU

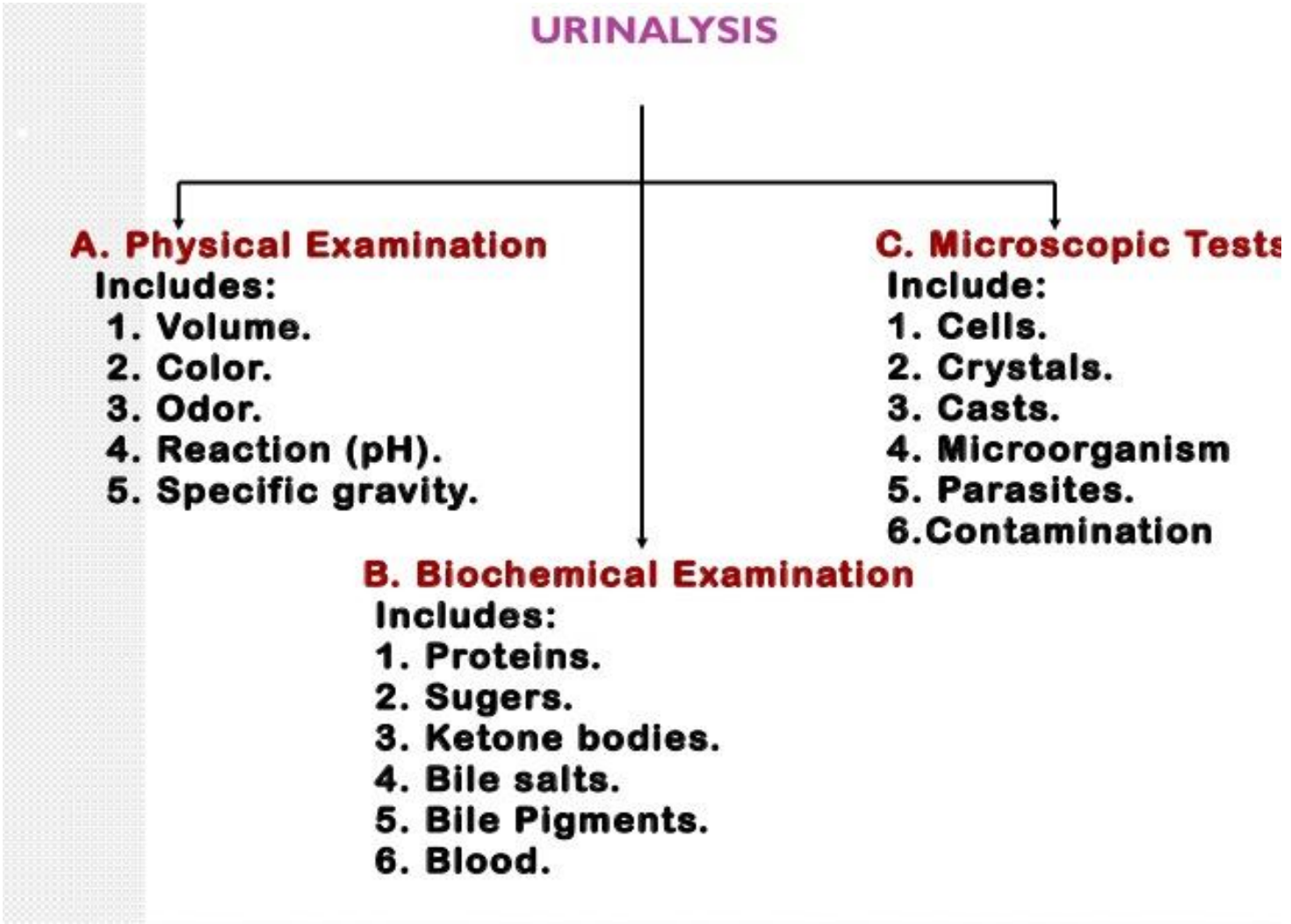
- sometimes distinguished and used to mean that both gonorrhea and chlamydia have been ruled out

Diagnosis

- Physical Exam:
  - CVA (Costovertebral angle) tenderness (**pyelonephritis**)
  - Urethral discharge (**urethritis**)
  - Tender prostate on DRE (Digital Rectal Exam) (**prostatitis**)
- biochemical test (UA) and urine microscopy, look for the presence of red blood cells white blood cells, or bacterial colony per mL.
- Urine culture, Staining and Antibiotic sensitivity can also be tested with these cultures
- However, women with negative cultures may still improve with antibiotic treatment


12th rib
Costovertebral
Angle (CVA)
CVA tenderness is often a sign of
kidney stones or pyelonephritis.

Urinalysis


URINALYSIS
A. Physical Examination
Includes:
1. Volume.
2. Color.
3. Odor.
4. Reaction (pH).
5. Specific gravity.
C. Microscopic Tests
Include:
1. Cells.
2. Crystals.
3. Casts.
4. Microorganism
5. Parasites.
6.Contamination
B. Biochemical Examination
Includes:
1. Proteins.
2. Sugers.
3. Ketone bodies.
4. Bile salts.
5. Bile Pigments.
6. Blood.

COLLECTION OF URINE

- Mid stream urine in adults
- Catheterization (hospitalized or elderly or sick infants)
- Suprapubic aspiration (infants)

- Describe color and clearness
- Normal urine is clear
- Normal urine should be a shade of yellow ranging from a straw to amber color
  - Cloudy means bacterial
  - Red means RBC
  - Brown means heamoglobin
  - Yellow-brown means bilirubin

Biochemical tests (dipstick) Urinalysis

- + Leukocyte esterase; it is a screening test used to detect a substance that suggests there are white blood cells in the urine and have UTI.
- + nitrites; Many types of bacteria change a normal chemical in your urine, called nitrates, into another chemical, called nitrites
  - More likely gram-negative rods
- Bilirubin in liver disease and jaundice
- Ketones;the endpoint of rapid or excessive fat breakdown, normally none, increase in ketoacidosis
- Glucose is usually none in healthy, if present means uncontrolled diabetes
- Protein usually are very small, Normally, you should have less than 150 milligrams (about 3 percent of a teaspoon) of protein in the urine per day. if increase means preeclampsia in pregnancy, nephrotic syndrome, glomerulonephritis,stress, or excess exercise

Follow UA

- PH and gravity. Normal urine PH ranges from 4.6 to 8.0
- The more concentrated the urine, the higher the urine specific gravity.
- Dehydration increase gravity.
- Normal urine ranges Gravity between 1.002 to 1.028

- Under microscope, positive if
  - WBC ≥5 in female
  - Any WBC in male
  - Bacteria ≥ 10^5 CFU/ml of urin in MSU, 10^3 in catheterization and 10^2 in suprapubic aspiration
  - Bacteriuria without pyuria; early infection, diabetes, enteric fever, bacterial endocarditis
  - Pyuria alone; TB, gonococcal urethritis or patient on antibiotics

Follow microscopy

- RBC (any number) means stones, schistosomas, acute glomerulonephritis, bacterial infections
- Yeast (any number) in candida
- Epithelial cells, usually normal to find low number but in high numbers means contamination
- Casts; indicate renal damage
- Crystals, calcium oxalate (stone)
- Parasites eggs of schistosoma. Trichominas vaginalis

Urine culture

- In the presence of bacteria
- Culture in blood agar or macconkey agar for E. coli, pseudomonas, proteus klebsiella and staph
- If TB is expected use lowenstein jensen medium
- S typhi and paratyphi found in the urine of about 25% OF patients with ENTERIC FEVER IN 3RD WEEK OF INFECTION
  - If S. typhi is expected use selenite broth and subculture in XLD medium

Gram stain

- Gram negative rods in E. coli, pseudomonas and proteus
- Gram positive cocci in streptococci and staph.saprophyticus
- ZIEHL-NEELSEN stain for TB

In those with recurrent UTI

- **Creating images of urinary tract.** If doctor suspects that an anatomical or functional abnormality in the urinary tract is causing frequent infections,
  - Kidney, ureters and bladder x ray (KUB film)
  - create images using ultrasound or computerized tomography (CT).
  - Another test called an intravenous urinary pyelogram uses X-rays to create images. During this test, a dye is injected into a vein in your arm and X-rays are taken of your urinary tract. The dye highlights the kidney, ureters, bladder and urethra and allows the doctor to determine if there are any abnormalities.
  - voiding cystourethrogram (functional) (watching a person's urethra and urinary bladder with real time x-rays while they urinate)
- **Using a scope to see inside the bladder.** a long, thin tube with a lens (cystoscope) is used to see inside urethra and bladder. The cystoscope is inserted in urethra and passed through to bladder. This procedure is called cystoscopy

prevention

- **Drink plenty of water** to dilute urine and help flush out bacteria .
- **Avoid drinks that may irritate your bladder .**Avoid coffee, alcohol, and soft drinks containing citrus juices and caffeine until infection has cleared. They can irritate bladder and tend to aggravate the frequent or urgent need to urinate .
- **Use a heating pad .**Apply a warm, but not hot, heating pad to abdomen to minimize bladder pressure or discomfort.
- Drink cranberry juice

- **Wipe from front to back .**Doing so after urinating and after a bowel movement helps prevent bacteria in the anal region from spreading to the vagina and urethra .
- **Empty your bladder soon after intercourse .**Also, drink a full glass of water to help flush bacteria .
- **Avoid potentially irritating feminine products .**Using deodorant sprays, in the genital area can irritate the urethra .

UTI complications

- Untreated urinary tract infections can lead to acute or chronic kidney infections (pyelonephritis), which could permanently damage kidneys mainly in young children.
- Young children also have an increased risk of kidney infections.
- Pregnant women who have urinary tract infections may have an increased risk of delivering low birth weight or premature infants.and kidney infection
- Women who experience three or more urinary tract infections are likely to continue experiencing them .