Urinary Tract Infection(UTI) in Children

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Texas Community and State
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Disclaimer

I have no actual or potential conflict of interest in relation to any product or service mentioned in this program or presentation.

Learning Objectives

1 **Describe the urinary tract anatomy and discuss where and how infections of the urinary track can occur**

2 **Recognize how UTIs present in children**

3 **Examine the assessment for UTIs and the recommended treatments**

What is the Urinary Tract?

What is the Urinary Tract?

2 Kidneys

- in the upper part of the abdomen
- one on each side

Bladder

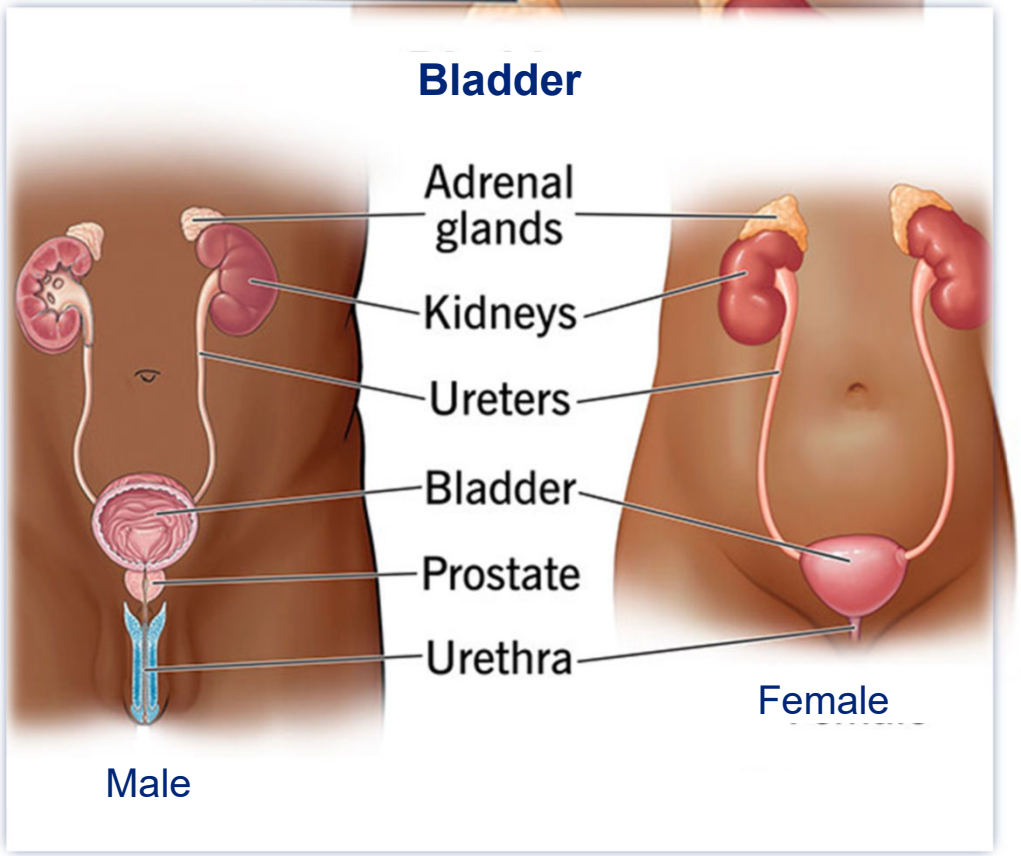
- behind the pubic bone

2 Ureters

- Each connects a kidney to the bladder

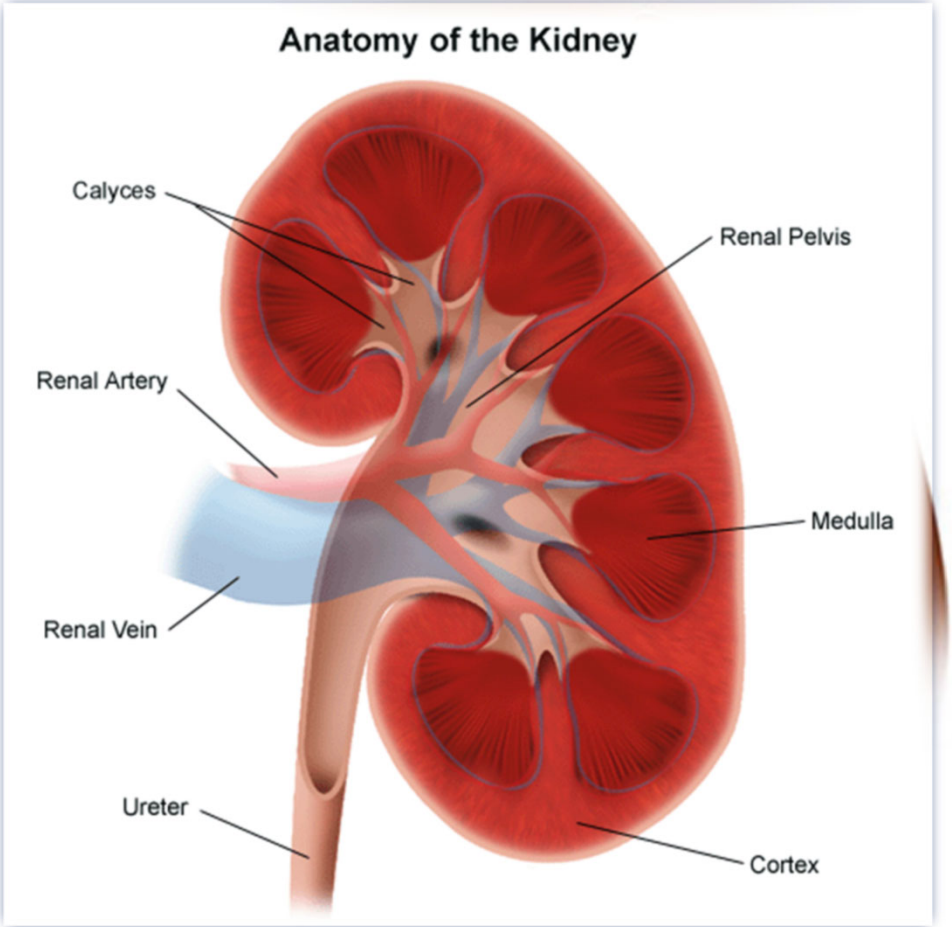
Urethra

- from the bladder to the outside
- through the penis or opening above the vagina

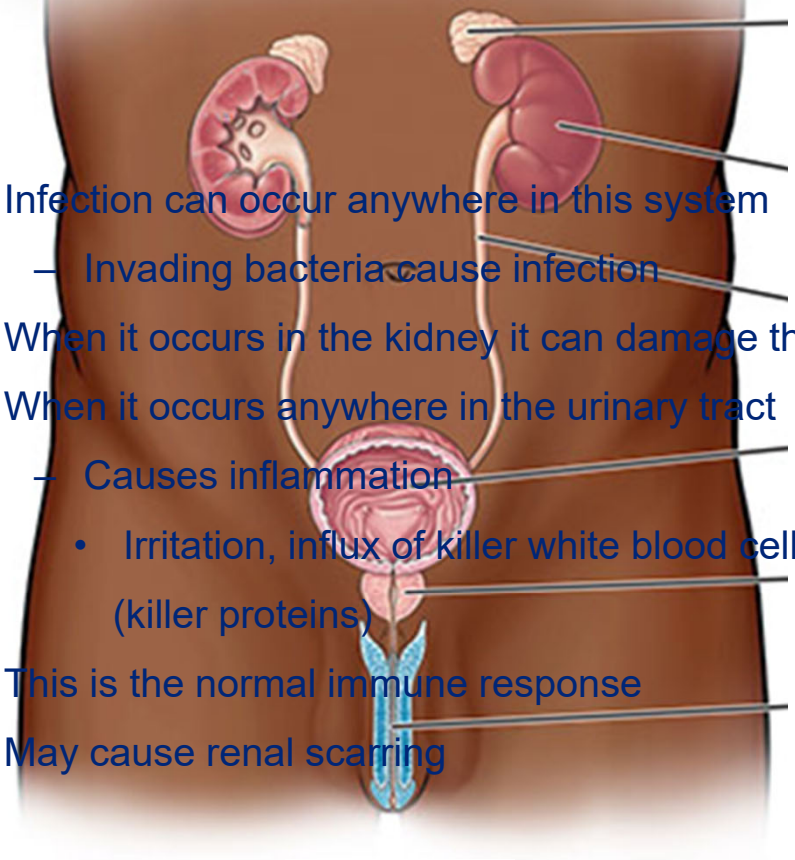


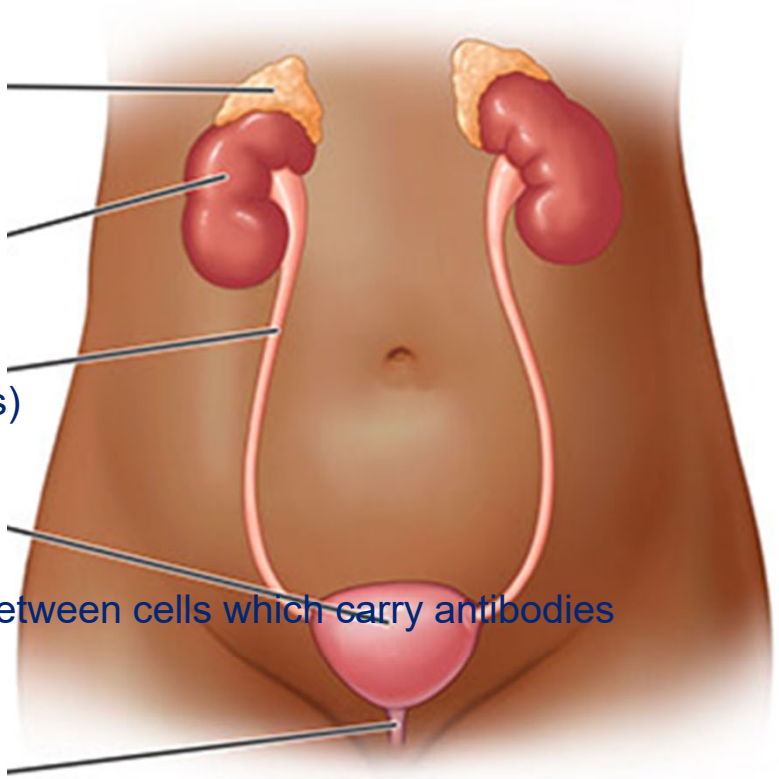
The Urinary Tract

- Each kidney has an artery supplying blood and a vein taking blood out
- The outer layer is the cortex
- The medulla is the middle layer
- The renal pelvis is the urine collecting system
- The blood supply and the collecting system are directly not connected
- Urine and waste substances are filtered out of the blood in the medulla by nephrons
- Urine collects in the collecting system and drains into the bladder through ureters



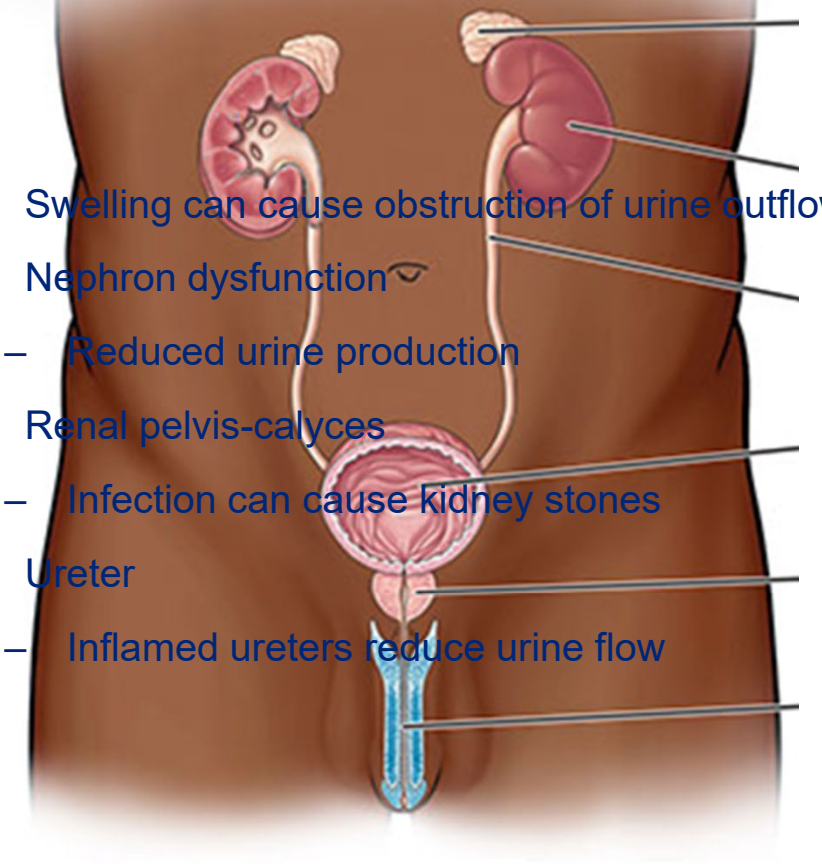
Where Does Infection Occur?



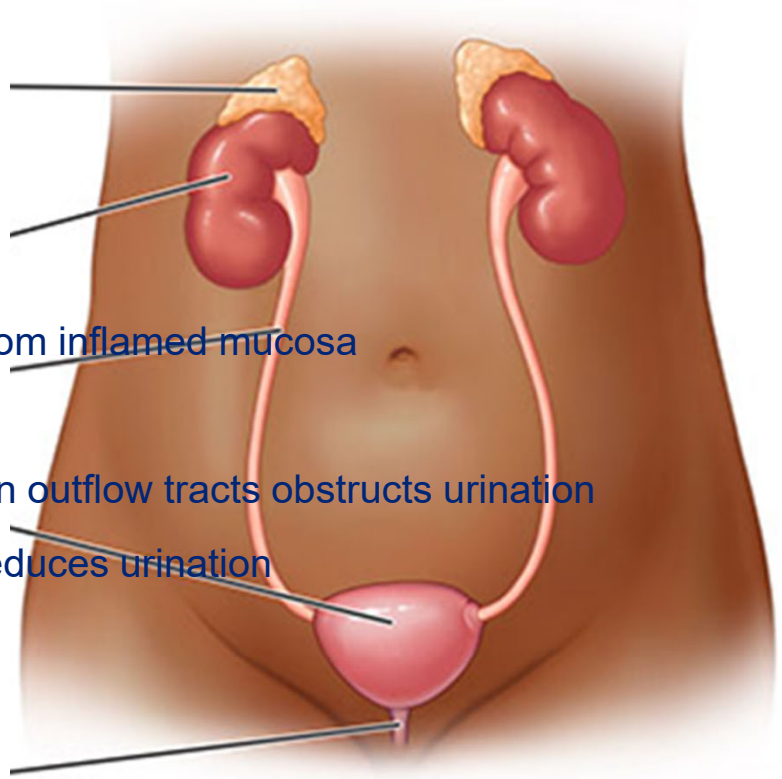


- Infection can occur anywhere in this system
  - Invading bacteria cause infection
- When it occurs in the kidney it can damage the filters (nephrons)
- When it occurs anywhere in the urinary tract
  - Causes inflammation
    - Irritation, influx of killer white blood cells, increase fluid between cells which carry antibodies (killer proteins)
- This is the normal immune response
- May cause renal scarring

Where Does Infection Occur?

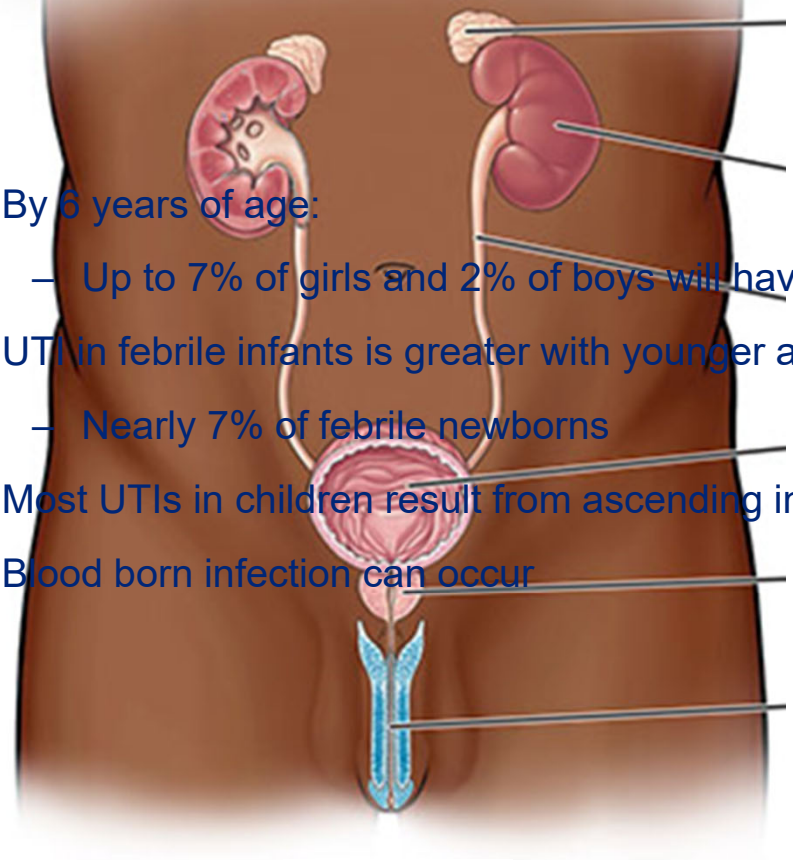


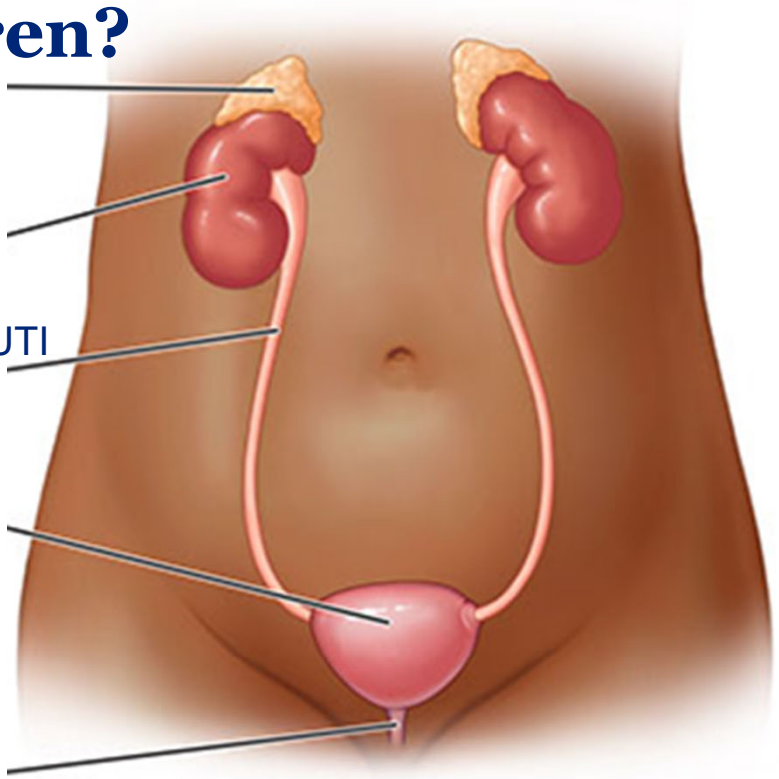
- Swelling can cause obstruction of urine outflow
- Nephron dysfunction
  - Reduced urine production
- Renal pelvis-calyces
  - Infection can cause kidney stones
- Ureter
  - Inflamed ureters reduce urine flow



- Bladder
  - Pain from inflamed mucosa
- Urethra
  - Swollen outflow tracts obstructs urination
  - Pain reduces urination

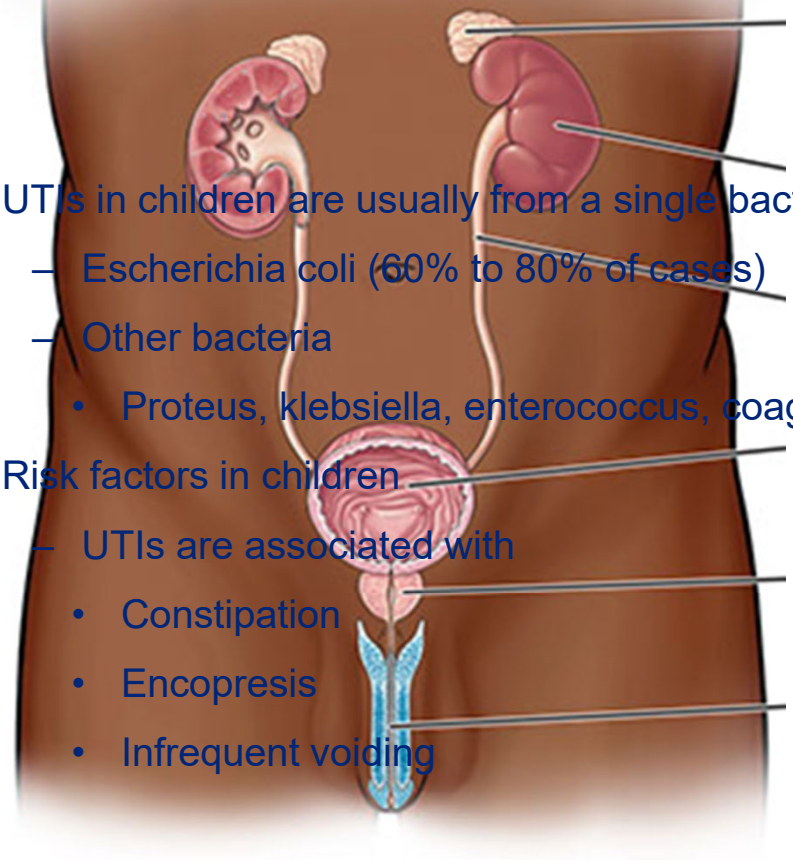
How Does UTI Present in Children?

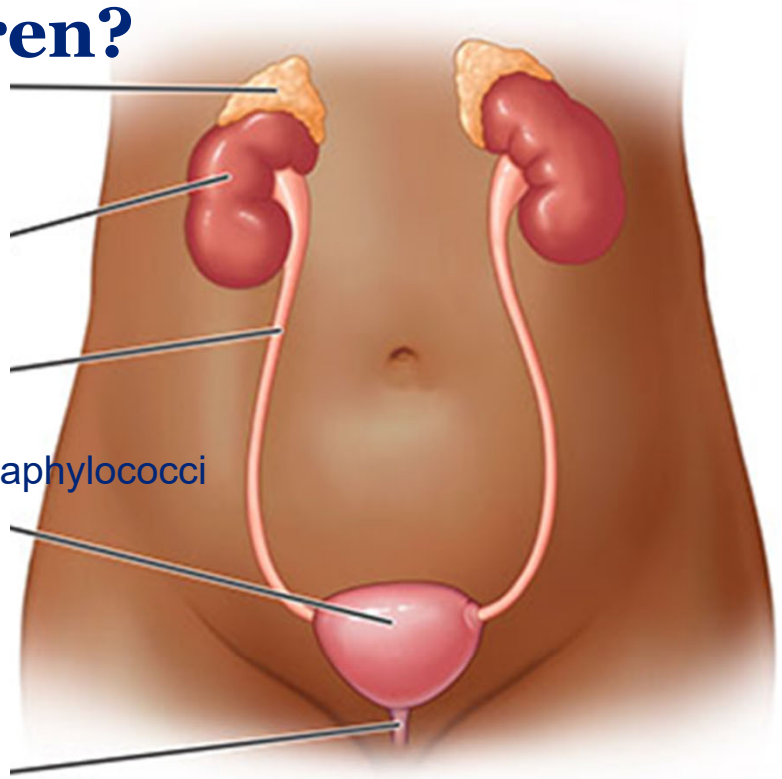




- By 6 years of age:
  - Up to 7% of girls and 2% of boys will have a symptomatic UTI
- UTI in febrile infants is greater with younger age
  - Nearly 7% of febrile newborns
- Most UTIs in children result from ascending infections
- Blood born infection can occur

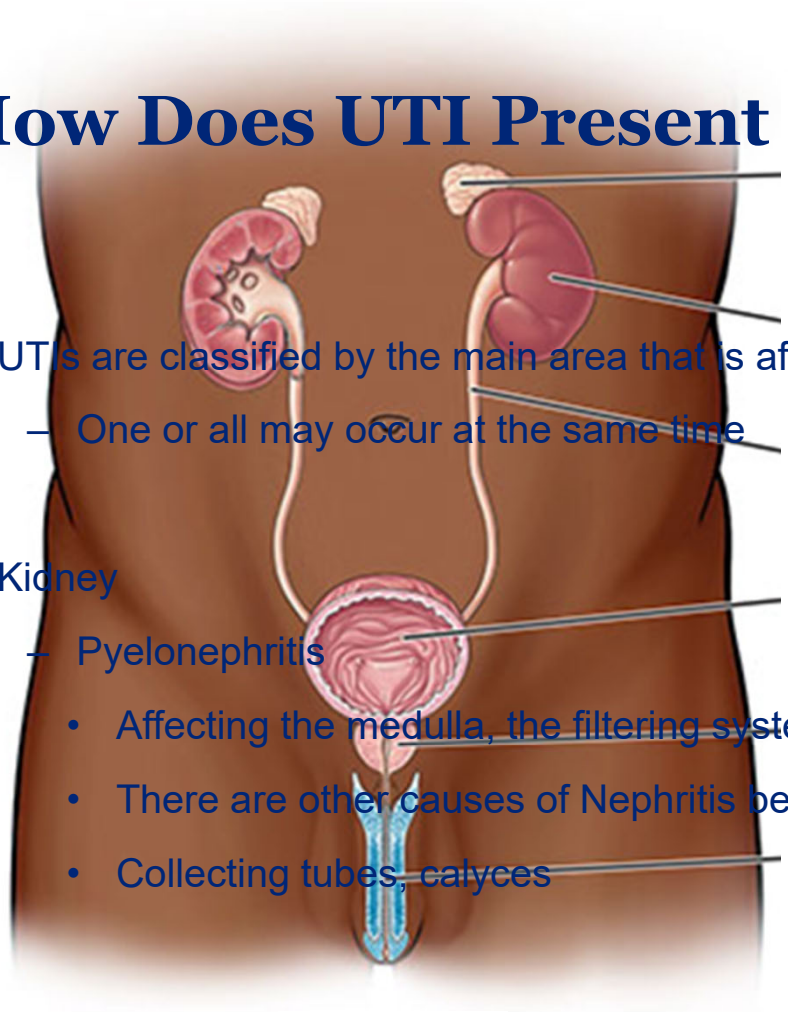
How Does UTI Present in Children?



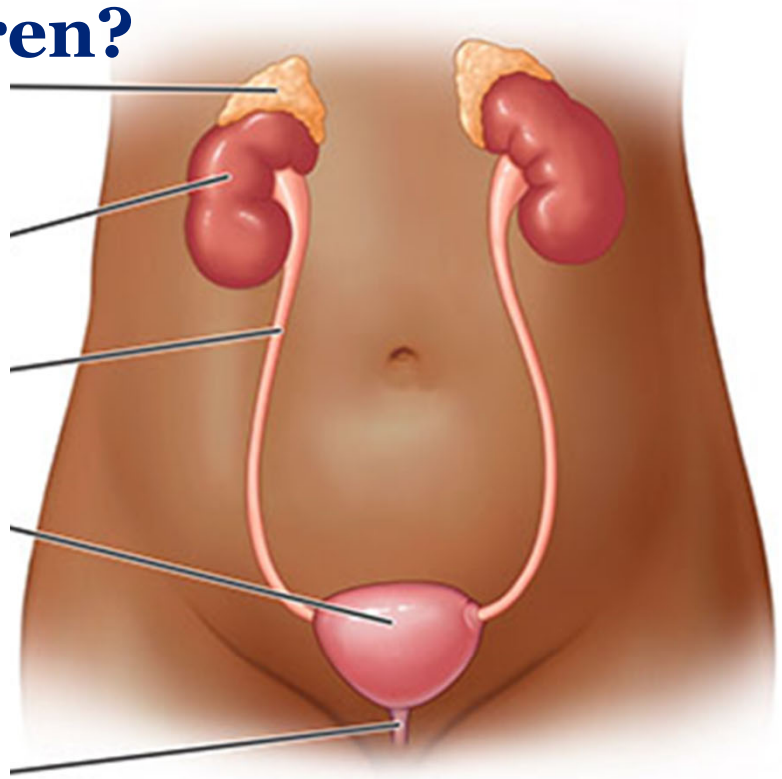


- UTIs in children are usually from a single bacteria
  - Escherichia coli (60% to 80% of cases)
  - Other bacteria
    - Proteus, klebsiella, enterococcus, coagulase-negative staphylococci
- Risk factors in children
  - UTIs are associated with
    - Constipation
    - Encopresis
    - Infrequent voiding

How Does UTI Present in Children?

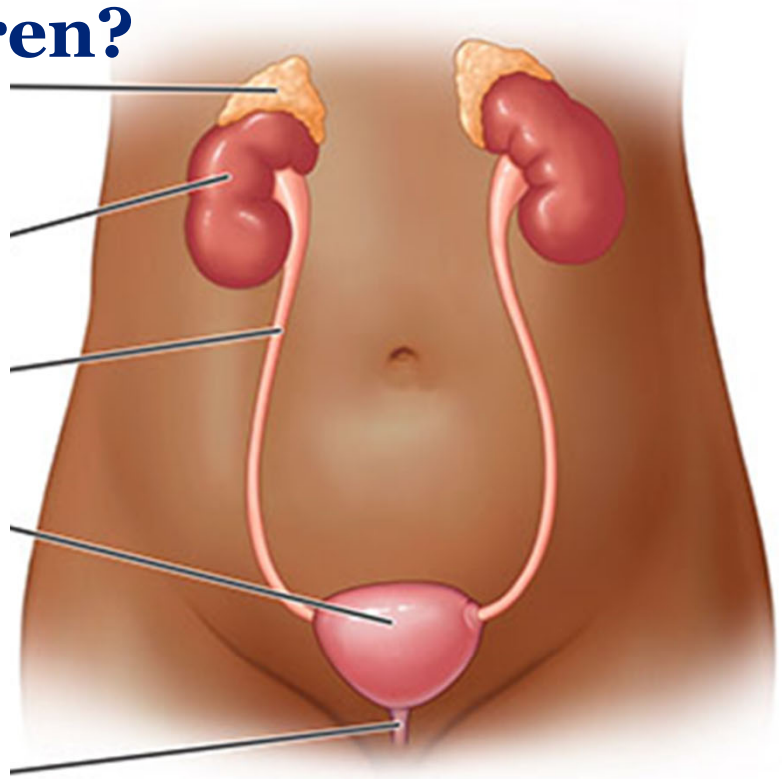


- UTIs are classified by the main area that is affected
  - One or all may occur at the same time
- Kidney
  - Pyelonephritis
    - Affecting the medulla, the filtering system
    - There are other causes of Nephritis beside infection
    - Collecting tubes, calyces



How Does UTI Present in Children?

- UTIs are classified by the main area that is affected
  - One or all may occur at the same time
- Ureters
  - Ureteritis
- Bladder
  - Cystitis
- Urethra
  - Urethritis



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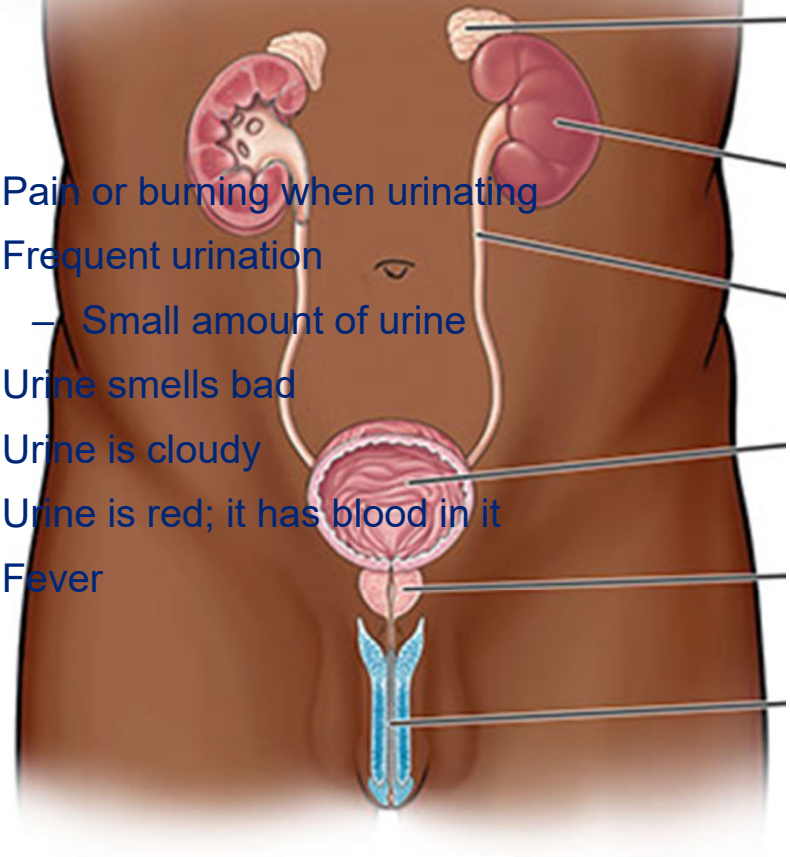
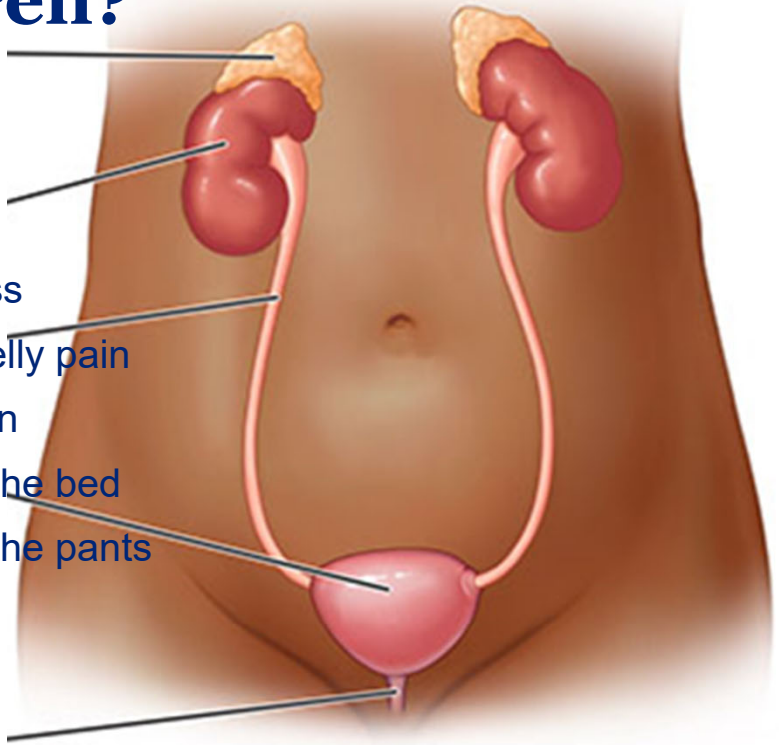
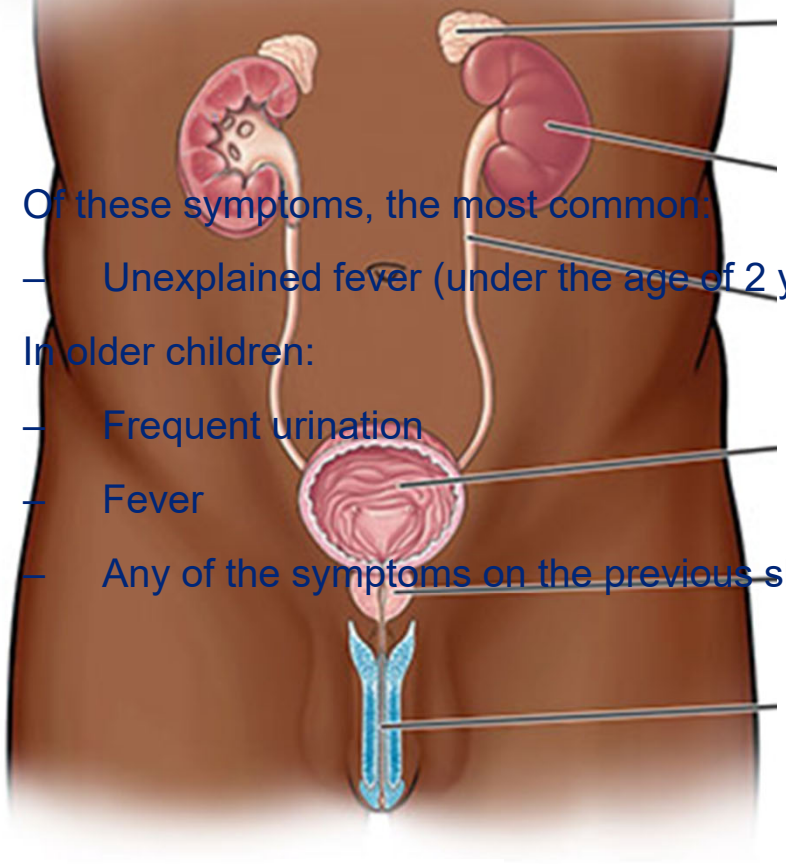


- Pain or burning when urinating
- Frequent urination
  - Small amount of urine
- Urine smells bad
- Urine is cloudy
- Urine is red; it has blood in it
- Fever

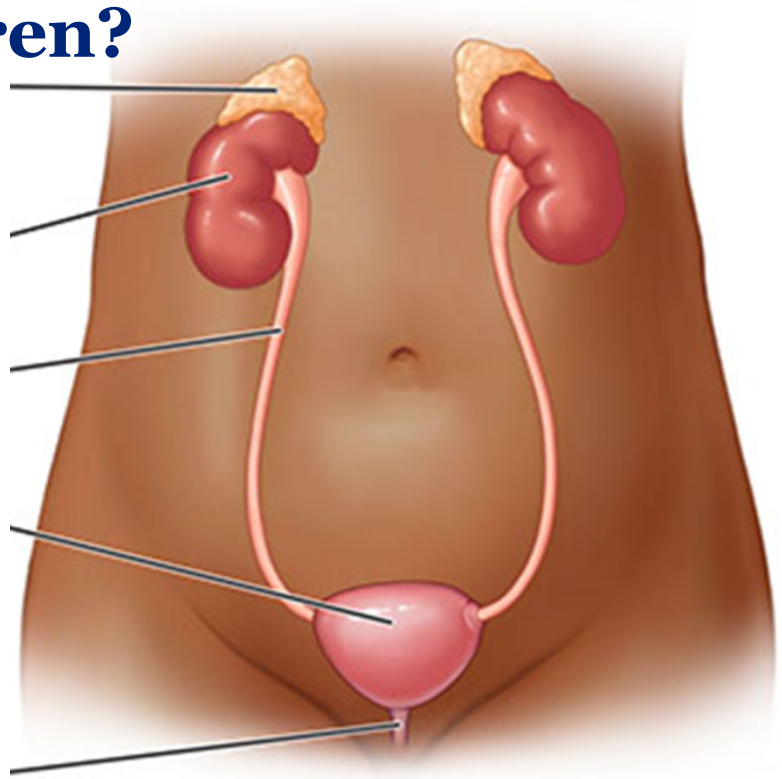


- Vomiting
- Fussiness
- Lower belly pain
- Back pain
- Wetting the bed
- Wetting the pants

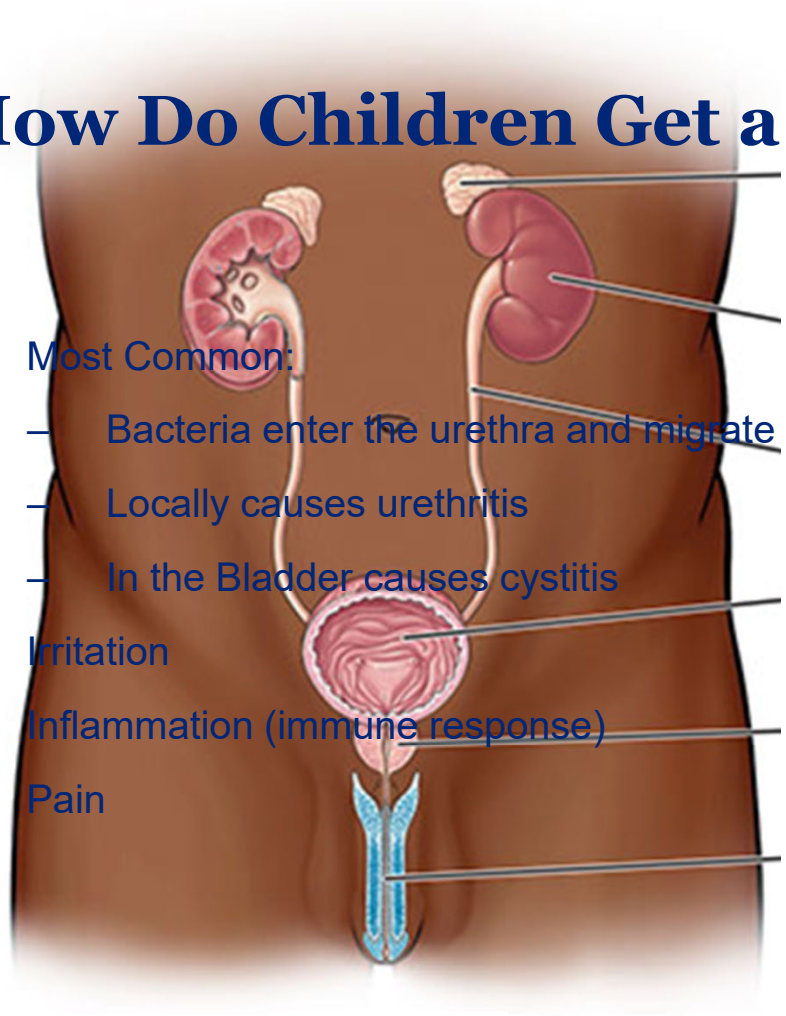
How Does UTI Present in Children?



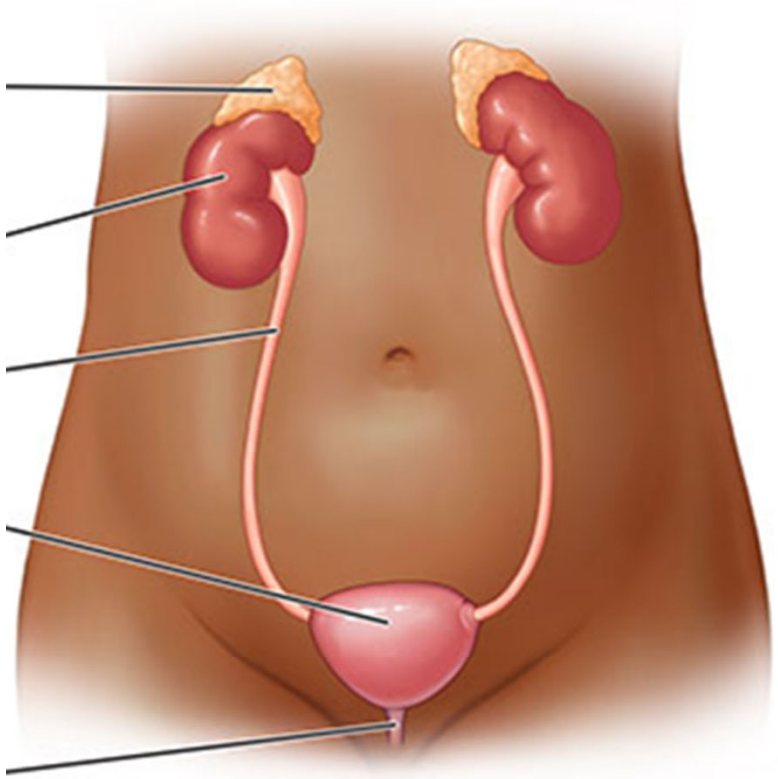
- Of these symptoms, the most common:
  - Unexplained fever (under the age of 2 years)
- In older children:
  - Frequent urination
  - Fever
  - Any of the symptoms on the previous slide



How Do Children Get a UTI?



- Most Common:
  - Bacteria enter the urethra and migrate into the bladder
  - Locally causes urethritis
  - In the Bladder causes cystitis
- Irritation
- Inflammation (immune response)
- Pain



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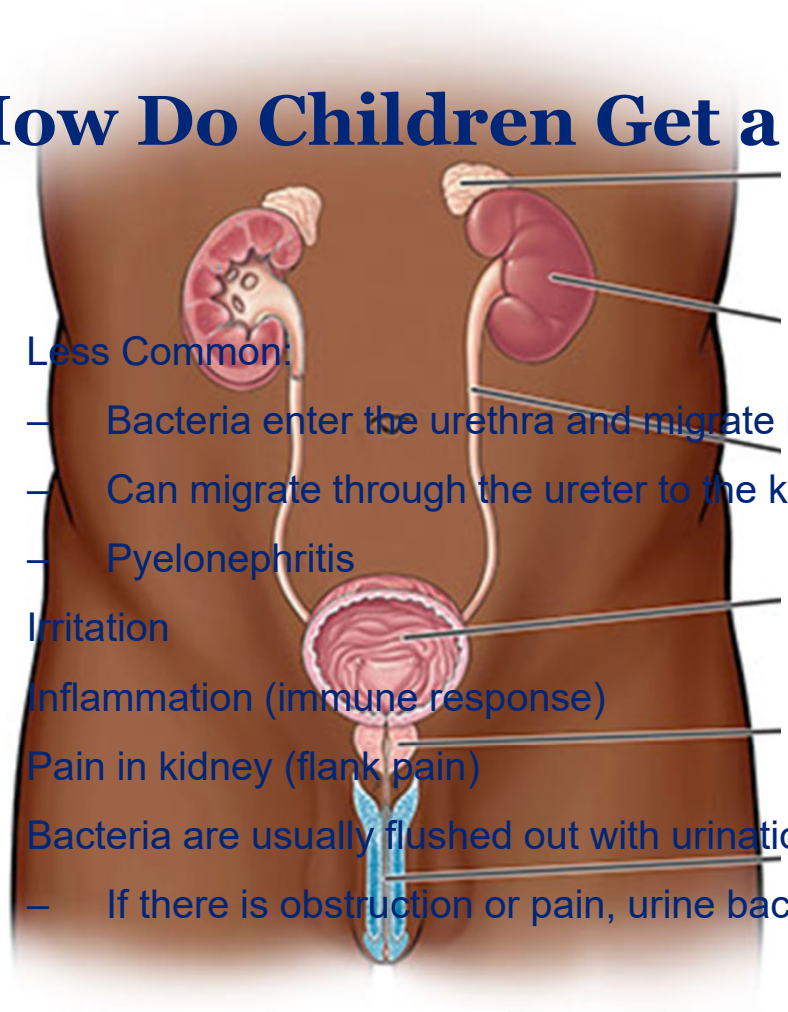
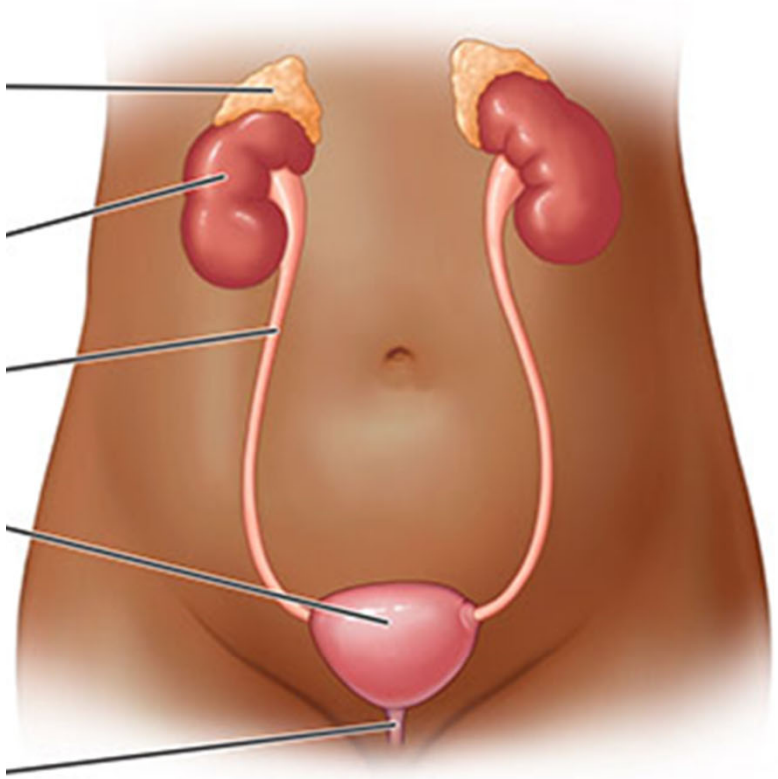
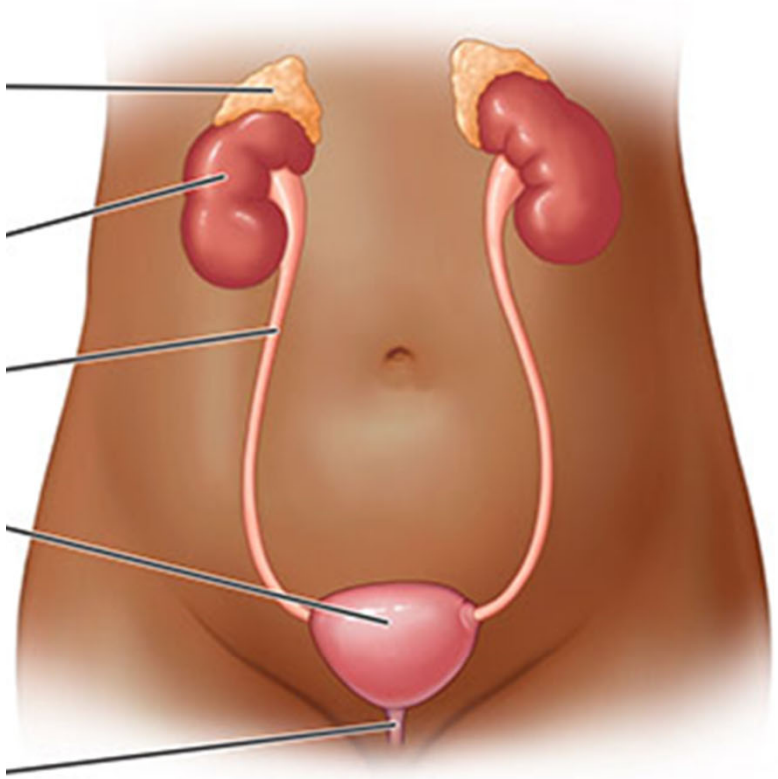


- Less Common:
  - Bacteria enter the urethra and migrate into the bladder
  - Can migrate through the ureter to the kidney
  - Pyelonephritis
- Irritation
- Inflammation (immune response)
- Pain in kidney (flank pain)
- Bacteria are usually flushed out with urination
  - If there is obstruction or pain, urine backs up: kidneys

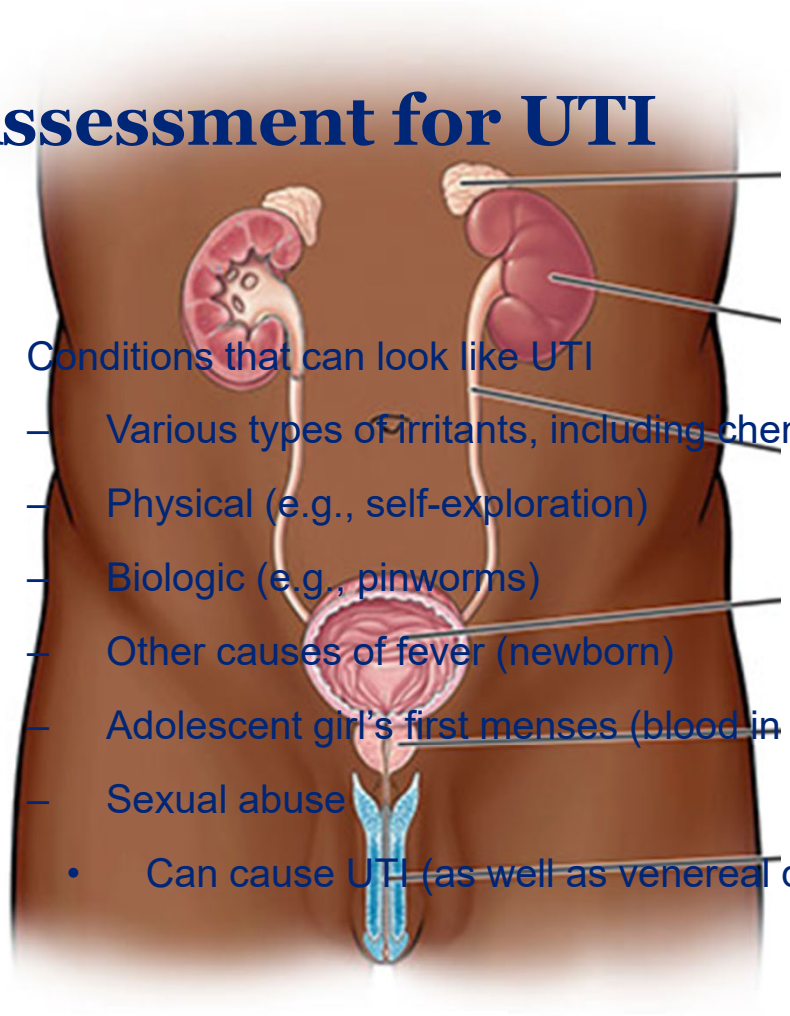


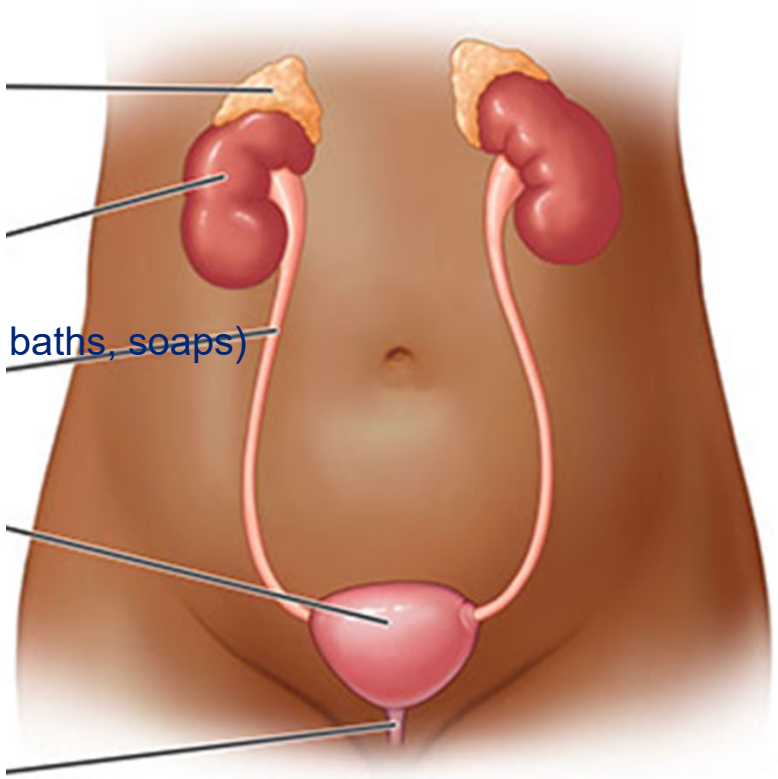
How Do Children Get a UTI?

- Causes:
  - Poor hygiene
  - Wiping in the wrong direction
  - Delaying urination
  - Dehydration (minimal urine-decreased washing out)
  - Use of bubble baths, especially for girls
  - Tight-fitting clothes for girls
  - Birth defects resulting backward flow of urine
  - Uncircumcised males (10 times more frequent)



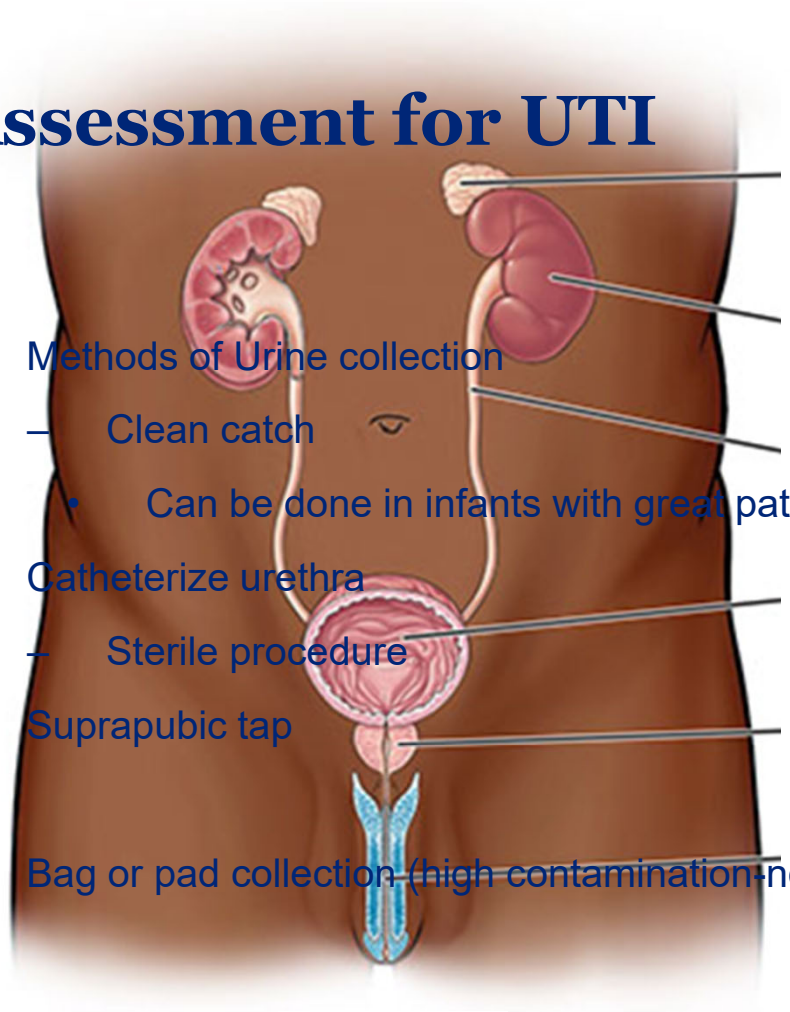
Assessment for UTI



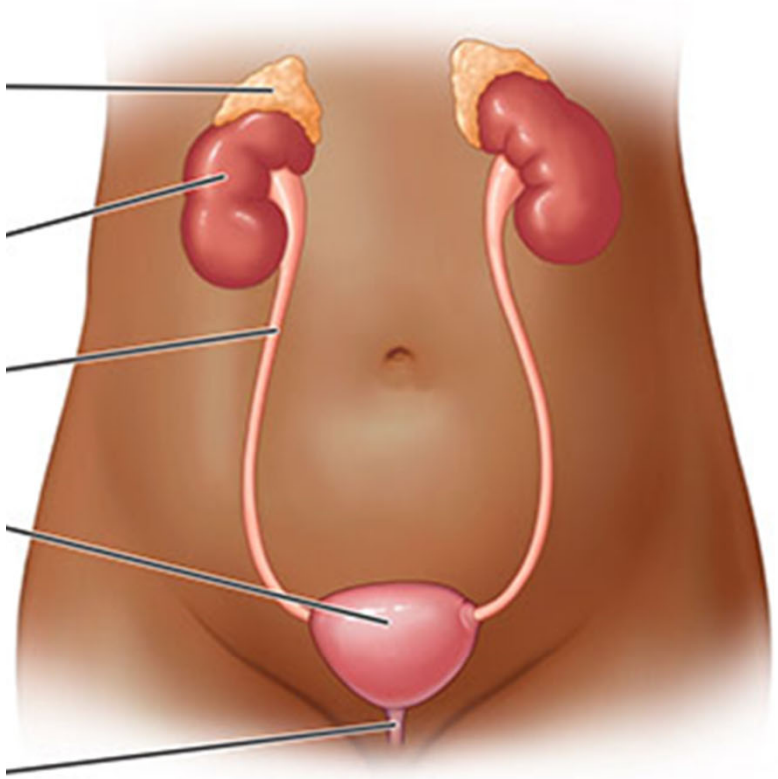


- Conditions that can look like UTI
  - Various types of irritants, including chemical (e.g., bubble baths, soaps)
  - Physical (e.g., self-exploration)
  - Biologic (e.g., pinworms)
  - Other causes of fever (newborn)
  - Adolescent girl's first menses (blood in the urine)
  - Sexual abuse
    - Can cause UTI (as well as venereal disease)

Assessment for UTI



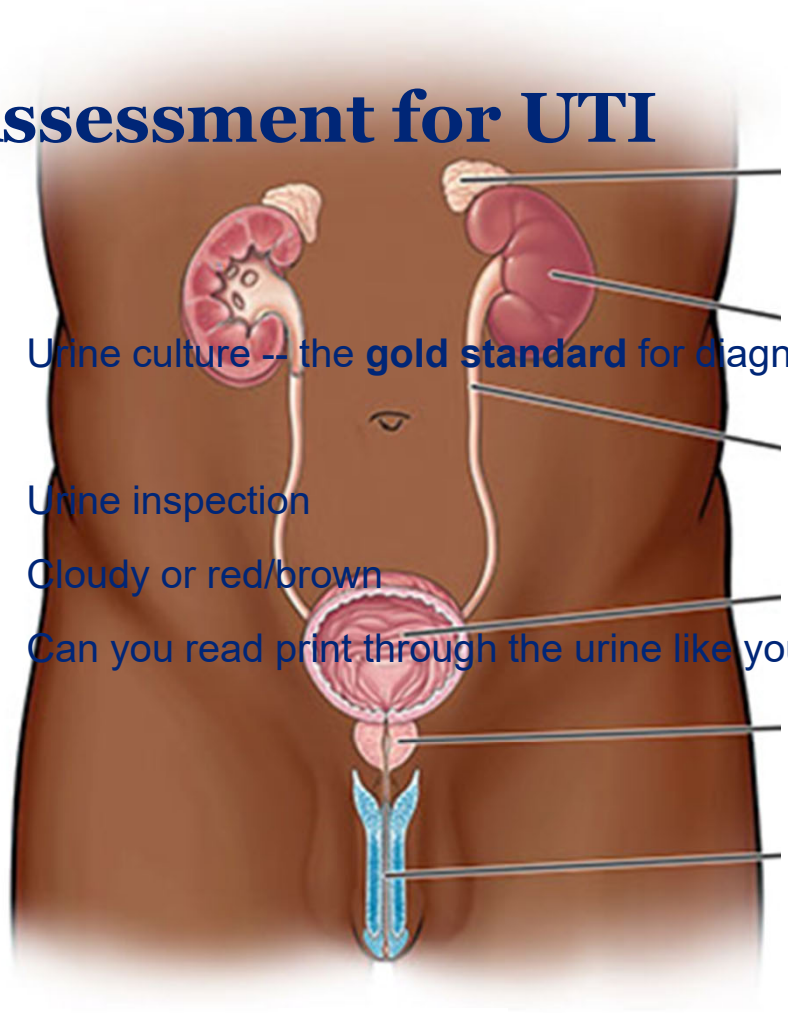
- Methods of Urine collection
  - Clean catch
    - Can be done in infants with great patience
- Catheterize urethra
  - Sterile procedure
- Suprapubic tap
- Bag or pad collection (high contamination-not recommended)

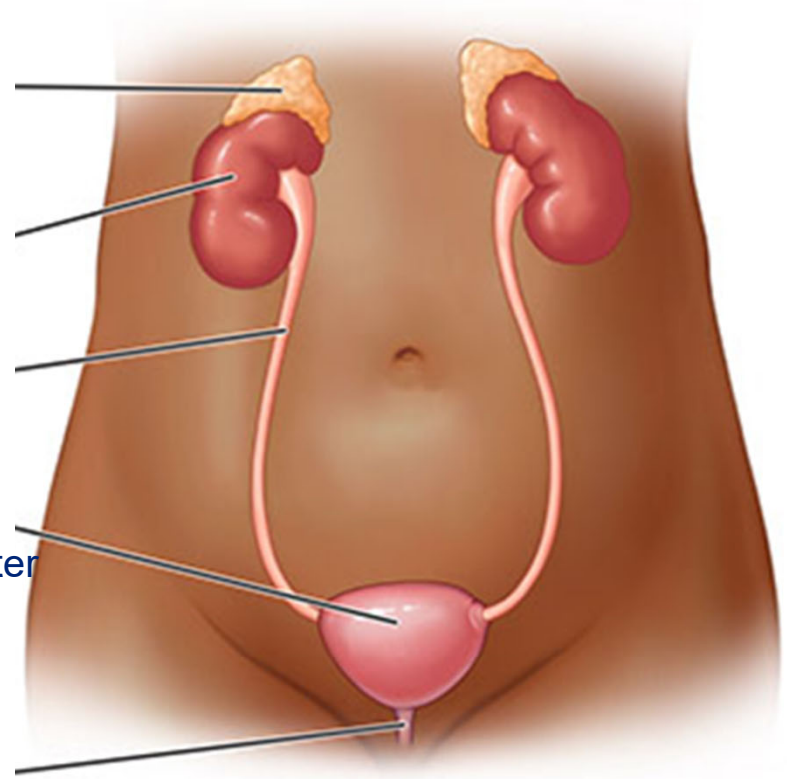


Assessment for UTI

- Urine culture -- the **gold standard** for diagnosis

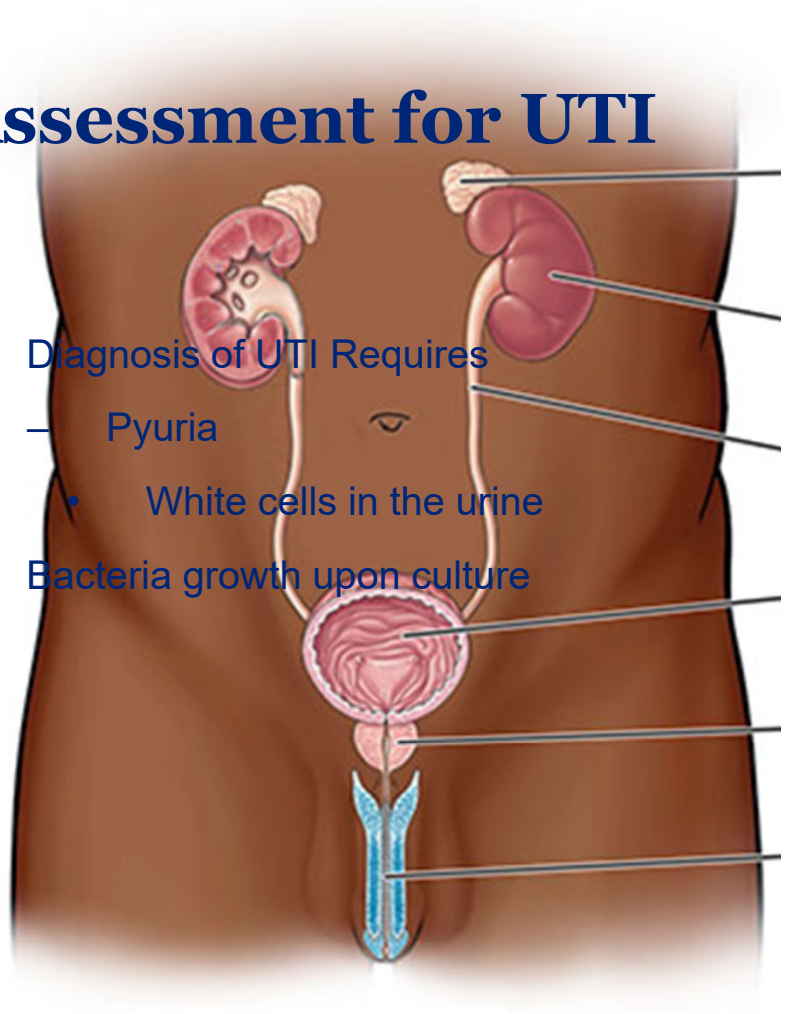
- Urine inspection
- Cloudy or red/brown
- Can you read print through the urine like you can through water

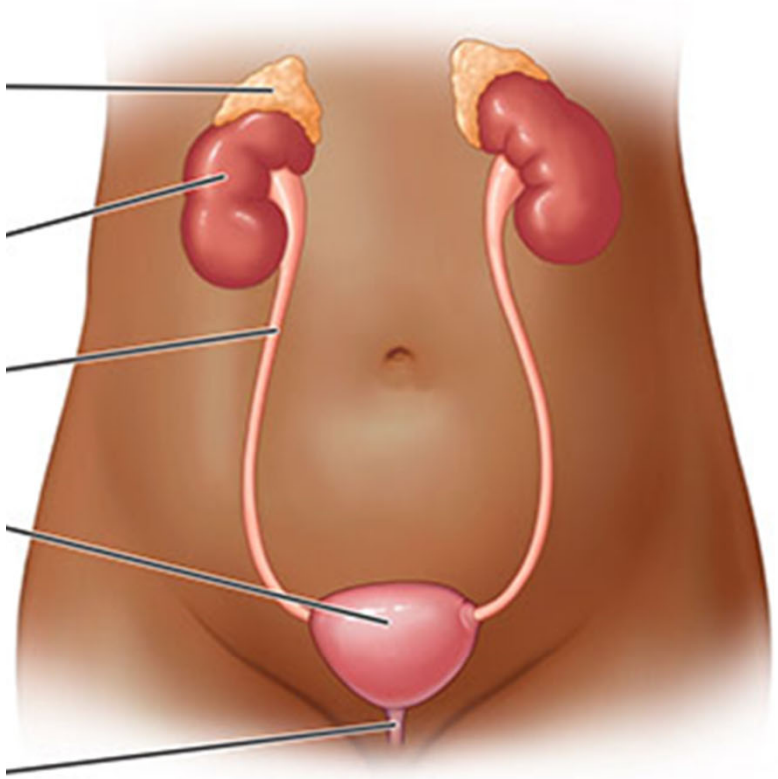




Assessment for UTI

- Diagnosis of UTI Requires
  - Pyuria
    - White cells in the urine
- Bacteria growth upon culture





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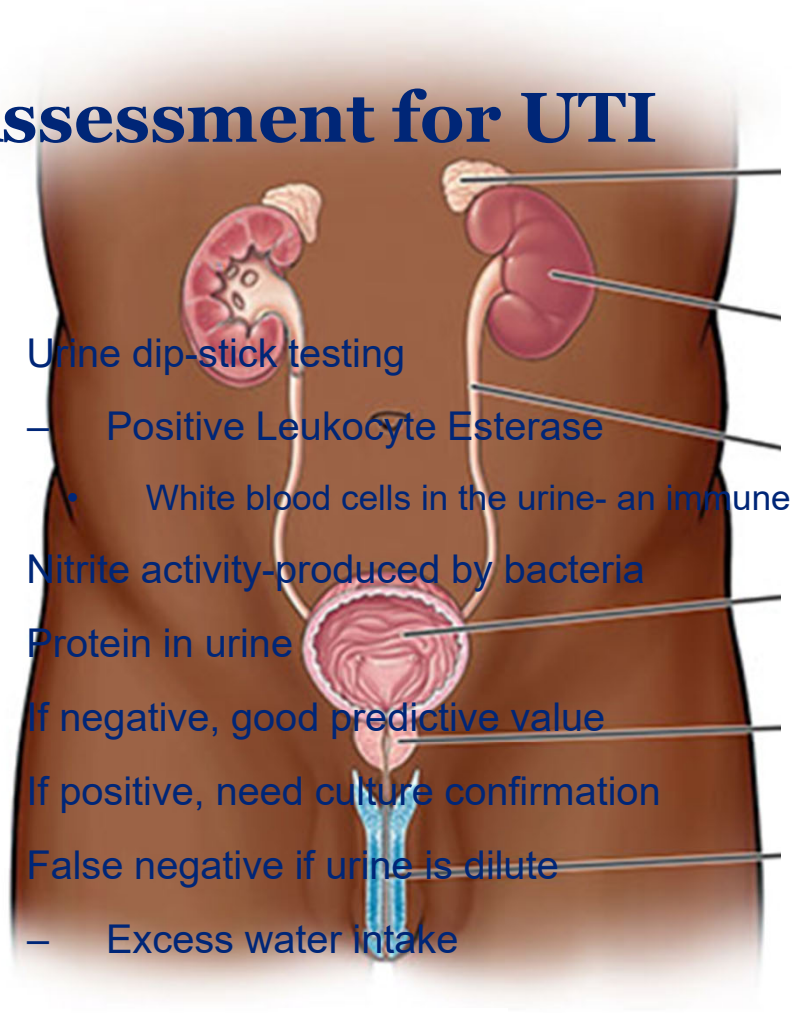
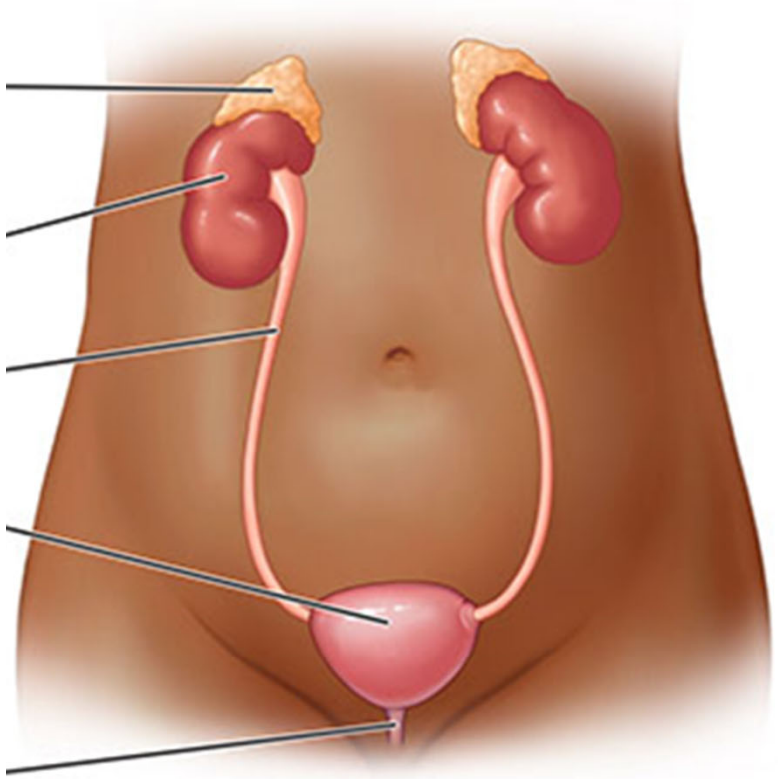
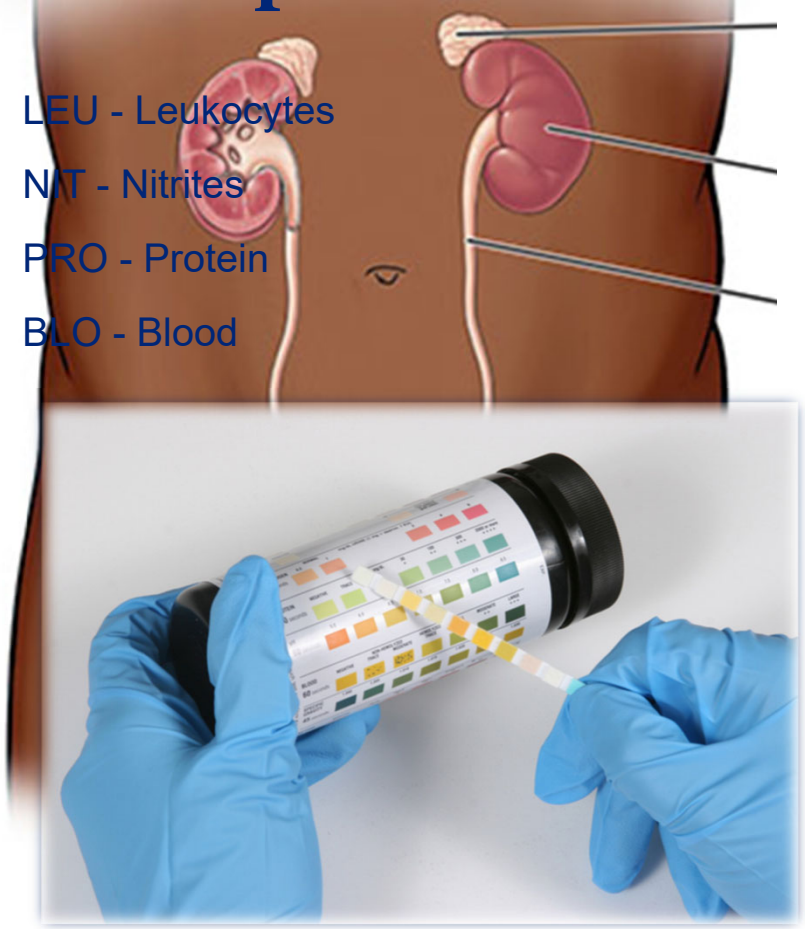


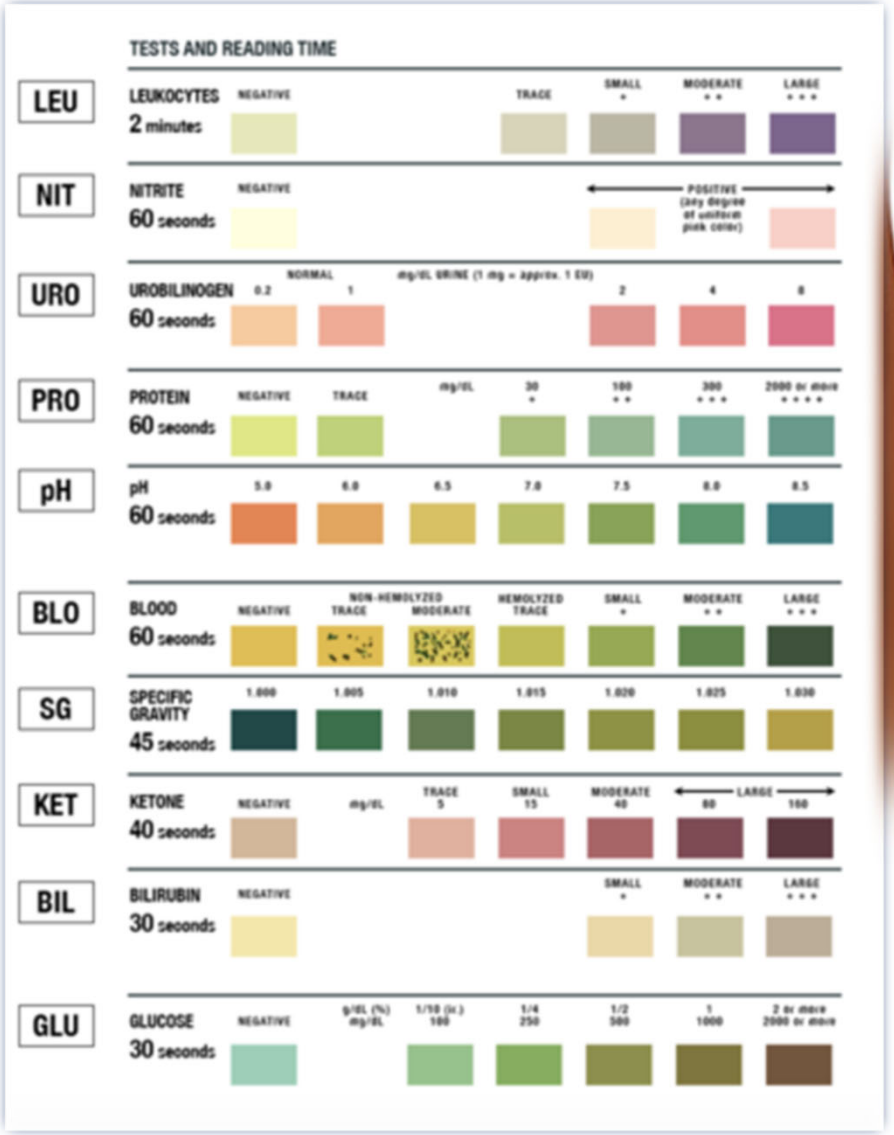
- Urine dip-stick testing
  - Positive Leukocyte Esterase
    - White blood cells in the urine- an immune response
- Nitrite activity-produced by bacteria
- Protein in urine
- If negative, good predictive value
- If positive, need culture confirmation
- False negative if urine is dilute
  - Excess water intake



Urine Dipstick Test

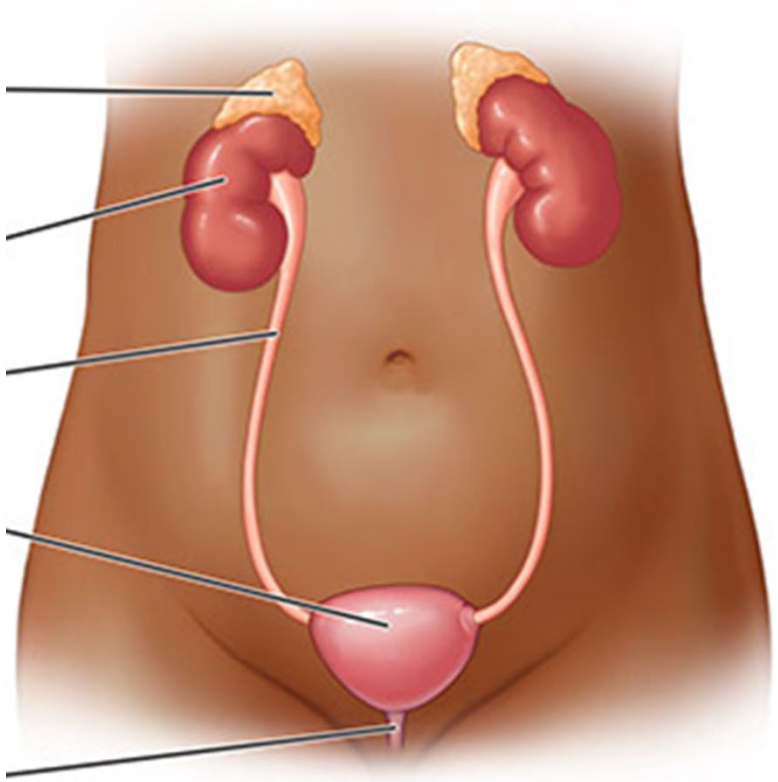
- LEU - Leukocytes
- NIT - Nitrites
- PRO - Protein
- BLO - Blood





Assessment for UTI

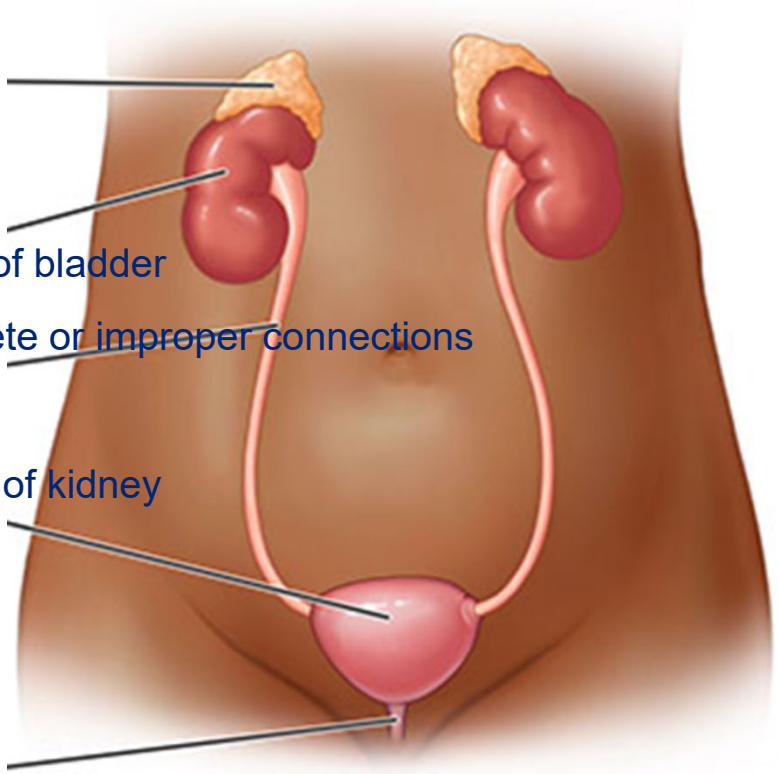
- Imaging studies
  - May not be necessary for first uncomplicated UTI
- Voiding cystourethrogram (X-ray), VCUG
- Ultrasound (US) evaluation kidneys and bladder
- Renal Scan
  - Magnetic Resonance Imaging - MRI
  - Computerized Tomography - CT



Assessment for UTI
What Are We Looking For?

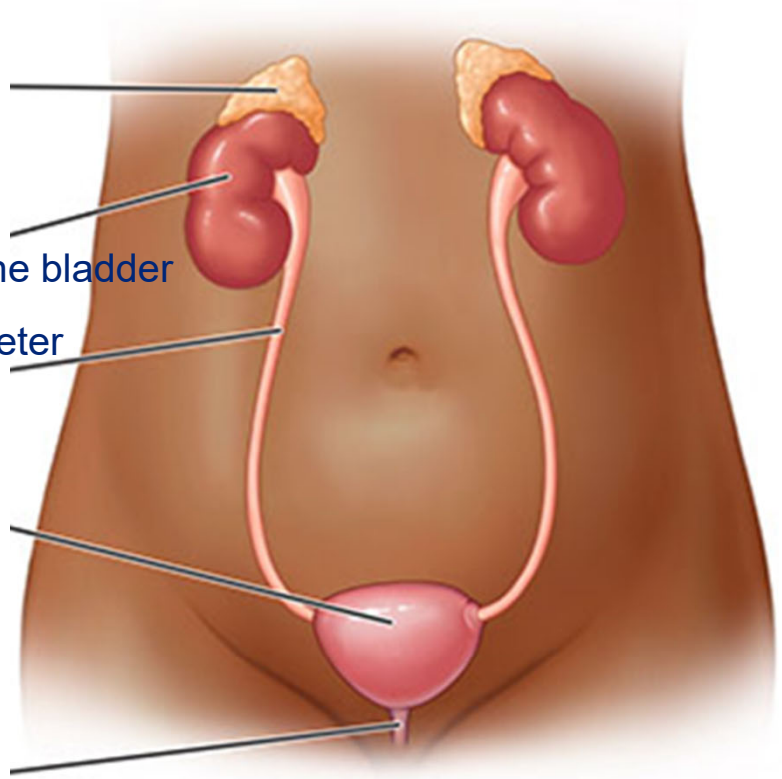
- Urinary reflux
- Obstruction
- Defects of the kidney
  - Horseshoe kidney
- Misplaced kidney

- Defects of bladder
- Incomplete or improper connections
- Tumor
- Scarring of kidney

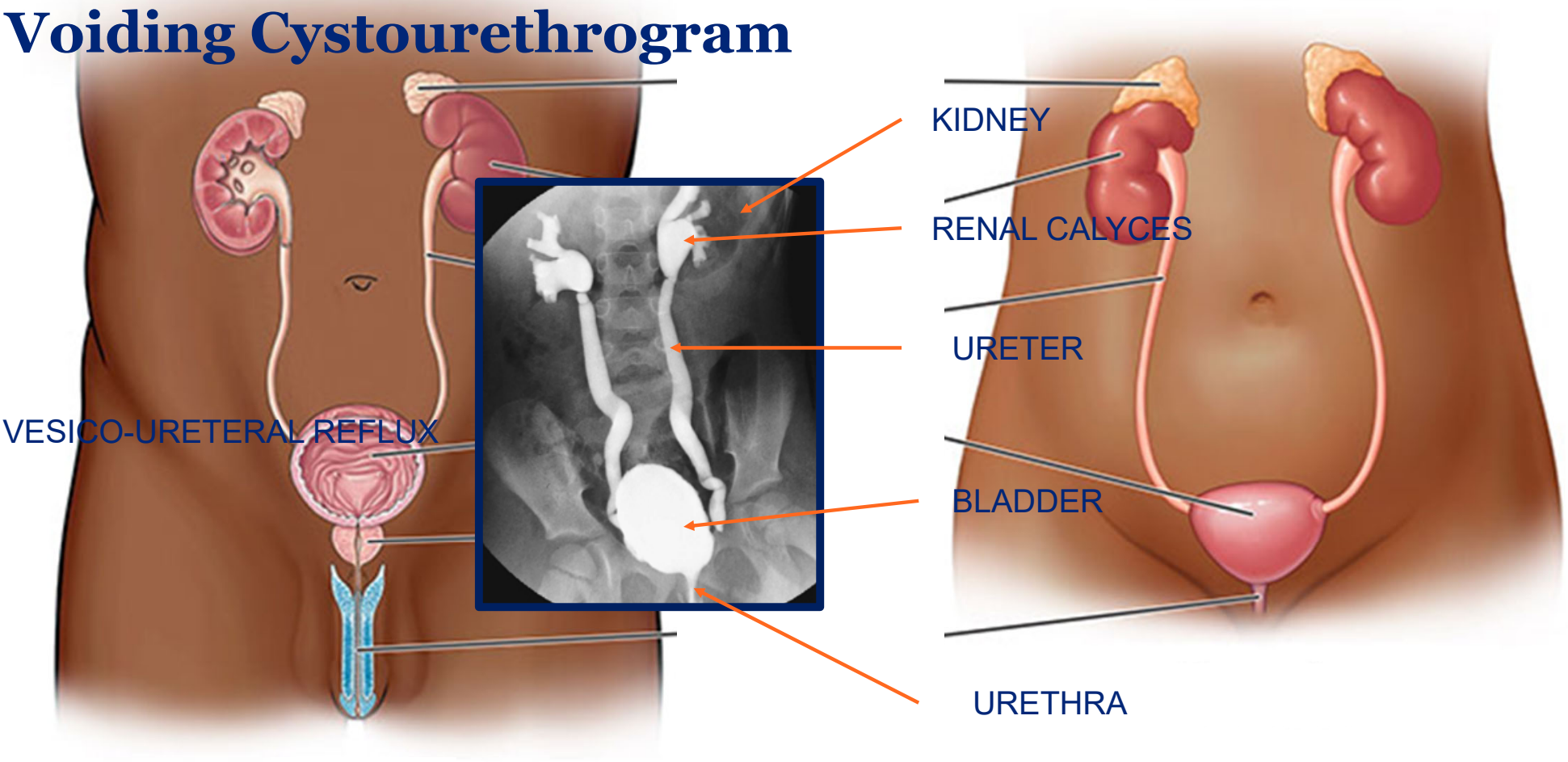


Voiding Cystourethrogram

- A catheter (thin tube) will be inserted into the urethra and into the bladder
- A contrast dye will be injected into the bladder through the catheter
- X-rays will be taken as the bladder fills and empties



Voiding Cystourethrogram



Urinary Tract Imaging

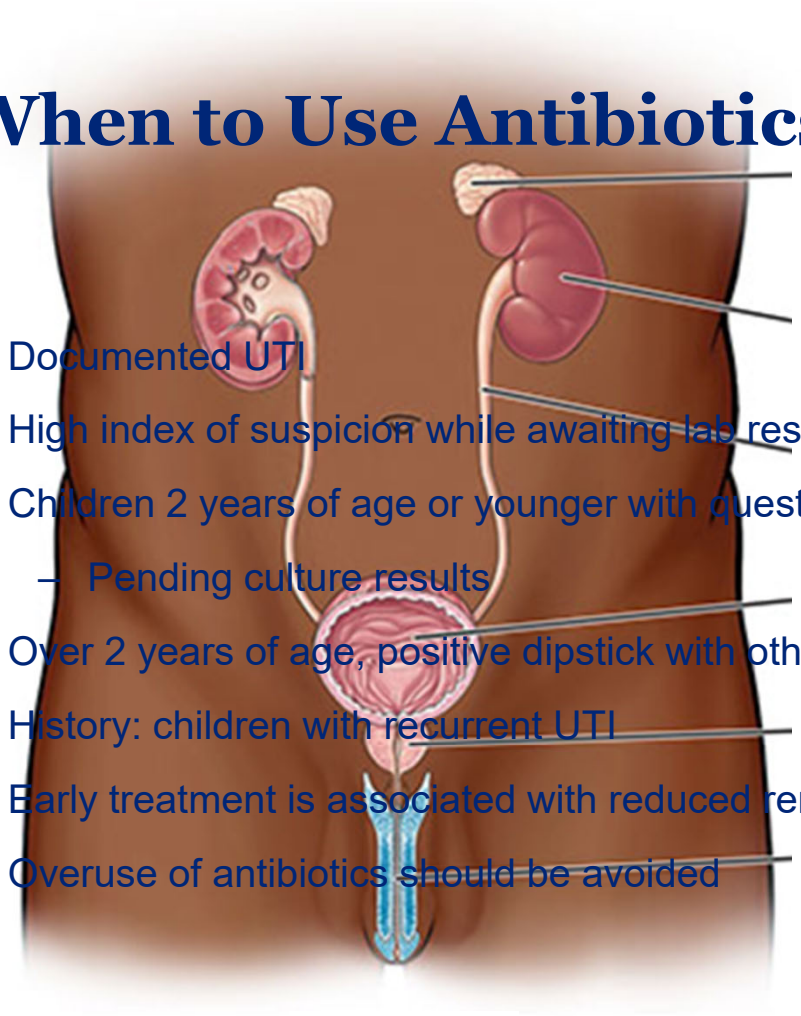
MRI KIDNEYS

CT KIDNEYS

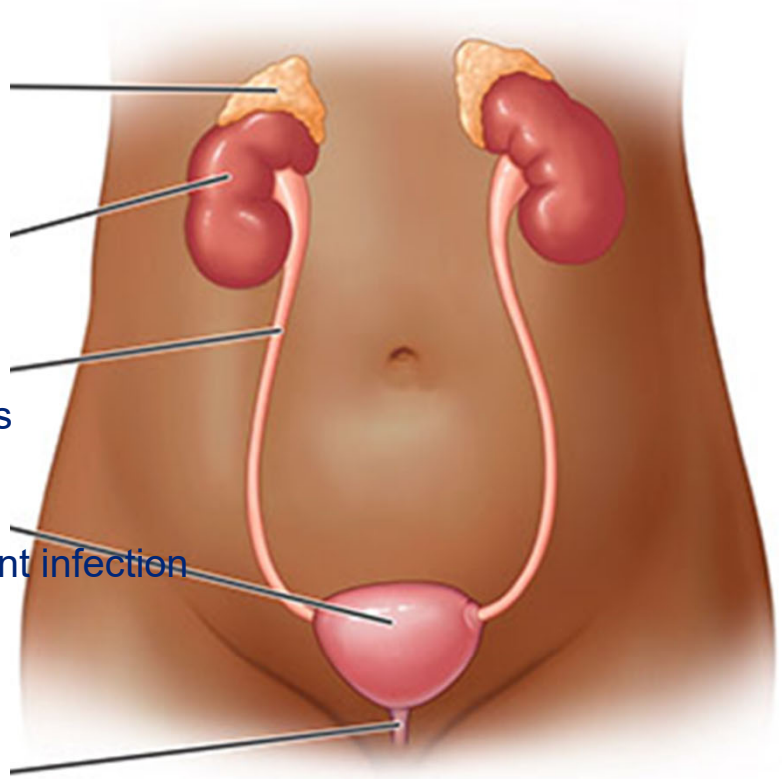
Urinary Tract Imaging

US BLADDER

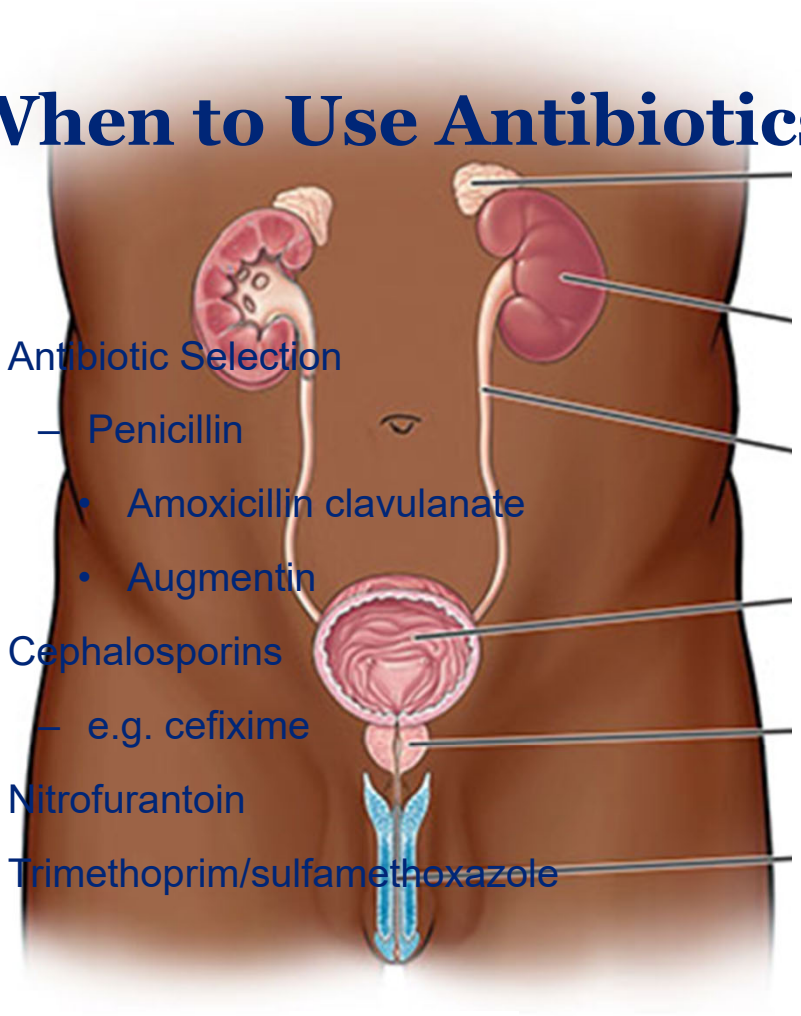
When to Use Antibiotics



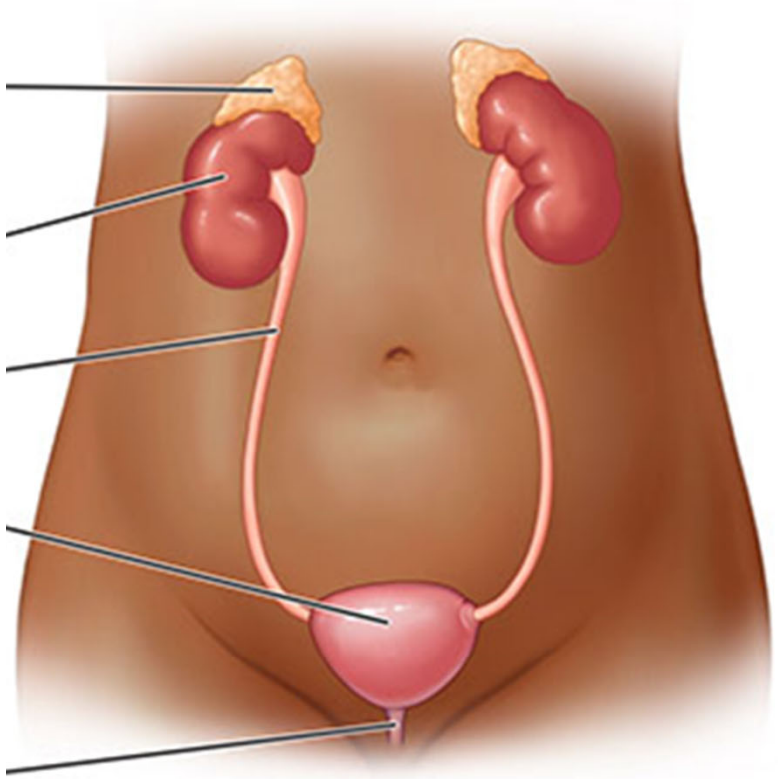
- Documented UTI
- High index of suspicion while awaiting lab results
- Children 2 years of age or younger with questionable symptoms
  - Pending culture results
- Over 2 years of age, positive dipstick with other S/S of significant infection
- History: children with recurrent UTI
- Early treatment is associated with reduced renal scarring
- Overuse of antibiotics should be avoided



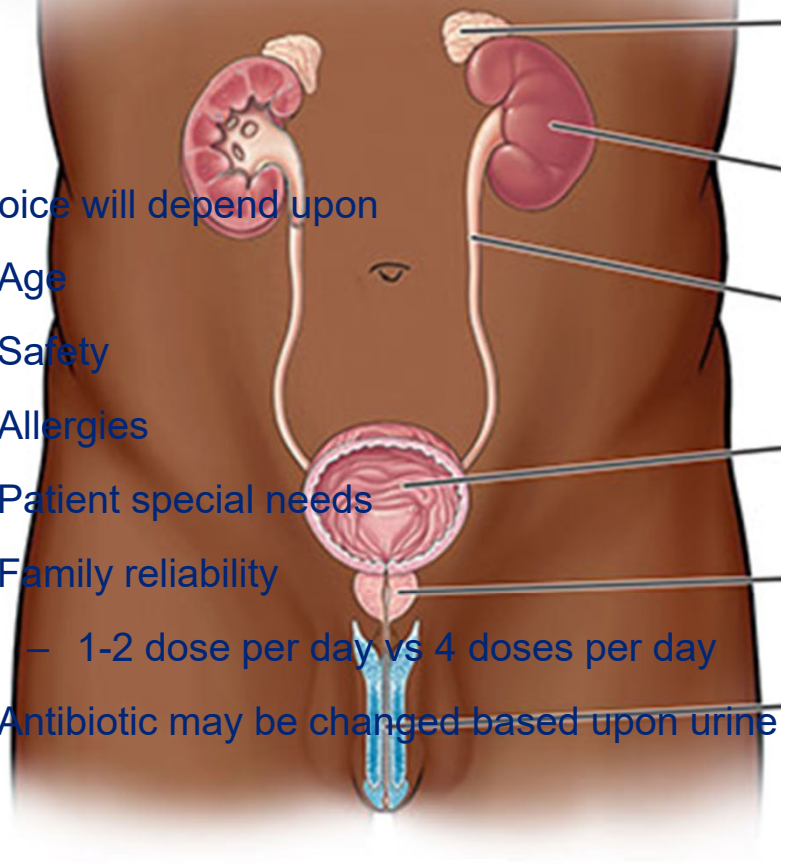
When to Use Antibiotics



- Antibiotic Selection
  - Penicillin
    - Amoxicillin clavulanate
    - Augmentin
- Cephalosporins
  - e.g. cefixime
- Nitrofurantoin
- Trimethoprim/sulfamethoxazole

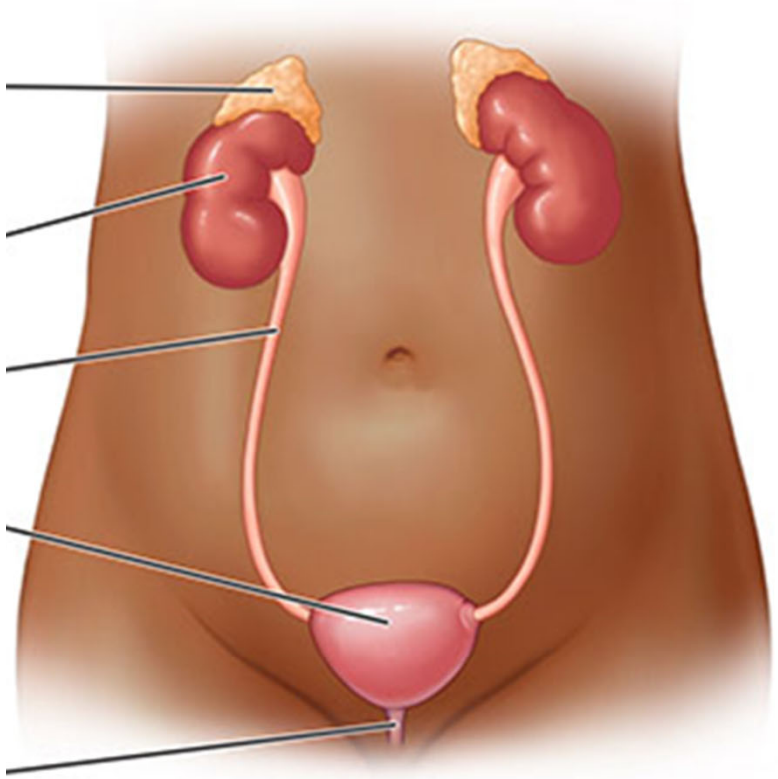


When to Use Antibiotics

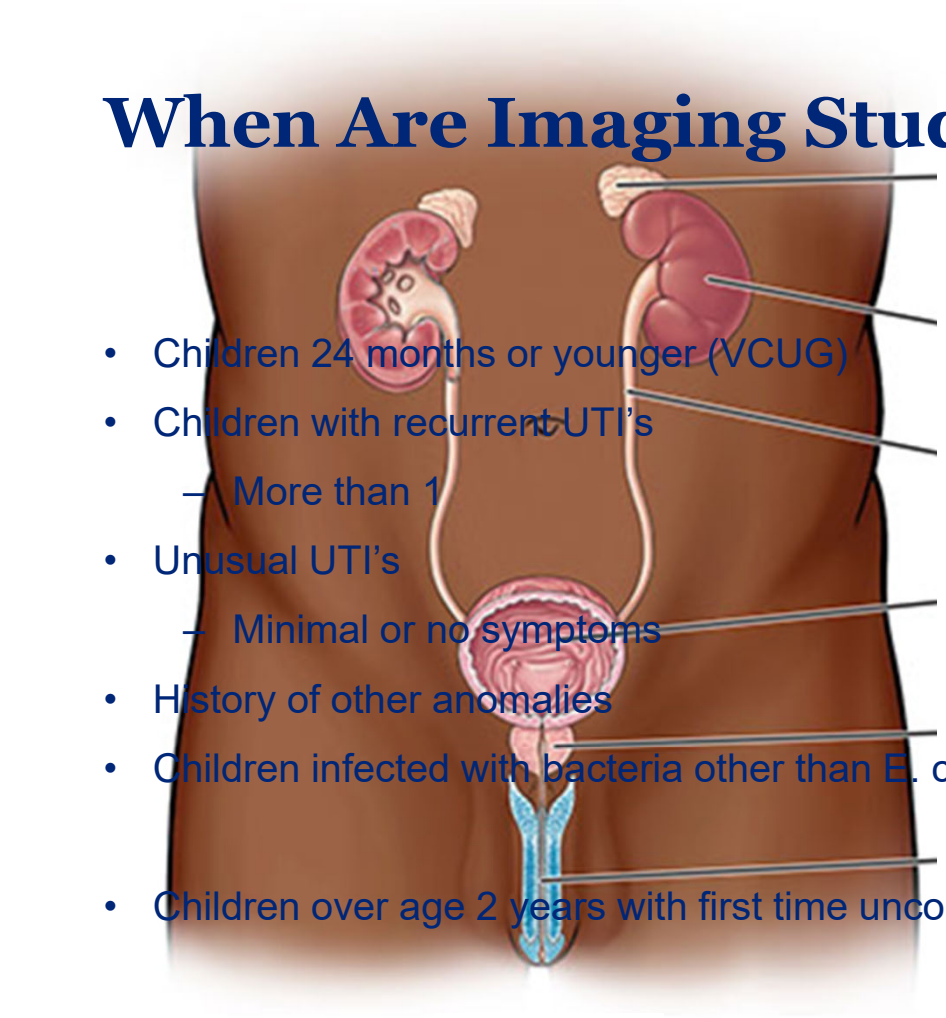


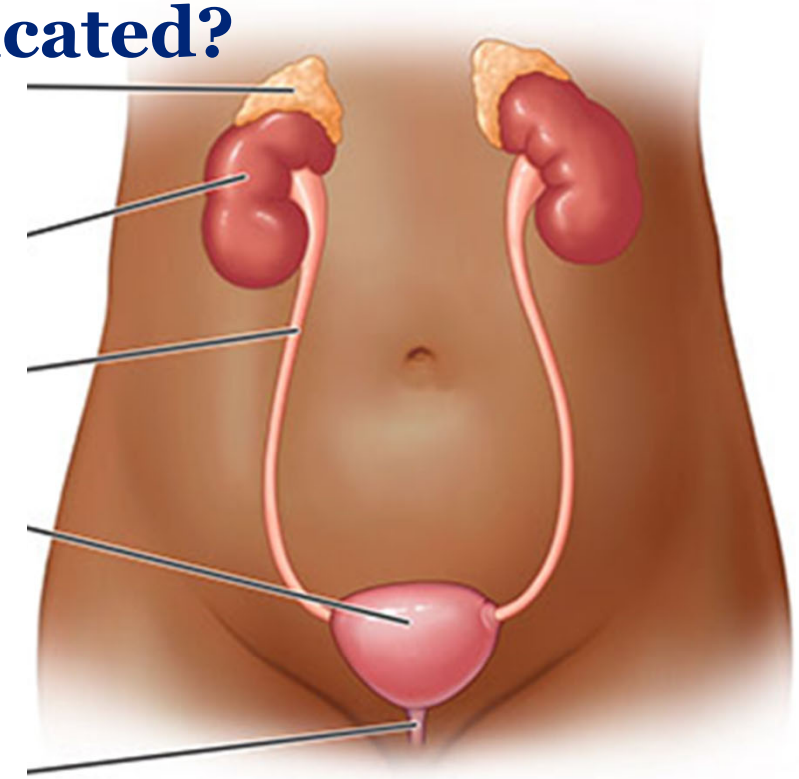
Choice will depend upon

- Age
- Safety
- Allergies
- Patient special needs
- Family reliability
  - 1-2 dose per day vs 4 doses per day
- Antibiotic may be changed based upon urine culture results.



When Are Imaging Studies Indicated?

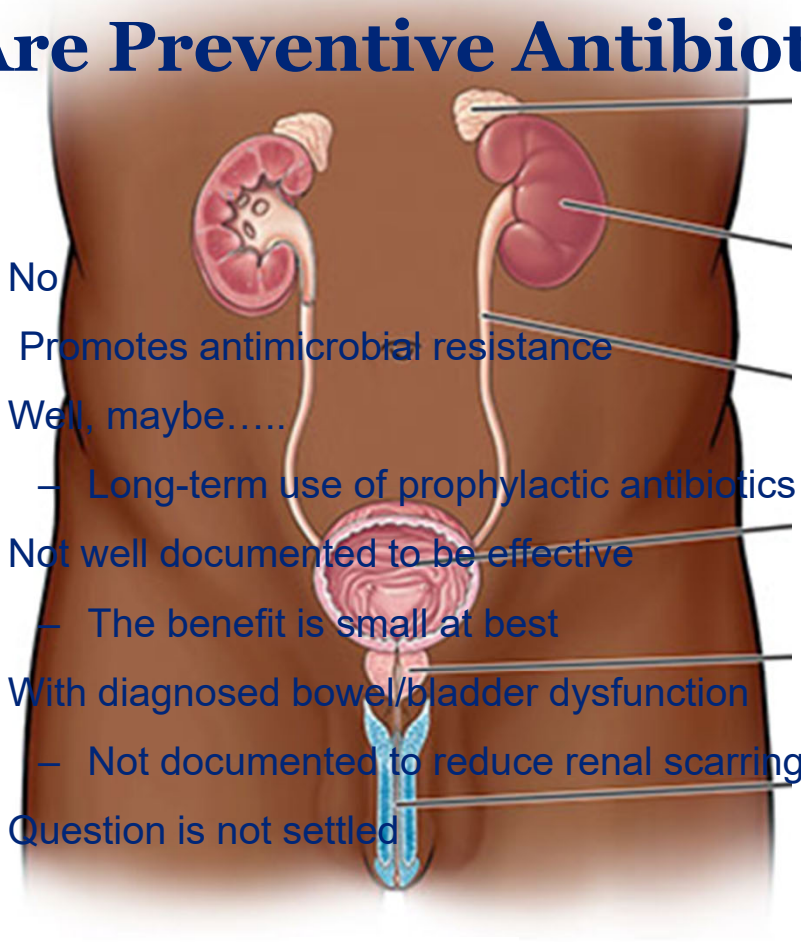


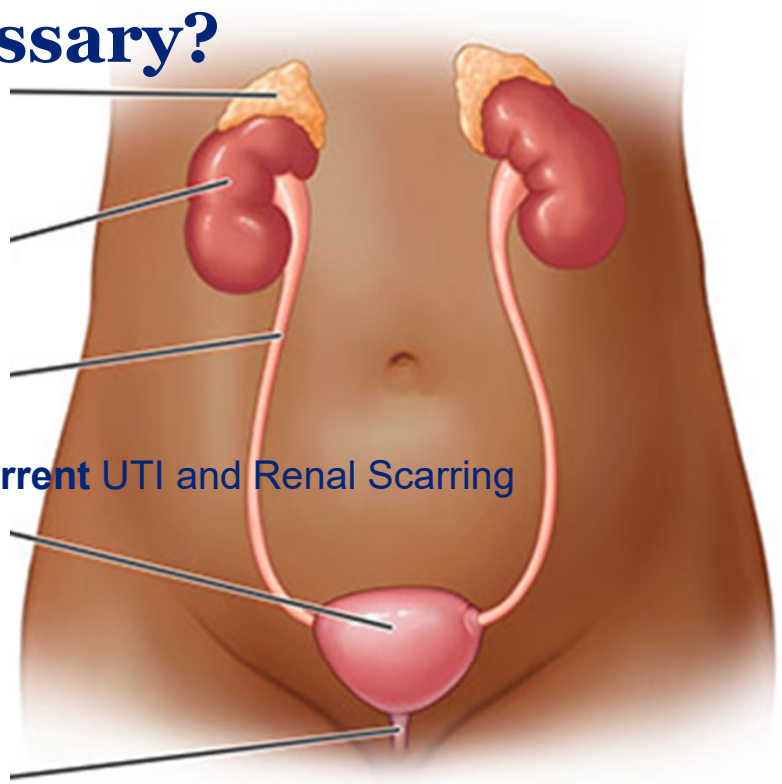


- Children 24 months or younger (VCUG)
- Children with recurrent UTI's
  - More than 1
- Unusual UTI's
  - Minimal or no symptoms
- History of other anomalies
- Children infected with bacteria other than E. coli

- Children over age 2 years with first time uncomplicated UTI do not need imaging

Are Preventive Antibiotics Necessary?





- No
- Promotes antimicrobial resistance
- Well, maybe…..
  - Long-term use of prophylactic antibiotics **may** reduce **recurrent** UTI and Renal Scarring
- Not well documented to be effective
  - The benefit is small at best
- With diagnosed bowel/bladder dysfunction
  - Not documented to reduce renal scarring
- Question is not settled

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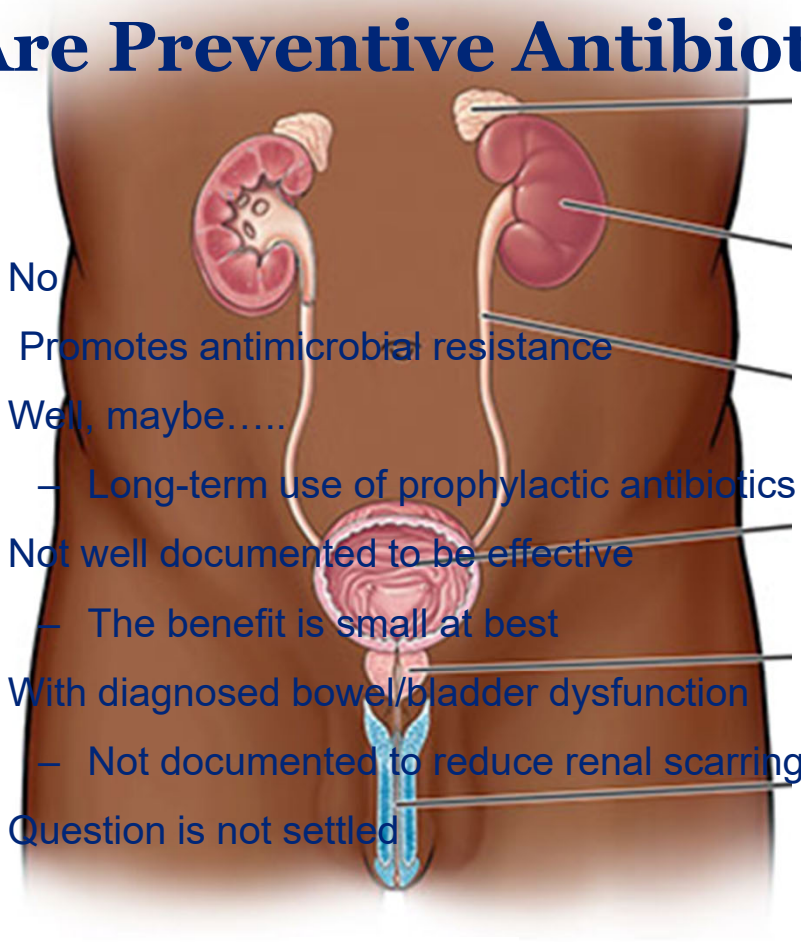

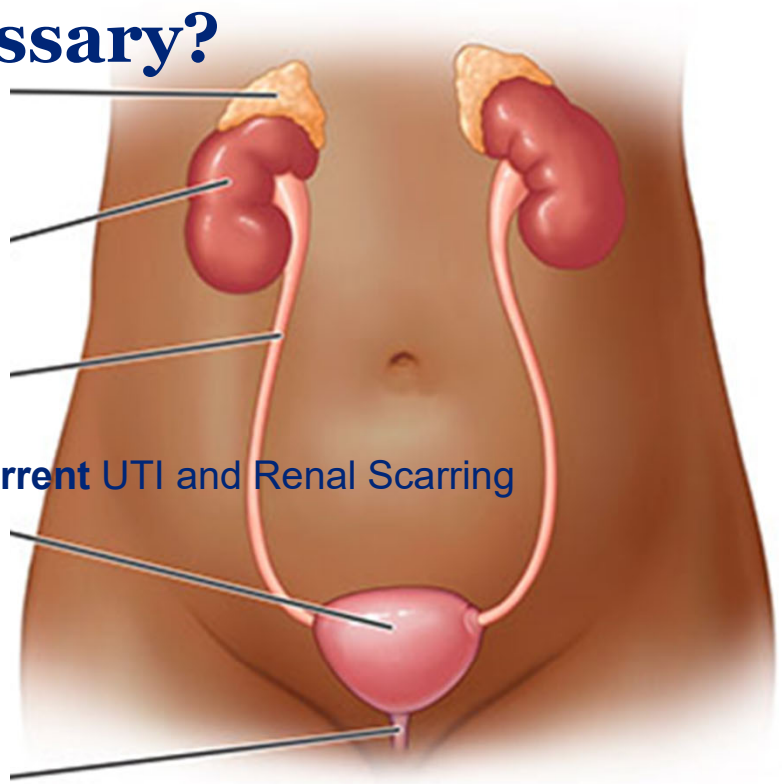

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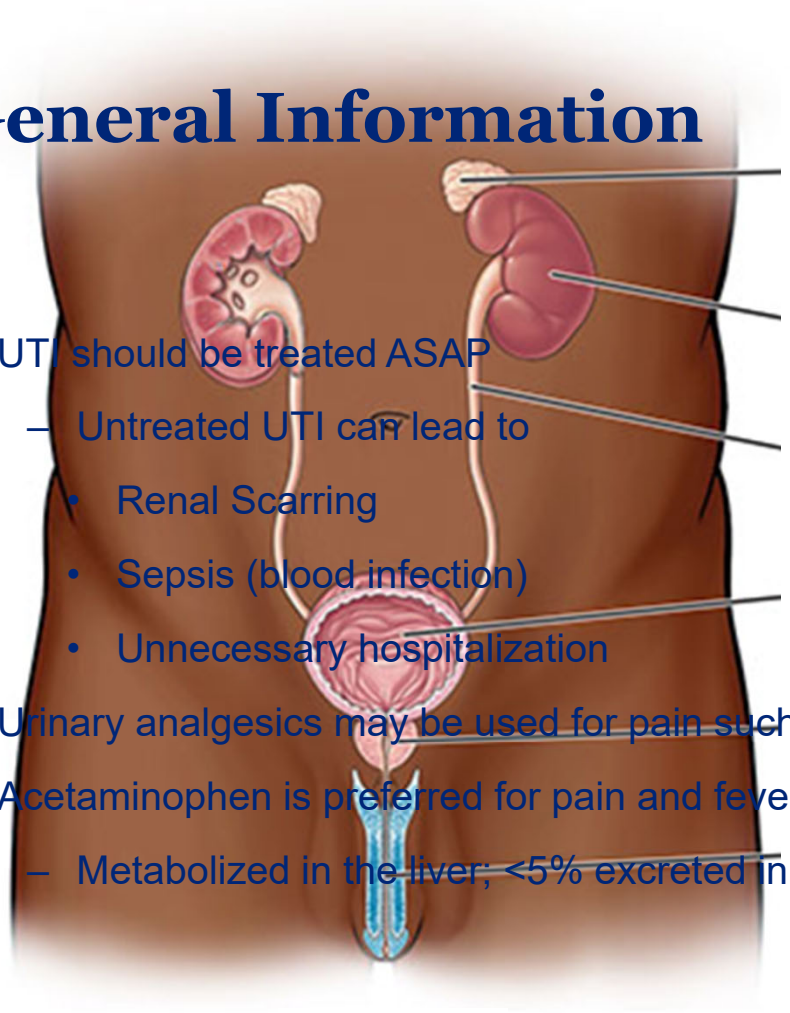
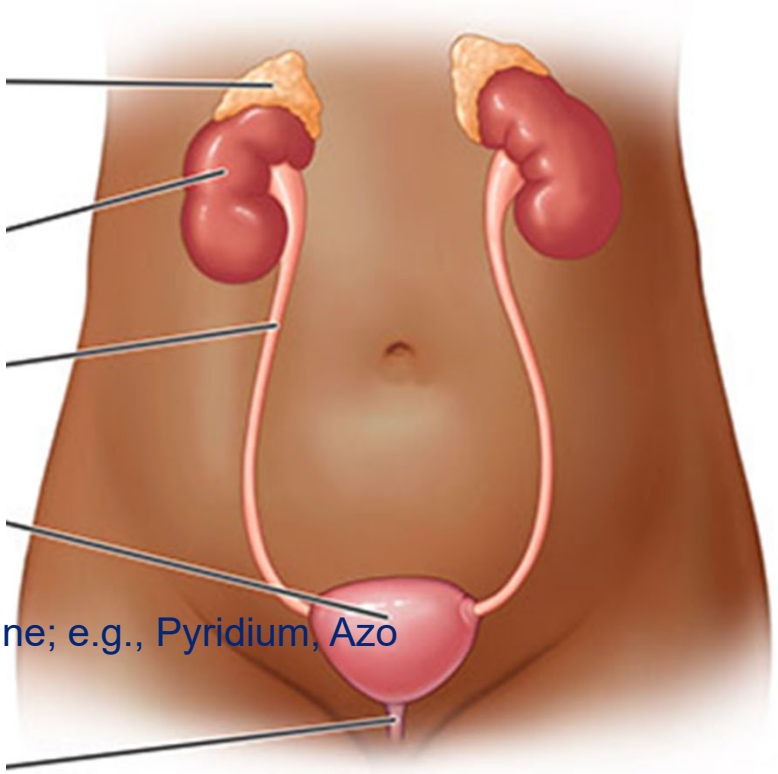
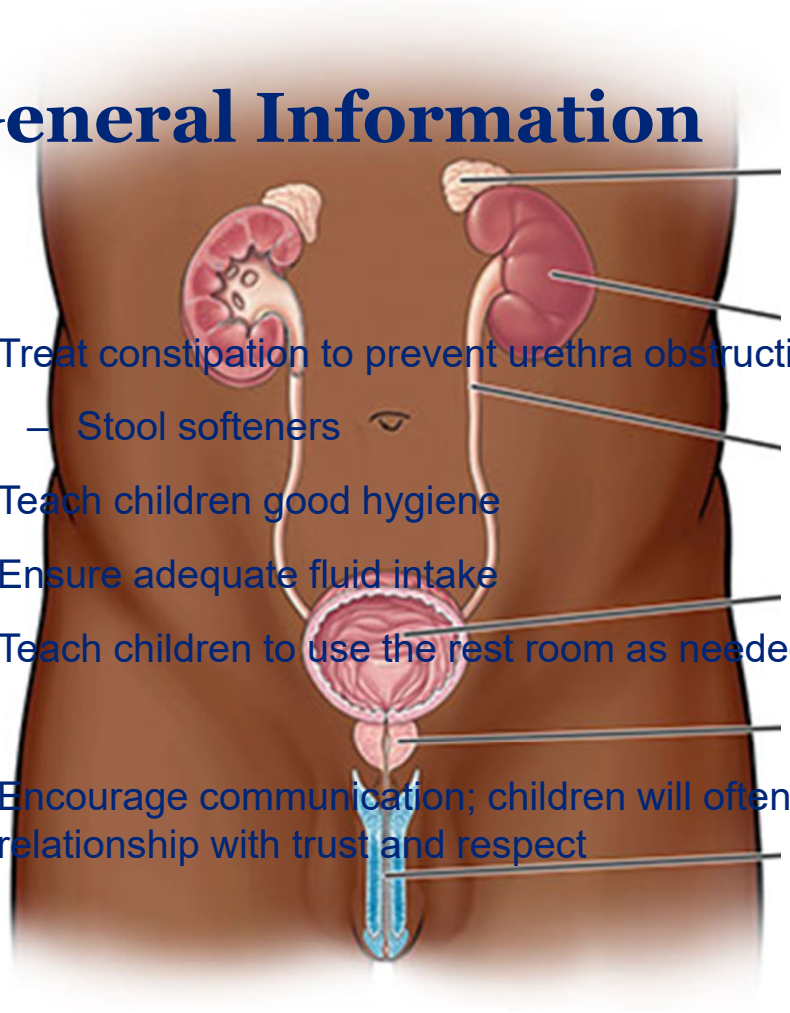
General Information

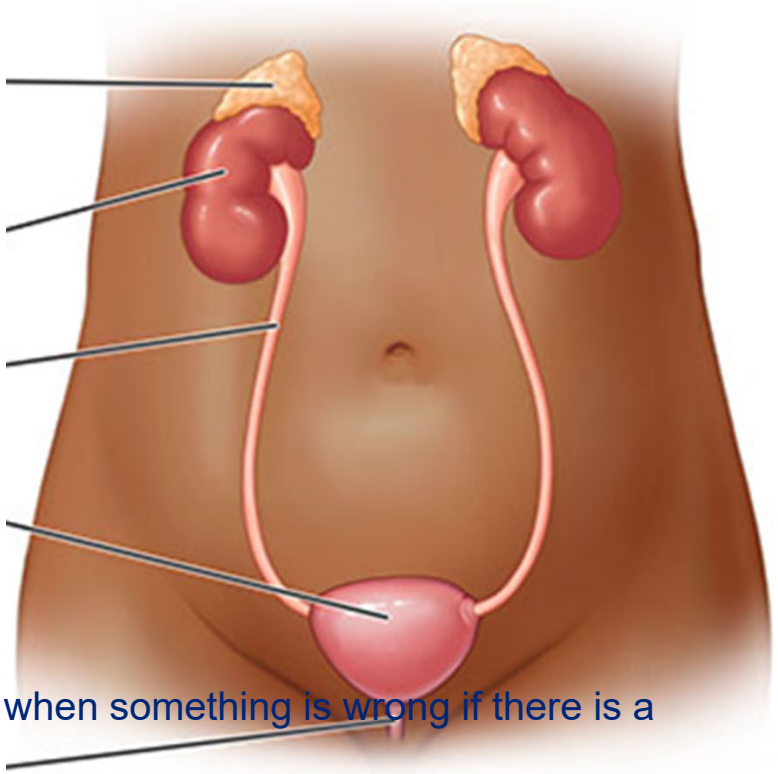




- UTI should be treated ASAP
  - Untreated UTI can lead to
    - Renal Scarring
    - Sepsis (blood infection)
    - Unnecessary hospitalization
- Urinary analgesics may be used for pain such as phenazopyridine; e.g., Pyridium, Azo
- Acetaminophen is preferred for pain and fever control
  - Metabolized in the liver; <5% excreted in urine

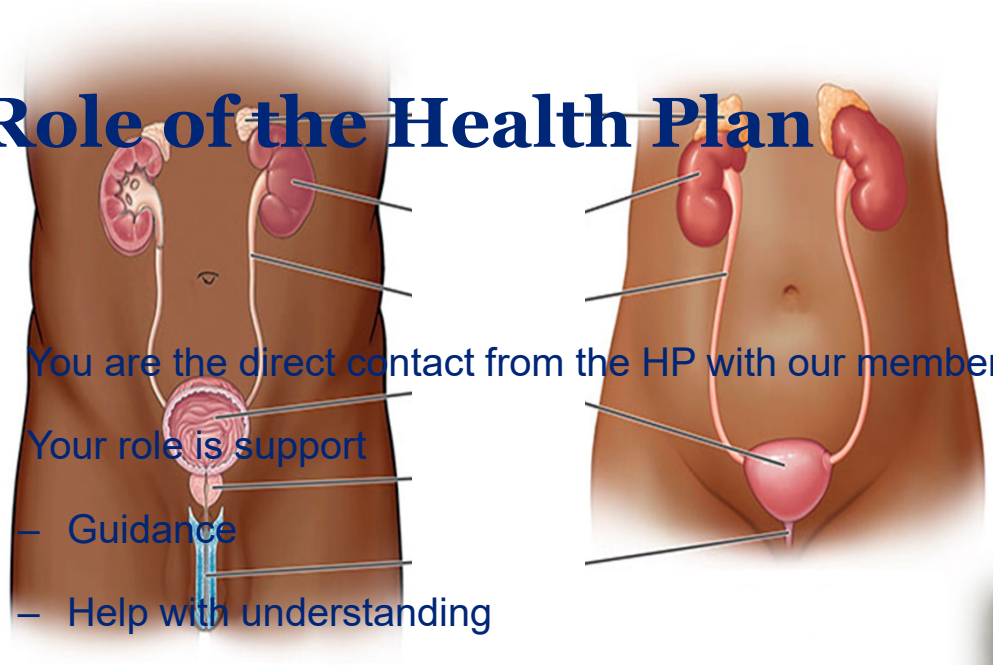
General Information





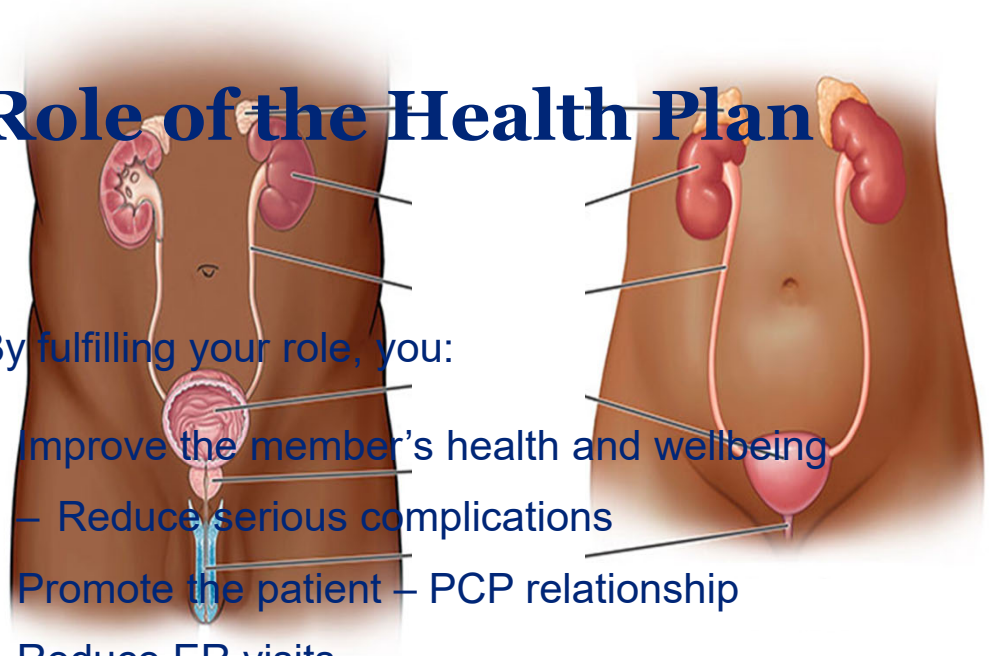
- Treat constipation to prevent urethra obstruction
  - Stool softeners
- Teach children good hygiene
- Ensure adequate fluid intake
- Teach children to use the rest room as needed
- Encourage communication; children will often tell you what and when something is wrong if there is a relationship with trust and respect

Role of the Health Plan



- You are the direct contact from the HP with our members/families
- Your role is support
  - Guidance
  - Help with understanding
  - Facilitation of using available services
  - Encouraging follow through at home of physician/profe
  - Gather information, e.g., SAI

Role of the Health Plan



By fulfilling your role, you:

- Improve the member's health and wellbeing
  - Reduce serious complications
- Promote the patient – PCP relationship
- Reduce ER visits
- Reduce hospitalizations

A BIG THANK YOU!