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**Author(s):** C. James Holliman (Penn State University), M.D., F.A.C.E.P.  
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# Urinary Tract Infections

**C. James Holliman, M.D., F.A.C.E.P.**

**Professor of Emergency Medicine**

**Director, Center for International Emergency Medicine**

**M. S. Hershey Medical Center**

**Penn State University**

**Hershey, PA, U.S.A.**

# Urinary Tract Infection (UTI)

## Incidence :

Adult women : 6 → 10 % per year

Pregnancy : 4 → 10 %

Single catheterization : 1 → 3 % for normal pt.

10 → 15 % for debilitated pt.

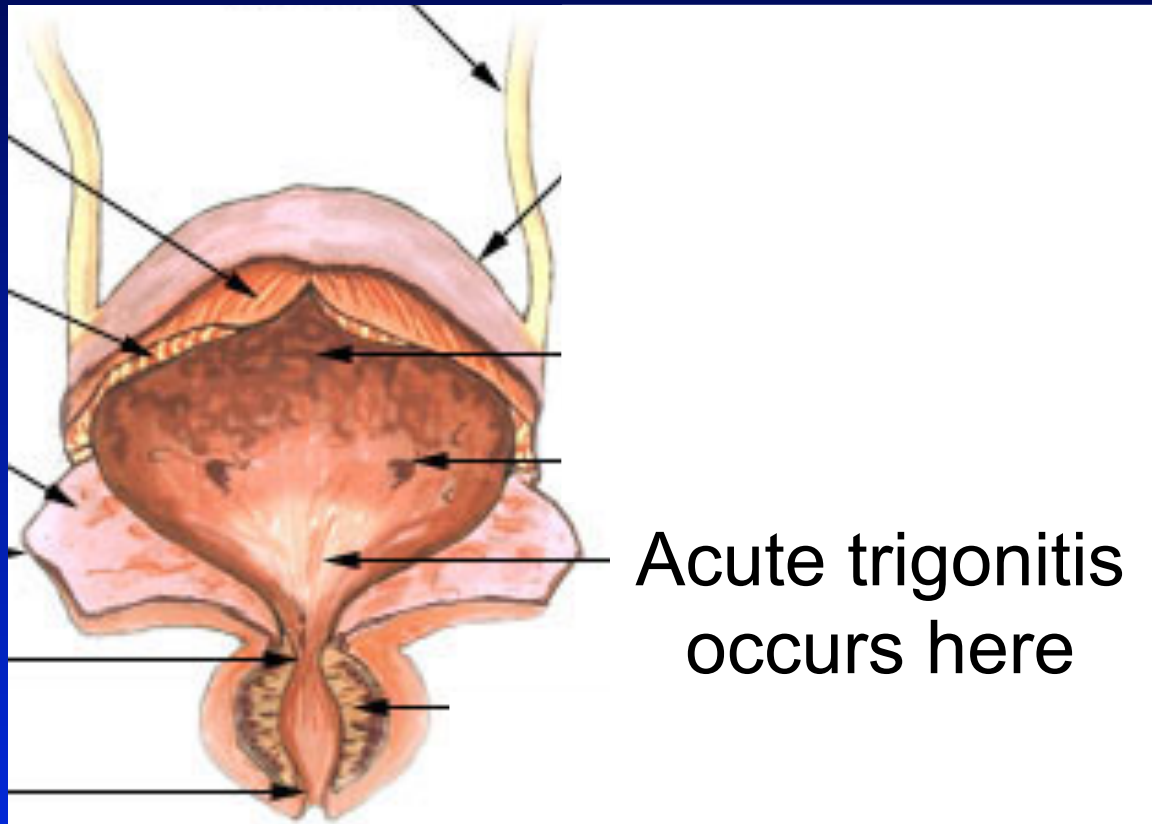
Female : male ratio overall 10 : 1

( ↑ male incidence age < 1 and > 50 years)

# **UTI**

## **Predisposing Factors**

- 1. Obstruction : calculi, tumors, BPH, extrinsic**
- 2. Vesicoureteral reflux**
- 3. Incomplete bladder emptying (neurogenic, voluntary)**
- 4. Diabetes / sickle cell / immune compromise**
- 5. Bladder instrumentation / foreign bodies**
- 6. Congenital structural abnormalities**
- 7. Marriage, sexual activity, pregnancy**



# **UTI**

## **Bacteriology**

**90 % of first episodes : E. coli**

**10 % : Proteus, Klebsiella, Strep. fecalis,  
Enterobacter**

**Debilitated pt. : Pseudomonas, Serratia,  
Providencia**

**Venereal : chlamydia, gonorrhea, trichomonas**

# **UTI**

## **Symptoms**

- 1. Adult : dysuria**
  - frequency**
  - urgency**
  - nocturia**
  - suprapubic pain**
  - ± back pain**
  - ± hematuria**
  - ± cloudy urine**
  - ± enuresis**



# **UTI**

## **Symptoms**

- 2. Babies : lethargy**
  - poor feeding**
  - fever or hypothermia**
  - vomiting**
  - diarrhea**
  - strong smelling urine**

# **UTI**

## **Symptoms**

**3. Elderly :**

- Malaise**
- weakness**
- vomiting**
- fever or hypothermia**
- confusion**
- hypotension**
- urine retention**

# UTI

**Symptoms and signs do not reliably differentiate upper from lower tract infection**

# **UTI**

## **Collection Methods**

- 1. Clean voided specimen (CVS)**
- 2. “Minicath” : for menstruating female**
- 3. Perineal bag or suprapubic tap for babies**
- 4. Straight cath male (8 to 10 French catheter) only if unable to void**



AfroBrazilian, [Wikimedia Commons](#)

**“Minicath” urine collection tube**

# **UTI**

## **Diagnosis**

- 1. Dipstick (Chemstrip 9)  
Leucocyte esterase : fairly accurate if 2+**
- 2. Gram stain unspun urine (if 1 bacteria per hpf :  
indicates UTI)**
- 3. U/A with microscopic (✓ for squamous cells)**
- 4. Urine Culture and Sensitivity (C & S)**



# **UTI**

## **Indications to Obtain Urine C & S**

- 1. Children**
- 2. Most males**
- 3. Immunosuppressed**
- 4. Pregnancy**
- 5. Toxic appearance**
- 6. Underlying medical / urologic disorder**
- 7. Recently hospitalized**
- 8. Recently instrumented**
- 9. Recently on antibiotics**
- 10. Recent treatment failure**



# **UTI**

## **Indications to Check Electrolytes / BUN / Creatinine**

- 1. Frequent vomiting**
- 2. Toxic appearance**
- 3. Urinary retention**
- 4. Post-catheter diuresis**
- 5. Hypertensive**
- 6. Known non-end-stage renal failure**
- 7. Marked edema**

# UTI

## Standard 7 day Treatment Choices

**Amoxicillin 500 mg (40 mg/Kg/day) tid (but fairly high incidence of E. coli resistance now in most areas of U.S.)**

**Bactrim DS one bid**

**Cefadroxil 500 mg bid or 1 gm qd**

**Cephalexin 250 to 500 mg bid to qid**

**Noroxin 400 mg bid**

**Ciprofoxacin 500 mg bid**

# Standard Antibiotic Dosages for UTIs in Adults

<u>Drug</u>	<u>Regimen</u>
Amoxicillin	250 to 500 mg q 8h for 7 days
Cephalexin	250 to 500 mg q 6h for 7 days
Doxycycline	50 to 100 mg q 12h or q 24h for 7 days
Nitrofurantoin	50 to 100 mg q 6h for 7 days or 100 mg q 6h for 3 days
Sulfamethoxazole	1 g q 12h for 7 days
Sulfisoxazole	1 g q 6h for 7 days
Tetracycline	250 to 500 mg q 6h for 7 days
Trimethoprim	100 mg q 12h for 7 days
Trimethoprim-sulfamethoxazole	1 DS tablet q 12h for 7 days

# **UTI**

## **Single Dose Treatment (for uncomplicated pt.)**

**Amoxicillin 3 grams PO**

**Septra DS 3 tablets PO**

**Sulfisoxazole 2 grams PO**

**Kanamycin 500 mg IM**

**Cefonicid 1 gram IM**

# Single-dose Treatments for UTIs in Adults

## Drug

## Regimen

### Oral

Amoxicillin

3 g (6 500 mg tablets)

Bacampicillin

1.6 g (4 400 mg tablets)

Sulfamethoxazole

2 g (4 500 mg tablets)

Sulfisoxazole

2 g (4 500 mg tablets)

Trimethoprim-sulfamethoxazole

3 DS tablets/d for 2 days

### Parenteral

Cefonicid

1 g IM

Kanamycin

500 mg IM

# **UTI**

## **Treatment**

**If chlamydia suspected, or recent treatment failure  
or unremarkable U/A with typical symptoms, try  
doxycycline 100 mg PO bid x 7 days**

# **UTI**

## **Treatment Choices in Pregnancy**

**Amoxicillin**

**Cephalosporins**

**Erythromycin**

**Penicillin G or VK**

# **Antimicrobial Agents for UTIs in Pregnancy**

<u>Drug</u>	<u>Regimen</u>
Amoxicillin	250 mg po tid for 7 days
Cephalexin	250 mg po qid for 7 days or 500 mg po bid for 7 days
Erythromycin	250 mg po qid for 7 days or 333 mg po tid for 7 days
Penicillin G	250 mg po qid for 7 days



# UTI

## Groups with Asymptomatic Bactiuria Who Should Receive Treatment

Pregnancy

Diabetics

Young

Severe immunocompromise

Sickle cell disease

Do not treat only because chronic catheter present

# **UTI**

## **Indications for Admission**

- 1. Toxic appearance / possible sepsis**
- 2. Possible urinary obstruction**
- 3. Vomiting / unable to take PO meds**
- 4. Kids < 1 y/o**
- 5. Most males, especially if febrile**
- 6. If pre-existent or suspected renal failure**

# UTI Treatment

If ill enough to admit :

IV ampicillin / gentamicin

IV cefoxitin

IV aminoglycoside / antipseudomonal PCN (if resistant *Pseudomonas* suspected)

# Urinalysis Acid-Base Status Related to Infections

## Alkaline

Group D-2

Corynebacterium

Kiebsiella (rare)

Proteus

Providencia

Serratia (rare)

Staphylococcus

saprophyticus

Ureaplasma urealyticum

## Acidic

Genitourinary

tuberculosis

# Pyuria : Differential Diagnosis

## INFECTIOUS

Chlamydia

Neisseria gonorrhoeae

Trichomonas

Acute appendicitis

Acute urethral syndrome

Balanitis

Brucellosis

Candidal UTI

Diphtheria

Enterovirus

Kawasaki Syndrome

Leptospirosis

Partially treated UTI

Prostatitis

Renal or cortical abscess

Salpingitis

Toxic shock syndrome

Tuberculosis

Urethritis

## NON-INFECTIOUS

Bladder tumors

Calculi

Cystitis

Diverticulitis

Exercise (excessive)

Interstitial nephritis

Lupus nephritis

Regional ileitis

Urethral Inflammation

# **Failure of Fever Resolution Within 96 hours in Pyelonephritis**

- **Infectious Causes**
  - Obstruction**
  - Abscess**
  - Inappropriate antimicrobial agent**
  - Coexistent infection at another body site**
- **Noninfectious Causes**
  - Adverse drug reaction**
  - Thrombophlebitis at IV catheter site**
  - Diabetes mellitus**





**Severe pyelonephritis.** A CT scan of the abdomen of a diabetic patient with severe pyelonephritis shows a massively distended right kidney. Air density collections are present within the renal parenchyma and the collecting system, which is consistent with emphysematous pyelonephritis. Nonfunction of right kidney is indicated by the absence of contrast material in



PD-INEL

Source Undetermined

# **Conditions That Increase Risk of Severe Morbidity and/or Renal Scarring from Recurrent Urinary Tract Infection**

- Renal failure
- Obstructive uropathy
- Diabetes melitus
- Renal papillary necrosis
- Infection caused by urea-splitting bacteria that cause infection stones
- Congenital abnormalities that become secondarily infected
- Pregnancy
- High-pressure neurogenic bladder
- Indwelling catheter



# **Correctable Urologic Abnormalities That Can Harbor Persistent Bacteria and Cause Recurrent Urinary Tract Infection With Same Organism**

- Infection stone
- Unilateral, atrophic pyelonephritis
- Medullary sponge kidney
- Papillary necrosis
- Pericalyceal diverticulum
- Nonrefluxing urethral stump following nephrectomy for pyonephrosis
- Ectopic or duplicated ureter
- Urethral diverticulum
- Paravesical abscess with fistula to bladder
- Foreign bodies

# UTI

## Lecture Summary

- Decide if empiric Rx on basis of dipstick positive leucocyte esterase alone or if full urinalysis and / or C & S needed
- Decide on length of Rx (one week sufficient usually for lower tract or occult upper tract infection)
- Arrange definite followup if C & S sent