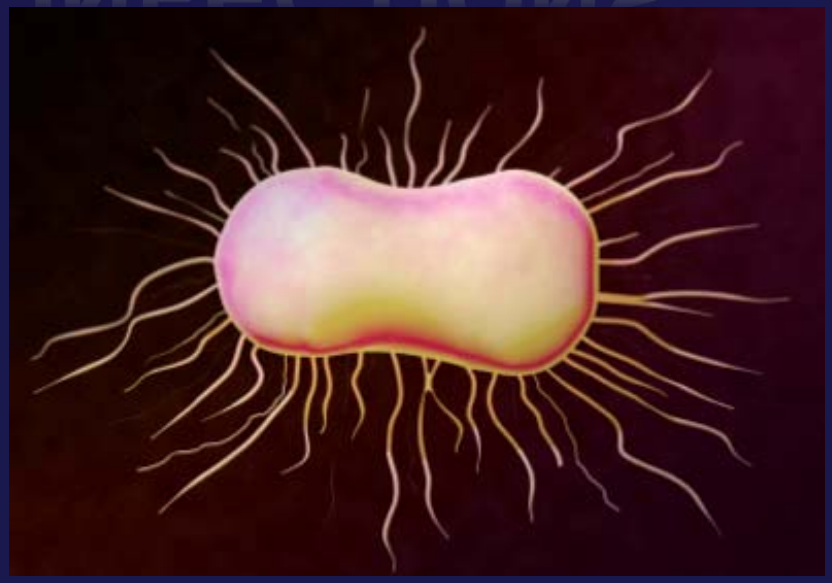
Canadian Undergraduate Urology Curriculum (CanUUC):

URINARY TRACT INFECTIONS



Last reviewed June 2014

UTI: Objectives

Describe the signs and symptoms of bacterial cystitis and pyelonephritis.

Define when to treat asymptomatic bacteruria.

List the common bacteria causing UTI.

List the common classes of antimicrobials used to treat urinary tract infections.

UTI: Objectives (cont'd):

Outline the investigation and treatment of bacterial cystitis and pyelonephritis.

Describe treatment regimens available for a patient with recurrent bacterial cystitis.

Recognize the importance of early diagnosis and emergent treatment of an obstructed UTI.

Bacterial Cystitis
Signs & Symptoms

SYMPTOMS

- Frequency
- Urgency
- Dysuria
- Hematuria - microscopic or gross
- Pain - suprapubic or urethral
- Foul-smelling urine

SIGNS

- Suprapubic tenderness

Pyelonephritis
Signs & Symptoms

- Same as bacterial cystitis, plus:

SYMPTOMS
- Flank pain
- General malaise
- Chills, sweats, rigors
- Nausea & vomiting
- Confusion / decreased level of consciousness
  - End-stage, due to sepsis

SIGNS
- Fever
- Abdominal tenderness
- Costovertebral angle tenderness
- Tachycardia
- Hypotension
- Unwell, unwell, flushed, diaphoretic, toxic

Asymptomatic Bacteriuria

When to Treat?

The presence of bacteria in the urine without signs or symptoms of infection

Absolute Indications to treat:

- ⇨ Pregnancy
- ⇨ Before urological/urogynecological procedures

Relative Indications to treat (controversial):

- ⇨ Before surgical procedures with implant material
- ⇨ Transplant patients
- ⇨ Immunocompromised state
- ⇨ Women with recurrent UTI's

Uncomplicated Cystitis
Common Pathogens

E. coli	75-90%
Staph saprophyticus	10-20%
Klebsiella	3-4%
Enterococcus	2-3%
Proteus	2-3%
Other	3%

Uncomplicated Pyelonephritis
Common Pathogens

E. coli	75-85%
Klebsiella	4-5%
Proteus	4-5%
Enterococcus	3-4%
Pseudomonas	2-3%
Serratia	1-2%
Mixed and other	7%

Complicated UTI
Common Pathogens

E. coli	32%
Enterococcus	22%
Pseudomonas	22%
Klebsiella	5%
Proteus	1%
Staph saprophyticus	14%
Mixed and other	

UTI Antimicrobials

Common Classes

Penicillins/aminopenicillins (Amoxicillin, ampicillin)

Cephalosporins (Cephalexin, ceftriaxone)

Fluoroquinolones (Ciprofloxacin, noroxin, levofloxacin)

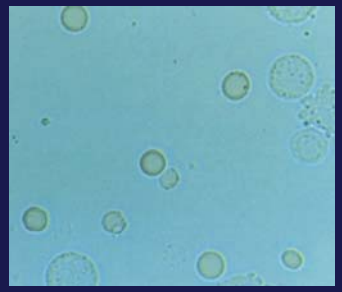
Aminoglycosides (Gentamicin, tobramycin)

Trimethoprim/Sulfamethoxazole

Nitrofurantoin

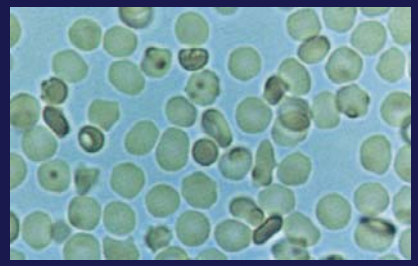
Uncomplicated Bacterial Cystitis
Investigation

Microscopic urinalysis
- Pyuria (WBC's)
- Hematuria (RBC's)
- Bacteriuria



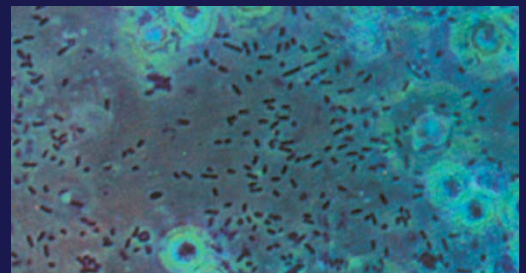
Pyuria

Rapid screen (indirect) dipsticks
- Nitrites (bacteriuria)
- Leukocyte esterase (pyuria)



Hematuria

Urine culture & sensitivity
- Often not necessary for simple UTI
- Less cost-effective



Extensive investigation unnecessary
- Radiologic tests
- Endoscopy

Bacterial Cystitis Management
Non-Pharmacologic

- Good hygiene
- Increased fluid intake
- Regular/timed voids
- Cranberry juice/pills/extract

Bacterial Cystitis Treatment
Pharmacologic

- Single dose vs. 3-day vs. 5-day vs. 7-day
- 3 to 5-day probably best
  - Effective, cost-effective, low recurrence, sterilization of introitus, few side effects
- Choice of antibiotic
  - Guidelines useful, but choice should depend on local pathogens and resistance patterns

Bacterial Cystitis
Antibiotic Options

oroquinolones	TMP/SMX	Nitrofurantoin
t choice in some delines	▪ Efficacious against uropathogens	▪ Efficacious against E. coli
ad spectrum	▪ No effect on vaginal or fecal flora	▪ No adverse effect on fecal flora
ellent side effect profile	▪ Few side effects if duration short	▪ Narrow spectrum
le resistance	▪ Increasing resistance (19%)	▪ Significant adverse event profile

Pyelonephritis
Investigation

- ⇨ Same as cystitis, plus:

- ⇨ Bloodwork – CBC, lytes, creatinine
- ⇨ Blood cultures (for sepsis)
- ⇨ Upper tract imaging – U/S or CT
  - ? obstruction
  - ? stone(s)
  - ? abscess
  - ? pyonephrosis
  - ? anatomic abnormality

Pyelonephritis
Treatment

Route? IV vs. oral antibiotics

Patient disposition? Inpatient vs. outpatient therapy

Duration? 7-10 days vs. 14-21 days

Depends on how sick patient is at presentation:

- Looks well, low grade fever ➔ outpatient oral fluoroquinolone
- Looks unwell, high grade fever ➔ admit to hospital for IV antibiotics (ie. cephalosporin or ampicllin and gentamicin)

onger course of antibiotics needed, may require IV antibiotics in hospital

Complicated UTI: Infection occurring with functional or structural abnormalities of the urinary tract

ATIENT FACTORS

- Children
- Pregnancy
- Male
- Diabetes
- Immunosuppression
- Spinal cord injury
- Hospitalized

URINARY TRACT FACTORS

- Stones
- Obstruction
- Indwelling tubes
- Congenital anomalies
- Voiding dysfunction
- Persistent infection
- Unusual organisms

Complicated UTI
Investigations

- Same as uncomplicated UTI, plus:

- Further investigations to rule out underlying predisposing factors
  - Diagnostic imaging
  - Endoscopy

Complicated UTI
Diagnostic Imaging

- Plain radiography
  - KUB and tomograms – gas and calculi
  - IVP – upper urinary tract anatomy and obstruction
  - VCUG – when VU reflux or posterior urethral valves are suspected
- U/S
  - Hydronephrosis or high post-void residual urine
- CT – best anatomic detail/most sensitive
- MRI – little benefit over CT (no radiation)
- Nuclear medicine – localize abscess

Complicated UTI
Endoscopy of Urinary Tract

- Cystourethroscopy – lower tract
  - Urethral diverticulum, bladder stone, bladder outlet obstruction leading to urinary stasis and lower urinary tract infection
- Ureterorenoscopy – upper tracts
  - Sloughed papilla, fungus ball, or any other cause of ureteral obstruction leading to upper tract infection

Can be diagnostic and/or therapeutic

Complicated UTI
Treatment

- Same as uncomplicated UTI, plus:
- Long-term antibiotic therapy often necessary
- Systemic support as required
  - Hydration, monitoring, ICU
- Urinary drainage as indicated
  - Bladder catheter, percutaneous nephrostomy, ureteral stent
- Surgery as indicated
  - Bladder outlet obstruction
  - Stones
  - Ureteropelvic junction obstruction
  - Strictures of ureter or urethra
  - Xanthogranulomatous/emphysematous pyelonephritis

Case # 1

Recurrent UTI's

23 y/o healthy female with recurrent UTI's

Symptoms: frequency, urgency, dysuria, suprapubic pain, no fever

7 UTI's over past 3 years, 4 in past year

E. coli

Recurrent Bacterial Cystitis
Treatment Regimens

Continuous prophylaxis
- Long-term, ie. 3-12 months
- Low dose (once daily) of less potent antibiotic
- ie. Nitrofurantoin 50 mg PO OD

Post-coital prophylaxis
- 1-2 doses max. pre-coital (if possible) and post-coital

Patient self-treatment
- Patients (mostly women) self diagnose their UTI
- Take a 3-day course of antibiotics
- Contact MD if no response by 48 hours
  - Urine C&S

Case # 1
Management

- Lifestyle modifications
  - Adequate fluid intake
  - Timed/regular voids
  - Cranberry juice/pills
  - Good hygiene
  - Post-coital voiding

- Long-term prophylactic antibiotics
  - Nitrofurantoin 50 mg PO OD x 3 months x 3 repeats PRN

Case # 2

Obstructive Urosepsis

58 y/o diabetic male with history of urolithiasis

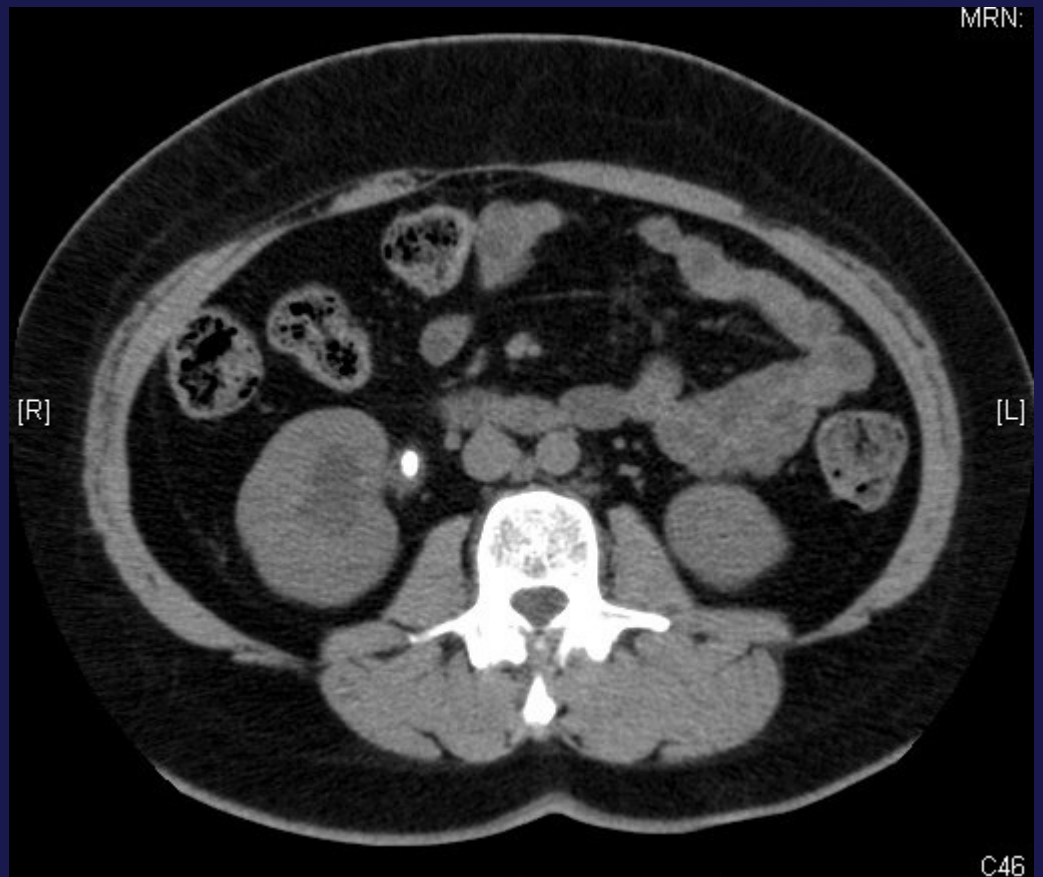
Hx: Right flank pain and fever x 2 days

Px: unwell, flushed, uncomfortable, tachycardia, hypotension, febrile (T 39.2 ° C)

Labs: WBC 19.0, creat 165

CT scan: 9 mm proximal right ureteral stone + hydronephrosis

Case # 2
CT Scan



Obstructive UTI
Urologic Emergency

Acute ureteral obstruction

- Most common cause = ureteral calculus

Presentation:

- Hx: flank pain, history of stones, diabetic
- Px: fever, unwell, flushed, diaphoretic, toxic-appearing

Investigations:

- Labs: leukocytosis, elevated creatinine from dehydration
- U/S or CT: hydronephrosis, pyonephrosis, stone

Life-threatening condition

- Requires urgent renal drainage

"Don't let the sun set on a septic stone"

Case # 2
Management

- Admit to hospital
- Attention to ABC's
- IV fluids (ARF pre-renal from dehydration)
- IV antibiotics
  - Ceftriaxone 1-2 g IV q24H
  - May be changed according to urine culture
- Urgent renal drainage
  - Percutaneous nephrostomy
  - Ureteral stent
- Elective (delayed) definitive treatment of