Treatment of UTI

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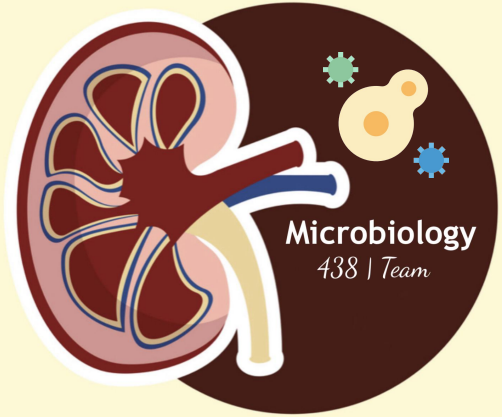


Objectives

Color index:
- Important,
- Doctor Notes
- Extra, TN

- Recall the principal goal of management of urinary tract infection (UTI) and that antibiotics are the main treatment of UTI
- Discuss the factors that management of UTI depends on
- Describe the management/treatment of different conditions of UTI (cystitis, pyelonephritis, catheter associated UTI ,etc.)

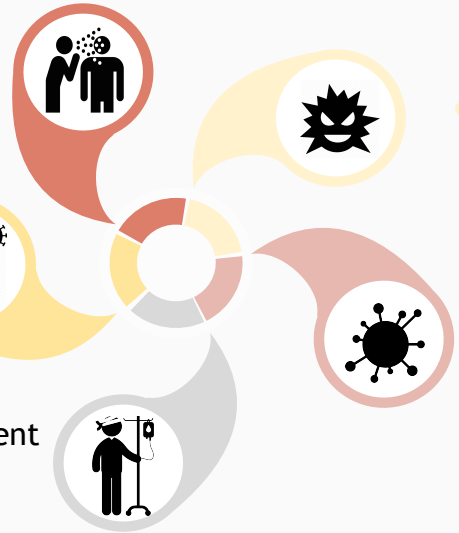
Goal of management of UTI

- The principal goal of management of UTI is to <u>eradicate</u> the offending organisms from the urinary bladder and tissues.

- The main treatment of UTI is by **antibiotics**.

Depends on:

- Presence of symptoms.
- Bacterial count.
- Type of patient (pregnant, child, hospitalized or not, diabetic patient,..etc)



- infection
  - complicated
  - uncomplicated
- infection
  - primary
  - recurrent

Uncomplicated UTI

Cure rate 94%

Low-risk patient (woman) for recurrent infection: 3 days antibiotic without urine test.

Choice of antibiotic depend on susceptibility pattern of bacteria, it includes ;

1. **Amoxicillin** ✸
   - with or without clavulanic acid

   ◄ Recall from respa pharma
   M.O.A: Inhibits bacterial wall synthesis.
   A.E. Hypertensive reaction & nephritis.

2. **Cephalosporins** ✸
   - first or second generation

   ◄ Recall from renal pharma
   M.O.A: inhibits cell wall synthesis.
   Mainly effective for gram-ve bacteria
   & used for severe UTI.

3. **Fluoroquinolone** ✸
   - ciprofloxacin or norfloxacin

   ✸ **not for pregnant women or children under 18 year**

   - first choice if other antibiotics are resistant.

   ◄ Recall from renal pharma
   M.O.A: inhibits DNA gyrase enzyme & cell division.
   Gram-ve aerobic.
   A.E. Nausea, vomiting, diarrhea & headache.

4. **TMP-SMX**
   - trade names: Bactrim, Septra and Cotrimoxazole

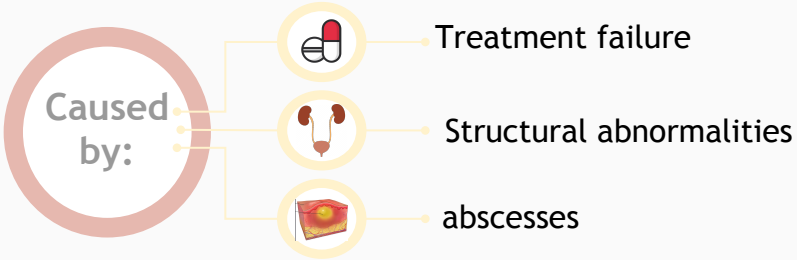
   ◄ Recall from renal pharma
   M.O.A: stops folic acid production in microorganisms
   A.E. Nausea, vomiting & Allergy .

5. **Nitrofurantoin**
   - for long term use

   ◄ Recall from renal pharma
   M.O.A: inhibits various enzymes and damages DNA.
   Effective against E.coli & Staph. Saprophyticus
   Not used for UTI or complicated infection,
   but use for uncomplicated LUTI.
   A.E. Hemolytic anemia & GI disturbances.
   Used for lower UTI only

Relapsing infections

Means when the patient worsens again after a period of improvement



Treatment: Antibiotics used at the initial infection for 7-14 days

Recurrent infections

Patients with **two** or more symptomatic UTIs within **6 months**

Patients with **3** or more symptomatic UTIs over a **year**

- Need preventive therapy
- Antibiotic taken as soon as symptoms develop

If infection occurs less than twice a year, a clean catch urine test should be taken for culture and treated as initial attack for 3 days.

Complicated UTI

Age
elderly, children, & neonate are considered complicated

Catheterization

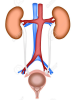
Diabetes mellitus

Spinal cord injury

Comorbidities in paediatric patient

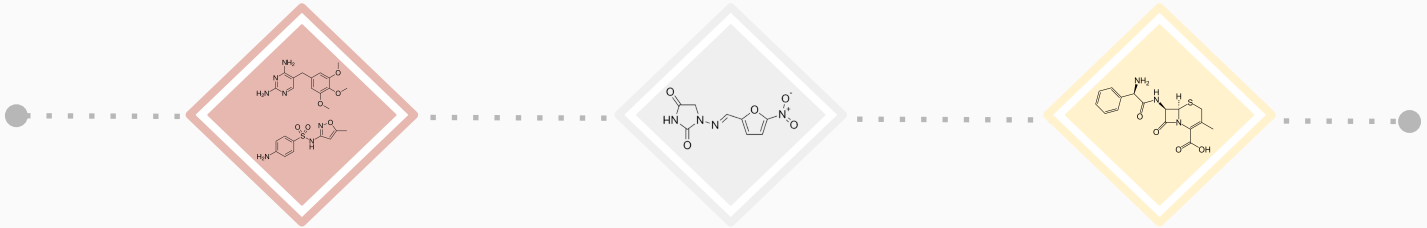
When to consult the doctor ?

NOT important

- If symptoms persist
- A change in symptoms 
-  Pregnant women
- Impaired immune system 
- 4 More than 4 infections per year
- Previous kidney infections 
-  Structural abnormalities of urinary tract
- History of infection with antibiotic resistant bacteria.

Prophylactic antibiotics

- Used with recurrent infections which reduces recurrence by up to 95%
- Optional for patients who do not respond to other measures.
- Low dose antibiotic taken continuously for 6 months or longer, it includes:



TMP-SMX **Nitrofurantoin** Cephalexin

Resistance can develop over time which is a problem

- Antibiotic taken at bed time more effective.

Pyelonephritis

Uncomplicated

Patients with fever, chills and flank pain
but they are ;

- **healthy** not sick
- female
- non-pregnant
- without relevant comorbidities
- without structural or functional urinary tract abnormalities

Can be treated at home with **oral** antibiotics
for 14 days with one of the followings:

1. Cephalosporins
2. Amoxicillin- clavulanic acid
3. Ciprofloxacin
4. TMP-SMX

- First dose may be given by injection

Moderate to severe

→ **Patients need hospitalization**
Patient is sick

- Antibiotic given by IV route for **3-5 days** until symptoms relieved for 24-48 hrs.
- Ceftriaxone is the best to start with, because it covers most of pyelonephritis etiology (gram -ve), and aminoglycoside such as gentamicin for the first 2-3 days sometimes.

If fever and back pain continue after 72 hrs of antibiotic, **imaging tests** indicated to exclude;

- abscesses
- obstruction
- abnormality

Treatment of specific population

Pregnant women

- High risk for UTI and complications
- Should be screened for UTI

Antibiotics during pregnancy includes;

1. Amoxicillin
2. Ampicillin
3. Cephalosporins
4. Nitrofurantoin

*Contraindicated in late pregnancy

→ **pregnant women should NOT take Quinolones**

- Pregnant women with asymptomatic bacteriuria (evidence of infection but no symptoms) have 30% risk for acute pyelonephritis in the second or third trimester. Screening and 3-7 days antibiotic needed.

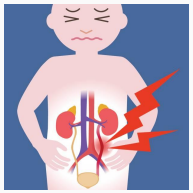
Because she's asymptomatic. If symptomatic then antibiotics are given up to 14 days

- Acute cystitis during pregnancy usually treated within 7 days of abx

Treatment of specific population

Diabetic patient

- Have more frequent and more severe UTIs, considered as complicated UTI.
- Treated for 7-14 days with antibiotics even for patients with less severe infection.



Urethritis in men

NOT important

Most important causes
- Neisseria gonorrhoeae
- Chlamydia trachomatis

Treated with :

1. IM Ceftriaxone + Doxycycline
2. Azithromycin

→ Patients should also be tested for accompanying STD (sexually transmitted disease) .

Treatment of specific population

Children with UTI

Usually treated with ;

1. TMP-SMX
2. Cephalexin
- Gentamicin

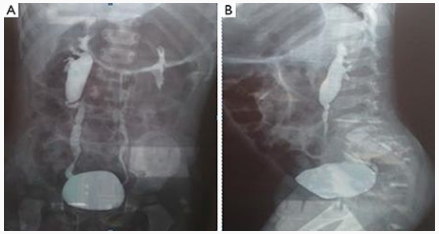
may be recommended as resistance to Cephalexin is increasing.

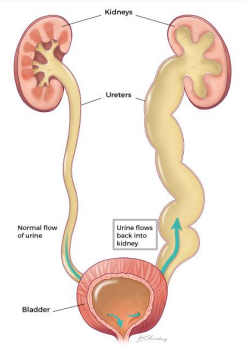
◄ Recall from renal pharma
M.O.A: inhibits protein synthesis by binding to 30S ribosomal sub.
Effective on Gram-ve aerobic (most of UTI pathogens).
A.E. Ototoxicity & Nephrotoxicity.

- Sometimes given as IV

Vesicoureteric reflux (VUR)

condition in which urine flows backward from the bladder to one or both ureters and sometimes to the kidneys





- Common in **children** with UTI
- Can lead to pyelonephritis and kidney damage.

Treatment : Long-term antibiotic plus surgery used to correct VUR and prevent infections.

→ **in Acute kidney infection** we use :

First 2-4 days

- Cefixime (oral)
- Ceftriaxone (IV)
- Gentamicin

Dose : One daily

Followed by oral treatment e.g,

- amoxicillin-clavulanic acid
- TMP-SMX

Treatment of specific population

Catheterized patient → Very common


*Closed system

Preventive measures when using a catheter ;

1. Catheter should not be used unless absolutely necessary and they should be removed as soon as possible and If catheter is required for long periods ,it is best to be used intermittently.
2. replaced every 2 weeks to reduce risk of infection and irrigating bladder with antibiotics between replacements
3. Daily hygiene and use of closed system* to prevent infection.
4. Antibiotic use for prophylaxis is rarely recommended since high bacterial counts present and patients do not develop symptomatic UTI.

Treatment of specific population

Catheterized patient

Catheterized patient who develop UTI or at risk of sepsis ;

- should be treated for each episode with antibiotics and catheter should be removed, if possible.
- Associated organisms are constantly changing and may be multiple species of bacteria.
- Antibiotic therapy has little benefit if the catheter is to remain in place for long period.
  Catheter became the source of infection
- Treated for 7-14 days

Case:

30 year-old Women Asymptomatic, Pregnant women culture +ve 100,000 Cfu for E.Coli And sensitive to all Classes of antibiotic

- Complicated UTI. (Pregnancy)
- asymptomatic Bacteriuria Usually shouldn't be Treated.
- But the presence of Pregnancy Indicate the **urge of treatment** Even Though It's Asymptomatic Bacteriuria Because the presence of Bacteriuria increase the Risk of pyelonephritis in pregnancy.

- When should you treat Asymptomatic Bacteriuria in Female:

-Pregnancy
-Pre-Urological procedure
-Post-kidney transplant

In UTI (cystitis) : we use Oral Antibiotic in complicated or UnComplicated UTI the only difference is the duration:
Complicated UTI : should be treated for 7-14 days present in patient with (D.M ,Structural abnormalities and Renal abscess Pregnancy , Catheter)
Uncomplicated: only 3 days

Sensitivity:
If patient comes with cystitis And he is sensitive to all Antibiotics You should use the **Narrowest** spectrum of Antibiotics SO,
Use: Amoxicillin,TRM-SMX **Not** Ceftriaxone.

Recurrent infection:
prophylactic Antibiotics
Generally the Antibiotics type depends on the susceptibility pattern
but we usually use these option: TMR-SMX , Nitrofurantoin

Pyelonephritis:
depending on severity we use I.V or Oral antibiotic.
This also applies to children(Severe = I.V)
What initial I.V Antibiotics should we use ?
Ceftriaxone

VesicoUreteric reflux:
Urine Backflow To the kidney which cause infection to kidney.
Usually sever.
Should be treated with by I.V therapy:
Ceftriaxone, Gentamicin
Never use Ciprofloxacin

Contra-Indications:
-Fluoroquinolone:
e.g: Ciprofloxacin:
Don't be tricked By ciprofloxacin
If a question come asking about giving Antibiotics to children or pregnancy
Never choose ciprofloxacin as an answer.
-Nitrofurantoin not used in late pregnancy.

Summary

	Ampicillin	Amoxicillin	Cephalosporins		Fluoroquinolone (ciprofloxacin)	TMP-SMX	Nitrofurantoin
			Ceftriaxone	Cephalexin			
Cystitis							
Uncomplicated For 3 days		✓	✓	✓	✓	✓	✓
As Prophylactic				✓		✓	✓
Pyelonephritis							
Uncomplicated 14 days orally		✓ With clavulanic acid	✓	✓	✓	✓	
Pregnant women	✓	✓	✓	✓	#		✓
Children			✓	✓	#	✓	

- Doesn't include everything.

= contraindicated

Quiz

1- Which is a common UTI risk factor in adults?

A. Enlarged prostate
B. Catheter usage
C. Diabetes
D. All of the above

2- UTIs are divided epidemiologically by where the infection is acquired.
Which of these are **NOT** examples of causative organisms of UTIs from the community?

A. Escherichia coli
B. Staphylococcus aureus
C. Serratia marcescens
D. Staphylococcus saprophyticus

3- Symptoms that significantly increase the probability of UTI except...

A. Dysuria
B. Haematuria
C. Vaginal discharge
D. Suprapubic pain
E. Back pain
F. Thin urethral discharge

4- gram -ve bacilli non-lactose formatting, Oxidase -ve, urease +ve, blood agar showed swarming:

A. E.coli
B. Pseudomonas
C. Klebsiella pneumonia
D. Proteus vulgaris

Key answers:

1-D 2-C 3-C 4-D

SAQ

1- 30 year old female with frequency and painful urination, urinalysis shows positive leukocyte esterase and nitrate. Microscopy shows elevated WBC and bacteria. How should you treat it? How long is the course if the patient was diabetic ?

2- 30 year old female with frequency and painful urination, fever, flank pain, tenderness on examination. Urinalysis shows positive leukocyte esterase and nitrate. Microscopy shows elevated WBC and bacteria. How should you treat it?

3- 30 year old asymptomatic pregnant woman. Culture is positive with 100k cfu/ml E.coli. Sensitive to all tested antibiotics what should we give her?

4- 4 year old with pyelonephritis what should we give him?

Answers

1-it's uncomplicated. Amoxicillin, Nitrofurantoin, cephalosporins. 7-14 days if diabetic

2- Pyelonephritis depends on the severity. 4-5 days of I.V if severe then start on oral antibiotics. If not as severe then oral antibiotics can be given immediately

3- Amoxicillin for 3-7 days since she's asymptomatic .

4- first treat the acute pyelonephritis with ceftriaxone then look for the cause. If the cause is VUR then surgery is needed along with long duration of antibiotics

Done by

Note taker

Team leaders:

Renad Almutawa • Badr Alqarni

Team members:

- Rema Almutawa
- Amirah Alzahrani

Faisal Al-Koblan

Lama Alassiri

Editor: Elaf Almusahel

Thank you

Special thanks to our amazing designer
Elaf Almusahel

Finally we're done with 1st year MICROBIOLOGY

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Badr Alqarni **Renad Almutawa** **Haneen Somily**

Special thanks to our wonderful members ✧

- Elaf Almusahel
- Lama Alassiri
- Noura Almazrou
- Ghada Alsadhan
- Raghad Alkhashan
- Sarah Alhelal
- Rawan Alzayed
- Lina Alnassar
- Deena Awartani
- Rema Almutawa
- Amirah Alzahrani
- Sarah Alkhalife
- Njoud Alali
- Taibah Alzaid
- Lina Alosaimi
- Maysoon Altamim
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- Abdullah Alzamil
- Abdullah Alessa
- Bader Almuhanna
- Abdulrahman Alhawas
- Abdullah Alnuwaibet