Approach To Urinary Tract Infections

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The Urinary Tract and Its Defenses

- Urinary tract: removes substances from the blood, regulates certain body processes, and forms urine and transports it out of the body
  - Includes the kidneys, ureters, bladder, and urethra
  - Defenses
    - Flushing action of urine
    - Desquamation of the epithelial cells
    - Acidity of urine
    - Antibacterial proteins in urine
    - Secretory IgA
## Antibacterial Host Defenses in the Urinary Tract

<table>
<thead>
<tr>
<th>defense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine (osmolality, pH, organic acids)</td>
</tr>
<tr>
<td>Urine flow and micturition</td>
</tr>
<tr>
<td>Urinary tract mucosa (bactericidal activity, cytokines)</td>
</tr>
<tr>
<td>Urinary inhibitors of bacterial adherence</td>
</tr>
<tr>
<td>Tamm-Horsfall protein</td>
</tr>
<tr>
<td>Bladder mucopolysaccharide</td>
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<tr>
<td>Low-molecular-weight oligosaccharides</td>
</tr>
<tr>
<td>Secretory immunoglobulin A (S IgA)</td>
</tr>
<tr>
<td>Lactoferrin</td>
</tr>
<tr>
<td>Inflammatory response</td>
</tr>
<tr>
<td>Polymorphonuclear neutrophils (PMNs)</td>
</tr>
<tr>
<td>Cytokines</td>
</tr>
<tr>
<td>Immune system</td>
</tr>
<tr>
<td>Humoral immunity</td>
</tr>
<tr>
<td>Cell-mediated immunity</td>
</tr>
<tr>
<td>Miscellaneous</td>
</tr>
<tr>
<td>Prostatic secretions</td>
</tr>
</tbody>
</table>
Normal Biota of the Urinary Tract

• Outer region of the urethra harbors some normal biota
• Nonhemolytic *streptococci, staphylocci, corynebacteria*, and some *lactobacilli*

Normal Biota of the Male Genital Tract
– Same as described for urethra, since the urethra is the terminal “tube”

Normal Biota of the Female Genital Tract
– The vagina harbors a normal population of microbes
  • *Lactobacillus species*
  • *Candida albicans* at low levels
<table>
<thead>
<tr>
<th>Genitourinary Tract Defenses and Normal Biota</th>
<th>Defenses</th>
<th>Normal Biota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary Tract (both genders)</td>
<td>Flushing action of urine; specific attachment sites not recognized by most nonnormal biota; shedding of urinary tract epithelial cells, secretory IgA, lysozyme, and lactoferrin in urine</td>
<td>Nonhemolytic <em>Streptococcus, Staphylococcus, Corynebacterium, Lactobacillus</em></td>
</tr>
<tr>
<td>Female Genital Tract (childhood and postmenopause)</td>
<td>Mucus secretions, secretory IgA</td>
<td>Same as for urinary tract</td>
</tr>
<tr>
<td>Female Genital Tract (childbearing years)</td>
<td>Acidic pH, mucus secretions, secretory IgA</td>
<td>Predominantly <em>Lactobacillus</em> but also <em>Candida</em></td>
</tr>
<tr>
<td>Male Genital Tract</td>
<td>Same as for urinary tract</td>
<td>Same as for urinary tract</td>
</tr>
</tbody>
</table>
UTI- Definitions

• **Bacteriuria**
  • Significant bacteriuria - $\geq 10^5$ bacteria/mL
  • Asymptomatic bacteriuria refers to significant bacteriuria in a patient without symptoms

• **Cystitis**

• **Acute pyelonephritis**

• **Uncomplicated urinary tract infection** refers to infection in a structurally and neurologically normal urinary tract

• **Complicated urinary tract infection** refers to infection in a urinary tract with functional or structural abnormalities (including indwelling catheters and calculi).
Recurrences of urinary tract infection may be either relapses or reinfections.

Relapse of bacteriuria refers to a recurrence of bacteriuria with the same infecting microorganism that was present before therapy was started.

Reinfection is a recurrence of bacteriuria with a microorganism different from the original infecting bacterium.
UTI- Definitions...

- **Urosepsis** is commonly used to describe the sepsis syndrome due to UTI.
  - It includes clinical evidence of UTI plus two or more of the following:
    - (1) temperature greater than 38° C or less than 36° C;
    - (2) heart rate greater than 90 beats per minute;
    - (3) respiratory rate greater than 20/minute, or $\text{PaCO}_2$ less than 32 mm Hg;
    - (4) white blood count greater than 12,000/mm$^3$, less than 4000/mm$^3$, or greater than 10% band forms.

- **Chronic urinary tract infection** has little meaning in many patients
Chronic pyelonephritis means different things to different authors.

Papillary necrosis from infection is an acute complication of pyelonephritis, usually in the presence of diabetes mellitus, urinary tract obstruction, sickle cell disease, or analgesic abuse.

Intrarenal abscess may result from bacteremia or may be a complication of severe pyelonephritis.

Perinephric abscess occurs when microorganisms from either the renal parenchyma or blood are deposited in the soft tissues surrounding the kidneys.
Pathogenesis

- Routes
  - Thrombophlebitic
  - Hematogenous
  - Lymphatic pathways

- Host-Parasite Interaction
  - Organism
  - Host

<table>
<thead>
<tr>
<th>bacterial attributes</th>
<th>host factors</th>
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</thead>
<tbody>
<tr>
<td>capsular antigens</td>
<td>renal calculi</td>
</tr>
<tr>
<td>hemolysins</td>
<td></td>
</tr>
<tr>
<td>urease</td>
<td></td>
</tr>
<tr>
<td>adhesion to uroepithelium (e.g. P fimbriae in Escherichia coli)</td>
<td>ureteric reflux</td>
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<tr>
<td>introital colonization</td>
<td>tumors in and adjacent to urinary tract</td>
</tr>
<tr>
<td></td>
<td>pregnancy, bladder stones</td>
</tr>
<tr>
<td></td>
<td>neurologic problems: incomplete bladder emptying large volume of residual urine</td>
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<td></td>
<td>loss of sphincter control</td>
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<td></td>
<td>prostatic hypertrophy</td>
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<td>short urethra in women</td>
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<td>catheterization</td>
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## Risk Factors for Urinary Tract Infection

<table>
<thead>
<tr>
<th>All Ages</th>
<th>Male</th>
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</thead>
<tbody>
<tr>
<td>Previous urinary tract infection</td>
<td>Lack of circumcision (children and young adults)</td>
</tr>
<tr>
<td>Urologic instrumentation or surgery</td>
<td>Urologic instrumentation or surgery</td>
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<tr>
<td>Urethral catheterization</td>
<td>Urethral catheterization</td>
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<tr>
<td>Urinary tract obstruction, including calculi</td>
<td>Urinary tract obstruction including calculi</td>
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<tr>
<td>Neurogenic bladder</td>
<td>Neurogenic bladder</td>
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<tr>
<td>Renal transplantation</td>
<td>Renal transplantation</td>
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<tr>
<td>Adults</td>
<td>Insertive rectal intercourse</td>
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<tr>
<td>Sexual intercourse</td>
<td></td>
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<tr>
<td>Lack of urination after intercourse</td>
<td></td>
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<tr>
<td>Spermicidal contraceptive jellies</td>
<td></td>
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<tr>
<td>Diaphragm use</td>
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<tr>
<td>Pregnancy</td>
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<td>Lower socioeconomic group</td>
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<tr>
<td>Diabetes</td>
<td></td>
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<tr>
<td>Sickle cell trait in pregnancy</td>
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<td>Human immunodeficiency virus with high viral load</td>
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<tr>
<td>Older Age</td>
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<tr>
<td>Functional or mental impairment</td>
<td>Functional or mental impairment</td>
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<tr>
<td>Estrogen deficiency (loss of vaginal lactobacilli)</td>
<td>Prostatic enlargement</td>
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<tr>
<td>Bladder prolapse</td>
<td>Condom catheter drainage</td>
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Etiology
In Ethiopia

A retrospective study on prevalence and antimicrobial susceptibility patterns of bacterial isolates from urinary tract infections in Tikur Anbessa Specialized Teaching Hospital Addis Ababa, Ethiopia, 2011

Getachew Kabew¹, Tamirat Abebe², Adane Miheret²

Abstract

Introduction: Urinary tract infection is an inflammation of the urinary system caused by any bacteria, usually bacteria from digestive tract or vagina cling to the opening of the urinary system. More than 150 million urinary tract infections occur annually worldwide. Indiscriminate use of antibiotics and emergence of drug resistant pathogens now.

Objective: To determine the prevalence and drug susceptibility patterns of bacterial isolates from urinary tract infections within the last three years, January 1st 2008 to December 31st 2010 in Tikur Anbessa Specialized Teaching Hospital of Addis Ababa, Ethiopia.

Method: An institution-based retrospective cross sectional population survey was conducted and patients were included for diagnosis of patients visiting Tikur Anbessa Specialized Teaching Hospital and analyzed using SPSS version 17 computer software package. Percentages and their confidence interval values were used to see statistical significance (p<0.05).

Results: Out of 3254 recorded patient’s data 3128 results were taken and urinary tract infection was 23.32 % and the highest prevalence was obtained among female patients. The bacterial pathogens isolated were predominantly, *Escherchia coli* 361 (16.81%), Coagglutinate negative *Staphylococci Spp* 49 (6.06%) and *Enterococci Spp* 134 (5.06%). Sensitivity testing showed that both gram negative and gram-positive isolates were sensitive to Ampicilin: (83.93%), Amoxicillin: (78.87%) and Tetracycline: (77.75%).

Conclusion: the prevalence of urinary tract infection was high, and the drug resistance rate was extremely high. For this reason, it is necessary to minimize the rate of urinary tract infections, and to constantly monitor susceptibility patterns of specific pathogens to commonly used antimicrobial agents before antibiotic therapy initiation. [Ethiop. J. Health Dev. 2013;27(2):111-117]
BACTERIAL UROPATHOGENS IN URINARY TRACT INFECTION AND ANTIBIOTIC SUSCEPTIBILITY PATTERN IN JIMMA UNIVERSITY SPECIALIZED HOSPITAL, SOUTHWEST ETHIOPIA

Getenet Beyene *1, Wondewosen Tsegaye1

ABSTRACT

BACKGROUND: Urinary tract infection (UTI) is one of the most common bacterial infections encountered by clinicians in developing countries. Area-specific monitoring studies aimed to gain knowledge about the type of pathogens responsible for urinary tract infections and their resistance patterns may help the clinician to choose the correct empirical treatment. Therefore, the aim of this study was to determine the type and antibiotic resistance pattern of the urinary pathogens isolated from patients attending Jimma University Specialized Hospital from April to June 2010.

METHODS: A hospital based cross sectional study was conducted and urine samples were collected using the mid-stream "clean catch" method from 228 clinically-suspected cases of urinary tract infections and tested bacteriologically using standard procedures. Antimicrobial susceptibility test was performed for the isolated pathogens using Kirby-Bauer disk diffusion method according to Clinical and Laboratory Standards Institute guidelines.

RESULTS: - Significant bacteria were detected from 9.2% of the total patients. The most common pathogens isolated were Escherichia coli (33.3%), Klebsiella pneumoniae (19%) and S. saprophyticus (14.3%). E. coli and Klebsiella pneumoniae showed the highest percentage of resistance to ampicillin and amoxicillin (100%) however, all isolates of E. coli and K. pneumoniae were susceptible to ciprofloxacin. S. saprophyticus and S. aureus were resistant to ampicillin (100%) and amoxicillin (66.7%). For all UTI isolates, least resistance was observed against drugs such as ceftriaxone, gentamycin and chloramphenicol.

CONCLUSION: - This study finding showed that E. coli isolates were the predominant pathogens and the presence of bacterial isolates with very high resistance to the commonly prescribed drugs that in turn leaves the clinicians with very few alternative options of drugs for the treatment of UTIs. As drug resistance among bacterial pathogens is an evolving process, routine surveillance and monitoring studies should be conducted to provide physicians knowledge on the updated and most effective empirical treatment of UTIs.

KEYWORDS: Urinary tract infection, antimicrobial resistance, Jimma, Ethiopia
Clinical features

- **Asymptomatic Bacteriuria**
  - The microbiologic criterion is usually $\geq 10^5$ bacterial CFU/mL except in catheter-associated disease, in which $\geq 10^3$ CFU/mL is the cutoff.
  - The clinical criterion is that the person has no signs or symptoms referable to UTI.
Cystitis

- Pain in the pubic area
- Frequent urges to urinate even when the bladder is empty
- Burning pain accompanying urination (dysuria)
- Cloudy urine
- Orange tinge to the urine (hematuria)
Pyelonephritis

- Mild pyelonephritis can present as low-grade fever with or without lower-back or costovertebral angle pain, whereas severe pyelonephritis can manifest as high fever, rigors, nausea, vomiting, and flank and/or loin pain.
- Symptoms are generally acute in onset, and symptoms of cystitis may not be present.
- Fever is the main feature distinguishing cystitis and pyelonephritis
Prostatitis

- Inflammation of the prostate gland
- Infectious and noninfectious
- Acute or chronic
- Pain in the pelvic area, lower back, or genital area; frequent urge to urinate; blood in the urine; and/or painful ejaculation
Catheter-Associated UTI (CAUTI)

- Infection occurring in a person whose urinary tract is currently catheterized or has been catheterized within the previous 48 h
- The accepted threshold for bacteriuria to meet the definition of CAUTI is $\geq 10^3$ CFU/mL
- The formation of biofilm—a living layer of uropathogens—on the urinary catheter is central to the pathogenesis of CAUTI and affects both therapeutic and preventive strategies
- The typical signs and symptoms of UTI have less predictive value for diagnosis
Diagnostic flow chart for evaluating urinary tract infection.
Diagnostic flow chart for evaluating urinary tract infection

- **Acute onset of**
  - Back pain
  - Nausea/vomiting
  - Fever
  - Cystitis symptoms

- **Otherwise healthy woman who is not pregnant**
  - Consider uncomplicated pyelonephritis
    - Urine culture
    - Consider outpatient management

- **All other patients**
  - Consider pyelonephritis
    - Urine culture
    - Blood cultures

- **Non-localizing systemic symptoms of infection**
  - Fever
  - Altered mental status
  - Leukocytosis

- **No obvious non-urinary cause**
  - Consider complicated UTI, CAUTI, or pyelonephritis
    - Urine culture
    - Blood cultures
    - Exchange or remove catheter if present
Diagnostic flow chart for evaluating urinary tract infection

Positive urine culture in the absence of
- Urinary symptoms
- Systemic symptoms related to the urinary tract

Patient who is pregnant, is a renal transplant recipient, or will undergo an invasive urologic procedure

Consider ASB
- Screening and treatment warranted

Consider CA-ASB
- No additional workup or treatment needed
- Remove unnecessary catheters

Patient with urinary catheter

Consider ASB
- No additional workup or treatment needed

All other patients

Consider recurrent cystitis
- Urine culture to establish diagnosis
- Consider prophylaxis or patient-initiated management

Otherwise healthy woman who is not pregnant

Consider chronic bacterial prostatitis
- Meares-Stamey 4-glass test
- Consider urology consult

Male
Approach to choosing an optimal antimicrobial agent for empirical treatment of acute uncomplicated cystitis

[Diagram]

- Woman with acute uncomplicated cystitis
  - Absence of fever, flank pain, or other suspicion for pyelonephritis
  - Able to take oral medication

  Yes

  No

  Consider alternate diagnosis (such as pyelonephritis or complicated UTI) & treat accordingly (see text)
Approach to choosing an optimal antimicrobial agent for empirical treatment of acute uncomplicated cystitis

Can one of the recommended antimicrobials* below be used considering:
- Availability
- Allergy history
- Tolerance

- Nitrofurantoin monohydrate/macrocrystals 100 mg bid X 5 days (avoid if early pyelonephritis suspected)  
  *A-I

- Trimethoprim-sulfamethoxazole 160/800 mg (one DS tablet) bid X 3 days (avoid if resistance prevalence is known to exceed 20% or if used for UTI in previous 3 months)  
  *A-I

- Fosfomycin trometamol 3 gm single dose (lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)  
  *A-I

- Pivmecillinam 400 mg bid X 5 days (lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)  
  *A-I

*The choice between these agents should be individualized and based on patient allergy and compliance history, local practice patterns, local community resistance prevalence, availability, cost, and patient and provider threshold for failure (see Table 4)

Gupta K et al. Clin Infect Dis. 2011;52:e103–e120a

Fluoroquinolones (resistance prevalence high in some areas)  
* A–III

- OR

  _β_-lactams  
  B–I*

  (avoid ampicillin or amoxicillin alone; lower efficacy than other available agents; requires close follow-up)

  *amox/clav, cefdinir, cefaclor, cefpodoxime for 3–7 d  
  B–I

“_β_-lactams generally have inferior efficacy & more adverse effects, compared with other UTI anti-microbials”  
B–I
### Treatment Strategies For Acute Uncomplicated Cystitis

<table>
<thead>
<tr>
<th>Drug and Dose</th>
<th>Estimated Clinical Efficacy, %</th>
<th>Estimated Bacterial Efficacy, %</th>
<th>Common Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrofurantoin, 100 mg bid × 5–7 d</td>
<td>84–95</td>
<td>86–92</td>
<td>Nausea, headache</td>
</tr>
<tr>
<td>TMP-SMX, 1 DS tablet bid × 3 d</td>
<td>90–100</td>
<td>91–100</td>
<td>Rash, urticaria, nausea, vomiting, hematologic abnormalities</td>
</tr>
<tr>
<td>Fosfomycin, 3-g single-dose sachet</td>
<td>70–91</td>
<td>78–83</td>
<td>Diarrhea, nausea, headache</td>
</tr>
<tr>
<td>Pivmecillinam, 400 mg bid × 3–7 d</td>
<td>55–82</td>
<td>74–84</td>
<td>Nausea, vomiting, diarrhea</td>
</tr>
<tr>
<td>Fluoroquinolones, dose varies by agent; 3-d regimen</td>
<td>85–95</td>
<td>81–98</td>
<td>Nausea, vomiting, diarrhea, headache, drowsiness, insomnia</td>
</tr>
<tr>
<td>β-Lactams, dose varies by agent; 5- to 7-d regimen</td>
<td>79–98</td>
<td>74–98</td>
<td>Diarrhea, nausea, vomiting, rash, urticaria</td>
</tr>
</tbody>
</table>

*Microbial response as measured by reduction of bacterial counts in the urine.*
Collateral damage

• Refers to the adverse ecologic effects of anti-microbial therapy, including killing of the normal flora and selection of drug-resistant organisms.

• Only pertains to cystitis not for more invasive or serious diseases

• Minimal risk of progression to tissue invasion or sepsis
  • Spontaneous resolution may attenuate differences in clinical outcomes when a drug with 80% efficacy is compared with one with 95% efficacy
Collateral damage…

- Outbreaks of *Clostridium difficile* infection offer an example of collateral damage in the hospital environment.
- The implication of collateral damage in this context is that a drug that is highly efficacious for the treatment of UTI is not necessarily the optimal first-line agent if it also has pronounced secondary effects on the normal flora or is likely to change resistance patterns.
Overview of antibiotic profiles for acute uncomplicated cystitis

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Efficacy</th>
<th>Safety</th>
<th>Resistant Prevalence</th>
<th>Collateral Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTF</td>
<td>93% (84-95%)</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>T-S</td>
<td>93% (90-100%)</td>
<td>Good</td>
<td>Intermed. (varies)</td>
<td>Poss</td>
</tr>
<tr>
<td>Fosfomycin</td>
<td>91%</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Pivmecillinam</td>
<td>55-82%</td>
<td>Good</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>FQs</td>
<td>90% (85-98%)</td>
<td>Good</td>
<td>Intermed. (varies)</td>
<td>Prob.</td>
</tr>
<tr>
<td>B-lactams</td>
<td>89% (79-98%)</td>
<td>Fair</td>
<td>Intermed. (varies)</td>
<td>Prob.</td>
</tr>
</tbody>
</table>
The threshold debate

• T-S: The threshold of 20% as the resistance prevalence at which the agent is no longer recommended for empirical treatment of acute cystitis is based on expert opinion derived from clinical, in vitro, and mathematical modeling studies (B-III).

• FQ: Data are insufficient to make a recommendation about what fluoroquinolone resistance level requires an alternative agent in conjunction with or to replace a fluoroquinolone for treatment of pyelonephritis.
Rx Pyelonephritis…

- Oral ciprofloxacin (500 mg twice daily) for 7 days, with or without an initial 400-mg dose of intravenous ciprofloxacin, is an appropriate choice for therapy in patients not requiring hospitalization (A-I)
  - where the prevalence of resistance of community uropathogens to fluoroquinolones is not known to exceed 10%
- A once-daily oral fluoroquinolone, including ciprofloxacin (1000 mg extended release for 7 days) or levofloxacin (750 mg for 5 days)(B-II)
When is intravenous administration indicated?

- Obvious clinical criteria (Nausea/vomiting; sepsis)
- Initial therapy for borderline patient who is probably going home with an oral regimen
- Resistance to FQ and T-S
  - An initial 1-time intravenous dose of a long-acting parenteral antimicrobial, such as 1 g of ceftriaxone (B-III) or a consolidated 24-h dose of an aminoglycoside, is recommended (B-III)
Rx Pyelonephritis...

- Oral trimethoprim-sulfamethoxazole DS twice daily for 14 days is effective for treatment of acute uncomplicated pyelonephritis if the uropathogen is known to be susceptible (AI).
  - If susceptibility is not known and trimethoprim-sulfamethoxazole is used, an initial intravenous one gram dose of ceftriaxone is recommended (BII).
- Oral β-lactam agents are less effective than other available agents (BIII).
- Initial intravenous dose of a long-acting parenteral antimicrobial is recommended (BIII).
UTI in Pregnant Women

- Nitrofurantoin, ampicillin, and the cephalosporins are considered relatively safe in early pregnancy.
- Sulfonamides and fluoroquinolones should be avoided.
UTI In Men

- Since the prostate is involved in the majority of cases of febrile UTI in men, the goal in these patients is to eradicate the prostatic infection as well as the bladder infection.
- A 7- to 14-day course of a fluoroquinolone or TMP-SMX is recommended if the uropathogen is susceptible.
Complicated UTI

- Therapy must be individualized and guided by urine culture results
- *Xanthogranulomatous pyelonephritis* is treated with nephrectomy
- Percutaneous drainage can be used as the initial therapy in *emphysematous pyelonephritis* and can be followed by elective nephrectomy as needed.
- *Papillary necrosis* with obstruction requires intervention to relieve the obstruction and to preserve renal function
Asymptomatic Bacteruria

- Treatment of ASB does not decrease the frequency of symptomatic infections or complications except in
  - Pregnant women,
  - Persons undergoing urologic surgery
  - Neutropenic patients and
  - Renal transplant recipients
  
  *Treatment should be directed by urine culture results.*

- In all other populations, screening for and treatment of ASB are discouraged
CAUTI

• Fairly good evidence supports the practice of catheter change during treatment for CAUTI
  • The goal is to remove biofilm-associated organisms that could serve as a nidus for reinfection
• In general, a 7- to 14-day course of antibiotics is recommended (A-III)
• The best strategy for prevention of CAUTI is to avoid insertion of unnecessary catheters and to remove catheters once they are no longer necessary
Candiduria

- An increasingly common complication of indwelling catheterization, particularly
  - for pts in ICU,
  - those taking broad-spectrum antimicrobial drugs, and
  - those with underlying diabetes mellitus
- >50% of urinary Candida isolates have been found to be non-albicans species
- Removal of the urethral catheter results in resolution of candiduria in more than one-third of asymptomatic cases
Candiduria...

- Treatment is recommended for patients who have symptomatic cystitis or pyelonephritis and for those who are at high risk for disseminated disease
  - those with neutropenia,
  - those who are undergoing urologic manipulation,
  - those who are clinically unstable, and
  - low-birth-weight infants.
- Fluconazole (200–400 mg/d for 14 days) reaches high levels in urine and is the first-line regimen for Candida infections of the urinary tract.
- For Candida isolates with high levels of resistance to fluconazole, oral flucytosine and/or parenteral amphotericin B are options.
Response to Therapy

- **Bacteriologic cure** is defined as negative urine cultures on chemotherapy and during the follow-up period (usually 1 to 2 weeks).

- **Bacteriologic persistence** has been used in two ways to describe a response to therapy:
  - (1) persistence of significant bacteriuria after 48 hours of treatment, and
  - (2) persistence of the infecting organism in low numbers in urine after 48 hours
Response to Therapy …

• **Bacteriologic relapse** usually occurs within 1 to 2 weeks after the cessation of chemotherapy and is often associated with renal infection, with structural abnormalities of the urinary tract, or with chronic bacterial prostatitis
• After initial sterilization of the urine, **reinfection** may occur during the administration of chemotherapy (also called **superinfection**) or at any time thereafter
Prevention of Recurrent UTI In Women

- Recurrence of AUC in reproductive age women is common
- The threshold of two or more symptomatic episodes per year is not absolute
  - Decisions about interventions should take the patient’s preferences into account
- Three prophylactic strategies are available:
  - Continuous
  - Postcoital, and
  - Patient-initiated therapy
Prevention of Recurrent UTI In Women…

- **Continuous prophylaxis and postcoital prophylaxis**
  - Usually entail low doses of TMP-SMX, a fluoroquinolone, or nitrofurantoin.
  - These regimens are all highly effective during the period of active antibiotic intake.
  - Typically, a prophylactic regimen is prescribed for 6 months and then discontinued

- **Patient-initiated therapy** involves supplying the patient with materials for urine culture and with a course of antibiotics for self-medication at the first symptoms of infection
International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases

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<table>
<thead>
<tr>
<th>Category/grade</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strength of recommendation</strong></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Good evidence to support a recommendation for or against use</td>
</tr>
<tr>
<td>B</td>
<td>Moderate evidence to support a recommendation for or against use</td>
</tr>
<tr>
<td>C</td>
<td>Poor evidence to support a recommendation</td>
</tr>
<tr>
<td><strong>Quality of evidence</strong></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Evidence from $\geq 1$ properly randomized, controlled trial</td>
</tr>
<tr>
<td>II</td>
<td>Evidence from $\geq 1$ well-designed clinical trial, without randomization; from cohort studies, controlled analytic studies (preferably from $\geq 1$ center); from multiple time points; from case studies, with dramatic results from uncontrolled experiments</td>
</tr>
<tr>
<td>III</td>
<td>Evidence from opinions of respected authorities, based on clinical experience, case studies, or reports of expert committees</td>
</tr>
</tbody>
</table>
THANK YOU!