

# GUIDELINES ON THE MANAGEMENT OF URINARY AND MALE GENITAL TRACT INFECTIONS

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## Introduction

Infections of the urinary tract pose a serious health problem, partly because of their frequent occurrence. Clinical and experimental evidence support the ascent of micro-organisms within the urethra as the most common pathway leading to urinary tract infections, especially for organisms of enteric origin (i.e. *Escherichia coli* and other Enterobacteriaceae). This also provides a logical explanation for the greater frequency of UTIs in women than in men and for the increased risk of infection following bladder catheterization or instrumentation.

## Classification and Definitions

For practical clinical reasons, urinary tract infections (UTIs) and male genital tract infections are classified into entities defined by the predominant clinical symptoms (Table 1).

### Table 1: Classification of urinary and male genital tract infections

- Uncomplicated lower UTI (cystitis)
- Uncomplicated pyelonephritis
- Complicated UTI with or without pyelonephritis
- Urosepsis

- Urethritis
- Prostatitis, epididymitis, orchitis

The definitions of bacteriuria and pyuria are listed in Table 2.

### **Table 2: Significant bacteriuria in adults**

1.  $\geq 10^3$  uropathogens/mL of midstream urine in acute uncomplicated cystitis in female
2.  $\geq 10^4$  uropathogens/mL of midstream urine in acute uncomplicated pyelonephritis in female
3.  $\geq 10^5$  uropathogens/mL in midstream urine of women or  $10^4$  uropathogens/mL of midstream urine in men (or in straight catheter urine in women) with complicated UTI
4. In a suprapubic bladder puncture specimen, any count of bacteria is relevant.

#### *Asymptomatic bacteriuria*

Asymptomatic bacteriuria is defined as two positive urine cultures taken more than 24 hours apart containing  $10^5$  uropathogens/mL of the same bacterial strain (usually only the species can be detected).

#### *Pyuria*

The diagnostic requirement for pyuria is 10 white blood cells per high-power field (HPF) (x400) in the resuspended sediment of a centrifuged aliquot of urine or per  $\text{mm}^3$  in unspun urine. For routine investigation, a dipstick method can also be used, including a leukocyte esterase test and the assessment of haemoglobin and of nitrites.

## *Urethritis*

Symptomatic urethritis is characterized by alguria and purulent discharge.

## *Classification of prostatitis/chronic pelvic pain syndrome (CPPS)*

It is recommended that the classification according to NIDDK/NIH is used (Table 3).

### **Table 3: Classification of prostatitis according to NIDDK/NIH**

- I Acute bacterial prostatitis (ABP)
- II Chronic bacterial prostatitis (CBP)
- III Chronic pelvic pain syndrome (CPPS)
  - A. Inflammatory CPPS: WBC in EPS/voided bladder urine-3 (VB3)/semen
  - B. Non-inflammatory CPPS: no WBC/EPS/VB3/semen
- IV Asymptomatic inflammatory prostatitis (histological prostatitis)

## *Epididymitis, orchitis*

Most cases of epididymitis, with or without orchitis, are caused by common urinary pathogens. Bladder outlet obstruction and urogenital malformations are risk factors for this type of infection.

## **Diagnosis**

### *UTI (general)*

A disease history, physical examination and dipstick urinalysis, including white and red blood cells and nitrite reaction, is recommended for routine diagnosis. Except in isolated episodes of uncomplicated lower UTI (cystitis) in premenopausal,

healthy women, a urine culture is recommended in all other types of UTI before treatment, so allowing antimicrobial therapy to be adjusted if necessary.

### *Pyelonephritis*

In cases of suspected pyelonephritis, it may be necessary to evaluate the upper urinary tract to rule out upper urinary tract obstruction or stone disease.

### *Urethritis*

Pyogenic urethritis is indicated by a Gram stain of secretion or urethral smear that shows more than five leukocytes per HPF (x1,000) and in case of gonorrhoea gonococci are located intracellularly as Gram-negative diplococci. A positive leukocyte esterase test or more than 10 leukocytes per HPF (x400) in the first voiding urine specimen is diagnostic.

### *Prostatitis/CPPS*

In patients with prostatitis-like symptoms, an attempt should be made to differentiate between bacterial prostatitis and CPPS. This is best done by the four glass test according to Meares & Stamey, if acute UTI and STD can be ruled out.

## **Treatment and Prophylaxis**

Treatment of UTI depends on a variety of factors. Table 4 provides an overview of the most common pathogens, antimicrobial agents and duration of treatment for different conditions. Prophylactic treatment may be recommended for patients with recurrent UTI. The regimens shown in Table 5 have a documented effect in preventing recurrent UTI in women.

**Table 4: Recommendations for antimicrobial therapy in urology**

Diagnosis	Most frequent pathogen/species
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Cystitis acute, uncomplicated	<ul style="list-style-type: none"><li>• <i>E. coli</i></li><li>• <i>Klebsiella</i></li><li>• <i>Proteus</i></li><li>• Staphylococci</li></ul>
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Pyelonephritis acute, uncomplicated	<ul style="list-style-type: none"><li>• <i>E. coli</i></li><li>• <i>Proteus</i></li><li>• <i>Klebsiella</i></li><li>• Other enterobacteria</li><li>• Staphylococci</li></ul>
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UTI with complicating factors	<ul style="list-style-type: none"><li>• <i>E. coli</i></li><li>• Enterococci</li><li>• <i>Pseudomonas</i></li><li>• Staphylococci</li></ul>
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Nosocomial UTI	<ul style="list-style-type: none"><li>• <i>Klebsiella</i></li><li>• <i>Proteus</i></li></ul>
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Pyelonephritis acute, complicated	<ul style="list-style-type: none"><li>• <i>Enterobacter</i></li><li>• Other enterobacteria</li><li>• (<i>Candida</i>)</li></ul>
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Initial, empirical antimicrobial therapy	Therapy duration
• TMP-SMX <sup>o</sup>	3 days
• Fluoroquinolone*	(1-)3 days
• Fosfomycin trometamol	1 day
• Pivmecillinam	(3-)7 days
• Nitrofurantoin	(5-)7 days
• Fluoroquinolone*	7-10 days
• Cephalosporin (group 3a)	
Alternatives:	
• Aminopenicillin/BLI	
• Aminoglycoside	
• Fluoroquinolone*	3-5 days after
• Aminopenicillin/BLI	defeverescence or
• Cephalosporin (group 2)	control/elimination
• Cephalosporin (group 3a)	of complicating
• Aminoglycoside	factor
In case of failure of initial therapy	
within 1-3 days or in clinically severe	
cases:	
Anti- <i>Pseudomonas</i> active:	
• Fluoroquinolone, if not used initially	
• Acylaminopenicillin/BLI	
• Cephalosporin (group 3b)	
• Carbapenem	
• ± Aminoglycoside	
In case of <i>Candida</i> :	
• Fluconazole	
• Amphotericin B	

Prostatitis	• <i>E. coli</i>
acute, chronic	• Other enterobacteria
	• <i>Pseudomonas</i>
Epididymitis	• Enterococci
acute	• Staphylococci
	• <i>Chlamydia</i>
	• <i>Ureaplasma</i>
Urosepsis	• <i>E. coli</i>
	• Other enterobacteria
	After urological
	interventions - multi-
	resistant pathogens:
	• <i>Pseudomonas</i>
	• <i>Proteus</i>
	• <i>Serratia</i>
	• <i>Enterobacter</i>

BLI = beta-lactamase inhibitor; UTI = urinary tract infection.

\*Fluoroquinolone with mainly renal excretion (see text).

° only in areas with resistance rate < 20% (for *E. coli*).

## Special situations

### *UTI in pregnancy.*

Asymptomatic bacteriuria is treated with a 7-day course based on sensitivity testing. For recurrent infections (symptomatic or asymptomatic), either cephalexin, 125-250 mg/day, or nitrofurantoin, 50 mg/day, may be used for prophylaxis.

### *UTI in postmenopausal women.*

In women with recurrent infection, intravaginal oestriol is rec-

• Fluoroquinolone*	Acute:
Alternative in acute bacterial prostatitis:	2-4 weeks
• Cephalosporin (group 3a/b)	
In case of <i>Chlamydia</i> or <i>Ureaplasma</i> :	Chronic:
• Doxycycline	4-6 weeks or longer
• Macrolide	
• Cephalosporin (group 3a/b)	3-5 days after
• Fluoroquinolone*	defeverescence or
• Anti- <i>Pseudomonas</i> active	control/elimination
acylaminopenicillin/BLI	of complicating
• Carbapenem	factor
• ± Aminoglycoside	

ommended. If this is not effective, antibiotic prophylaxis should be added.

#### *UTI in children.*

Treatment periods should be extended to 7-10 days. Tetracyclines and fluoroquinolones should not be used because of adverse effects on teeth and cartilage.



### *Acute uncomplicated UTI in young men.*

Treatment should last at least 7 days.

### *Complicated UTI due to urological disorders.*

The underlying disorder must be managed if a permanent cure is to be achieved. Whenever possible, treatment should be guided by urine culture to avoid inducing resistant strains.

### *Sepsis in urology (urosepsis).*

Patients with UTI may develop sepsis. Early signs of systemic inflammatory response (fever or hypothermia, tachycardia, tachypnoea, hypotension, oliguria, leukopenia) should be recognized as the first signs of possible multi-organ failure. As well as appropriate antibiotic therapy, life-support therapy in collaboration with an intensive care specialist may be necessary. Any obstruction in the urinary tract must be drained.

**Table 5: Recommendations for antimicrobial prophylaxis of recurrent uncomplicated UTI**

Agent <sup>1</sup>	Dose
<b>Standard regimen</b>	
• Nitrofurantoin	50 mg/day
• Nitrofurantoin macrocrystals	100 mg/day
• TMP-SMX	40/200 mg/day or three times weekly
• TMP	100 mg/day
• Fosfomycin trometamol	3 g/10 day
<b>'Breakthrough' infections</b>	
• Ciprofloxacin	125 mg/day
• Norfloxacin	200-400 mg/day
• Pefloxacin	800 mg/week

### During pregnancy

- Cephalexin 125 mg/day
- Cefaclor 250 mg/day

TMP = trimethoprim-sulphamethoxazole.

<sup>†</sup>Taken at bedtime.

### Follow-up of patients with UTI

- For routine follow-up after uncomplicated UTI and pyelonephritis in women, dipstick urinalysis is sufficient.
- In women with a recurrence of UTI within 2 weeks, repeated urinary culture with antimicrobial testing and urinary tract evaluation is recommended.
- In the elderly, newly developed recurrent UTI may warrant a full evaluation of the urinary tract.
- In men with UTI, an urological evaluation should be performed in adolescent patients, cases of recurrent infection and all cases of pyelonephritis. This recommendation should also be followed in patients with prostatitis, epididymitis and orchitis.
- In children, investigations are indicated after two episodes of UTI in girls and one episode in boys. Recommended investigations are ultrasonography of the urinary tract supplemented by voiding cystourethrography.

### Urethritis

The following guidelines for therapy comply with the recommendations of the Center for Disease Control and Prevention (2002). For the treatment of gonorrhoea, the following antimicrobials can be recommended:

**First choice**

Cefixime 400 mg orally  
as a single dose  
Ceftriaxone 125 mg im  
as a single dose  
(im with local anaesthetic)

**Second choice**

Ciprofloxacin 500 mg orally or  
Ofloxacin 400 mg orally or  
Levofloxacin 250 mg orally  
as a single dose

As gonorrhoea is often accompanied by chlamydial infection, an antichlamydial active therapy should be added. The following treatment has been successfully applied in *Chlamydia trachomatis* infections:

**First choice**

Azithromycin  
1 g (= 4 caps @ 250 mg) orally  
as single dose  
Doxycycline  
2 times daily 100 mg orally for  
7 days

**Second choice**

Erythromycin  
4 times daily 500 mg orally  
for 7 day  
Ofloxacin 2 times daily  
300 mg orally or  
Levofloxacin once daily  
500 mg orally  
for 7 days

If therapy fails, infections with *Trichomonas vaginalis* and/or *Mycoplasma* spp. should be considered. These can be treated with a combination of metronidazole (2 g orally as a single dose) and erythromycin (500 mg orally, 4 times daily, for 7 days).

**Prostatitis**

Acute bacterial prostatitis can be a serious infection. The parenteral administration of high doses of bactericidal antibiotics,

such as an aminoglycoside and a penicillin derivative or a third-generation cephalosporin, is required until defervescence occurs and infection parameters return to normal. In less severe cases, a fluoroquinolone may be given orally for at least 10 days.

In chronic bacterial prostatitis and inflammatory CPPS, a fluoroquinolone or trimethoprim should be given orally for 2 weeks after the initial diagnosis. The patient should then be reassessed and antibiotics only continued if the pretreatment cultures were positive or if the patient has reported positive effects from the treatment. A total treatment period of 4-6 weeks is recommended.

*Combination therapy with antibiotics and  $\alpha$ -blockers:* Urodynamic studies have shown increased urethral closing pressure in patients with chronic prostatitis. Combination treatment with  $\alpha$ -blockers and antibiotics has been reported to have a higher cure rate than antibiotics alone in inflammatory CPPS. This treatment option is favoured by many urologists.

*Surgery:* Generally, surgery should be avoided in the treatment of prostatitis, except for the drainage of prostatic abscesses.

### *Epididymitis, orchitis*

Prior to antimicrobial therapy, a urethral swab and midstream urine sample should be obtained for microbiological investigation. The first choice of drug therapy should be fluoroquinolones, preferably those agents that react well against *C. trachomatis* (e.g. ofloxacin, levofloxacin), because of their broad antibacterial spectra and favourable penetration into urogenital tract tissues.

**Table 6: Recommendations for peri-operative antibacterial**

Procedure	Pathogens (expected)	Prophylaxis
<i>Diagnostic procedures</i>		
Transrectal biopsy of the prostate	Enterobacteriaceae Anaerobes?	All patients
Cystoscopy	Enterobacteriaceae	No
Urodynamic examination	Enterococci Staphylococci	
Ureteroscopy	Enterobacteriaceae Enterococci Staphylococci	No
<i>Endourological surgery and ESWL</i>		
ESWL	Enterobacteriaceae Enterococci	No
Ureteroscopy for uncomplicated distal stone	Enterobacteriaceae Enterococci Staphylococci	No
Ureteroscopy of proximal or impacted stone and percutaneous stone extraction	Enterobacteriaceae Enterococci Staphylococci	All patients

## prophylaxis in urology

Antibiotics	Remarks
Fluoroquinolones TMP ± SMX Metronidazole?	Short course ( $\leq 72$ h)
Cephalosporin 2 <sup>nd</sup> generation TMP ± SMX	Consider in risk patients
Cephalosporin 2 <sup>nd</sup> generation TMP ± SMX	
Cephalosporin 2 <sup>nd</sup> or 3 <sup>rd</sup> generation TMP ± SMX Aminopenicillin/BLI <sup>a</sup>	In patients with stent or nephrostomy tube Consider in risk patients
Cephalosporin 2 <sup>nd</sup> or 3 <sup>rd</sup> generation TMP ± SMX Aminopenicillin/BLI Fluoroquinolones	In patients with stent or nephrostomy tube Consider in risk patients
Cephalosporin 2 <sup>nd</sup> or 3 <sup>rd</sup> generation TMP ± SMX Aminopenicillin/BLI Fluoroquinolones	Short course, Length to be determined Intravenous suggested

TUR of the prostate	Enterobacteriaceae Enterococci	All patients
TUR of bladder tumour	Enterobacteriaceae Enterococci	No
<i>Open urological surgery</i>		
Clean operations	Skin-related pathogens, e.g. staphylococci Catheter-associated uropathogens	No
Clean-contaminated (opening of urinary tract)	Enterobacteriaceae Enterococci Staphylococci	Recommended
Clean-contaminated (use of bowel segments)	Enterobacteriaceae Enterococci Anaerobes Skin-related bacteria	All patients
Implant of prosthetic devices	Skin-related bacteria, e.g. staphylococci	All patients
<i>Laparoscopic procedures</i>		
BLI = beta-lactamase inhibitor; TMP ± SMX = trimethoprim with or without		

Cephalosporin 2<sup>nd</sup> or  
3<sup>rd</sup> generation  
TMP ± SMX  
Aminopenicillin/BLI

Low-risk patients and  
small-size prostate  
require no prophylaxis

Cephalosporin 2<sup>nd</sup> or  
3<sup>rd</sup> generation  
TMP ± SMX  
Aminopenicillin/BLI

Consider in risk patients  
and large necrotic  
tumours

Consider in high-risk  
patients.  
Short post-operative  
catheter treatment

Cephalosporin 2<sup>nd</sup> or  
3<sup>rd</sup> generation  
TMP ± SMX  
Aminopenicillin/BLI

Single peri-operative  
course

Cephalosporin 2<sup>nd</sup> or  
3<sup>rd</sup> generation  
Metronidazole

As for colonic surgery

Cephalosporin 2<sup>nd</sup> or  
3<sup>rd</sup> generation  
Penicillin  
(penicillinase stable)

As for open surgery

*sulphamethoxale (co-trimoxazole)*; TUR = transurethral resection.



In cases caused by *C. trachomatis*, treatment may also be continued with doxycycline, 200 mg/day, for a total treatment period of at least 2 weeks. Macrolides are alternative agents. In cases of *C. trachomatis* infection, the sexual partner should also be treated.

## **Perioperative Antibacterial Prophylaxis in Urological Surgery**

The main aim of antimicrobial prophylaxis in urology is to prevent symptomatic or febrile genitourinary infections, such as acute pyelonephritis, prostatitis, epididymitis and urosepsis, as well as serious wound infections. The recommendations for short-term peri-operative antibacterial prophylaxis in standard urological interventions are listed in table 6.

*This short booklet is based on the more comprehensive EAU guidelines (ISBN 90-70244-37-3), available to all members of the European Association of Urology at their website: <http://www.uroweb.org>.*