

# Summary of guidelines from the Polish Urological Association, Polish Society of Gynaecologists and Obstetricians, and Polish Society of Family Medicine on the diagnosis, therapy, and management of community-acquired lower urinary tract infections

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**Introduction** This publication provides a summary of national guidelines developed in response to the regional characteristics of aetiological factors, resistance patterns, and the availability of antibacterial drugs in Poland.

**Material and methods** After reviewing the epidemiological evidence, case-control studies, randomised control trials, and current international guidelines and statements, a Polish multidisciplinary group prepared the final recommendations. These recommendations cover diagnosis and management of community-acquired lower urinary tract infections in both genders, pregnant and breastfeeding women, recurrent lower urinary tract infections, and asymptomatic bacteriuria.

**Results** The regional choice of antimicrobial agents for first-line therapy of uncomplicated cystitis in women includes fosfomycin trometamol, pivmecillinam, furazidin (furagin), and nitroloxoline. For men, co-trimoxazole or fluoroquinolone therapy is recommended. Pivmecillinam and fosfomycin are recommended for the treatment of pregnant and breastfeeding women. For continuous prophylaxis of recurrent urinary tract infections in women, the following antimicrobial agents can be used: fosfomycin trometamol, trimethoprim, furazidin (furagin), and cefaclor. The significance of behavioural management and the use of vaginal hormonal therapy, vaginal probiotics, and immunoprophylaxis is emphasised. Asymptomatic bacteriuria should be treated in pregnant women and in patients prior to surgical intervention in the urinary tract.

**Conclusions** New national guidelines based on locally available therapeutic resources should contribute to a more rational choice of therapy in patients with lower urinary tract infection and asymptomatic bacteriuria in Poland.

**Key Words:** urinary tract infection <> prophylaxis <> prevention <> bacteriuria <> treatment

## INTRODUCTION

This publication provides a summary of guidelines developed by 3 Polish medical societies, which have been published in national journals in Polish [1]. In addition to recommendations on diagnosis and treatment, the main text covers broader topics such as the epidemiology, aetiology, and microbiology of lower urinary tract infections (UTIs). This publication highlights aspects that may distinguish these guidelines from their international counterparts. The creation of national guidelines is justified by the specific characteristics of aetiological factors, pathogen resistance to antibiotics, and the availability of antibacterial drugs. The second aim was to create a unified document that consolidates guidelines from different fields, particularly for the use of family doctors.

The guidelines address bacterial community-acquired lower urinary tract infections. They cover both genders, with specific guidelines for pregnant women and for recurrent UTIs. They do not address sexually transmitted infections or infections of the genital organs. Recommendations include the treatment of complicated lower urinary tract infections, provided they are not related to medical institutions or urinary catheterisation/instrumentation. They also do not cover issues related to the treatment of urosepsis.

## DEFINITIONS

**Urinary tract infection (UTI)** – a clinical condition caused by the presence of microorganisms in the urinary tract, resulting in a local or systemic inflammatory response with associated symptoms.

**Bacteriuria** – the presence of significant levels of bacteria in urine collected from the urinary tract, as confirmed by a microbiological test.

**Asymptomatic bacteriuria (ASB)** – the presence of significant levels of bacteria in the urine without associated local or systemic symptoms. Diagnosis requires identification of the same species of bacteria in 2 consecutive tests.

**Uncomplicated UTI** – acute infection of the lower (uncomplicated cystitis) or upper (pyelonephritis) urinary tract limited to non-pregnant women with no known significant anatomical or functional abnormalities of the urinary tract or comorbidities predisposing to infection.

**Complicated UTI** – UTI in a patient with risk predisposing factors for incidence and high severity. The term refers to UTI in all men, pregnant women, patients with significant anatomical or functional abnormalities of the urinary tract, patients with

catheters in the urinary tract, and patients with renal disease and/or other coexisting conditions that weaken the immune system, such as diabetes, immunosuppression, or advanced age.

**Community-acquired UTI** – UTI in individuals who have not recently been hospitalised or undergone urinary tract instrumentation.

**Recurrent UTI (rUTI)** – the occurrence of uncomplicated and/or complicated UTI with a frequency of at least 3 episodes per year or 2 episodes in the last 6 months [2].

**Urosepsis** – life-threatening organ dysfunction caused by an unregulated host response to an infection originating from the urinary tract and/or male genital organs (Sepsis-3, Third International Consensus Definitions for Sepsis and Septic Shock) [3].

## DIAGNOSIS

### Clinical diagnosis

It is recommended that when taking medical history, the following aspects should be asked about, among others:

- typical symptoms of lower urinary tract infection: pain in the urethra and lower abdomen when urinating, urinary urgency, frequency, and a feeling of incomplete bladder emptying,
- haematuria, which occurs in up to 10% of cases,
- systemic symptoms (fever, chills, malaise, etc.) that may be associated with a severe lower urinary tract infection or more often with pyelonephritis,
- genital symptoms such as discharge in women, swelling and pain in the testicles in men, and purulent discharge from the urethra may coexist,
- risky sexual behaviour, history of sexually transmitted diseases, casual sex partners, and unprotected anal sex,
- comorbidities,
- previous episodes of UTI, their frequency, results of laboratory and microbiologic tests, and the treatment used,
- self-treatment of UTI with pharmaceuticals available over the counter (e.g. furazidin in Poland),
- recent antibiotic use, which facilitates the interpretation of microbiological findings and influences the choice of empirical antibiotic therapy or prevention strategies.

Pain in the suprapubic region is experienced by most adults with an uncomplicated lower urinary tract infection.

If the diagnosis in women is uncertain, a bimanual examination should be performed to rule out vagi-

nitis, cervicitis, or soreness of other pelvic structures, including muscles.

Digital rectal and external genitalia examinations should be performed in men with symptoms of UTI. Signs of dehydration should be assessed, especially in older patients.

### Laboratory diagnosis

In uncomplicated cystitis, urine tests are not necessary.

Urine tests are recommended in patients with atypical symptoms and in those who do not respond to appropriate antimicrobial therapy.

Urinalysis and urine culture should be considered in cases of cystitis in patients:

- immunocompromised;
- after urinary tract instrumentation;
- after antibiotic therapy;
- with recurrent or persistent symptoms of UTI.

**Urinalysis** is much less prone to errors due to improper collection and storage and the use of antibiotics than urine culture.

**Creatinine and GFR** testing is not necessary in most cases of UTI, but it may be helpful in patients with abnormal urinary tract anatomy or a history of chronic kidney disease, the elderly, cachectic patients, and those with serious comorbidities.

**Complete blood count** is not helpful in differentiating between lower and upper UTI. Leukocytosis usually occurs in febrile patients. C-reactive protein (CRP) and procalcitonin levels are more specific indicators of the severity of systemic inflammation.

### Imaging

Imaging is not required for the routine diagnosis of uncomplicated acute bacterial cystitis.

Urinary tract ultrasound is indicated when UTI symptoms are accompanied by lower back pain, palpable resistance in the lower abdomen or abdomen, or in other cases classified as complicated UTI.

Computed tomography, preferably with contrast and excretory phase, is indicated if ultrasound shows upper urinary tract obstruction, fluid collections suggesting an abscess, other concerning findings, or if symptoms of infection persist or worsen despite treatment.

### Microbiological diagnosis

Quantitative urine culture is considered the gold standard for the microbiological diagnosis of UTI [4–6]. Patients need to be instructed on the collec-

tion and handling of the sample of midstream urine for culture. Written instructions can be provided.

The preanalytical phase is the most common cause of laboratory errors (32–75%), leading to unnecessary treatment.

The sample should be tested as soon as possible after collection. If the sample cannot be delivered to the laboratory within 2 hours, it should be refrigerated and transported at 4°C or preserved with boric acid.

The growth of bacteria that are part of the normal vaginal flora and a small number of uropathogenic bacteria ( $<2 \times 10^3$  CFU/ml) can be considered as contamination of the sample. The definition of a positive urine culture has been the subject of controversy for decades. The definitions presented in Table 1 are currently accepted.

It is not recommended to routinely perform follow-up urine cultures after treatment of a single episode of UTI.

Control urine cultures are recommended in patients with persistent symptoms, as well as 1–2 weeks after treatment in pregnant women and in patients at high risk of renal damage despite the absence of clinical signs of infection.

The isolation of a microorganism recognised as the aetiological agent of UTI or asymptomatic bacteriuria in pregnant women or in patients prior to urinary tract surgery requires the determination of its susceptibility to the antibiotics recommended for the treatment of these infections, preferably using dilution methods to determine the minimum inhibitory concentration. In the case of a resistant strain, the mechanism of resistance should be determined.

**Table 1.** Criteria of significant bacteriuria according to gender, symptoms, and method of urine collection

Criteria of significant bacteriuria
I. Midstream urine in symptomatic patients <ul style="list-style-type: none"> <li>• Acute cystitis in premenopausal women who are not pregnant: <math>\geq 10^3</math> CFU/ml</li> <li>• Acute UTI in men: <math>\geq 10^3</math> CFU/ml</li> <li>• Acute uncomplicated pyelonephritis in women: <math>\geq 10^4</math> CFU/ml</li> <li>• Acute complicated UTI: <math>\geq 10^5</math> CFU/ml</li> <li>• Recurrent uncomplicated UTI in women: <math>\geq 10^5</math> CFU/ml</li> </ul>
II. Catheter-collected urine in symptomatic patients <ul style="list-style-type: none"> <li>• Patients without an indwelling catheter: <math>\geq 10^2</math> CFU/ml</li> <li>• Patients with an indwelling catheter or on intermittent catheterisation: <math>\geq 10^3</math> CFU/ml</li> </ul>
III. Midstream urine in asymptomatic patients <ul style="list-style-type: none"> <li>• Women: <math>\geq 10^5</math> CFU/ml in 2 urine samples</li> <li>• Men: <math>\geq 10^5</math> CFU/ml in 1 urine sample</li> </ul>
IV. Catheter-collected urine in asymptomatic catheterised patients <ul style="list-style-type: none"> <li>• Men and women: <math>\geq 10^5</math> CFU/ml</li> </ul>
V. Suprapubic puncture <ul style="list-style-type: none"> <li>• <math>&gt; 10^2</math> CFU/ml</li> </ul>

## Differential diagnosis

**Differential diagnosis of pyuria** includes the following:

- infections with sexually transmitted microorganisms (*Chlamydia trachomatis*, *Mycoplasma hominis*, *Trichomonas vaginalis*, *Neisseria gonorrhoeae*);
- urinary tuberculosis;
- fungal infection of the urinary tract;
- cancer of the urinary tract and cancers that infiltrate the urinary tract;
- interstitial cystitis;
- irradiation cystitis;
- chemical cystitis, caused, for example, by cyclophosphamide;
- non-steroidal anti-inflammatory drugs;
- catheterisation and history of urinary tract instrumentation;
- urinary tract lithiasis;
- urine retention in any part of the urinary tract;
- systemic diseases, including systemic lupus and Kawasaki disease.

**The differential diagnosis of acute dysuria** includes the following:

- urolithiasis;
- trauma or inflammation of the urethra;
- exacerbation of interstitial cystitis or urethral syndrome;
- exacerbation of chronic bladder outlet obstruction due to urethral stenosis, benign prostatic hyperplasia, and others;
- contact with irritating washing and bathing products or spermicides;
- atrophic vaginitis;
- inflammation of the vagina, cervix, and pelvic organs (chlamydiosis);
- genital and urinary tract herpes (HSV-2);
- other viral infections of the lower urinary tract, especially in immunosuppressed patients (adenovirus, BK virus, varicella zoster virus).

## TREATMENT

### A. Uncomplicated cystitis in women

For uncomplicated cystitis in women [2, 7–9], the recommended antibiotics are listed in Table 2.

Aminopenicillins are no longer suitable for empiric therapy of uncomplicated cystitis due to the worldwide high level of antibiotic resistance of *Escherichia coli*.

Aminopenicillins in combination with a  $\beta$ -lactamase inhibitor are not recommended for empirical therapy of uncomplicated cystitis [10]. Neither should fluoroquinolones be used as drugs of choice for uncomplicated UTI, due to their potential to induce cross-resistance and adverse effects [2].

### B. Lower urinary tract infections in men

Cystitis without a concurrent prostate infection is rare in men and is thus classified as a complicated UTI. Therefore, men need to be treated with antimicrobial drugs that can penetrate the prostate. In these cases, therapy for at least 7 days is recommended, preferably with trimethoprim with sulfamethoxazole or a fluoroquinolone (depending on the level of local antibiotic resistance) [2]. Microbiological diagnosis is recommended in cases of UTI in men because of the high resistance rate to these antibiotics in Poland [11].

### Other recommendations regarding therapy and follow-up

For complicated lower UTIs, antibiotic therapy should be combined with the elimination of modifiable risk factors.

Routine urinalysis after successful treatment of lower UTI or urine culture in asymptomatic patients is not indicated.

In women whose symptoms do not resolve by the end of antibiotic therapy, and in those

**Table 2.** Recommended antimicrobial therapy for uncomplicated sporadic cystitis in women

	Substance	Dose	Time
First-line	Fosfomycin trometamol	3 g	Single dose
	Pivmecillinam	400 mg t.i.d.	3–5 days
	Furazidin (furagin)	100 mg 4 times in the first day, then 100 mg t.i.d.	7–10 days
	Nitroxoline	250 mg t.i.d.	5 days
Option	Cefadroxil	500 mg b.i.d.	3 days
	Trimethoprim	200 mg b.i.d. Only in areas with <i>Escherichia coli</i> resistance rates <20%	5 days
	Co-trimoxazole	160/800 mg b.i.d. Only in areas with <i>Escherichia coli</i> resistance rates <20%	3 days

t.i.d. – 3 times daily; b.i.d. – twice a day

whose symptoms resolve but recur 2 weeks after the end of therapy, urinalysis and urine culture with an antibiogram should be performed [12]. In these cases, retreatment with a different drug on a 7-day regimen should be considered.

### C. Prevention and management of recurrent urinary tract infections

Diagnosis of recurrent UTI (rUTI) is made according to the previously stated definition, and only if a bacterial factor of infection is confirmed with multiple urinalyses and microbiological examinations. Potential risk factors for the development of these infections should be identified in patients with rUTI. The most common risk factors for rUTI are as follows: sexual intercourse, use of spermicides including spermicide-coated condoms, maternal history of UTI, UTI in childhood, urinary incontinence, atrophic vaginitis or postmenopausal age, significant post-void urine volume, diabetes mellitus, other significant comorbidities, and previous antibiotic prescriptions [2, 13–19].

Methods of rUTI prevention include the following: 1) behavioural approaches; 2) use of non-antibiotic products; and 3) use of antibiotics. These actions should be taken in the order in which they are listed.

#### Behavioural approaches:

- increasing fluid intake;
- voiding immediately after intercourse;
- proper hygiene;
- avoiding constipation;
- avoiding spermicide products including spermicide-coated condoms.

#### Non-antibiotic products

- Immunoprophylaxis, e.g. with lyophilised *Escherichia coli* lysates [24, 25], reduces the risk of recurrent UTIs in women and can therefore be recommended to women of all age groups. However, there is a lack of data on the outcomes of this method in men and other clinical scenarios.
- Vaginal oestrogen supplementation stimulates proliferation of *Lactobacilli* producing lactic acid, lowers the pH, and prevents vaginal colonisation by uropathogens [20].
- Vaginal probiotics with proven efficacy in regenerating the vaginal microbiota, including *L. rhamnosus* GR-1, *L. reuteri* B-54, *L. reuteri* RC-14, *L. casei* Shirota, and *L. crispatus* CTV-05 strains, seem to be the most effective [21–23].
- Glycosaminoglycan layer substitutes in intravesical instillations, such as hyaluronic acid

or chondroitin sulphate solutions, have been investigated for their effects.

- Cranberry products have been studied multiple times for the prevention of UTIs, with both positive and negative results. The most recent systematic review and network meta-analysis provides moderate to low certainty evidence supporting the use of cranberry juice for the prevention of UTIs [26].
- Other herbal products, such as bearberry leaf, dandelion root, rosemary leaf, lovage root, and centaury herb, have been tested in a limited number of low-quality studies. Therefore, no clear recommendation regarding the use or non-use of herbal therapy in the prevention of UTIs is currently possible [27].

#### Antibiotics

Antimicrobial prophylaxis for recurrent urinary tract infections (rUTI) should be considered only if behavioural and non-antibiotic preventive measures prove ineffective [2, 4, 28, 29]. Antibiotic prophylaxis can be administered in 2 alternative forms:

- continuous: taken in the evening, typically for 3–6 months;
- single dose: taken after intercourse.

The recommended antibiotics for these prophylactic methods are listed in Table 3.

Self-administration of short course antimicrobial therapy is a recommended alternative to prophylaxis for patients with rUTI who can recognise early symptoms of the diseases.

**Methenamine hippurate** is a urinary antiseptic agent that converts to formaldehyde in the urine, which is toxic to bacteria. Evidence suggests that methenamine hippurate is non-inferior to prophylactic antibiotics in reducing the incidence of symptomatic UTIs over a 12-month period [30]. Continuous methenamine prophylaxis

**Table 3.** Antibiotics used for prophylaxis of recurrent urinary tract infections in women

	Agent	Dosing
Continuous therapy	Fosfomicin trometamol	3 g every 10 days
	Trimethoprim	100 mg q.d.
	Furazidin (furagin)	50 mg q.d.
	Cefaclor	250 mg q.d.
Single dose after intercourse	Co-trimoxazole	240 or 480 mg
	Furazidin (furagin)	50 mg
	Cefaclor	250 mg

q.d. – quaque die, once daily



avoids the risks associated with long-term antibiotic treatment. Therefore, this agent may be considered a first-line alternative to continuous antibiotic therapy for UTI prevention in women.

#### D. Asymptomatic bacteriuria

Asymptomatic bacteriuria is common and corresponds to colonisation [31]. Clinical studies have shown that ASB can prevent symptomatic UTIs caused by superinfection. Therefore, treatment of ASB should only be initiated when there is a proven benefit, to avoid the risk of developing antimicrobial resistance and eliminating the potentially protective strain responsible for ASB. In most cases, ASB does not lead to kidney disease or damage [32, 33]. Screening and treatment are not recommended for ASB patients without risk factors. If eradication of ASB is decided, the choice of antibiotics should be guided by microbiological results. When the uropathogen is sensitive to multiple antibiotics, the choice and duration of therapy should be the same as that used to treat symptomatic, uncomplicated UTI, taking into account the patient's gender, health status, and risk factors for developing UTI. Treatment should be targeted rather than empirical [2].

##### Indications for treating ASB:

- Pregnancy – see Section E.
- Prior to endoscopic and open procedures in the urinary tract [34–36].

##### No indication for ASB therapy in other patient groups, including the following:

- patients with diabetes mellitus,
- patients in nursing facilities [37],
- kidney transplant patients [38],
- patients with indwelling catheters, suprapubic cystostomy, or percutaneous nephrostomy, who always have ASB, and do not benefit from antibiotic therapy. This also applies to patients with ASB and an upper urinary tract stent or drain [39],
- prior to urinary tract catheter insertion or replacement [40],
- prior to orthopaedic surgery [41].

Immunocompromised patients should be considered on a case-by-case basis, as should the potential benefits of ASB screening and treatment [42, 43].

#### E. Pregnant and breastfeeding women

The choice of antimicrobial agents for pregnant and breastfeeding women should prioritise the safety of both the mother and the foetus or child.

#### Cystitis in pregnancy and breastfeeding

Symptoms such as frequent urination, urgency, and atypical abdominal and pelvic pain are common in normal pregnancy, which can delay diagnosis. The diagnosis, treatment, and follow-up for cystitis are similar to those for asymptomatic bacteriuria, with urine culture remaining the preferred diagnostic method. Short courses of antimicrobial therapy may be considered for treating cystitis during pregnancy [44, 45], but the range of safe medications for pregnant women is limited (Table 4).

For breastfeeding mothers, the first-line treatments are pivmecillinam and fosfomycin trometamol, with cefuroxime axetil as a possible second-line option. A 3–5-day treatment course (except for a single dose of fosfomycin trometamol) is typically sufficient to sterilise the urine. If no bacterial growth is detected in the follow-up culture, the treatment is considered successful.

Pregnant women who have been treated for UTIs should be monitored monthly until delivery.

#### Asymptomatic bacteriuria in pregnancy and breastfeeding

The ASB is an indication for antimicrobial treatment during pregnancy due to the risk of developing complications, such as pyelonephritis. Recent studies have not provided sufficient evidence of a strong association between untreated asymptomatic bacteriuria and the development of pyelonephritis, nor a significant reduction in post-infectious complications, such as low birth

**Table 4.** Treatment of lower urinary tract infection in pregnancy

	Substance	Dosage
First-line drugs	Pivmecillinam <sup>1</sup>	400 mg t.i.d. for 3–5 days
	Fosfomycin <sup>2</sup>	3 g single dose
Second-line drugs	Cefaclor <sup>3</sup>	250–500 mg t.i.d. for 3–5 days
	Cefuroxime axetil <sup>4</sup>	500 mg b.i.d. for 3–5 days
	Cefixime <sup>5</sup>	200 mg b.i.d. or 400 mg q.d. for 3 days

<sup>1</sup>Safe in all trimesters of pregnancy and during breastfeeding (studies in around 40,000 pregnant women in each trimester)

<sup>2</sup>May cross the placental barrier when administered i.m.

<sup>3</sup>During pregnancy – if the benefits outweigh the risks, use cautiously while breastfeeding.

<sup>4</sup>During pregnancy and breastfeeding – if the benefits outweigh the risks.

<sup>5</sup>During pregnancy – if the benefits outweigh the risks; do not use while breastfeeding.

t.i.d. – 3 times daily; b.i.d. – twice daily; q.d. – quaque die, once daily

weight and preterm birth, in pregnant women treated for asymptomatic bacteriuria identified in a single culture during the first trimester [46]. However, until more conclusive evidence is available, the recommendation to treat ASB in pregnancy remains valid.

The ASB treatment during pregnancy should involve standard short-term therapy, similar to the first-line treatment for cystitis in pregnancy.

There are no indications for treating asymptomatic bacteriuria in breastfeeding mothers.

#### CONFLICTS OF INTEREST

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The ethical approval was not required.

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