

Urinary tract infection in adults

Types of urinary tract infections (definitions) ^[1]

- **Bacteriuria** – this refers to the presence of bacteria in the urine. This may be symptomatic or asymptomatic. Asymptomatic bacteriuria is the presence of significant levels of bacteria in the urine in a person without signs or symptoms of UTI.
- **Lower UTI** – this is generally considered to be infection of the bladder (cystitis).
- **Upper UTI** – this includes pyelitis and [pyelonephritis](#).
- **Recurrent UTI** – this is usually defined as two or more episodes of UTI in six months or three or more episodes in one year.
- **Uncomplicated UTI** – this refers to infection of the urinary tract by a usual pathogen in a person with a normal urinary tract and with normal kidney function.
- **Complicated UTI** – this occurs where anatomical, functional, or pharmacological factors predispose the person to persistent infection, recurrent infection or treatment failure – eg, abnormal urinary tract.

See the separate article for [Urinary Tract Infection in Children](#).

Urinary tract infection pathogenesis ^[2]

Urinary tract infection (UTI) is usually caused by bacteria from the gastrointestinal tract entering into the bladder via the urethra, as a consequence of catheter insertion or other surgery/instrumentation, or via the bloodstream (much more likely in immunocompromised people).

The bacterial causes of UTI are similar in men and women. The most common causes are:

- *Escherichia coli* (80%).
- *Staphylococcus saprophyticus* (4%).
- *Klebsiella pneumoniae* (4%).
- *Proteus mirabilis* (4%).

Less common organisms include:

- *Enterobacter* spp., *Enterococcus* spp., *Serratia marcescens*, *Pseudomonas* spp., and *Staphylococcus aureus*.
- *Candida albicans* UTI is rare in the community, but may be seen with risk factors such as indwelling catheters, or in immunocompromised men.
- *Streptococci* rarely cause uncomplicated UTI, although *Lancefield Group B streptococci* may cause infection in some women.

Urinary tract infection epidemiology^[1] ^[2]

Urinary tract infection (UTI) is one of the most common conditions presenting in primary care. UTI is also the most common hospital-acquired infection in the UK, accounting for 23% of all infections. The majority of hospital-acquired UTIs are associated with catheter use. The use of catheters is the source of 8% of hospital-acquired bacteraemia.

Women

- Acute UTI occurs in up to 50% of women in their lifetimes. 20–30% of women who have had a UTI will have a recurrence. Studies have found a recurrence rate of 0.3–7.6 infections per person per year, with an average rate of 2.6 infections per year.
- UTIs are common in older women. A large study of women aged 65 years and older in England found that 21% had at least one clinically diagnosed UTI over the 10-year study period. Incidence was found to increase with increasing age.

- Catheter-associated UTI:
 - Bacteriuria: bacteriuria develops within days of catheter insertion. All people with a catheter will develop bacteriuria.
 - UTI prevalence is estimated to be 8.5%.
- Asymptomatic bacteriuria is estimated to occur in 2-10% of pregnant women, 1-5% of healthy pre-menopausal women, 4-19% of healthy elderly women (up to 50% in women in long-term care facilities), 0.7-27% of people with diabetes, and 23-89% of patients with spinal cord injuries.

Men

UTI is very uncommon in otherwise healthy young and middle-aged men, and rarely develops in men before 50 years of age.

However, the incidence of UTI in men greatly increases with increasing age, comorbidities, institutional care and indwelling urinary catheter use.

The reported prevalence of asymptomatic bacteriuria in men older than 70 years is 4-7%, and is 19-37% in institutionalised older people.

Risk factors

Apart from age and gender, risk factors associated with UTI include:

- Recent instrumentation of the renal tract.
- Abnormality of the renal tract
- Incomplete bladder emptying - particularly by prostatic obstruction in men.
- Antibiotic use changes the vaginal flora and promotes colonisation of the genital tract with *E. coli*, resulting in subsequent increased risk of UTI.
- Sexual activity.
- New sexual partner.
- Use of spermicide.
- Diabetes.

- Presence of catheter.
- Institutionalisation.
- Pregnancy.
- Immunocompromise.
- Genetic component to risk - increased incidence of UTI in the immediate female relatives of women with recurrent UTI, and associated genes have been identified.^[3]

Urinary tract infection presentation^[1] ^[2]

A urinary tract infection in adults can present with a range of symptoms, or may be totally asymptomatic and diagnosed only on routine dipstick testing. The presenting symptoms will vary with the age and sex of the patient and also with the severity and site of the infection but may include:

- Urinary frequency.
- Painful frequent passing of only small amounts of urine.
- Dysuria.
- Haematuria.
- Foul-smelling ± cloudy urine.
- Urgency.
- Urinary incontinence.
- Suprapubic or loin pain.
- Rigors.
- Pyrexia.
- Nausea ± vomiting.
- Acute confusional state - particularly elderly patients.

Women aged under 65 years can be diagnosed with a urinary tract infection (UTI) if they have two or more key urinary symptoms and no other excluding causes or warning signs.^[4]

- The three key urinary symptoms are dysuria, new nocturia and visibly cloudy urine.
- The excluding causes are other possible genitourinary causes of urinary symptoms including vaginal discharge, urethritis, or any genitourinary symptoms of menopause/atrophic vaginitis/vaginal atrophy.
- Warning signs are signs of pyelonephritis (kidney pain or tenderness in back under ribs; new or different myalgia, flu-like illness; rigors] or temperature 37.9°C or above; nausea or vomiting), sepsis or cancer.

Differential diagnosis

The differential diagnosis will depend on the presenting symptoms:

- Many of the symptoms of a UTI can be seen in women with [urethral syndrome](#) who have no bacterial infection or in postmenopausal women with [atrophic vaginitis](#) and urethritis.
- Other infections of the genital tract such as with *C. albicans*, *herpes simplex*, *Chlamydia trachomatis* and *Gardnerella* spp. may also produce similar symptoms in some women.
- In men, an [enlarged or inflamed prostate gland](#) may also present in a similar manner to a UTI.
- UTI may be a differential diagnosis in presentations such as [acute abdomen](#), [sepsis](#) and [acute confusional state \(delirium\)](#).

Investigations

Assessment of a patient with symptoms suggestive of a urinary tract in adults may include:

- History – eg, any previous UTI, sexual history, antibiotic use, any history of renal tract abnormality or diabetes, use of immunosuppressant agents such as steroids, family history of UTI.
- Examination of the bladder and kidneys.

- Dipstick analysis of urine – may treat as bacterial if there are positive results for nitrite and/or leukocytes. It is advised that dipstick testing is not used to diagnose UTIs in adults with indwelling urinary catheters. [4]
- Urine microscopy – leukocytes indicate presence of infection.
- Urine culture – to exclude the diagnosis, or if high-risk (eg, pregnant, immunosuppressed, renal tract anomaly), or if failed to respond to earlier empirical treatment. Urine culture should always be performed in men with a history suggestive of UTI, regardless of the results of the dipstick test. Urine culture is not required for symptomatic lower UTI in non-pregnant women.
- An ultrasound evaluation of the upper urinary tract should be considered to rule out urinary obstruction or renal stone disease in acute uncomplicated pyelonephritis. Further imaging may be required in those who remain febrile following 72 hours of treatment. [5]

Indications for referral [1] [2]

Further investigations are rarely necessary in otherwise healthy females with lower tract infections, as underlying renal tract abnormalities are uncommon even in those patients with recurrent infections. However, women should be referred urgently if they show signs of serious or systemic illness such as [sepsis](#).

Referral for imaging or cystoscopy should be considered in patients who:

- Have persistently not responded to treatment.
- Have a history of renal tract disease or anomaly.
- Have haematuria.
- Are women with recurrent infections who are not responding to preventative measures, or men with two or more episodes in three months

In addition to the above criteria, referral should be considered for men who have any suggestion of obstruction along the urinary tract – eg, enlarged prostate gland, or who have had signs of upper UTI.

Guidelines from the National Institute for Health and Care Excellence (NICE) for suspecting cancer in 2015 advise:^[6]

- Consider a prostate specific antigen (PSA) test and digital rectal examination (DRE) to assess for prostate cancer in men with lower urinary tract symptoms (such as nocturia, urinary frequency, hesitancy, urgency or retention) or visible haematuria.
- Refer under the two-week wait rule if a person aged 45 or over has:
 - Unexplained visible haematuria without UTI; or
 - Visible haematuria which persists or recurs after successful treatment of UTI.
- Refer under the two-week wait rule if a person aged 60 or over has unexplained non-visible haematuria and either dysuria or a raised white cell count on a blood test.
- Consider non-urgent referral to exclude bladder cancer in those aged 60 or over with recurrent or persistent unexplained UTI.

Urinary tract infection treatment and management^{[1] [2] [7] [8]}

General measures

Some women may find it helpful to be made aware of the risk factors for recurrent infection. These include:

- Use of spermicide
- Frequent sexual intercourse
- New sexual partner

Cranberry juice has been traditionally advised as being helpful in the prevention and treatment of UTI but the evidence base is low and it is not recommended by current guidelines.

Also traditionally, a number of measures have been advised, such as increasing fluid intake and personal hygiene behaviours (for example, avoiding delay in urination, wiping from front to back after defecation, avoiding douching), but there is no evidence to support these.^[5]

Pharmacological

Non-pregnant women with an uncomplicated lower UTI should be prescribed a three-day course of antibiotics, and men and pregnant women with an uncomplicated lower UTI should be prescribed a seven-day course of antibiotics. Men with recurrent UTI, and women with recurrent upper UTI or recurrent lower UTI where the cause is unknown should be referred for specialist advice.^[4]

Non-pregnant women

- Acute, uncomplicated lower UTIs can be self-limiting and for some, delaying antibacterial treatment with a back-up prescription to see if symptoms will resolve, may be an option. Consider advising use of a back-up antibacterial prescription if symptoms worsen or do not improve within 48 hours.
- Oral first-line: nitrofurantoin or trimethoprim (if low risk of resistance).
- Oral second-line (if no improvement after at least 48 hours, or first-line not suitable): nitrofurantoin (if not used first-line), fosfomicin, pivmecillinam hydrochloride or amoxicillin (high rate of resistance, so only use if culture- susceptible).

Men

- An immediate antibacterial prescription should be given and a midstream urine sample should be sent for culture and susceptibility testing before treatment starts.
- Oral first-line: nitrofurantoin, or trimethoprim.
- Oral second-line (if no improvement after at least 48 hours, or first-line not suitable): dependent on culture results. Consider possible pyelonephritis or prostatitis.

Pregnant women

- An immediate antibacterial prescription should be given and a midstream urine sample obtained before treatment is taken and sent for culture and susceptibility testing.
- Oral first-line: nitrofurantoin.

- Oral second-line (if no improvement after at least 48 hours, or first-line not suitable): amoxicillin (only if culture-susceptible), or cefalexin.
- Alternative second-line: consult local microbiologist.
- Asymptomatic bacteriuria: amoxicillin, cefalexin, or nitrofurantoin.

Asymptomatic bacteriuria should not be treated in men or in non-pregnant women. Antibiotic prophylaxis is not required to prevent UTI in adults with long-term indwelling catheters unless there is a history of recurrent or severe UTI.^[4]

Urinary tract infection complications

Ascending urinary tract infection in adults can occur leading to:

- [Pyelonephritis](#).
- Perinephric and intrarenal abscess.
- Hydronephrosis or pyonephrosis.
- [Acute kidney injury](#).
- [Sepsis](#).

Men with UTI may also have infection of the prostate gland. Prostatic involvement in the infection can result in prostatic abscesses or prostatitis.

Complications of untreated asymptomatic bacteriuria in pregnancy include:^[9]

- Pyelonephritis (in up to 40% of women).
- [Preterm delivery](#) and infants with low birth weight.
- [Anaemia](#).

See also the separate [Recurrent Urinary Tract Infection](#), [Urinary Tract Infection in Children](#), [Lower Urinary Tract Symptoms in Men](#) and [Lower Urinary Tract Symptoms in Women](#) articles for further information.

Further reading

- [Diagnosis of UTI](#); GOV.UK, last updated October 2020

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