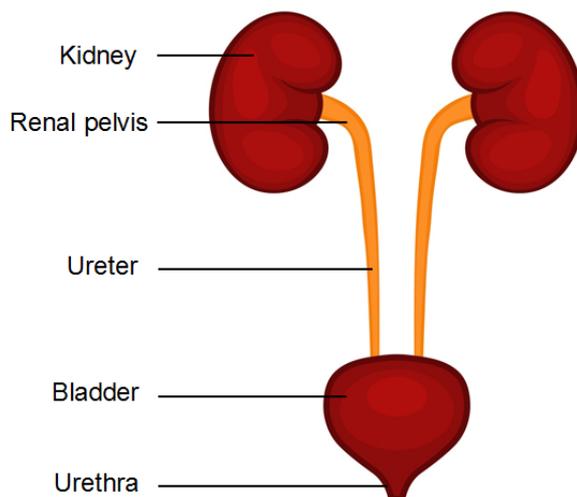


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Definition

A urinary tract infection (UTI) is an infection of the urinary tract (the kidneys, ureter, bladder and urethra) caused by the presence and multiplication of microorganisms.¹



As described by the National Institute for Health and Care Excellence (NICE), 'a urinary tract infection can result in several clinical syndromes, including acute and chronic pyelonephritis (infection of the kidney and renal pelvis), cystitis (infection of the bladder), urethritis (infection of the urethra), epididymitis (infection of the epididymis) and prostatitis (infection of the prostate gland). Infection may spread to surrounding tissues (for example, perinephric abscess) or to the bloodstream. A urinary tract infection is defined by a combination of clinical features and the presence of bacteria in the urine. Asymptomatic bacteriuria is the occurrence of bacteria in the urine without causing symptoms. When symptoms occur as a result of bacteria this is referred to as symptomatic bacteriuria.'¹

UTIs can be classified as uncomplicated or complicated, recurrent, catheter associated or urosepsis. Visit the webpage for the European Association of Urology, **Guidelines on Urological Infections**, Section 3.1 *Classification*, for more details.

Please note that this factsheet does not cover the management of UTI in children or pregnant women.

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Prevalence and incidence

Incidence of UTI increases with age and is much more common in women than in men.^{2,3}

One third of women will have had at least one UTI by the age of 24 and about 50 percent of women will be treated for a symptomatic UTI during their lifetime.³

UTI is very uncommon in healthy young and middle-aged men. The incidence rates increase in older men and those who have indwelling urinary catheters.²

Asymptomatic bacteriuria occurs in an estimated one to five percent of healthy pre-menopausal women. This increases to 4 to 19 percent in otherwise healthy older women and men.⁴ In those over 65 years of age, NHS England tells us that 2012/2013 had the worst incidence of UTIs in care homes. Being in a care home increased the prevalence from 6 to 16 percent, up to 25 to 57 percent for women and from one to six percent, up to 19 to 37 percent for men. Since then measures and national guidelines have been put in place to reduce the incidence.^{5, 32}

More information about the incidence of UTI in older people and antibiotic prescribing can be found in the *PLOS One* article **Incidence and antibiotic prescribing for clinically diagnosed urinary tract infection in older adults in UK primary care, 2004-2014**.⁶

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Signs and symptoms

Typical symptoms of UTI include:

- urinary frequency, urgency, and/or strangury (the feeling of needing to pass urine despite having just done so)
- dysuria (pain or discomfort on passing urine)
- urine that is offensive smelling, cloudy or contains blood
- constant lower abdominal ache
- non-specific malaise, such as aching all over, nausea, tiredness and cold sweats
- urge incontinence (a sudden and strong need to urinate).^{7,8}

In the frail and elderly, those with **dementia** and those in care homes, UTIs may not present in a typical way, and new-onset or worsening delirium (confusion) or agitation can indicate a UTI,⁹ along with worsening fever, rigors or central low back tenderness.^{7,8,10}

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Causes/risk factors

UTIs are usually caused by bacteria from the gastrointestinal tract; the spectrum of microorganisms is similar in men and women.¹¹

The most common organism that causes uncomplicated UTIs is *Escherichia coli* (*E. coli*), followed by *Staphylococcus saprophyticus* and *Klebsiella pneumoniae*.^{11,12}

A larger spectrum of microorganisms cause complicated UTIs and the bacteria are more likely to be resistant to antibiotics that are used empirically. Again, *E. coli* is the most common pathogen, with other common organisms being *Proteus* species, *Klebsiella* species, *Pseudomonas* species, *Serratia* species and *Enterococcus* species. If infections are recurrent, the spectrum of bacteria involved may vary. The spectrum of bacteria that cause UTIs also varies between hospitals.¹²

There are strains of *E. coli* and *Klebsiella spp.*, known as extended-spectrum beta-lactamase (ESBL) producing *E. coli* or *Klebsiella spp.*, that are antibiotic resistant. The Public Health England collection **Extended-spectrum beta-lactamases (ESBLs): guidance, data, analysis** includes guidance on how to prevent the spread of ESBL-producing *E. coli* and *Klebsiella*, as well as treatment options.

UTIs caused by *Candida albicans* (a fungal species) is rare in the community, but could be seen in people with risk factors such as indwelling catheters, immunosuppression, **diabetes mellitus**, or antibiotic treatment.^{11,13}

Risk factors for asymptomatic bacteriuria for both men and women include:

- increasing age
- institutionalisation
- the presence of a urinary catheter.

Risk factors for UTIs for both men and women include:

- immunocompromise
- abnormalities of the urinary tract^{5,14,15}
- diabetes.¹⁶

For more risk factors for lower urinary tract infection, visit the following NICE clinical knowledge summaries (CKS) pages: **Urinary tract infection (lower) – women, Risk factors** and **Urinary tract infection (lower) – men, Risk factors**.

The European Association of Urology's **Guidelines on Urological Infections** goes into further detail about risk factors for recurrent UTIs, uncomplicated pyelonephritis, complicated UTIs, catheter-associated UTIs and other urinary tract infections. Section 3.5. *Recurrent UTIs*, Table 2, outlines age-related risk factors for recurrent UTIs in women.

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Pathophysiology (mechanism of disease)

As described in the NICE CKS **Urinary tract infection (lower) – women, Causes** page:

'For the urinary tract to become infected, bacteria must gain entry to the urinary tract, avoid being flushed away, adhere to the epithelial surface, and multiply.

- *Entry of bacteria into the urinary tract may be:*
 - *Retrograde, with ascension through the urethra into the bladder.*
 - *Via the blood stream, which is more likely in people who are immunosuppressed.*
 - *Direct, for example with insertion of a catheter into the bladder, instrumentation, or surgery.*
- *Incomplete emptying of the bladder during micturition is a key factor predisposing to urinary tract infection.*
- *Many bacteria adhere to the surface of the urinary tract with the aid of fimbriae.*
- *Bacteria adhering to the urothelium employ a number of poorly understood methods to optimize their environment for rapid multiplication.*¹⁷

In acute pyelonephritis, bacteria usually enter the kidneys by ascending from the lower urinary tract. They then cause infection in the functional areas of the kidneys (the renal pelvis and sometimes renal parenchyma).¹⁸

The theory for why UTIs are less prevalent in men is that:

- there is a greater distance between the usual source of pathogens that cause a UTI (the anus) and the usual entry point (the opening of the urethra)
- the environment surrounding the male urethra is drier, the urethra is much longer and prostatic fluid has antibacterial activity.²

There is more information on the pathogenesis of UTIs in the following open-access, peer-reviewed chapter: ***The Pathogenesis of Urinary Tract Infections***.

In recurrent UTIs, it is thought that there is a distinct pathogenesis and two possible pathways:

- frequent repeat ascending infections
- chronic infections in the bladder.¹⁹

It is also thought that there are two possible mechanisms related to recurrent UTIs:

- factors relating to the bacteria causing the infection
- deficiencies in the defence mechanisms of the person affected.¹⁹

The following *Tzu Chi Medical Journal* article offers further details on the pathogenesis of recurrent UTI:

Recent advances in recurrent urinary tract infection from pathogenesis and biomarkers to prevention.

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Prognosis and complications

Lower UTIs can lead to pyelonephritis, renal abscesses, hydronephrosis (swelling of kidneys due to build-up of fluid), pyonephrosis (obstruction of urine outflow in kidneys due to a build-up of pus), renal failure, and urosepsis (sepsis with the source being the urinary tract) when the infection ascends to the kidneys.²⁰

It has been reported that UTIs account for five percent of severe sepsis cases, which have a mortality rate of 20 to 42 percent.²⁰

For more information about prognosis and complications for lower urinary tract infection, visit the following NICE CKS pages:

- *Urinary tract infection (lower) – women*
 - **Prognosis**
 - **Complications**
- *Urinary tract infection (lower) – men*
 - **Complications and prognosis.**

The NICE CKS page ***Pyelonephritis – acute, Complications*** covers the complications of pyelonephritis and the risk factors associated with developing pyelonephritis.

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Diagnosis/detection

A definitive diagnosis of a UTI requires a positive microbiology culture to confirm the presence of bacteria in the urine.

Women

In women, microbiology samples are not always required and a working diagnosis can be made based on the presence of the symptoms as outlined above.^{7,5} Dipstick testing to look for nitrites (broken down from nitrates by bacteria) and leucocyte esterase (produced by neutrophils) can be used to guide treatment decisions in otherwise healthy women **under the age of 65** who present with two or more UTI symptoms.⁵

Men

A midstream sample of urine should be taken and sent for microbiology culture for any man who presents with symptoms of a UTI.⁵ Urine dipstick testing can be used in uncatheterised men, but it should not be used to confirm diagnosis.¹¹

The NICE guideline ***Urinary tract infection (lower): antimicrobial prescribing*** [NG109] sets out an antimicrobial prescribing strategy for lower urinary tract infections in children, young people and adults who do not have a catheter. There is a three-page **summary document** associated with this guideline, which outlines when to send midstream urine samples for culture and susceptibility and how to respond to the results.

Those who are older and living in care homes and those with catheters

People who are catheterised and older people in care homes may have different symptoms, as discussed above.

Public Health England's ***Urinary tract infection: diagnosis guide for primary care*** describes when to send urine for culture in women and men over 65 years old, and when to send urine for culture in women and men with catheters. It also outlines when to consider UTIs in other patient groups.

The Guidelines website hosts a page by the Scottish Antimicrobial Prescribing Group, ***SAPG suspected UTI in older people guideline***, which includes a *Decision aid for diagnosis and management of suspected urinary tract infection (UTI) in older people*.

The NHS Infection. Prevention. Control. team have also published the ***IPC Advice Bulletin for Care Home Staff***, which describes when to dipstick urine for a UTI, the symptoms of a UTI and how to collect specimens of urine.

Pyelonephritis

Pyelonephritis can be suspected in those with loin pain and/or fever.²¹ Although management options are outlined below, it should be noted that a urine sample should be taken for those who present with pyelonephritis before starting empirical antibiotics. Some people may be treated for nephritis in primary care, but many groups should be admitted to hospital. This includes frail, elderly residents in care homes who have recently been hospitalised or who have had recurrent UTIs.²²

Recurrent UTIs

Urine should be sent for culture and sensitivity from all those who present with recurrent UTIs. Alternative diagnosis should also be considered and appropriate testing offered.^{21,23}

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Pharmacological treatment

The NICE guideline **Urinary tract infection (lower): antimicrobial prescribing [NG109]** Section 1.3, *Self-care states*, 'Advise people with lower UTI about using paracetamol for pain, or if preferred and suitable ibuprofen.'²⁴

Note that non-steroidal anti-inflammatories (NSAIDs) should be used with caution in older people. This is due to the increased risk of serious adverse effects such as gastrointestinal bleeding and perforation, which may be fatal.²⁵

UTIs may be treated with antibiotics in the community, unless lower UTIs in men cause them to be severely unwell and displaying symptoms or signs suggestive of sepsis, for example:

- a temperature greater than 38 °C or less than 36 °C
- marked signs of illness (such as impaired level of consciousness, profuse sweating, rigors, pallor, significantly reduced mobility)
- significant tachycardia, hypotension, or breathlessness.

Hospital admission is also recommended if pyelonephritis affects someone who:

- is significantly dehydrated
- is unable to take oral fluids and medicines
- has signs of sepsis
- is a frail or older resident in a care home who has recently been hospitalised or has had recurrent UTIs.^{26,27}

Antibiotic treatment

Local guidelines should be followed when treating UTIs with antibiotics, as they take into account local resistance patterns.²¹

Antibiotic choice and dosing information can be found in the following NICE guidance **Urinary tract infection (lower): antimicrobial prescribing [NG109]** and **Pyelonephritis (acute): antimicrobial prescribing [NG111]**.

The *British National Formulary* (BNF) offers a treatment summary on **Urinary-tract infections**.

This summary outlines several alternative options for treatment of lower and upper UTIs with links to the individual monographs. It should be noted that, due to antimicrobial resistance and healthcare-associated infections such as methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* infection (CDI), the use of broad-spectrum antibiotics such as cephalosporins, quinolones, and co-amoxiclav should be avoided where possible.⁵

It should be noted that nitrofurantoin is associated with risk of peripheral neuropathy in those with renal impairment²⁸ and is contraindicated in those with an estimated glomerular filtration rate (eGFR) of less than 45 mL/minute.²⁹ Its efficacy depends on renal secretion of the medicine into the urinary tract, which may be reduced in those with impaired renal function.²⁸ Renal function should be assessed in older people to ensure that nitrofurantoin is appropriate.

Recurrent UTIs

NICE guideline **Urinary tract infection (recurrent): antimicrobial prescribing [NG112]** covers preventing recurrent UTIs, self-care and choice of antibiotic prophylaxis for recurrent UTIs, and should be used in conjunction with local guidelines.

Asymptomatic bacteriuria

Treatment of asymptomatic bacteriuria in those with indwelling catheters is not recommended,^{21,1,31} and asymptomatic bacteria should not be tested for or treated in the following groups:

- women without risk factors
- patients with well-regulated diabetes mellitus
- post-menopausal women
- older institutionalised patients
- patients with dysfunctional and/or reconstructed lower urinary tracts
- patients with renal transplants
- patients prior to arthroplasty surgeries
- patients with recurrent UTIs.³¹

The NICE guideline **Urinary tract infection (lower): antimicrobial prescribing [NG109]**, Section 1.2 *Managing asymptomatic bacteriuria*, makes recommendations on screening for and managing asymptomatic bacteraemia in pregnant women.

Antimicrobial stewardship

When thinking about antibiotic use, it's always important to remember the need for antimicrobial stewardship. The following lecture, *Antimicrobial Stewardship in long term care facilities (LTCFs)* by Elizabeth Beech, NHS Improvement, provides more information on this topic and signposts to many useful guidance documents.

Antimicrobial stewardship in long term care facilities (LTCFs)



The slides are also available here: **Antimicrobial Stewardship in long term care facilities – room for improvement**. They contain hyperlinks to the resources that are discussed in the lecture.

e-Learning for Healthcare's *Antimicrobial Resistance* programme is available via CPPE's website: **e-Learning for Healthcare learning modules**.

The Royal Pharmaceutical Society has a policy on antimicrobial stewardship: **The pharmacy contribution to antimicrobial stewardship. 2017**.

PresQIPP hosts an **Antimicrobial Stewardship** hub, with a range of information and resources.

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Non-pharmacological treatment

As per the NHS **Urinary tract infections (UTIs)** page, the following advice can be offered to those who have a UTI:

- *'place a hot water bottle on your tummy, back or between your thighs*
- *rest and drink plenty of fluids – this helps your body to flush out the bacteria*
- *avoid having sex until you feel better. You can't pass a UTI on to your partner but sex may be uncomfortable.'*⁹

NICE guideline **NG109**, Section 1.3 *Self-care*, states, 'Advise people with lower UTI about drinking enough fluids to avoid dehydration' and 'Be aware that no evidence was found on cranberry products or urine alkalinising agents to treat lower UTI.'²⁴

NICE guidelines **Pyelonephritis (acute): antimicrobial prescribing [NG111]** and **Urinary tract infection (recurrent): antimicrobial prescribing [NG112]** also contain non-pharmacological management options and self-care recommendations.

The NICE Shared Learning Database entry **Reducing incidence of Urinary Tract Infections by promoting hydration in care homes** describes how the East Berkshire clinical commissioning group (CCG) reduced the incidence of UTIs by promoting hydration in local care homes.

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Patient support

The NHS offers information on **Urinary tract infections (UTIs)**.

The Public Health England page, **Extended-spectrum beta-lactamases (ESBLs): FAQs**, offers information to the public on ESBL-producing *E. coli*.

Bladder Health UK is a charity that gives support to people with all forms of cystitis, overactive bladder and continence issues, together with their families and friends.

Age UK have some information on **their website** for patients and carers, including how someone with dementia may present with a UTI.

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Further resources

The CPPE **Infections** gateway page offers further learning on infections.

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External websites

CPPE is not responsible for the content of any non-CPPE websites mentioned on this page or for the accuracy of any information to be found there.

All web links were accessed on 30 March 2020.

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