Urinary Tract Infection in Adults

Definitions

- **Bacteriuria** - this refers to the presence of bacteria in the urine. This may be symptomatic or asymptomatic. Asymptomatic bacteriuria should be confirmed by two consecutive urine samples.
- **Urinary tract infection (UTI)** - this implies the presence of characteristic symptoms and significant bacteriuria from kidneys to bladder. Many laboratories regard $10^5$ colony-forming units per millilitre (cfu/ml) as the threshold for diagnosing significant bacteriuria. Bacteriuria does NOT equate to a UTI, especially in the population aged over 65.
- **Lower UTI** - this is generally considered to be infection of the bladder (cystitis).
- **Upper UTI** - this includes pyelitis and pyelonephritis.
- **Recurrent UTI** - this may be due to relapse or re-infection. The number of recurrences regarded as clinically significant depends on age and sex.
- **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.

Pathogenesis

Several micro-organisms are known to cause UTI but the majority of infections will be produced by *Escherichia coli*. Other causative organisms are:

- **Staphylococcus saprophyticus**
- **Proteus mirabilis**
- **Enterococci**

Infection with less common organisms is more likely to occur in patients who have underlying pathology and/or frequent infections, are immunosuppressed, or who are catheterised. Organisms which may produce infection under these circumstances include:

- **Klebsiella spp.**
- **Proteus vulgaris**
- **Candida albicans**
- **Pseudomonas spp.**

Epidemiology

UTIs are common in general practice, accounting for 1-3% of all consultations. UTI is the second most common clinical indication for empirical antibiotic treatment in primary and secondary care, and urine samples constitute the largest category of specimens examined in most medical microbiology laboratories. Around one in three women have had a UTI by the age of 24 and around half of all women report at least one UTI sometime during their lifetime.

UTIs occur much less frequently in men at all ages, although they occur more commonly in older men.

Prevalence of bacteriuria increases over the age of 65 and does not equate to a diagnosis of a UTI. Alone it is not usually an indication for treatment. In the population aged over 65, bacteriuria may be so high that urine culture ceases to be a diagnostic test.
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.\(^4\)

Presentation
A UTI can present with a range of symptoms, or may be totally asymptomatic and diagnosed only on routine dip 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.

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 may also present in a similar manner to a UTI.

Investigations
Investigation of a patient with symptoms suggestive of a UTI 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.\(^5\)
- 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.\(^6\)

**Indications for referral\(^1\)**

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.

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, 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:\(^7\)

- 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.

**Management**

**Clinical Editor’s notes (August 2017)**

Dr Hayley Willacy would like to draw your attention to the useful patient information produced this year by Public Health England\(^8\). This includes information for your patient on recognising when they have an infection, self-help advice, when to seek help from a healthcare professional and how they may be treated.

**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; however, latest Cochrane reviews suggest the benefit is limited.\(^9\) A Cochrane review also found insufficient evidence to comment on the use of probiotics in preventing UTIs.\(^10\)
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 defection, avoiding douching), but there is no evidence to support these.\[6\]
Pharmacological

- Trimethoprim or nitrofurantoin remains the drug of first choice for the empirical treatment of uncomplicated UTI. 10-20% of *E. coli* infections may be resistant. Current recommendations suggest that the treatment period should be no longer than three days in women with uncomplicated UTI, although should remain at seven days for the treatment of UTIs in men.\(^1\)
- First-line therapy in mild cases of uncomplicated pyelonephritis is oral ciprofloxacin for 7-10 days.\(^1\) Co-amoxiclav and cefalexin usually feature as alternatives in local guidelines.
- Studies suggest the use of topical oestrogen in postmenopausal women reduces recurrence of UTI.\(^{12}\) However, the Scottish Intercollegiate Guidelines Network (SIGN) states it should not be used for prevention.\(^1\)
- Prophylactic low-dose antibiotics may be helpful in certain circumstances:\(^2\)
  - In women, for recurrent cystitis associated with sexual intercourse, trimethoprim 100 mg may be taken within two hours of intercourse. This is an off-label use.
  - In women, for recurrent infection not associated with sexual intercourse, a six-month course of a low-dose antibiotic may be used (such as trimethoprim 100 mg nocte or nitrofurantoin 50-100 mg nocte).

- Paracetamol and/or non-steroidal anti-inflammatory drugs (NSAIDS) are of use for symptomatic relief.

Asymptomatic bacteriuria should not be treated in adults with catheters 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.\(^5\)

Complications

Ascending infection 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. Between 52% and 90% of men with a UTI have been reported to have prostatic involvement in the infection, which can result in prostatic abscesses or prostatitis.\(^1\)

Complications of untreated asymptomatic bacteriuria in pregnancy include:\(^{13}\)

- 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 & references

1. Management of suspected bacterial urinary tract infection in adults; Scottish Intercollegiate Guidelines Network - SIGN (updated guidelines 2012)
2. Urinary tract infection (lower) - women; NICE CKS, July 2015 (UK access only)
3. Urinary tract infection (lower) - men; NICE CKS, October 2014 (UK access only)
5. Urinary tract infections in adults; NICE Quality Standard, June 2015
8. Uncomplicated urinary tract infection in women; Royal College of General Practitioners/Public Health England (January 2017)
11. Pyelonephritis - acute; NICE CKS, June 2013 (UK access only)

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