Diagnosis, prevention and treatment of urinary tract infections in older people


Abstract
Urinary tract infections (UTIs) are common in older people, with the prevalence increasing with age in both sexes. UTI is a frequent reason for emergency admission to hospital. There are many conditions that contribute to older people being more at risk of UTI and the main preventive strategy is to avoid the use of indwelling urethral catheters. Where an indwelling catheter is inserted its continued use should be regularly reviewed and the catheter removed, especially if the reason for insertion is incontinence and the person becomes additionally incontinent of faeces.

Diagnosis of UTI can be complex because older people do not always exhibit the signs and symptoms commonly associated with UTI. Diagnosis can be further complicated by a person’s inability to provide a comprehensive history and by difficulties obtaining an uncontaminated, ‘clean catch’ urine specimen. Antibiotic therapy should not be used routinely for people with asymptomatic bacteriuria and, where antibiotics are required, healthcare professionals should follow local prescribing guidelines.

Keywords
bacteriuria, diagnosis, older people, prevention, treatment, urinary tract infection

Aim and intended learning outcomes
The aims of this article are to help readers to critically review their understanding of the risk of urinary tract infection (UTI) in older people, and to provide an overview of assessment and treatment.

After reading this article and completing the time out activities, you should be able to:
> Summarise why older people are especially at risk of UTI.
> Discuss preventive strategies.
> List the signs and symptoms of a UTI in older people.
> Explain the rationale for urinalysis and discuss options for collection of a urine sample from an older person.
> Describe the treatment and management options for UTI in older people.

Introduction
UTI is broadly defined as an infection of the urinary system by microorganisms, with signs and symptoms that can be attributed to an infection, and that may involve the upper and lower urinary tracts (Sobel and Kaye 2010, Ninan et al 2014). Bacteriuria is defined as the presence of bacteria in the urine, while asymptomatic bacteriuria is defined as the presence of bacteria in the urine without the typical signs and symptoms of a UTI (Ninan et al 2014).

UTIs and asymptomatic bacteriuria are common in older people (Rowe and Juthani-Mehta 2013). More than one third of infections diagnosed in care home residents are UTIs (Cotter et al 2012) and they account for nearly 20% of all hospital-acquired infections (Department of Health (DH) 2007). Frequently a reason for emergency hospital admission (Gopal and Patel 2009, NHS England 2014), UTIs are more common in women, with between 10% and 20% experiencing UTIs at some point in their lifetimes (Colgan and Williams 2011, Van Schoor 2015). Prevalence increases with age in both sexes, with an estimated 10% of men and 20% of women over 65 years experiencing symptomatic UTI (National Institute for Health and Care Excellence (NICE) 2012). Where UTI occurs in men it is more complicated and related to abnormalities in the urinary tract (NICE 2012), such as prostate enlargement or a urethral stricture.

Risk factors
Many conditions common to older people can contribute to urinary tract dysfunction and asymptomatic bacteriuria. Most people can
eliminate bacteria that enter the urinary tract with urine flow (Benton et al. 2006), but age-associated changes to immune function and greater numbers of co-morbidities increase the risk of UTI (Rowe and Juthani-Mehta 2013).

Indwelling urethral catheterisation is the main risk factor for UTI in older people. The risks versus the benefits must be considered carefully before older people are catheterised, especially for urinary incontinence alone. Faecal incontinence in addition to indwelling urethral catheterisation increases the risk of UTI. Management with incontinence pads should be considered (Cove-Smith and Almond 2007).

Previous history of UTI is another important risk factor. One study demonstrated that postmenopausal women with a previous UTI were more than four times more likely to develop a UTI (Jackson et al. 2004). Oestrogen deficiency in postmenopausal women is also linked to recurrent UTI (Stamm and Raz 1999, Raz 2011).

A summary of risk factors for UTI in older people is shown in Box 1.

**TIME OUT 1**

**Cognitive impairment**

Imagine that you are summarising to a lay carer or a nursing student why cognitive impairment increases the risk of UTI in older people. Write a short paragraph about what you would explain.

**Prevention**

The most important preventive strategy in older people is to minimise the use of indwelling urethral catheters (NICE 2012). For older adults with urinary incontinence, catheterisation should be undertaken only when all other options for treatment and management have been considered.

Where catheterisation is required, for example in people with atonic or neurogenic bladders, intermittent catheterisation should be considered because it carries a reduced infection risk (Cove-Smith and Almond 2007).

Topical oestrogen therapy given to postmenopausal women has been found to lower intravaginal pH and enable colonisation with lactobacilli, which replace the Gram-negative organisms associated with UTIs (Raz and Stamm 1993, Cove-Smith and Almond 2007).

Cranberry juice and capsules have been considered to prevent or treat UTI, although their usefulness in older people is disputed (Beveridge et al. 2011, Jepson et al. 2012). Cranberries contain tannins (proanthocyanidins), which prevent *Escherichia coli* adhering to the bladder lining (Cove-Smith and Almond 2007, Beveridge et al. 2011). The Scottish Intercollegiate Guidelines Network (SIGN) guideline (2012) recommends that women with recurrent UTI should take cranberry products to reduce the frequency of recurrence. However, patients taking warfarin should avoid cranberry as it can potentiate the effect of the warfarin (British National Formulary (BNF) 2016).

**Signs, symptoms and diagnosis**

Typical signs and symptoms of a UTI include (Kalra and Raizada 2009, SIGN 2012, Kelly-Fatemi 2015):

- Urine that appears cloudy.
- Blood in the urine.
- Strong or foul-smelling urine.
- Increased frequency or urgent need to pass urine.
- Pain or burning on passing urine (dysuria).
- Pressure in the lower pelvis.
- Low grade fever (pyrexia).
- Night sweats, shaking or chills.

Presentation of UTI in practice can vary, from patients with limited clinical symptoms to those with urinary sepsis. Infection in the lower urinary tract can spread to the upper tract with symptoms suggesting pyelonephritis, such as fever, rigor and loin pain (SIGN 2012, Kelly-Fatemi 2015). If these symptoms are accompanied by signs of systemic infection, such as tachycardia and tachypnoea (rapid breathing), sepsis can be diagnosed (Kalra and Raizada 2009).

UTIs are classed as either ‘complicated’ or ‘uncomplicated’. Most infections in healthy older women are classed as uncomplicated because they occur without structural or functional abnormalities of the urinary tract, history of renal disease and co-morbidities, such as diabetes (Rowe and Juthani-Mehta 2013). Diagnosis follows the same algorithm used for younger women.
A change in mental status, such as lethargy. Where recurrent UTIs are confirmed, a
Increased frequency
Low abdominal pain.
A review of the patient’
Constipation.
The patient’
A change in the colour or odour of the urine.
Falls.
Anorexia.
Gross haematuria.
A physical examination, which should
There is suspected pyelonephritis (loin pain
Loss of motor skills or dizziness.
New onset urinary incontinence, increased
Assessment of pulse, temperature and blood
Other behavioural changes, for example,
Hallucinations.
Agitation.
There is suspected UTI in men.
Confusion/or delirium-like state.
Changes in urine colour and odour.
Anorexia.
Low abdominal pain.
Constipation.
New onset urinary incontinence, increased
urinary frequency and urgency.

TIME OUT 2
Signs and symptoms
Reflect on an older patient with a UTI who you have cared
for. What signs and symptoms did he or she exhibit? How do they compare these with those in the list above?

Older adults who present with symptoms of
a UTI, such as dysuria, increased frequency
of urination, suprapubic tenderness, urgency
and polyuria, should receive a full clinical
assessment before a diagnosis of UTI is made. This full clinical assessment should include
(NICE 2012, SIGN 2012, Ninan et al 2014):
A review of the patient’s past medical history,
in particular, history of previous UTI.
A physical examination, which should
include the lower back, abdomen and
pelvis for signs of tenderness, pain or
abnormalities. The genital organs should be
externally examined for signs of swelling,
discharge or abnormalities. An internal
examination should not be routinely
undertaken.
Assessment of pulse, temperature and blood
pressure.
The patient's reported symptoms.
Where recurrent UTIs are confirmed, a
bladder scan to exclude urine retention.
Informed consent should be obtained before
any examination including urinalysis. Patients
should be advised of the potential outcomes
and what further tests or examinations may be
required depending on the results (DH 2009).

Urinalysis and urine culture
Urinalysis provides an effective screening tool,
but should not be used in isolation in older
adults (NICE 2012, SIGN 2012, Ninan et al
2014), and a negative urinalysis does not rule out a UTI (Little et al 2009, Mundt and Shanahan 2011). The main indicators for UTI in a urine sample are the presence of leucocytes and nitrites (Mundt and Shanahan 2011). Nitrites are present due to the reduction of urine nitrates to nitrites by the bacteria that cause UTIs (Mundt and Shanahan 2011). Leucocyte esterase is produced by leucocytes (white blood cells) to fight infection (Mundt and Shanahan 2011) and shows on urinalysis when the urine dipstick changes colour. Where infection is suspected from the clinical assessment, further testing such as microscopy, culture and sensitivities may be required.

TIME OUT 3
Urine testing
Consider how you would explain to patients why they require a urine test. Critically review the information provided on the RCN’s website First Steps for Healthcare Assistants (rcn.ca.org.uk/clinical-skills/observation/urine-testing). Do you think it provides a clear explanation of urinalysis? Are there any steps missing?

Care needs to be taken when obtaining urine samples from older people as they can become contaminated leading to false positives and false negatives (Ninan et al 2014). Urine samples should be collected using methods that minimise contamination from genital mucosa and the perineal skin. The need for, and effectiveness of, meatal cleansing before sample collection remains debatable. Evidence suggests that general hygiene with water is sufficient (Simerville et al 2005, Cunha et al 2013). The use of disinfectants and soap can prohibit the growth of organisms if introduced into the specimen, which can lead to false negative results (Cunha et al 2013).

About 30ml of urine is required for urinalysis and patients should be encouraged to obtain a ‘clean catch’ from the middle part of the void (midstream). The constitution of urine changes over a 24-hour period so the sample must be stored and transported in line with local guidelines. If the person is catheterised, the sample should be obtained from the needle-free sample port.

TIME OUT 4
Collection of urine samples
Considering the information above, how do you currently collect a urine sample from an older person who is incontinent? Could this be improved to prevent contamination?

Obtaining a clean catch from older people can be problematic, as they may be cognitively impaired, have physical limitations and/or be incontinent. For men, an external condom (sheath) device is a good option; for women who are incontinent, specialist urine sample collection pads are available, which can be placed in a disposable incontinence pad. These products do not have the absorbent gel component found in disposable incontinence pads and therefore will not contaminate the sample. Both are a preferred option to samples obtained from clean and disinfected urinals or bedpans, which can be contaminated (Latour et al 2011). In-out catheterisation can be used, but should be a last resort.

Treatment
The main aim of treatment is relief of symptoms associated with UTI, such as frequency, urgency and dysuria, so treatment of asymptomatic bacteriuria is not required. Studies have demonstrated that 40% to 75% of antibiotic use is inappropriate (D’Agata et al 2013, Rowe and Juthani-Mehta 2013). The unnecessary use of antibiotics is associated with an increased risk of adverse events such as Clostridium difficile infection, methicillin-resistant Staphylococcus aureus and the development of antibiotic resistance (Zalmanovici Trestioreanu et al 2015).

For patients with indwelling catheters, antibiotics are generally considered ineffective at eliminating asymptomatic bacteriuria (PHE 2016). Prophylactic use of antibiotics for patients with indwelling catheters is not recommended except on the advice of a specialist (Kelly-Fatemi 2015). For catheterised patients, exclude other sources of infection, check that the catheter is draining appropriately and is not blocked, and consider if continued catheterisation is required. If the catheter has been in place for more than seven days, consider changing it before or when starting antibiotics. An adequate and appropriate fluid intake of 1,500-2,000ml a day should be encouraged for all patients (Benelam and Wyness 2010).

Treatment of uncomplicated UTI should be in line with local guidelines, which are similar to guidelines for younger women. However, healthcare professionals should understand that the risk of adverse drug reactions is higher in older people as a result of increased prescription use, age-related metabolism and excretion changes. PHE (2016) guidance for primary care recommends a three-day course of trimethoprim or nitrofurantoin first line, or pivmecillinam, for uncomplicated UTI, although the BNF (2016) states that up to seven days’ treatment can be considered. The
choice of medications and lengths of treatment should depend on the patient’s allergy status, tolerability and compliance, and local guidelines. Patients for whom trimethoprim or nitrofurantoin are unsuitable should be prescribed amoxicillin, ampicillin or an oral cephalosporin instead (BNF 2016).

For complicated UTI, treatment for 7-14 days is generally recommended, but can be prolonged for up to 21 days, according to clinical presentation (Grabe et al 2015, BNF 2016).

Although *E. coli* has low resistance rates to nitrofurantoin, other *Enterobacteriaceae* species more common in older adults may have intrinsic resistance to nitrofurantoin (Rowe and Juthani-Mehta 2013), so either trimethoprim or pivmecillinam may be considered a better alternative.

Many drugs, including antibiotics, are excreted from the body via the kidneys, and therefore renal function is an important consideration when prescribing. Older patients have reduced renal function. Glomerular filtration rate (GFR) provides the level of renal function below which the dose of a drug must be reduced to avoid toxicity. Dose regimens are therefore based on GFR. GFR is equal to the total filtration rates of the functioning nephrons in the kidney. Although GFR cannot be measured directly, the urinary or plasma clearance of a filtration marker, such as creatinine, can be used to estimate GFR (National Kidney Foundation 2014).

When nitrofurantoin was approved, the prescribing information included a warning against use in patients with GFR less than 40mL/min (Oplinger and Andrews 2013). More recent updates changed the threshold to 60mL/min, making it contraindicated for patients with chronic kidney disease and therefore potentially unsuitable for older patients (Rowe and Juthani-Mehta 2013, BNF 2016). However, the Beers Criteria (American Geriatrics Society 2015 Beers Criteria Update Expert Panel 2015), which provide a consensus-based guideline for potentially inappropriate medications in the older population, recently lowered the renal function threshold to GFR 30mL/min. Therefore, PHE (2016) guidance for primary care recommends first-line treatment

**References**


Rowe BM, Juthani-Mehta M (2013) Update of der Beers Criteria (American Geriatrics Society 2015 Beers Criteria Update Expert Panel 2015), which provide a consensus-based guideline for potentially inappropriate medications in the older population, recently lowered the renal function threshold to GFR 30mL/min. Therefore, PHE (2016) guidance for primary care recommends first-line treatment...
with nitrofurantoin if GFR is >45 mL/min. If GFR is 30–45 mL/min, nitrofurantoin can be used if there is resistance or no alternative. Where there is an increased risk of resistance, or the GFR is <45 mL/min or the patient is older, pivmecillinam or alternatively fosfomycin should be considered.

TIME OUT 5
Prescribing
Review your local area prescribing guidelines for UTI and the information on prescribing in the renal impairment section of the BNF (2016). What implications does this have for the patients in your care?

Conclusion
UTIs are common in older people. The use of indwelling catheters should be avoided because they are the main risk factor for UTI. Where an indwelling catheter is inserted, the need for it should be reviewed regularly and removed as soon as possible. The catheter should be removed if the reason for insertion was incontinence and the person becomes additionally incontinent of faeces.

Diagnosis can be complicated where patients are unable to provide a history due to cognitive difficulties. Older people should be monitored routinely for signs and symptoms of infection, such as increased confusion. Urinalysis should form part of a comprehensive history before treatment. Healthcare practitioners should consider how they obtain an uncontaminated urine sample, especially for those patients who are incontinent.

Antibiotic therapy should not be routinely used for asymptomatic bacteriuria and, where antibiotics are required, healthcare professionals should follow local prescribing guidelines, and should ensure that patients and/or their carers are encouraged to complete the full course, even where symptoms have resolved.

TIME OUT 6
Reflection
Now that you have completed the article, you may want to complete the questionnaire on page 38 and write a reflective account as part of your revalidation. Go to journals.rcni.com/r/nop-reflective-account to find out more.

Urinary tract infections in older people
TEST YOUR KNOWLEDGE BY COMPLETING THIS SELF-ASSESSMENT QUESTIONNAIRE

1. Urinary tract infections (UTIs) account for what percentage of hospital-acquired infections?
   a) 10%
   b) 20%
   c) 33%
   d) 40%

2. What is the main risk factor for UTI in older people?
   a) Oestrogen deficiency
   b) Dehydration
   c) Indwelling urethral catheterisation
   d) Use of incontinence pads

3. Signs and symptoms of UTI include:
   a) Cloudy urine
   b) Pain on passing urine
   c) Foul-smelling urine
   d) All of the above

4. The main indicator for a UTI in a urine sample is the presence of:
   a) Urobilinogen and bilirubin
   b) Leucocytes and nitrates
   c) Erythrocytes and haemoglobin
   d) Albumin and glucose

5. How much urine is required for urinalysis?
   a) 24ml
   b) 48ml
   c) 50ml
   d) 75ml

6. First-line antibiotic treatment for uncomplicated UTI includes:
   a) Tetracycline
   b) Ticarcillin
   c) Trimethoprim
   d) Telavancin

7. Which of the following statements is correct?
   a) Glomerular filtration rate (GFR) provides the level of renal function below which the dose of a drug must be reduced to avoid toxicity
   b) GFR provides the level of renal function above which the dose of a drug must be increased to avoid toxicity
   c) Drug dose regimens are not based on GFR
   d) GFR can be measured directly

8. The minimum adequate daily fluid intake is:
   a) 800mL
   b) 1,200mL
   c) 1,400mL
   d) 1,500mL

9. Unnecessary use of antibiotics to treat UTI is associated with an increased risk of:
   a) Clostridium difficile infection
   b) Meticillin-resistant Staphylococcus aureus
   c) Antibiotic resistance
   d) All of the above

10. A drug known to interact with cranberry is:
    a) Nitrofurantoin
    b) Warfarin
    c) Amoxicillin
    d) Cefaclor

How to complete this assessment
This self-assessment questionnaire will help you to test your knowledge. It comprises ten multiple choice questions that are broadly linked to the previous article. There is one correct answer to each question.
- You can test your subject knowledge by attempting the questions before reading the article, and then go back over them to see if you would answer any differently.
- You might like to read the article before trying the questions. The answers will be published in the next issue.

When you have completed the questionnaire, cut out this page and add it to your professional portfolio. You can record the amount of time it has taken you to complete it.

You may want to write a reflective account.

Visit journals.rcni.com/page/ns/cpd/write-a-reflective-account

Go online to do this self-assessment questionnaire and you can save it to your RCNi portfolio to help meet your revalidation requirements.

Go to rcni.com/cpd/test-your-knowledge

This self-assessment questionnaire was compiled by Lisa Berry