Urinary tract infections are commonly seen in primary care. This review focuses on key points and recent guidelines on the diagnosis and management of bacterial infections.

Urinary tract infections (UTIs) are commonly seen in primary care and represent 1–3 per cent of all GP consultations. UTI reflects an infection of any part of the urinary system and can give rise to a wide spectrum of presentations including cystitis (bladder infection) and pyelonephritis (kidney and renal pelvis). Uncomplicated UTI refers to infection of a structurally and functionally normal urinary tract. Complicated UTIs occur in individuals with structural or functional abnormalities of the urinary tract. Upper tract infection may also be considered complicated. Individuals with complicated UTI are prone to persistent infection, recurrent infection and treatment failure.

The Scottish Intercollegiate Guidelines Network (SIGN) and Public Health England (PHE) have published guidelines on the diagnosis and management of bacterial UTIs in adult. Rational use of antibiotics, in the face of increasing antimicrobial resistance and healthcare-associated infections such as Clostridium difficile infection, was one of the key drivers for these guidelines.

**Diagnosis**

**Specimen collection**
Acceptable methods for urine collection include midstream clean catch, “in and out” catheterisation and suprapubic aspiration (SPA) of the bladder. A midstream clean catch urine specimen is the most common method used as it is non-invasive, can be collected easily and is diagnostically useful, particularly if collected carefully. Although the gold standard investigation is SPA of the bladder, this is usually reserved for infants and children who cannot reliably produce a voided specimen. It can also be used to clarify equivocal results from voided urine (eg in infants and small children). Occasionally, urine specimens may be collected by a transient (“in and out”) catheterisation in an attempt to avoid contamination. Specimens from indwelling catheters are not diagnostically useful. When collected the urine should be aspirated aseptically from the catheter tubing or from a sample port in tubing. Specimens should not be taken from the collection bag. Bag urine or pad urine may be collected in infants and young children, but contamination of this sample is common.

Specimens should reach the laboratory for processing within four hours of collection to prevent undue multiplication.
of contaminants. Where delays are unavoidable, refrigeration at 4°C is recommended. Alternatively, specimens may be collected in a container with boric acid preservative. Boric acid preservative helps to maintain the microbiological quality of the specimen for up to 96 hours and prevents overgrowth of bacteria during transport to the laboratory.9 Boric acid containers should be filled to the marked line and the contents mixed well. With a lesser volume of urine, the concentration of boric acid can be high enough to be bactericidal. Boric acid can cause false-negative urine dipstick leucocyte esterase (LE) tests through inhibition of the reaction.6,8 It is essential to check whether the dipstick product used is compatible with urine containing boric acid (consult product literature) and to follow the manufacturer’s instruction on sample volume in boric acid containers.

Near patient testing
Near patient tests (NPTs) that can be readily carried out in primary care settings are as follows.

Visual appearance of midstream clean catch urine; examine against a bright background for signs of turbidity. A clear urine sample has been shown to have a negative predictive value (NPV) of 97 per cent for excluding urine infection.9,10 However, visual appearance is prone to observer error and may not be a useful discriminator.

Urine dipstick is the most widely used simple NPT in primary care because of its rapidity and low cost. LE, nitrite and blood are the important tests in evaluating for UTI.11 The diagnostic accuracy of urine dipsticks for UTI varies with clinical setting and patient group.12,13 Generally, a nitrite test is highly specific (96–99 per cent) but poorly sensitive (44–64 per cent).8,12,13 However, the sensitivity of LE is slightly higher (61–84 per cent) while the specificity is lower (74–90 per cent) than a nitrite test. A positive urine dipstick for either nitrite or LE or for both is the most sensitive (71–90 per cent) while the specificity is lower (71–90 per cent) than a nitrite test. A positive urine dipstick for either nitrite or LE reflects the presence of white blood cells (WBCs) in the urine. Nitrite testing is based on the conversion of nitrate (derived from dietary metabolites) to nitrite by the action of certain species of bacteria in the urine. Infection with non-nitrate-reducing organisms such as enterococci and staphylococci will result in a negative nitrate test. Insufficient dietary nitrate intake and short retention of urine in the bladder (less than four hours) can also cause false-negative results.8 LE reflects the presence of white blood cells (WBCs) in the urine. However, not all UTIs are associated with pyuria as pyuria without infection is also possible.

Urine dipstick testing does not reliably confirm or exclude infection. When nitrite, LE and blood are all negative the NPV of having a positive nitrite and/or LE result is approximately 92 per cent. A positive dipstick tests for nitrite and/or LE is less likely to predict bacteriuria than combinations of specific symptoms of dysuria and frequency without vaginal discharge (post-test probability of UTI: 81 per cent vs 96 per cent respectively).14 Dipstick urinalysis alone is a moderately powerful diagnostic test but should only

### Adults
- Pregnancy:
  - if symptomatic
  - at first antenatal visit (to screen for asymptomatic bacteriuria)
- at every antenatal visit until delivery if true asymptomatic bacteriuria detected at first visit
- Catheterised patients with features of systemic infection
- Suspected pyelonephritis
- Suspected UTI in men
- Failed antibiotic treatment or persistent symptoms
- Recurrent UTI
- Abnormalities of genitourinary tract
- Renal impairment

### Infants and children
- Who have a diagnosis of acute pyelonephritis/upper UTI
- With a high to intermediate risk of serious illness
- Under 3 years
- With a single positive result for leucocyte esterase or nitrite
- With recurrent UTI
- With an infection that does not respond to treatment within 24–48 hours (if no sample has already been sent)
- When clinical symptoms and dipstick tests do not correlate

Table 1. Indication for urine culture1,7 be used to guide treatment decisions in patients with limited symptoms.

### Interpretation of urine culture results

#### Bacteriuria

Bacterial counts of ≥10^5 colony-forming units (cfu/ml ≥10^8 cfu/litre) are indicative of an infection.6 In specific groups of patients, counts between 10^2 cfu/ml (10^5 cfu/litre) and 10^5 cfu/ml (10^8 cfu/litre) may be significant. The PHE guidance on diagnosis of UTI regards the following colony counts as significant in patients with urinary symptoms:2

- ≥10^4 cfu/ml of a single organism
- ≥10^5 cfu/ml mixed growth with one predominant organism
- ≥10^7 cfu/ml of Escherichia coli or Staphylococcus saprophyticus

The cut-offs for symptomatic UTI are set by the European Confederation of Laboratory Medicine.15 Higher counts have a higher PPV. In patients with indwelling catheters, urine culture may not accurately reflect bladder bacteriuria because sampled organisms may have arisen from biofilms on the inner surface of the catheter. Bacterial counts in these patients are not diagnostic.

Pyuria – WBC of ≥10^9/ml ≥10^9 WBC/litre) are considered significant. Sterile pyuria (ie pyuria with no growth on routine culture media) may be caused by a number of factors including prior antibiotic treatment, genital tract infection, Chlamydia trachomatis infection, infections with fastidious organism, renal stones, bladder neoplasm, catheterisation or renal tuberculosis.6 Conversely, an alkaline urine (as occurs in infections
### Table 2. Treatment options for UTIs

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Adult dose</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>Uncomplicated UTI: 500mg tds</td>
<td>Widespread resistance to amoxicillin has been reported. Use only when the infecting organism is known to be sensitive. Avoid in patients with true penicillin hypersensitivity(^a)</td>
</tr>
<tr>
<td>Cefalexin</td>
<td>Symptomatic or asymptomatic UTIs in pregnancy: 250mg qds or 500mg bd</td>
<td>Avoid in patients with known allergy to cephalosporin. Avoid in patients with true penicillin hypersensitivity(^a). Pseudomembranous colitis should be considered in people who develop antibiotic-associated diarrhoea.</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>Complicated upper UTI/acute pyelonephritis: 500mg bd</td>
<td>Avoid in pregnancy. Use with caution in epilepsy, G6PD deficiency, myasthenia gravis, conditions which predispose to QT interval prolongation and in children or adolescents. Risk of <em>Clostridium difficile</em> infection and rarely, tendinitis and tendon rupture.</td>
</tr>
<tr>
<td>Co-amoxiclav</td>
<td>Acute pyelonephritis: 500/125mg tds</td>
<td>Avoid in patients with true penicillin hypersensitivity(^a). Pseudomembranous colitis should be considered in people who develop antibiotic-associated diarrhoea.</td>
</tr>
<tr>
<td>Fosfomycin</td>
<td>Uncomplicated UTI: women – 3g as single dose; men – 3g as a single dose and a second 3g dose 3 days later</td>
<td>Oral fosfomycin is currently unlicensed in the UK but may be available on the advice of a microbiologist.</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>Uncomplicated UTI: 50mg qds or 100mg (modified release) bd Prophylaxis: 50–100mg at night</td>
<td>Avoid in patients with significant renal impairment. MHRA advises avoid in patients with eGFR of less than 45ml/min/1.73m(^2)(^b). However, a short course (3 to 7 days) may be used with caution in certain patients with an eGFR of 30 to 44ml/min/1.73m(^2). Avoid alkalinising agents (eg potassium citrate) when taking nitrofurantoin. Use with caution in elderly patients, who may be at increased risk of toxicity. Use in pregnancy: <em>BNF</em> advises avoid at term due to risk of neonatal haemolysis. However, the risk seems very small(^c). Short-term use is unlikely to cause problems to the foetus.</td>
</tr>
<tr>
<td>Pivmecillinam</td>
<td>Uncomplicated UTI: 400mg stat then 200mg tds</td>
<td>A pro-drug of mecillinam. Limited clinical experience in the UK. Avoid in patients with penicillin hypersensitivity, carnitine deficiency, oesophageal strictures and gastro-intestinal obstruction.</td>
</tr>
<tr>
<td>Trimethoprim</td>
<td>Acute infections: 200mg bd Prophylaxis: 100mg at night</td>
<td><em>BNF</em> advises against its use in first trimester. If used in first trimester, give folic acid 5mg daily. Avoid in pregnant women with established folate deficiency, with low dietary folate intake or on other folate antagonists (eg antiepileptics).</td>
</tr>
</tbody>
</table>

\(^a\)confirmed by a reliable history of an anaphylactic (type 1) reaction, positive skin test reactivity, or well-documented reaction to a second dose of penicillin.  
\(^b\)eGFR = estimated glomerular filtration rate  
with Proteus species) can cause lysis of WBCs and result in bacteriuria without pyuria. Bacteriuria without pyuria can also be caused by bacterial contamination.16

Squamous epithelial cells (SECs) are generally regarded to be a useful indicator of the degree of contamination from the perineal region although there are no reputable studies that either confirm or refute this logical assumption.

Red cells – haematuria is often seen in UTI. Patients with persistent haematuria following a UTI should be referred for assessment.

Management

**Bacterial UTI in non-pregnant women (see Figure 1)**

Women are more prone to UTIs than men because the female urethra is shorter. The probability of UTI in otherwise healthy women who have combinations of specific symptoms (e.g. dysuria and frequency without vaginal discharge) is more than 90 per cent.14 Consequently, empirical antibiotic treatment (without urine dipstick or urine culture) is recommended for otherwise healthy women under 65 years of age with severe or at least three symptoms of UTI and no vaginal discharge or irritation (see Figure 1). If vaginal discharge is present, the likelihood of UTI is low and alternative diagnoses such as sexually transmitted infections and vulvovaginitis should be considered. The presence of fever and back or loin pain increases the likelihood of upper UTI (UTI; acute pyelonephritis) and urine culture should be performed. Women under 65 years of age with limited symptoms of UTI should have dipstick tests (for LE and nitrite) to look for further evidence of UTI. A negative dipstick test does not exclude bacteriuria. Clinical judgement should be used to decide whether to perform a urine culture. Patients should be advised to return if their symptoms persist or worsen.

Typical features of UTIs may be absent in the elderly (over 65 years of age).17 The presence of one of the following may suggest a UTI and warrants further assessment: new incontinence, increased confusion, new onset delirium, fever, rigor or new costovertebral pain/tenderness.4,18 Asymptomatic bacteriuria is very common in the elderly and does not require treatment. Indiscriminate urine cultures often lead to unnecessary treatment of asymptomatic bacteriuria (number needed to harm, NNH=3, CI 95% 2 to 10).4

A three-day course of oral antibiotics is recommended in non-pregnant women with symptoms or signs of acute lower UTI. The choice of antibiotics should be directed by local antimicrobial policy. Increasing antimicrobial resistance is of great concern – especially to amoxicillin and trimethoprim, and including the increased prevalence of community acquired organisms harbouring extended-spectrum beta-lactamase (ESBL) enzymes. Nitrofurantoin, pivmecillinam and fosfomycin are often effective against multi-resistant organisms. As multi-resistant organisms are becoming more prevalent, empiric use of potent and broad-spectrum antibiotics needs to be employed judiciously and where required should be accompanied by culture whenever possible. Nitrofurantoin is currently the preferred first-line empiric agent for acute lower UTI. Trimethoprim (if low risk of resistance) and pivmecillinam are alternative first-line agents. However, pivmecillinam is not widely available in the UK. Amoxicillin can also be used if susceptible organisms are isolated. Oral fosfomycin is not currently licensed in the UK but can be obtained via “specialist drug importers” generally following recommendation from a microbiologist. Urine culture should be performed in patients who do not respond after a single course of treatment and treatment adjusted as necessary when results become available. Alternative diagnosis should be considered if the culture returns negative.

Hospital admission should be considered for patients with features of acute UUTI (pyelonephritis) who are unable to take fluids and medication or show signs of sepsis. If hospitalisation is not deemed necessary, urine culture should be performed before commencing empirical antibiotics. Oral beta-lactam agents are less effective than other agents for treatment of pyelonephritis. In addition, nitrofurantoin, fosfomycin, and pivmecillinam should be avoided because they do not achieve adequate renal tissue levels.18 Seven days of oral ciprofloxacin or co-amoxiclav is recommended, 14 days is recommended if trimethoprim is used. Because of the levels of antimicrobial resistance, trimethoprim is not recommended first line and preferably would only be used where the organism is known to be susceptible. If there is no response to the antibiotic within 24 hours, the patient should be admitted to hospital. In patients at risk of infection with multi-resistant UTIs (eg ESBL), outpatient parenteral antibiotic (OPAT) can be considered. Referral for investigation of an underlying renal tract abnormality should be considered following two or more episodes of acute pyelonephritis.

**Bacterial UTI in pregnant women**

UTIs are common during pregnancy. Untreated infections and asymptomatic bacteriuria is associated with an increased risk of pyelonephritis, preterm birth, low birth weight, and perinatal mortality.20 Urine culture should be performed in all pregnant women with symptomatic UTI before commencing empirical antibiotic, and seven days after completing the antibiotic treatment as a test of cure. Screening (a midstream clean catch urine specimen sent for culture) for asymptomatic bacteriuria is recommended in all pregnant women at first antenatal visit. Dipstick testing is not sufficiently sensitive to be used as a screening test. If asymptomatic bacteriuria is detected, it should be confirmed with a second urine culture. Women with bacteriuria confirmed by a second urine culture should be treated and have repeat urine culture at each antenatal visit until delivery. Women who do not have bacteriuria in the first trimester do not need repeat urine cultures if they remain asymptomatic.

Symptomatic UTI and asymptomatic bacteriuria in pregnancy should be treated with a seven-day course of antibiotic in accordance with local prescribing guidelines. Oral nitrofurantoin or amoxicillin (if susceptible) are the preferred first-line agents (see prescribing information in the appendix for use of nitrofurantoin in pregnancy). Trimethoprim and cefalexin are suitable alternatives. If a group B streptococcus (Streptococcus agalactiae) is isolated from urine, the antenatal care service should be informed because it is associated with an increased risk of neonatal disease and chorioamnionitis, and because intrapartum prophylactic antibiotics are recommended at the time of delivery.21
Urinary tract infections | DRUG REVIEW

Figure 1. Management of suspected UTI in non-pregnant women

*The choice of empirical antibiotic should be based on local susceptibility data.
Bacterial UTI in adult men
UTIs in men are generally considered as complicated and related to abnormalities of the urinary tract. Conditions such as urethritis, prostatitis and epididymitis that may present with similar features to UTI should always be considered in men with acute dysuria or urinary frequency. Urine culture is recommended in all men with symptoms suggestive of UTI before commencing empirical antibiotic treatment.

A seven-day course of oral antibiotic is recommended. The choice of empirical antibiotic in men is similar to non-pregnant women (see section on UTI in non-pregnant women). Men with symptoms of UTI should be referred for urological investigation if they have symptoms of upper UTI, fail to respond to appropriate antibiotics or have recurrent UTI. Referral to nephrology is recommended in men with persistent microscopic haematuria and proteinuria or renal impairment. If symptoms are mild or non-specific, a negative dipstick can be helpful in reducing the probability that a UTI is present.

Bacterial UTI in patients with catheters
No constellation of symptoms or signs can accurately predict the likelihood of a symptomatic UTI in catheterised people. Signs and symptoms compatible with catheter-associated UTI include new onset or worsening of fever, rigors, altered mental status, malaise, flank pain; costovertebral angle tenderness; acute haematuria; pelvic discomfort; and in those patients whose catheters have been removed: dysuria, urgent or frequent urination, or suprapubic pain or tenderness.4,18 Smell or appearance of the urine is not helpful diagnostically. Pyuria is common in catheterised patients and has no predictive value in this population. Dipstick testing is also not predictive and should not be used to diagnose UTI in patients with catheters.

Urine culture is only recommended if the patient has features of systemic infection. If a catheter is to be changed because of possible infection, then any urine sample should be taken from the new catheter.

Antibiotic treatment is not recommended in catheterised patients with asymptomatic bacteriuria. When treatment is deemed appropriate the choice of empirical antibiotic should be guided by local antimicrobial policy and then adjusted according to culture results. A change of catheter should be considered in symptomatic patients with long-term indwelling catheters before commencing antibiotic treatment.4 Long-term prophylactic antibiotics are not recommended in patients with catheters. However, patients with frequent or severe UTIs that significantly impact on daily function and quality of life can be referred for specialist advice on prophylaxis. Use of antimicrobial prophylactic is not recommended during routine catheter change unless there is a history of infection associated with catheter change.4 When prophylaxis for catheter change is required, an antibiotic with the appropriate cover for the typical infecting organisms, such as gentamicin, should be considered.

Recurrent bacterial UTI in women
Recurrent UTI refers to two or more infections in six months or three or more infections in one year. Most recurrences are thought to represent re-infection rather than relapse, although occasionally a persistent focus can produce relapsing infection. Recurrent uncomplicated UTIs are common among young, healthy women even though they have anatomically and physiologically normal urinary tracts.22 Several risk factors for recurrent UTI have been identified including frequency of sexual intercourse, spermicide use, pelvic anatomy, and among postmenopausal women, mechanical and/or physiological factors that affect bladder emptying.22,23

Urinary culture is recommended in all patients with recurrent UTIs to exclude resistant organisms. Each episode should be treated as for acute infection. All women with recurrent UTIs should be referred for urological investigation if they have haematuria, abnormality of the urinary tract, are immunocompromised or fail to respond to preventative treatments.

Repeated or prolonged treatment with antibiotics may promote antimicrobial resistance. A number of alternatives to antibiotics have been used in an attempt to prevent recurrent UTIs. Simple measures such as change of contraception (eg avoiding spermicides) and liberal fluid intake can be helpful. Cranberry products (juice, tablets, capsules) have been used widely for the prevention and treatment of UTIs.24,25 However, current evidence does not support their use and they are no longer recommended for the prevention of recurrent UTIs.26 Oestrogen products (for postmenopausal women) and methenamine hippurate are also not recommended as there is no good evidence to support their use for preventing recurrent UTIs.4,27

Prophylactic antibiotics can be considered in patients who do not respond to simple measures and experience significant discomfort or disruption to their lives. Options include intermittent self-treatment (“standby antibiotics”), continuous prophylaxis and post-coital prophylaxis (depending upon the frequency and pattern of recurrences, and patient preference). If standby antibiotic is offered, the patient should be advised to collect a midstream clean catch urine sample before starting the treatment and to seek medical advice if symptoms persist for more than 48 hours. Post-coital prophylaxis can be prescribed for recurrent UTIs associated with sexual intercourse; trimethoprim 100mg to be taken within two hours of intercourse is recommended (off-label use). For continuous prophylaxis, a six-month trial of trimethoprim 100mg every night or nitrofurantoin 50–100mg every night is recommended.

Bacterial UTI in children (see Figure 2)
The diagnosis of UTI is often difficult in children. The features of UTI are often non-specific (eg fever, vomiting, poor feeding, failure to thrive), particularly in young infants. However, more specific features such as loin or abdominal pain, frequency and dysuria may occur in older children. NICE has published a guideline on the management of UTI in infants, children and young people younger than 16 years.2 Infants and children with unexplained fever of ≥38°C should have a urine sample tested within 24 hours. Infants and children with symptoms and signs suggestive of UTI should also have a urine sample tested for infection before antibiotic treatment. However, treatment should not be delayed in those with a high risk of serious illness if a urine sample is unobtainable.
Figure 2. Management of suspected UTI in infants and children

**Infants <3 months**
- Symptoms and signs suggesting UTI:
  - Fever
  - Vomiting
  - Lethargy
  - Irritability
  - Frequency
  - Dysuria

**3 months–3 years**
- Symptoms and signs suggesting UTI:
  - Poor feeding
  - Failure to thrive
  - Abdominal pain
  - Loin tenderness
  - Dysfunctional voiding
  - Changes to continence

**Children ≥3 years**
- Symptoms and signs suggesting UTI:
  - Jaundice
  - Haematuria
  - Offensive urine
  - Cloudy urine
  - Malaise

Assess the risk of serious illness in accordance with recommendations in *Feverish illness in children* (NICE CG160)

Collect urine specimen
(treatment should not be delayed in an infant or child with a high risk of serious illness if a urine sample is unobtainable)

- Send urine for urgent culture
- Refer to paediatric specialist care
- Manage in line with NICE CG160

Specific urinary symptoms
- Start empirical antibiotic
  - LUTI
  - UUTI
- Give empirical antibiotic for 3 days as directed by local antimicrobial policy
  - First line: trimethoprim or nitrofurantoin or amoxicillin (if susceptible)
  - Second line: cefalexin
- Consider referral to paediatric specialist
- Give oral antibiotics for 7–10 days:
  - First line: co-amoxiclav
  - Second line: cefixime
- Consider iv cefotaxime or ceftriaxone if oral antibiotics cannot be used

Non-specific symptoms
- High risk of serious illness:
  - Urgent referral to paediatric specialist care
  - Manage in line with CG160
- Intermediate risk:
  - Consider urgent referral
  - Start antibiotics if positive microscopy or dipstick test
- Low risk:
  - Start antibiotic if microscopy or culture is positive

Use dipstick test to diagnose UTI
- Positive nitrite and leucocytes:
  - Start empirical antibiotic
  - Send urine for culture if high or intermediate risk of serious illness or past history of UTI
- Positive nitrite and negative leucocytes:
  - Start empirical antibiotic if fresh sample was tested
  - Send urine for culture
- Negative nitrite and positive leucocytes:
  - Send urine for culture
  - Explore other causes
  - Only start antibiotic if there is good clinical evidence of UTI
- Negative nitrite and leucocytes:
  - Explore other causes of illness

*The choice of empirical antibiotic should be based on local susceptibility data*
The method of urine collection from young children has been extensively debated. Urine obtained by SPA and transurethral catheterisation is unlikely to be contaminated and are strongly recommended by the American Academy of Pediatrics (AAP) guidelines for children aged 2–24 months. However, these methods are invasive, unpleasant for the child, require technical expertise and may not be feasible as routine procedures in primary care. The NICE guideline recommends a clean catch urine sample as the method of choice for children (<16 years). Urine collection bags and pads are prone to contamination but are recommended by the NICE guideline as alternative to clean catch method due to convenience.

Urinary tract infections

Urinary tract infections (UTIs) are one of the most common bacterial infections seen in primary care. The diagnosis of bacterial UTI is primarily based on symptoms and signs. The diagnosis may be difficult in children because the features are often non-specific. Laboratory testing has traditionally been used to support the diagnosis. Laboratory diagnostic tools consist of urinalysis (either by microscopy or by dipstick) and urine culture with susceptibility profiles. Empirical treatment (without dipstick or culture) is recommended for non-pregnant women with symptoms of lower UTI. Urine dipstick testing does not reliably confirm or exclude UTI but can be used to guide treatment decisions in patients with limited symptoms. Suprapubic aspirate is regarded as the gold standard for obtaining urine specimens for culture. However, it is usually reserved for clarification of equivocal results from voided urine in infants and small children. Urine culture is recommended for suspected pyelonephritis and UTI in men. Asymptomatic bacteriuria is common, especially in the elderly and does not require treatment (NNH=3). Investigation and treatment in this group needs to be carried out prudently. In contrast, during pregnancy treatment of bacteriuria whether symptomatic or not has been shown to be beneficial. The choice of empirical antibiotics in all settings should be based on local susceptibility data. Antibiotics should not be prescribed excessively, especially in view of the increasing prevalence of antimicrobial resistance.

References

2005;331(7518):669.

Declaration of interests
None to declare.

Dr Durojaie is a specialist registrar in infectious diseases and medical microbiology at the University Hospital of Wales, Cardiff, and Dr Healy is consultant in medical microbiology and infectious diseases, Public Health Wales Microbiology Cardiff, University Hospital of Wales, Cardiff