Urinary tract infection (catheter-associated): antimicrobial prescribing

NICE guideline

Draft for consultation, May 2018

This guideline sets out an antimicrobial prescribing strategy for catheter-associated urinary tract infection. It aims to optimise antibiotic use and reduce antibiotic resistance.

See a 3-page visual summary of the recommendations, including tables to support prescribing decisions.

Who is it for?

- Health professionals
- People with catheter-associated urinary tract infections, their families and carers

The guideline contains:

- the draft recommendations
- summary of the evidence.

Information about how the guideline was developed is on the guideline's page on the NICE website. This includes the full evidence review, details of the committee and any declarations of interest.

Recommendations

The recommendations in this guideline are for preventing and managing urinary tract infection (UTI) in adults, young people and children with a catheter.

1.1 Managing catheter-associated urinary tract infection

1.1.1 Be aware that:

- catheter-associated UTI occurs when bacteria in a catheter bypass the body's defence mechanisms (such as the urethra and the passing of urine) and enter the bladder
- the longer a catheter is in place, the more likely bacteria will be found in the urine
- treatment is only needed for symptomatic catheter-associated UTI not asymptomatic bacteriuria (apart from in pregnant women with asymptomatic bacteriuria, see the NICE antimicrobial prescribing guideline on lower UTI).

1.1.2 Consider removing or changing the catheter before treating the infection if it has been in place for more than 7 days. Catheters should be removed rather than changed where possible.

1.1.3 Give advice about managing symptoms with self-care (see the recommendations on self-care) to all people with catheter-associated UTI.

Treatment for catheter-associated UTI

1.1.4 Obtain a urine sample from the sampling port of the catheter using an aseptic technique (in line with the NICE guideline on healthcare-associated infection) and send for culture and susceptibility testing.

- If the catheter has been changed, obtain the sample from the new catheter.
- If the catheter has been removed obtain a midstream specimen of urine.

1.1.5 Take account of the severity of symptoms and consider waiting until urine culture and susceptibility results are available before prescribing an antibiotic for catheter-associated UTI.

1.1.6 Offer an antibiotic (see the recommendations on choice of antibiotic) to people with catheter-associated UTI. Take account of:

- the severity of symptoms
- the risk of developing complications, which is higher in people with known or suspected structural or functional abnormality of the genitourinary tract or underlying disease (such as diabetes or immunosuppression)
- previous urine culture and susceptibility results
- previous antibiotic use which may have led to resistant bacteria.

1.1.7 When urine culture and susceptibility results are available:

- review the choice of antibiotic, **and**
- change the antibiotic according to susceptibility results if the bacteria are resistant and symptoms are not already improving, using narrow spectrum antibiotics wherever possible.

Advice when an antibiotic prescription is given

1.1.8 When an antibiotic is given, as well as the general advice on self-care, give advice about:

- possible adverse effects of antibiotics, particularly diarrhoea and nausea
- seeking medical help if symptoms worsen rapidly or significantly at any time, do not start to improve within 48 hours of taking the antibiotic, or the person becomes systemically very unwell.

Reassessing symptoms

1.1.9 Reassess if symptoms worsen rapidly or significantly at any time, or do not start to improve within 48 hours of taking the antibiotic, taking account of:

- other possible diagnoses
- any symptoms or signs suggesting a more serious illness or condition, such as sepsis
- previous antibiotic use, which may have led to resistant bacteria.

Referring to hospital

1.1.10 Refer people with catheter-associated UTI to hospital if they have a severe systemic infection (any of the high risk criteria from the NICE guideline on sepsis).

1.1.11 Consider referring people with catheter-associated UTI to hospital or for specialist assessment and investigations if they:

- are significantly dehydrated or unable to take oral fluids and medicines, **or**
- are pregnant, **or**
- have a higher risk of developing complications (for example, people with known or suspected structural or functional abnormality of the genitourinary tract or underlying disease [such as diabetes or immunosuppression]), **or**
- have recurrent catheter-associated UTIs.

See the evidence and committee discussion on antibiotics for managing catheter-associated UTI.

1.2 Self-care

1.2.1 Consider paracetamol for pain in people with catheter-associated UTI.

1.2.2 Advise people with catheter-associated UTI about the adequate intake of fluids.

See the evidence and committee discussion on self-care.

1.3 Choice of antibiotic

1.3.1 When prescribing antibiotic treatment for catheter-associated UTI:

- follow table 1 for non-pregnant women and men aged 16 years and over
- follow table 2 for pregnant women aged 12 years and over
- follow table 3 for children and young people under 16 years.

1.3.2 Give oral antibiotics first-line if the person can take oral medicines, and the severity of their condition does not require intravenous antibiotics.

1.3.3 Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible.

Table 1. Antibiotics for non-pregnant women and men aged 16 years and over

Antibiotic[1]	**Dosage and course length**
First choice oral antibiotic if no upper UTI symptoms[2]	
Nitrofurantoin – if eGFR ≥45 ml/minute	50 mg four times a day or 100 mg modified-release twice a day for 7 days
Trimethoprim – if low risk of resistance and not used in the past 3 months	200 mg twice a day for 7 days
Amoxicillin (only if culture results available and susceptible)	500 mg three times a day for 7 days
Second choice oral antibiotic if no upper UTI symptoms (when first choice not suitable)[2]	
Pivmecillinam	400 mg initial dose, then 200 mg three times a day for a total of 7 days

Fosfomycin	3 g single dose sachet
First choice oral antibiotic if upper UTI symptoms[2]	
Co-amoxiclav	625 mg three times a day for 7 days
Ciprofloxacin	500 mg twice a day for 7 days
Levofloxacin	500 mg once a day for 7 days
Trimethoprim (only if culture results available and susceptible)	200 mg twice a day for 14 days
First choice intravenous antibiotic (if vomiting, unable to take oral antibiotics or severely unwell). Antibiotics may be combined if sepsis a concern[2,3]	
Co-amoxiclav	1.2 g three times a day
Ciprofloxacin	400 mg twice or three times a day
Ceftriaxone	1 to 2 g once a day
Gentamicin	5 mg/kg to 7 mg/kg once a day
Amikacin	15 mg/kg once a day
Second choice intravenous antibiotic if higher risk of developing resistance[2,3]	
Consult local microbiologist	
[1]See BNF for appropriate use and dosing in specific populations, for example, hepatic impairment, renal impairment and breast-feeding. [2]Check any previous urine culture and susceptibility results and antibiotic prescribing and choose antibiotics accordingly. [3]Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible for a total antibiotic course of 7 days.	

Table 2. Antibiotics for pregnant women aged 12 years and over

Antibiotic[1]	Dose and course length
First choice oral antibiotic[2]	
Cefalexin	500 mg twice or three times a day for 7 days
First choice intravenous antibiotic (if vomiting, unable to take oral antibiotics, or severely unwell)[2,3]	
Cefuroxime	750 mg three or four times a day
Second choice intravenous antibiotic if higher risk of developing resistance[2,3]	
Consult local microbiologist	
[1]See BNF for appropriate use and dosing in specific populations, for example, hepatic impairment and renal impairment. [2]Check any previous urine culture and susceptibility results and antibiotic prescribing and choose antibiotics accordingly. [3]Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible for a total antibiotic course of 7 days.	

Table 3. Antibiotics for children and young people under 16 years

Antibiotic[1]	Dosage and course length[2]
Children under 3 months	
Refer to paediatric specialist and treat with intravenous antibiotics in line with the NICE guideline on fever in under 5s.	
Children aged 3 months and over	
First choice oral antibiotic if no upper UTI symptoms[3,4]	
Trimethoprim – if low risk of resistance and not used in the past 3 months	3 to 5 months, 4 mg/kg or 25 mg twice a day for 7 days 6 months to 5 years, 4 mg/kg or 50 mg twice a day for 7 days 6 to 11 years, 4 mg/kg or 100 mg twice a day for 7 days 12 to 17 years, 200 mg twice a day for 7 days
Nitrofurantoin – if eGFR ≥45 ml/minute	3 months to 11 years, 750 micrograms/kg four times a day for 7 days 12 to 17 years, 50 mg four times a day or 100 mg modified-release twice a day for 7 days
Second choice oral antibiotic if no upper UTI symptoms (when first choice not suitable)[3,4]	
Cefalexin	3 to 11 months, 12.5 mg/kg or 125 mg twice a day for 7 days 1 to 4 years, 12.5 mg/kg twice a day or 125 mg three times a day for 7 days 5 to 11 years, 12.5 mg/kg twice a day or 250 mg three times a day for 7 days 12 to 17 years, 500 mg two or three times a day for 7 days
Amoxicillin (only if culture results available and susceptible)	1 to 11 months, 125 mg three times a day for 7 days 1 to 4 years, 250 mg three times a day for 7 days 5 to 11 years, 500 mg three times a day for 7 days 12 to 17 years, 500 mg three times a day for 7 days
First choice oral antibiotic if upper UTI symptoms[3]	
Co-amoxiclav	3 to 11 months, 0.25 ml/kg of 125/31 suspension three times a day for 7 to 10 days (dose doubled in severe infection) 1 to 5 years, 5 ml of 125/31 suspension or 0.25 ml/kg of 125/31 suspension three times a day for 7 to 10 days (dose doubled in severe infection) 6 to 11 years, 5 ml of 250/62 suspension or 0.15 ml/kg of 250/62 suspension three times a day for 7 to 10 days (dose doubled in severe infection) 12 to 17 years, 250/125 mg or 500/125 mg three times a day for 7 to 10 days
Cefalexin	3 to 11 months, 125 mg or 12.5 mg/kg twice a day

	for 7 to 10 days 1 to 4 years, 125 mg three times a day or 12.5 mg/kg twice a day for 7 to 10 days 5 to 11 years, 250 mg three times a day for 7 to 10 days 12 to 17 years, 500 mg two to three times a day for 7 to 10 days
First choice intravenous antibiotic (if vomiting, unable to take oral antibiotics or severely unwell). Antibiotics may be combined if sepsis a concern[3,5,6]	
Co-amoxiclav	3 months to 17 years, 30 mg/kg three times a day (maximum 1.2 g three times a day)
Cefotaxime	50 mg/kg twice or three times a day (four times a day for severe infections; maximum 12 g per day)
Ceftriaxone	3 months to 11 years (up to 50 kg), 50 to 80 mg/kg once a day (maximum 4 g per day) 9 to 11 years (50 kg and above), 1 to 2 g once a day 12 to 17 years, 1 to 2 g once a day
Gentamicin	7 mg/kg once a day
Amikacin	15 mg/kg once a day
Second choice intravenous antibiotic if higher risk of developing resistance[3,5,6]	
Consult local microbiologist	
[1]See BNF for children for appropriate use and dosing in specific populations, for example, hepatic impairment and renal impairment. See table 2 if the young woman is pregnant. [2]The age bands apply to children of average size and, in practice, the prescriber will use the age bands in conjunction with other factors such as the severity of the condition being treated and the child's size in relation to the average size of children of the same age. [3]Check any previous urine culture and susceptibility results and antibiotic prescribing and choose antibiotics accordingly. [4]If 2 or more antibiotics are appropriate, choose the antibiotic with the lowest acquisition cost. [5]Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible for a total antibiotic course of 10 days. [6]If intravenous treatment is not possible, consider intramuscular treatment.	

See the evidence and committee discussion on antibiotics for managing catheter-associated UTI.

1.4 Preventing catheter-associated urinary tract infections

1.4.1 Do not offer routine antibiotic prophylaxis to prevent catheter-associated UTI in people with a short-term or a long-term (indwelling or intermittent) catheter.

1.4.2 Give advice about seeking medical help if symptoms of an acute UTI develop.

See the evidence and committee discussion on antibiotic prophylaxis for preventing catheter-associated UTI.

Summary of the evidence

Self-care

- One RCT (Gunnarsson et al. 2017) in adult females (n=92) who had a hip fracture and a perioperative urinary catheter with planned removal at 48 hours compared cranberry juice concentrate (capsules) with placebo for the prevention of post-operative urinary tract infection. There were no significant differences in positive urine cultures (>10^4 colony forming units per mL) at either 5 or 14 days post-operatively (low quality evidence).
- No systematic reviews or RCTs of any other non-antimicrobial treatments were identified that met the inclusion criteria.

Committee discussion on self-care

- There was no evidence for the use of oral analgesia in catheter-associated-UTI. However, paracetamol has a well-established efficacy and safety profile for managing pain. The committee agreed that it was reasonable to consider paracetamol for managing pain in people with a catheter-associated UTI.
- The committee agreed that the evidence for use of cranberry in preventing catheter-associated UTI (which showed no effect) was limited to a specific population in the immediate post-operative period, and could

not be extrapolated to other populations or settings. The committee was, therefore, unable to make a recommendation on its use.

Antibiotics for managing catheter-associated UTI

- In most cases, managing symptomatic catheter-associated UTI will require antibiotics.
- Gram-negative bacteria, particularly *Escherichia coli*, are the most common causative pathogens in UTIs. However, catheter-associated UTI can be associated with more than 1 bacterial species and is often caused by bacteria that are resistant to antibiotics (European Association of Urology guidelines on urological infections 2017).
- UTI is the most common healthcare acquired infection, accounting for 19% of all healthcare-associated infections, with around half of these infections due to an indwelling urinary catheter (Health Protection Agency 2012). In some people, catheter-associated UTI can lead to a more serious systemic infection (urosepsis).

Efficacy of antibiotics

- One RCT (Leone et al. 2007) of adults with asymptomatic bacteriuria admitted to an intensive care unit with a short-term catheter found that a short course (3 days) of antibiotics and catheter change did not significantly reduce the proportion of patients with urosepsis (p=1, low quality evidence), or bacteraemia or severe sepsis (p>0.05, low quality evidence), compared with no antibiotics and no catheter change. Short-course antibiotics and catheter change significantly reduced the proportion of positive urine cultures (>10^5 colony forming units/mL) at 7 days (30% versus 70%, NNT 3 [range 2 to 6], moderate quality evidence) but not at 15 days (very low quality evidence).
- One RCT (Darouiche et al. 2014) of hospitalised adults with a long-term catheter for spinal cord injury and catheter-associated UTI found that a shorter course (5 days) of antibiotics plus a catheter change was not significantly different to 10 days of antibiotics and no catheter change for clinical cure at the end of therapy (p<0.001 for non-inferiority, moderate

quality evidence). However, for other outcomes (microbiological response and resolution of pyuria at the end of therapy) the short-course and catheter change was not shown to be as effective as the long-course and no catheter change. There were also significantly more episodes of recurrent UTI in the short-course plus catheter change group compared with the long-course and no catheter change group (32.1% versus 11.1%, p=0.043; low quality evidence).

Changing the catheter before antibiotics

- One prospective open-label RCT (Raz et al. 2000) in older adults with a long-term catheter in a long-stay care facility with catheter-associated UTI compared catheter change before antibiotics with no catheter change before antibiotics. Antibiotic therapy was ciprofloxacin or ofloxacin, initially intravenously then orally for 14 days. There was a significant difference in cure or improvement favouring catheter change at 72 hours (92.6% versus 40.7%, NNT 2 [range 2 to 4]; moderate quality evidence) and 28 days (88.9% versus 59.3%, NNT 4 [range 2 to 14; low quality evidence), but not at 7 days. There was no significant difference in recurrence or treatment failure at either 7 or 28 days, but mortality was significantly lower in the catheter change group (0% versus 7.4% [urosepsis in 1 person on day 2 and 1 person on day 3; very low quality evidence).

Safety of antibiotics

- The RCT on duration of antibiotics (and catheter change) for people with spinal cord injury and catheter-associated UTI (Darouiche et al. 2014) found no significant difference in adverse events between the no catheter change and 10 days of antibiotics group and the catheter change and 5 days of antibiotics group (40.7% versus 64.3%%; low quality evidence).
- Antibiotic-associated diarrhoea occurs in 2 to 25% of people taking antibiotics, depending on the antibiotic used (NICE Clinical Knowledge Summary [CKS]: diarrhoea – antibiotic associated).
- Allergic reactions to penicillins occur in 1 to 10% of people and anaphylactic reactions occur in less than 0.05%. People with a history of atopic allergy (for example, asthma, eczema and hay fever) are at a higher

risk of anaphylactic reactions to penicillins. People with a history of immediate hypersensitivity to penicillins may also react to cephalosporins and other beta lactam antibiotics (BNF, April 2018). See the NICE guideline on drug allergy: diagnosis and management for more information.

- Nitrofurantoin should be used with caution in those with renal impairment. It should be avoided at term in pregnancy because it may produce neonatal haemolysis. Adults (especially the elderly) and children on long-term therapy should be monitored for liver function and pulmonary symptoms (BNF, April 2018).
- Trimethoprim has a teratogenic risk in the first trimester of pregnancy (folate antagonist), and the manufacturers advise avoidance during pregnancy (BNF, April 2018).
- Quinolones are generally not recommended in children or young people who are still growing (BNF, April 2018).
- Aminoglycosides doses are based on weight and renal function and whenever possible treatment should not exceed 7 days (BNF, April 2018).
- See the summaries of product characteristics for information on contraindications, cautions and adverse effects of individual medicines.

Committee discussion on antibiotics for managing catheter-associated UTI

- Based on evidence and experience, the committee agreed that people with a symptomatic catheter-associated UTI should be offered an antibiotic.
- Urine should be sent for culture to confirm susceptibility of the bacteria and inform treatment choice. The committee noted that it is useful to add a comment to the request form to alert the laboratory to a suspected catheter-associated infection and the name of any antibiotic prescribed.
- Delaying the antibiotic until urine culture and susceptibility results are available could be considered, depending on the severity of symptoms.
- The committee agreed that the evidence for antibiotic treatment for catheter-associated UTI specifically was limited, but that evidence for antibiotic treatment for acute pyelonephritis could be extrapolated. The

evidence for acute pyelonephritis included some people with complicated UTI, which included some people with a catheter (see the NICE antimicrobial prescribing guidelines on acute pyelonephritis).

- The committee recommended considering removal or change of the catheter before starting antibiotic treatment, if it has been in place for more than 7 days. The longer a catheter is in place, the more likely bacteria will be found in the urine, and catheters should be removed rather than changed, where possible. Changing the catheter is based on evidence from 1 small RCT, which found changing the catheter before starting antibiotic treatment resulted in higher cure or improvement rates and reduced mortality (from urosepsis) compared with not changing the catheter before starting antibiotics.
- Based on evidence and experience, the committee agreed that asymptomatic bacteriuria is not routinely screened for, or treated with antibiotics, in people with a catheter because it is not generally a risk factor for harm. It is routinely screened for, and treated with antibiotics, in pregnant women (including those with a catheter) because it is a risk factor for pyelonephritis and pre-term labour.

Committee discussion on choice of antibiotic

- The committee agreed, based on evidence, experience and resistance data, that several oral and intravenous of antibiotics should be available for people with a catheter-associated UTI. Having a choice enables antibiotics to be selected based on the severity of illness, presence or absence of upper UTI symptoms, antibiotic susceptibilities from culture results when available, local resistance patterns, risk of resistant bacteria, the setting, and known patient factors.
- The committee agreed that any recent previous urine culture and susceptibility results, and antibiotic prescribing, should be reviewed before choosing an antibiotic.
- Based on experience, the committee agreed that when results of urine cultures are available, if the results suggest the antibiotic given is not

susceptible, the person should be contacted and if symptoms are not already improving, the antibiotic should be changed.

Non-pregnant women and men with catheter-associated UTI

- Based on evidence, their experience and resistance data, the committee agreed to recommend **nitrofurantoin**, **trimethoprim** or **amoxicillin** at usual doses as first-choice **oral antibiotics** for people with no upper UTI symptoms.
  - Nitrofurantoin is not recommended for people with an eGFR <45 ml/minute.
  - Trimethoprim should only be prescribed if a lower risk of resistance is likely, for example if trimethoprim has not been used in the past 3 months, if previous urine culture results suggest trimethoprim susceptibility (but this was not used as treatment) and in younger people in areas where local epidemiology data suggest resistance is low. There is a higher risk of trimethoprim resistance with recent use and in older people in residential facilities.
  - Amoxicillin is recommended only if culture results are available and bacteria are susceptible because resistance rates are high.
- Where nitrofurantoin, trimethoprim or amoxicillin are not suitable, second choice oral antibiotics for people with no upper UTI symptoms are **pivmecillinam** or **fosfomycin** at usual doses.
- For people with upper UTI symptoms, nitrofurantoin, trimethoprim, amoxicillin, pivmecillinam and fosfomycin are not appropriate and **co-amoxiclav** (a penicillin with a beta-lactamase inhibitor), **ciprofloxacin** or **levofloxacin** (quinolones), at usual doses, are recommended to cover a broader range of bacterial pathogens.
- Based on evidence, their experience and resistance data, the committee agreed to recommend a choice of first-line **intravenous antibiotics**, at usual doses, for people who are unable to take oral antibiotics due to nausea and vomiting, or are more severely unwell. These are:
  - **co-amoxiclav** or **ciprofloxacin** (quinolones); which can be given intravenously if oral antibiotics are not appropriate.

  - **ceftriaxone** (a third generation cephalosporin): which would be a suitable alternative to co-amoxiclav or ciprofloxacin.
  - **gentamicin** or **amikacin** (aminoglycosides): which may be appropriate for some people with catheter-associated UTI, particularly those with severe infection or sepsis, but identifying the causal bacteria and reviewing use by 48 hours is particularly important for aminoglycosides because of safety concerns. Gentamicin is the preferred aminoglycoside in the UK but shortages may result in the use of amikacin.
- The committee agreed, based on experience, that it may be necessary to combine antibiotics in the care of people with suspected sepsis. This should be done according to local policy or on the advice of a microbiologist.

Pregnant women with catheter-associated UTI

- Based on evidence, their experience and resistance data, the committee agreed to recommend **cefalexin** (a first-generation cephalosporin) as the first-choice oral antibiotic for pregnant women who don't need intravenous antibiotics, and **cefuroxime** (a second generation cephalosporin) as the first choice intravenous antibiotic.

Children and young people with catheter-associated UTI

- Based on evidence, their experience and resistance data, the committee agreed to recommend **trimethoprim** or **nitrofurantoin** at usual doses as first-choice **oral antibiotics** for children and young people with no upper UTI symptoms.
  - The committee was aware that nitrofurantoin suspension is currently substantially more expensive than trimethoprim suspension and, if both antibiotics are appropriate, the one with the lowest acquisition cost should be chosen.
- Where trimethoprim or nitrofurantoin are not suitable, second choice oral antibiotics for people with no upper UTI symptoms are **cefalexin** or **amoxicillin** at usual doses.

- For children or young people with upper UTI symptoms, **co-amoxiclav** or **cefalexin**, at usual doses, are recommended.
- Based on evidence, their experience and resistance data, the committee agreed to recommend a choice of first-line **intravenous antibiotics**, at usual doses, for children and young people who are unable to take oral antibiotics due to nausea and vomiting, or are more severely unwell. These are: **co-amoxiclav, cefotaxime**, **ceftriaxone**, **gentamicin** or **amikacin**.
- The committee agreed, based on experience, that it may be necessary to combine antibiotics in the care of children and young people with suspected sepsis. This should be done according to local policy or on the advice of a microbiologist.

Committee discussions on antibiotic course length

- The committee agreed that the shortest course that is likely to be effective should be prescribed to reduce the risk of antimicrobial resistance and minimise the risk of adverse effects.
- In line with the NICE guideline on antimicrobial stewardship and Start smart – then focus, the committee agreed that the use of intravenous antibiotics should be reviewed by 48 hours (taking into account the person's response to treatment and susceptibility results from urine culture) and switched to oral treatment where possible.

Course length for non-pregnant women, pregnant women and men with catheter-associated UTI

- Based on evidence, their experience and resistance data, the committee agreed that, for oral treatment, a 7-day course of all the recommended antibiotics was required to treat catheter-associated UTI, apart from trimethoprim where 14 days was required. For intravenous treatment, antibiotics should be reviewed by 48 hours and stepped down to oral antibiotics where possible for a total antibiotic course of 7 days.

Course length for children and young-people with catheter associated UTI

- Based on evidence, their experience and resistance data, the committee agreed that, for oral treatment, a 7-day course of all the recommended antibiotics was required to treat catheter-associated UTI with no upper UTI symptoms. For children and young people with upper UTI symptoms a 7- to 10-day course of the recommended oral antibiotics was required. For intravenous treatment, antibiotics should be reviewed by 48 hours and stepped down to oral antibiotics where possible for a total antibiotic course of 10 days.

Antibiotic prophylaxis for preventing catheter-associated UTI

Antibiotic prophylaxis for people with a long-term (indwelling or intermittent) catheter

- One systematic review (Niël-Weisse et al. 2012) found antibiotic prophylaxis for adults using intermittent self-catheterisation was associated with fewer episodes of either asymptomatic or symptomatic bacteriuria (incidence density rate [IDR] 0.61, 95% CI 0.44 to 0.87, with significant heterogeneity, using a fixed effect model; low quality evidence) compared with antibiotics only when microbiologically indicated. Another RCT which the authors did not include in the meta-analysis also favoured antibiotic prophylaxis for a similar population (incidence rate ratio (IRR) 0.34, 95% CI 0.156 to 0.74; moderate quality evidence). However, 1 additional RCT included in the systematic review found no significant benefit of antibiotic prophylaxis compared with antibiotics when microbiologically indicated for the number of episodes of bacteriuria.
- Two RCTs in the systematic review (Niël-Weisse et al. 2012) showed inconsistent results for antibiotic prophylaxis for symptomatic bacteriuria in adults using intermittent catheterisation compared with antibiotics when microbiologically indicated. In 1 RCT fewer participants had at least 1 episode of symptomatic bacteriuria with antibiotic prophylaxis compared

with antibiotics when microbiologically indicated (6.1% versus 31.7%, NNT 4 [range 3 to 8]; moderate quality evidence). In the other RCT there was no significant difference in the rate of symptomatic bacteriuria between groups.

- One RCT in the systematic review (Niël-Weisse et al. 2012) compared antibiotic prophylaxis with antibiotics when clinically indicated in older adults in nursing homes with indwelling urinary catheters. There were no statistically significant differences between groups for episodes of symptomatic UTI, rates of visual encrustation, or catheter obstructions (very low to low quality evidence). The prophylaxis group had a higher number of participants with improved general condition (52.2% versus 4.3%, NNT 3 [range 2 to 4]; very low quality evidence).
- Evidence from 2 RCTs in the systematic review (Niël-Weisse et al. 2012) including children with neurogenic bladder using intermittent catheterisation found no significant difference between antibiotic prophylaxis and antibiotics only when clinically indicated for symptomatic UTI.
- Evidence from 1 RCT in the systematic review (Niël-Weisse et al. 2012) which included children with spina bifida using intermittent catheterisation found no significant difference in the risk of febrile symptomatic UTI when antibiotic prophylaxis was discontinued at 6 months compared with continued prophylaxis. However there were significantly fewer afebrile symptomatic UTIs in the group where antibiotic prophylaxis was continued (IDR 0.69, 95% CI 0.55 to 0.87; low quality evidence).
- The systematic review (Niël-Weisse et al. 2012) found no significant difference in adverse events between antibiotic prophylaxis and antibiotics when microbiologically indicated in adults using intermittent catheterisation. There was also no significant difference between antibiotic prophylaxis and antibiotics when clinically indicated in the rates of adverse events in older people in nursing homes (low quality evidence).

Antibiotic prophylaxis before or during short-term catheterisation in hospital

- One systematic review (Lusardi et al. 2013) compared antibiotic prophylaxis with no prophylaxis in hospitalised adults with a short-term

catheter. A meta-analysis of 3 RCTs of surgical patients showed a significant reduction in asymptomatic bacteriuria with antibiotics (8.2% versus 31.3%, NNT 5 [range 4 to 7]; moderate quality evidence). Two further RCTs of non-surgical patients could not be pooled for the outcome of asymptomatic bacteriuria due to heterogeneity. One study showed no reduction with antibiotics (low quality evidence) and the other significant reduction with antibiotics (10% versus 53.7%, NNT 3 [range 2 to 4], moderate quality evidence). One RCT of surgical patients found significantly fewer cases of symptomatic bacteriuria with antibiotic prophylaxis (6.3% versus 31%, NNT 4 [range 3 to 11]).

- The systematic review (Lusardi et al. 2013) also found that antibiotic prophylaxis was associated with a significantly lower risk of pyuria (presence of white cells in the urine) in surgical patients (7.5% versus 32.9%, NNT 4 [range 3 to 7]; moderate quality evidence) and significantly reduced febrile (high temperature) morbidity (12.5% versus 23.2%, NNT 10 [range 6 to 52]; very low quality evidence).
- Evidence from 1 additional RCT (Dieter et al. 2011) found the risk of requiring antibiotic treatment for a UTI within 3 weeks of urinary catheterisation for pelvic organ prolapse or urinary incontinence surgery was not significantly associated with prophylactic use of nitrofurantoin compared with placebo (moderate quality evidence).
- The systematic review (Lusardi et al. 2013) found no significant difference between levofloxacin and ciprofloxacin (very low quality evidence) or between 2 different doses of ciprofloxacin (250 mg versus 1000 mg daily; very low quality evidence) for asymptomatic bacteriuria at follow-up.
- Evidence from 1 RCT in the systematic review (Lusardi et al. 2013) found that a single antibiotic dose at the time of catheterisation only compared with antibiotic prophylaxis throughout the entire period of catheterisation was associated with significantly fewer cases of bacteriuria (12.5% versus 42.9%, NNT 4 [range 2 to 13]; low quality evidence).
- The systematic review (Lusardi et al. 2013) included 3 RCTs that reported adverse reactions to antibiotics. One RCT reported 23 adverse reactions, none were judged to be treatment related and there were no serious

adverse events. A second RCT reported no serious adverse reactions to co-trimoxazole. The third RCT reported 3 patients taking ciprofloxacin had moderate gastrointestinal symptoms on the second day of prophylaxis and the antibiotic was discontinued (very low quality evidence).

Antibiotic prophylaxis at the time of short-term catheter removal in hospital

- Evidence from a systematic review (Marschall et al. 2013) in hospitalised patients found that antibiotic prophylaxis at the time of short-term catheter removal was associated with a significantly lower risk of symptomatic UTI at 2 to 42 days follow-up compared with placebo or other control intervention (4.7% versus 10.5%, NNT 18 [range 12 to 31]).
- In sub-group analyses, the effect was maintained for surgical patients (4.8% versus 10.3%, RR 0.45, 95% CI 0.29 to 0.59; moderate quality evidence) but not for mixed hospital populations. Additional subgroup analysis of the surgical studies found significant benefit for people undergoing prostate surgery (3.57% versus 8.18%, RR 0.41, 95% CI 0.22 to 0.79; low quality evidence) but not for those undergoing other surgery (6.1% versus 14.1%, RR 0.45, 95% CI 0.18 to 1.14; low quality evidence).
- In further sub-group analyses of surgical studies not including prostate surgery studies, there was a significant benefit of antibiotic prophylaxis with catheter duration longer than 5 days (3.8% versus 16.7%, RR 0.25, 95% CI 0.10 to 0.59; high quality evidence) but not with catheter duration less than 5 days (3.22% versus 12.3%, RR 0.41, 95% CI 0.02 to 10.96; very low quality evidence).

Antibiotic prophylaxis during short-term catheterisation for urodynamic procedures

- A systematic review (Foon et al. 2012) in people who had short-term catheterisation during urodynamic studies found that prophylactic antibiotics did not significantly reduce episodes of symptomatic UTI (low quality evidence) but did significantly reduce bacteriuria (4.1% versus 12.5%, NNT 12 [range 9 to 21]; moderate quality evidence) compared with placebo or no treatment. In a single study of people with spinal cord injury,

antibiotic prophylaxis was not significantly different to placebo or no treatment for the outcome of bacteriuria (very low quality evidence). There was a significant reduction in the number of participants with haematuria with antibiotic prophylaxis (6.3% versus 13.7%, NNT 14 [range 8 to 89]; low quality evidence) but not fever or dysuria.

- The systematic review (Foon et al. 2012) found no significant difference in adverse events between antibiotics and placebo (very low quality evidence).

Committee discussion on antibiotic prophylaxis for preventing catheter-associated UTI

- The committee discussed the evidence on antibiotic prophylaxis for preventing catheter-associated UTI in various populations.
- Based on evidence, their experience and resistance data, the committee agreed not to recommend routine antibiotic prophylaxis to prevent catheter-associated UTIs in people with a **long-term (indwelling or intermittent) catheter**.
  - The benefit of antibiotic prophylaxis on symptomatic bacteriuria, rather than asymptomatic bacteriuria, was mixed.
  - The committee discussed that people should be advised to seek medical help if symptoms of a UTI develop, and they would then be managed for an acute UTI, rather than receiving long-term antibiotic prophylaxis.
  - The committee was aware of recommendations in the NICE guideline on healthcare-associated infections that antibiotic prophylaxis should not be offered routinely when changing long-term indwelling catheters, but should be considered for people with a history of symptomatic UTI after catheter change or an experience of trauma (frank haematuria after catheterisation or 2 or more attempts of catheterisation). The committee for the healthcare-associated infections guideline agreed that for these groups of people the benefits of antibiotic prophylaxis outweigh the risks of antimicrobial resistance. These groups of people

are likely to be at high risk of a UTI and at risk of complications if a UTI develops.

- Based on evidence, the committee agreed not to recommend routine antibiotic prophylaxis to prevent catheter-associated UTI in people with a short-term catheter in hospital. Prophylaxis is not recommended routinely before insertion, while the catheter is in place, or at the time of removal of a short-term catheter for surgical, non-surgical or urodynamic procedures.
  - Before or during short-term catheterisation, there is only limited evidence of benefit with antibiotic prophylaxis for symptomatic bacteriuria in surgical patients.
  - During short-term catheterisation for urodynamic studies, antibiotic prophylaxis did not reduce episodes of symptomatic UTI.
  - At the time of catheter removal, there is evidence of benefit for antibiotic prophylaxis for symptomatic UTI, but in subgroup analysis this was limited to surgical patients, and predominantly those who had either prostate surgery or had a catheter in place for longer than 5 days. The committee discussed that antibiotic prophylaxis for all short-term catheter removal in hospital would be a change in practice, and widespread prophylaxis is not warranted taking into account the principles of antimicrobial stewardship.

Other considerations

Medicines adherence

- Medicines adherence may be a problem for some people with medicines that require frequent dosing (for example, some antibiotics) or longer treatment duration (see the NICE guideline on medicines adherence).
- No systematic reviews or RCTs were identified that addressed medicines adherence.

Resource implications

Antibiotic prophylaxis before or during short-term catheterisation in hospital

- One included RCT in a systematic review (Lusardi et al. 2013) of hospitalised adults with a short-term catheter which compared antibiotic prophylaxis (levofloxacin or ciprofloxacin) with placebo calculated hospital stay in pre-surgery and post-surgery phases. There was no statistically significant difference in mean pre-surgical or post-surgical stay between the placebo group and either the levofloxacin or ciprofloxacin groups (low quality evidence).
- In a second included RCT comparing antibiotic prophylaxis with placebo, the mean hospital stay was significantly higher in the placebo group compared with the intervention group (8 days [±1.4 days] compared with 7 days [±1.2 days], p=0.0002; low quality evidence). Febrile morbidity and UTI prolonged hospitalisation significantly to a mean stay of 9.2 days ([±1.6] days, $p<0.05$).
- In a third included RCT comparing antibiotic prophylaxis with placebo, the average hospital stay was 6 days and 5.6 days for abdominal hysterectomy, and 6.1 days and 7.6 days for vaginal hysterectomy patients, in the prophylaxis group and placebo groups respectively.
- Recommended antibiotics (nitrofurantoin, trimethoprim, penicillins, cephalosporins, quinolones and aminoglycosides) are available as generic formulations, see Drug Tariff for costs.
- Nitrofurantoin 25mg/5ml oral suspension is more expensive than other oral suspensions, such as trimethoprim 50mg/5ml. The cost of a 300 ml bottle of nitrofurantoin is £446.95 compared with £2.30 for a 100 ml bottle of trimethoprim (Drug Tariff, April 2018).