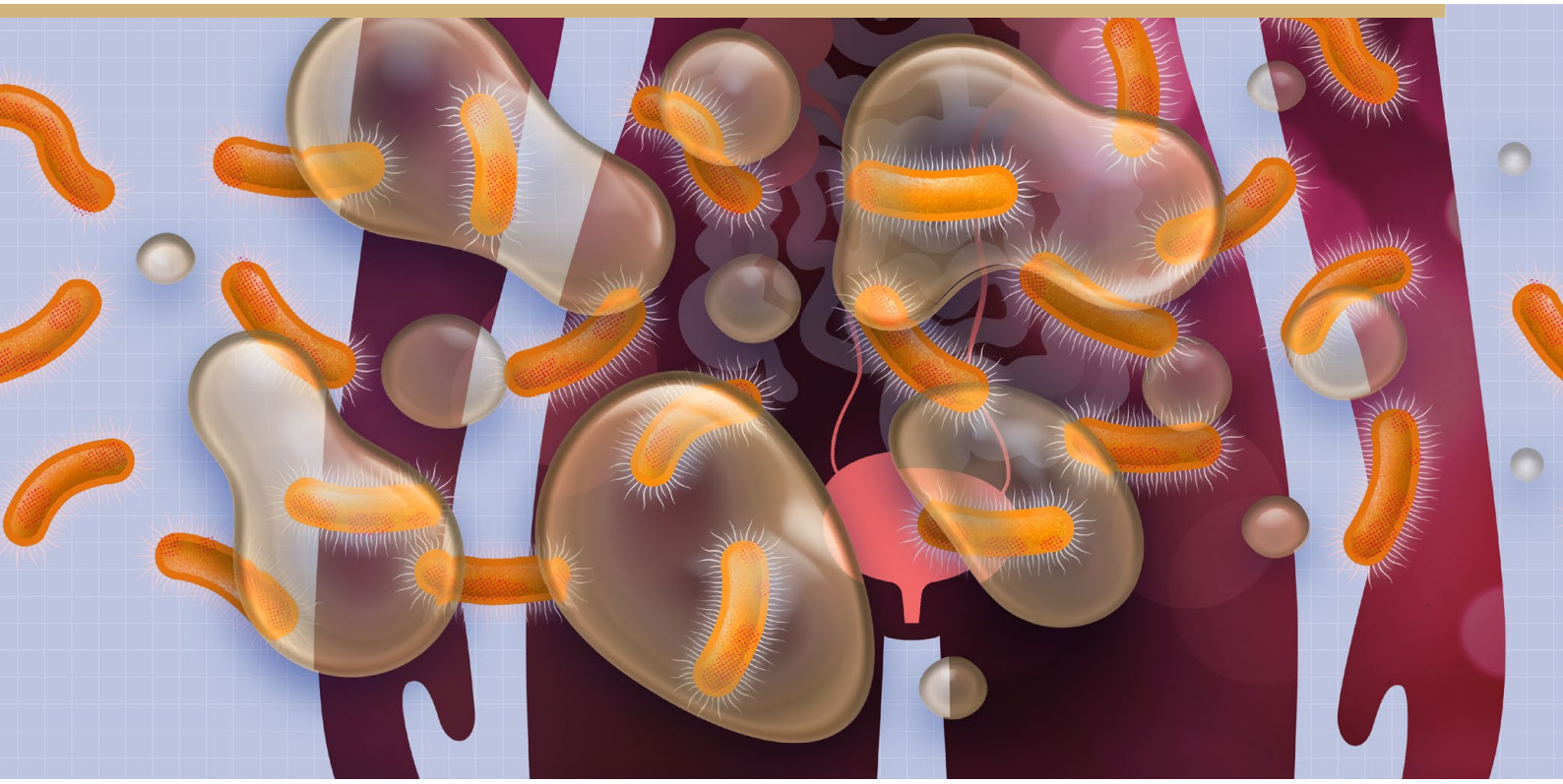

Urinary tract infections (UTIs) – an overview of lower UTI management in adults

Urinary tract infections (UTIs) are a common reason for primary care consultations and antibiotic prescribing in New Zealand, with almost half of all females experiencing at least one episode during their lifetime. In the absence of complicating factors, empiric antibiotic treatment is usually sufficient for most patients with a lower UTI, without the need for additional investigations, e.g. laboratory sensitivity analysis.

KEY PRACTICE POINTS

- In most patients, the diagnosis of an uncomplicated lower UTI is guided by the presence of characteristic symptoms and signs, along with urine dipstick analysis if required
- Empiric antibiotics should be prescribed for patients with an uncomplicated UTI
- Obtaining a midstream urine sample for microscopy, culture and sensitivity analysis is generally only recommended in patients with UTIs who are at higher risk of complications, e.g. males, pregnant females, patients with diabetes, recurrent UTIs, renal impairment, urinary catheterisation, or if there is diagnostic uncertainty
- UTIs are considered recurrent when there are three or more episodes within 12 months, or two or more within six months
- Discuss self-care and behavioural strategies with all patients diagnosed with a UTI to help reduce the risk of future infections, e.g. sufficient fluid intake
- Non-antibiotic prophylactic strategies that have a low risk of harm can be discussed with patients, but some of these strategies are not routinely recommended due to a lack of high-quality evidence for efficacy, e.g. D-mannose, probiotics
- Continuous low-dose antibiotic prophylaxis is effective at preventing recurrent UTIs, however, it should only be considered in patients as a "last resort" if other strategies are unsuccessful – primarily due to the risk of antibiotic resistance

This is a revision of a previously published article. What's changed:

- General article revision, including update of evidence and references
- Fosfomycin is now funded with Special Authority approval for some patients with a UTI
- Information added on vaccines for the prevention of recurrent UTIs, e.g. MV140 (Uromune)

Distinguishing "uncomplicated" and "complicated" UTIs

Urinary tract infections (UTIs) are a common reason for primary care and community pharmacy consultations, and antibiotic prescribing in New Zealand.[1–3] The lower urinary tract is most often affected due to bacteria, usually from the gastrointestinal tract, entering the urethra and proliferating in the bladder.[4, 5] When this occurs and remains confined to the urethra and bladder in an otherwise healthy, non-pregnant female with normal anatomy, it is broadly referred to as an uncomplicated lower UTI (or cystitis).[6, 7] In contrast, "complicated UTIs" include infections in people with risk factors that increase the probability of bacterial colonisation, or that decrease the potential efficacy of antibiotic treatment.[8] This includes males, pregnant females, patients with anatomical or functional abnormalities of the urinary tract, indwelling urinary catheters and immunosuppression.[6, 7]

Despite this terminology, the criteria for distinguishing UTIs as being "uncomplicated" or "complicated" varies across the medical literature, and the significance of risk factors – and the potential need for a referral – differs according to the specific patient and their clinical history. The focus of UTI management for any patient is to promptly resolve the infection before it ascends via the ureters to involve the kidneys (pyelonephritis), which is associated with an increased risk of sepsis and multi-organ involvement.[5]

Females have an increased risk of UTIs

Females have an increased UTI risk compared with males, predominantly due to the shorter length of the urethra and the shorter distance between the urethral meatus and anus.[9, 10] An estimated one-third of females have a UTI before age 24 years, and almost half experience at least one episode during their life.[6] Other factors that increase the risk of UTIs in females include:[6, 9, 10]

- Sexual activity, e.g. high frequency, spermicide or diaphragm use
- Incomplete voiding, urinary retention or other urinary issues
- Pelvic organ prolapse, e.g. cystocoele
- Vulvovaginal atrophy
- Anatomical abnormalities
- A personal or family history of UTIs (particularly maternal history)
- Pregnancy

The cause of uncomplicated lower UTIs is highly predictable

Escherichia coli is the cause in 70 – 95% of cases of uncomplicated UTIs; other causative species include *Staphylococcus saprophyticus*, *Klebsiella* spp., *Enterococcus* spp. and *Proteus* spp.[5, 6, 11] Many complicated UTIs are also caused by *E. coli*, however, the range of possible causative species is much broader than for uncomplicated infections.[7, 12] Although rare in the community, UTIs can occur as the result of fungal infection, which is generally associated with *Candida* spp., e.g. in people with an indwelling catheter.[7, 12, 13]

The symptoms and signs of an uncomplicated UTI

Uncomplicated UTIs can be diagnosed with a high level of confidence in patients with a focused history of lower urinary tract symptoms in the absence of complicating factors or red flags (see: "Red flags for a complicated UTI" and Figure 1).[6, 14] Although subtle or atypical presentations are possible, the combination of two or more "classic" features of a UTI, without vaginal irritation or discharge in females, indicates that a UTI is likely.[14–16] Classic features of a lower UTI are:[6, 11, 14]

- New-onset dysuria
- Increased urinary frequency
- Increased urinary urgency
- Suprapubic pain

It is reported that nine out of ten young females with a history of acute dysuria and urinary frequency, without vaginal irritation or discharge, will have a UTI.[17] Odorous, discoloured or cloudy urine is sometimes present in patients with a UTI, however, these changes can also occur due to non-infectious causes (e.g. dehydration, diet, renal calculi).[13, 15] A UTI cannot be excluded if patients present with only one symptom or sign, and further investigation may be required depending on individual clinical circumstances and history (see: "Urinalysis: indications and interpretation").[11, 15]

Physical examination is often not required but can help exclude differential diagnoses

A physical examination is not usually required to diagnose a patient with an uncomplicated UTI, but can be helpful to ensure systemic features are not present, e.g. measure temperature and other baseline observations, assess abdomen and flank checking for renal tenderness that may indicate the infection has spread to the kidneys (Figure 1).[16]

Pelvic examination in females is also unnecessary if an uncomplicated UTI is suspected (see: "Other demographic-specific considerations" for examination in males); generally, this should only be performed if the patient's suprapubic pain is significant, or if an alternative diagnosis is suspected, e.g. vaginitis, urethritis (associated with sexually transmitted infections [STIs] or pelvic inflammatory disease), anatomical abnormalities.[14, 16, 18]

Other demographic-specific considerations

Males. UTIs are uncommon in males aged under 50 years, although risk increases with age.[19, 20] Classic symptoms and signs are generally present, but infection is often associated with genitourinary tract abnormalities, e.g. prostatic enlargement.[6, 19, 20] Therefore, it is important to ask about any prostate symptoms as well as features of epididymo-orchitis or consider the likelihood of a STI. If appropriate, perform a physical examination, checking the abdomen, genitals, pelvis and lower back.[19] A bedside ultrasound (if available) may be used to confirm urinary retention if this is suspected on examination. UTI in males is unusual, and ideally, they should be referred for a renal tract ultrasound, however, this will depend on local resource availability and criteria for referral. If the ultrasound is abnormal, refer the patient for non-acute urology assessment.[15, 19]

Patients at risk of a STI. Consider a STI check in patients with an increased STI risk (e.g. partner with a STI, new or multiple sexual partners) to exclude infections such as chlamydia or gonorrhoea as a possible cause of symptoms, particularly if vaginal or urethral discharge is reported.[18, 20]

Older patients. Diagnosing a UTI in older patients can be challenging due to the presence of co-morbidities or the use of multiple medicines, which can obscure or resemble UTI symptoms and signs.[13, 14] While classic UTI symptoms are often present, atypical features such as acute confusion/delirium and fatigue may also occur.[13, 14] Urinary incontinence and other non-specific urinary symptoms are relatively common in older people, but alone are not predictive of a UTI.[13, 14] For further information on the diagnosis and management of UTIs in older people, see: **bpac.org.nz/BT/2015/July/guide.aspx** *(published in 2015; some content may no longer be current)*

Red flags for a complicated UTI

Most UTIs can be managed in primary care. However, the presence of red flags or complicating factors may indicate a more serious situation that requires secondary care advice or referral (Figure 1).[16, 17] In particular:

- Patients who are pregnant and have suspected acute pyelonephritis (e.g. systemic symptoms, fever > 38°C, significant flank or suprapubic pain) should be immediately referred for acute obstetric assessment, and their lead maternity carer contacted due to the increased risk of maternal and fetal complications[21]
- Patients with signs of sepsis, e.g. tachycardia, low blood pressure, and increased respiratory rate, should be referred to secondary care for intravenous antibiotics and fluids[15, 16]

Urinalysis: indications and interpretation

Dipstick testing can strengthen diagnostic certainty in symptomatic patients

In most patients aged under 65 years without complicating factors, a lower UTI can be reliably diagnosed according to clinical presentation alone, without additional urinalysis.[6, 14, 16] However, if there are atypical features, complicating factors or diagnostic uncertainty, urine dipstick testing can be useful to indicate if an infection is likely.[6, 14] Key aspects to consider:[4, 14, 22]

- **Leukocyte esterase status** – leukocyte esterase is an enzyme produced by white blood cells. If the test is positive, it may indicate that white blood cells have been generated by the body in response to infection, and that they are present in the urine (pyuria).
- **Nitrite status** – sterile urine generally should not contain detectable traces of nitrite. Most UTIs are caused by bacteria belonging to the Enterobacteriaceae family, which can metabolise nitrates to nitrites.

A positive result for leukocyte esterase or nitrites, in the presence of lower UTI symptoms, is sufficient to confirm a lower UTI diagnosis in a patient and proceed with treatment (see: "The treatment of uncomplicated UTIs").[11, 14, 22] However, negative nitrite results may not reliably exclude the possibility of a UTI, e.g. some UTIs are caused by bacterial species that are unable to produce nitrites.[14, 22] Haematuria on dipstick can also be an informative finding as this is common in patients with a UTI.[11, 14] However, if microscopic haematuria is persistently present, or if gross haematuria is observed in a patient (i.e. visible blood in the urine sample), other diagnoses should be strongly considered, e.g. renal calculi or urinary tract malignancy.[14, 17, 22]

For further information on urine dipstick testing, see: **bpac.org.nz/bt/2013/june/urine-tests.aspx** *(published in 2013; some content may no longer be current)*

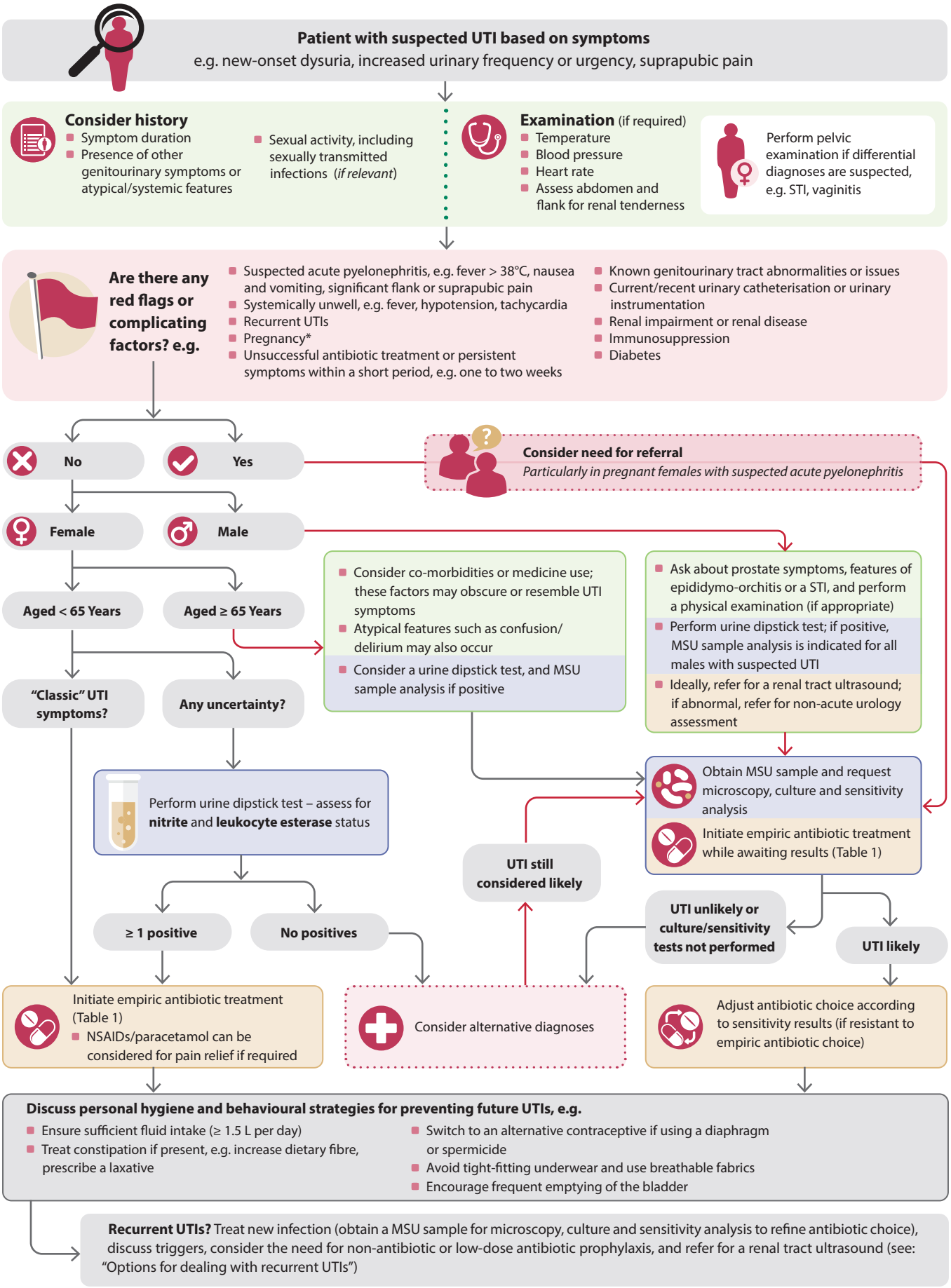

Figure 1. An overview of the diagnosis and management of symptomatic lower UTIs in adults.[6, 13, 14, 16, 19]

* A MSU sample should be obtained and sent for laboratory analysis in all pregnant females, ideally as part of the first antenatal check; asymptomatic bacteriuria should be treated in this group due to the risk of complications

MSU = midstream urine; UTI = urinary tract infection

Asymptomatic bacteriuria is not generally treated

Routine urine dipstick screening for infection in patients without UTI symptoms is not recommended as asymptomatic bacteriuria should not be treated. This is due to the risk of antibiotic-related adverse effects, selecting for antibiotic-resistant bacteria and disruption of the patient's normal urinary microflora.[5, 6, 14] The exception to this is in pregnant females, as bacteriuria can cause pregnancy complications if left untreated.[5, 6] Pregnant females should be screened via urine culture for asymptomatic bacteriuria at the first antenatal appointment.[21]

For further information on UTIs and asymptomatic bacteriuria in pregnancy, see: **bpac.org.nz/2019/pregnancy-care.aspx** *(published in 2019; some content may no longer be current)*

Requesting analysis of a MSU sample is not routinely recommended

For patients with an uncomplicated UTI, the causative bacteria and antibiotic sensitivity profile are often predictable. Therefore, requesting urine microscopy, culture and sensitivity analysis is not usually necessary as it is unlikely to influence treatment decisions (see: "Empiric antibiotic selection").[6, 14] Obtaining a urine sample – ideally midstream urine (MSU) – and requesting laboratory analysis is only indicated in certain clinical circumstances, which may include:[6, 11, 14]

- When dipstick testing is negative, but a UTI is still strongly suspected after considering differential diagnoses
- Patients with atypical symptoms, persistent symptoms despite antibiotic treatment or recurrent UTIs (three or more episodes within 12 months, or two or more within six months)
- Patients with suspected acute pyelonephritis
- Patients with complicating factors, e.g. pregnancy, urinary catheterisation, urinary tract abnormalities, immunosuppression, renal impairment, diabetes, or other high-risk groups, e.g. males, patients aged ≥ 65 years

The treatment of uncomplicated UTIs

Antimicrobial resistance is a global issue, primarily driven by inappropriate and excessive use. In response, some international guidance recommends that NSAIDs be considered as a first-line treatment for some patients with mild UTI symptoms as an alternative to immediate antibiotic use.[6, 14] However, while uncomplicated UTIs are self-limiting for most patients, the natural course varies, and symptoms may progress instead.[5, 14] Therefore, it currently remains standard practice in New Zealand primary care to prescribe antibiotics to most patients with an uncomplicated UTI.

Multiple studies, including a 2024 Cochrane review, have found that antibiotics are generally superior to NSAIDs in reducing duration of symptoms, and that many patients taking NSAIDs require a rescue antibiotic due to persistent or worsening symptoms.[14, 23, 24] In addition, antibiotic use is generally associated with a lower risk of pyelonephritis and other complications.[14, 24] Therefore, NSAIDs alone for a UTI are not appropriate, but they can still be prescribed alongside an antibiotic for analgesia (paracetamol can also be used for pain relief).[5, 11]

Empiric antibiotic selection

The initial antibiotic choice for patients with an uncomplicated UTI should be empiric (Table 1).[4, 14] If symptoms do not resolve, or the patient experiences a recurrent infection within a short period, e.g. one to two weeks, a MSU sample should be sent for microscopy, culture and sensitivity analysis to guide selection of an alternative antibiotic.[4, 14, 18] If resistance to the empiric choice is demonstrated, select an alternative antibiotic.[5] MSU

Urinalysis in older patients: use clinical judgement

In general, UTIs in older patients are more difficult to diagnose and manage, and those who are older are more likely to have co-morbidities or complicating factors, and a higher risk of antimicrobial resistance and infection caused by a wider range of bacteria.[14] The literature tends to use age 65 years as an arbitrary distinction between older and younger populations, however, in practice, a flexible approach is required that takes into account individual factors and patient circumstances. For example, a patient aged over 65 years living in the community who is otherwise healthy and presents with typical UTI symptoms, may be diagnosed with a UTI and managed in the same way as a patient aged under 65 years.[14]

samples will not be cultured in some laboratories if initial microscopy indicates that infection is unlikely, e.g. if white blood cells are absent.

Urinary alkalinisers such as citrate sodium anhydrous + citric acid anhydrous + sodium bicarbonate + tartaric acid (Ural) should not be routinely recommended during the acute treatment of a UTI as it raises urinary pH, which in turn, reduces the effectiveness of some antibiotics, e.g. nitrofurantoin.[14, 25] Ural may be considered to relieve dysuria in patients with a UTI who are not taking antibiotics, although evidence of efficacy is limited.[14] Alternatively, NSAIDs or paracetamol can be recommended for pain relief if required.[5, 11]

Table 1. Empiric antibiotic regimens for uncomplicated lower UTIs in adults.[26] N.B. Treat for **seven days** in pregnant females and in all males, regardless of antibiotic choice.

	Antibiotic	Dose
First line	Nitrofurantoin*†	Modified-release (Macrobid): 100 mg, twice daily, for five days Immediate-release (Nifuran): 50 mg, four times daily, for five days
Alternatives (see note below)	Cefalexin	500 mg, twice daily, for three days
	Trimethoprim‡	300 mg, once daily at night, for three days

N.B. Regional guidelines differ in alternative antibiotic recommendations. This may be due to local resistance and sensitivity patterns. If an alternative antibiotic is needed, check for local advice, e.g. HealthPathways, and follow corresponding recommendations if available.

* Prescribe by brand name to reduce errors as there are two different formulations

† Avoid after 36 weeks gestation in pregnant patients and in those with creatinine clearance < 60 mL/min due to the risk of peripheral neuropathy

‡ Avoid during the first trimester of pregnancy

Fosfomycin now funded with Special Authority approval

If a MSU sample has been analysed and multi-drug resistant *E. coli* is identified as the cause of the patient's UTI, or if standard antibiotic options are not suitable (e.g. due to a contraindication or intolerance), a single dose of fosfomycin may be considered: 3 g sachet of powder dissolved in half a glass of water (ideally taken at bedtime after emptying the bladder).[26] N.B. Use in males is unapproved.[26]

Fosfomycin is a broad-spectrum antibiotic that is effective against a range of Gram-positive and Gram-negative bacteria and since November, 2024, has been funded in the community subject to the following Special Authority criteria:[26]

- Patient has an acute, symptomatic, bacteriologically-proven uncomplicated UTI/cystitis with *E. coli*; ***AND***
  - Microbiological testing confirms the bacteria is resistant to all of: trimethoprim, nitrofurantoin, amoxicillin, cefaclor, cefalexin, amoxicillin with clavulanic acid and norfloxacin ***OR***
  - The patient has a contraindication or intolerance to all of: trimethoprim, nitrofurantoin, amoxicillin, cefaclor, cefalexin, amoxicillin with clavulanic acid and norfloxacin that the bacteria is susceptible to

Previously, fosfomycin (IV administration) was only funded for patients in the hospital setting, or in the community on the recommendation by, or prescription from, an infectious diseases specialist or clinical microbiologist.

Referral for further investigations or assessment

Early investigation with imaging or cystoscopy is not usually required for most patients with an uncomplicated UTI unless other risk factors are present, e.g. suspected nephrolithiasis, or differential diagnoses are strongly suspected.[6, 13] Referral for further investigation should also be considered for patients, particularly those who are older, who do not improve with antibiotic treatment after requesting urine culture to confirm infection and sensitivity analysis to guide antibiotic choice.[13, 18]

Discuss self-care strategies with all patients

A core component of every consultation with a patient experiencing a UTI is to discuss self-care in relation to behavioural practices as this may reduce the risk of future infections. Strategies include advising the patient to:[6, 10, 14]

- Ensure fluid intake is sufficient (≥ 1.5 L/day)
- Avoid wearing tight-fitting underwear and use breathable fabrics such as cotton rather than synthetics, e.g. nylon or polyester
- Urinate when required (i.e. not "holding on" unnecessarily)
- Switch to an alternative contraceptive method if using diaphragms or spermicides
- Treat constipation if present, by increasing dietary fibre intake or using a pharmacological intervention, e.g. docusate sodium + sennoside B (Laxsol) or lactulose; constipation may exert pressure on or obstruct the bladder, leading to incomplete voiding which increases UTI risk

Why is trimethoprim no longer a first-line empiric antibiotic option?

Trimethoprim was previously considered to be a first-line empiric option for managing patients with uncomplicated UTIs, and was also supplied by pharmacists who had undergone training in UTI management.[3, 27] However, there is now evidence that trimethoprim should not be a first-line antibiotic for managing uncomplicated lower UTIs due to a growing pattern of resistance across New Zealand, and prescribers and many pharmacists have switched to prescribing nitrofurantoin.[3]

A multi-region audit of urine samples obtained between June, 2016, and August, 2018, demonstrated that approximately one-quarter of all *E. coli* isolates from females aged 15 – 55 years lacked trimethoprim sensitivity.[3] In comparison, < 1% of *E. coli* tested were resistant to nitrofurantoin and < 5% were resistant to cefalexin.[3] Although trimethoprim is often preferred by patients due to its once daily dosing, these findings suggest that nitrofurantoin and cefalexin are generally better empiric antibiotic choices – unless there is recent community resistance data available to guide such decisions.

Options for dealing with recurrent UTIs

UTIs are considered recurrent when there are three or more episodes within 12 months, or two or more within six months.[6] A recurrent UTI may be due to re-infection or relapse of the original strain.[14, 15] If recurrence occurs within a short period of time, e.g. less than two weeks after finishing the antibiotic course, it is more likely to be caused by the original strain.[14] A MSU sample for microscopy, culture and sensitivity analysis should be obtained to refine antibiotic selection in patients with recurrent UTIs.[6, 17]

Non-antibiotic prophylactic treatments can be discussed

For all patients with recurrent UTIs, first re-iterate the importance of self-care strategies (e.g. adequate fluid intake, behavioural practices) and advise them to avoid known triggers, e.g. spermicides.[6, 8] Other non-antibiotic prophylactic strategies that have a low risk of harm can be discussed, but some of these strategies are not routinely recommended due to a lack of high-quality evidence for efficacy, e.g. D-mannose, probiotics.[10, 17]

Prophylactic strategies for UTIs include:

Vaginal oestrogen cream or pessary (funded).[8] The use of topical vaginal oestrogen may reduce the risk of UTI recurrence in post-menopausal females.[6, 28] Oral oestrogen supplementation has not been found to confer a similar benefit.[6, 28]

Consumption of cranberry products, e.g. juices, tablets or concentrated capsules (not funded).[8] A 2023 Cochrane review found that cranberry products reduced the number of UTIs in females with recurrent UTIs (and in people who had undergone intervention involving the bladder, e.g. radiotherapy).[29] However, there is no standardised dosing regimen or treatment duration.[29] Overconsumption of cranberry products, e.g. juices, may cause gastrointestinal irritation for some people, as well as exceed the recommended daily sugar intake.[8, 29]

Expert tip: When recommending cranberry juice, higher percentage products (e.g. ≥ 18%) are more likely to be effective than lower percentage (e.g. 2 – 4%). A higher concentration product also means that a smaller volume can be consumed. Some people may find that consuming cranberry juice at night is more effective.

Products/supplements containing D-mannose (not funded).[8] D-mannose has been proposed to limit the adherence of bacteria to cells in the urinary tract.[10, 30] There is currently insufficient evidence to support D-mannose for reducing the risk of UTI recurrence and further studies are required to establish benefit and determine the optimal regimen.[6, 30]

***Lactobacillus*-containing probiotics** (not funded). There is a plausible scientific basis for the use of probiotics in preventing UTIs, e.g. competitive inhibition of UTI-causing bacteria binding to vaginal epithelial cells, creating an acidic environment (via production of lactic acid).[10, 28] However, there is limited evidence of efficacy for probiotics in recurrent UTI prophylaxis.[6, 28, 31] Intravaginal probiotic suppositories may reduce the rate of recurrent UTIs, however, these formulations are not readily available in New Zealand and further studies are required.[6] If a probiotic is to be trialled, ensure one containing *Lactobacillus* spp. is recommended; although there is insufficient evidence to guide the selection of a particular strain or dose, *L. rhamnosus* is among the most widely studied at doses of ≥ 10^8 colony-forming units (CFU)/capsule.[6, 31]

Immunomodulator vaccines (e.g. MV140, OM-89, StroVac; administered orally, intravaginally or via injection), are potentially more effective than placebo at UTI prophylaxis in people with recurrent infections, although the current evidence base is small.[6, 10] MV140 (Uromune; unapproved, not funded) is the most commonly used vaccine for UTI prophylaxis in New Zealand and can be prescribed by primary care clinicians for patients with recurrent UTIs. It is an inactivated vaccine that contains *K. pneumoniae*, *E. coli*, *E. faecalis* and *P. vulgaris*, and is administered daily for three months as a sublingual spray.[32, 33] Long-term effectiveness at preventing recurrent UTIs has been demonstrated in multiple small studies; UTI-free rates of 33 – 78% have been reported over follow-up periods ranging from 9 – 24 months.[33] There is currently no New Zealand-specific information for prescribers available on this vaccine; information is available from the pharmaceutical company Immunotek, including a summary of product characteristics data sheet: **https://www.inmunotek.com.au/uromune**. Australian-based information is also available: **https://www.usanz.org.au/news-updates/our-announcements/2025-announcements/january-2025/uti-vaccine**.

Intravesical treatments. Intravesical glycosaminoglycan therapy involves the addition of compounds such as hyaluronic acid and chondroitin sulphate to the bladder (via a catheter) which replaces the non-stick coating of the bladder mucosa.[6, 10] Available evidence shows promising results,[6, 10] however, these treatments have limited availability in New Zealand and would generally only be offered by a specialist urology clinic.

Low-dose antibiotic prophylaxis should generally be a last resort

Females with recurrent UTIs are over six times less likely to experience another UTI if they take prophylactic antibiotics.[17] However, in keeping with the principles of antimicrobial stewardship, this approach is not appropriate for all patients; it should generally only be considered in non-pregnant females* if behavioural modifications and non-antibiotic prophylactic options have been unsuccessful.[6, 8]

* Daily antibiotic prophylaxis may be trialled under specialist supervision in males and pregnant females who experience recurrent UTIs[26]

Options include a once daily night-time dose of nitrofurantoin (immediate-release, 50 – 100 mg), trimethoprim (150 mg) or cefalexin (125 – 250 mg).[6, 26] Single-dose antibiotic prophylaxis (unapproved indication) may also be considered after exposure to a known UTI trigger, e.g. two hours post sexual intercourse.[6, 10]

Caution is required when considering nitrofurantoin for long-term antibiotic prophylaxis due to the risk of pulmonary toxicity.[26] Use should be restricted to less than six months, unless the possible benefits outweigh the risks. Clinicians should regularly ask about respiratory symptoms and ensure the patient is aware of this potential adverse effect and to report any new or worsening symptoms of cough or shortness of breath. Nitrofurantoin should be discontinued if any deterioration in pulmonary function occurs.[26]

There is no consensus on the optimal duration of long-term antibiotic prophylaxis;[6] a trial for six months, with review after three months to consider the benefits and risks of continued use, is usually appropriate.[10, 14] Patients who develop a UTI after prophylaxis ends may require treatment indefinitely, and it is usually appropriate to discuss these patients with a urologist.[10]

Methenamine hippurate (Hiprex) 1 g, twice daily (pharmacist-only and funded on prescription), can be considered as an alternative form of antimicrobial prophylaxis in some patients with a history of recurrent UTIs to avoid long-term antibiotic use.[8, 26] Methenamine is a urinary antiseptic that is progressively converted into formaldehyde in acidic urine, which then functions to denature bacterial proteins and nucleic acids.[10, 34, 35] There is some evidence that methenamine hippurate reduces the risk of recurrent UTIs, and is considered non-inferior to continuous low-dose antibiotic prophylaxis.[6, 35] However, further high-quality studies are needed to support its role.[35]

Practice Point: Consider providing a "back pocket" antibiotic prescription for patients with recurrent UTIs who are trialling prophylactic strategies, to self-manage any UTI that subsequently develops. However, patients should be advised to make an appointment if they experience ongoing episodes so that a MSU sample can be taken for microscopy, culture and sensitivity analysis, and so that alternative treatment options can be discussed.

Referral for patients with recurrent UTIs

All patients with recurrent UTIs should be referred for a renal tract ultrasound.[10] If the ultrasound is abnormal, the patient should be referred for non-acute urology assessment. Referral for urology assessment is also indicated for patients who still experience UTIs despite long-term use of prophylactic antibiotics.

For further information on the diagnosis and management of UTIs in other groups:

- **Pregnant females: bpac.org.nz/2019/pregnancy-care.aspx** (*published in 2019; some information may no longer be current*)
- **Older people: bpac.org.nz/BT/2015/July/guide.aspx** (*published in 2015; some information may no longer be current*)
- **Children: starship.org.nz/guidelines/urinary-tract-infection/**

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