

Assessment and management of lower urinary tract infection in adults

SUMMARY

Lower urinary tract infections are common in the community and in hospitals.

Management of acute uncomplicated infections in non-pregnant women is usually simple and involves antibiotic treatment for 3–5 days.

Infections in men and recurrent, drug-resistant or complicated urinary tract infections require further evaluation. Confirming the cause is important to ensure the best treatment.

Because of the risk of antibiotic resistance, asymptomatic bacteriuria should only be treated in select groups such as pregnant women and those undergoing an invasive genitourinary procedure. Bacteriuria in patients with a catheter should only be treated if they are symptomatic.

Introduction

Lower urinary tract infections are responsible for a large number of presentations in general practice and frequent antibiotic prescriptions. They also cause significant financial strain on health services.¹ For females, there is a one-in-three lifetime incidence of urinary tract infection (approximately 50 times more than for males). Prevalence increases with age in men and women.²

Pathogenesis

Lower urinary tract infections generally present as cystitis, which is an infection of the superficial bladder mucosa. Ascending access via the urethra is the most common mechanism by which pathogens such as *Escherichia coli* infect the bladder. *E. coli* accounts for 80–90% of infections. Other pathogens include *Staphylococcus saprophyticus* (5–10%), enterococci, *Proteus mirabilis* and other enteric Gram-negative rods such as *Klebsiella* species. Spread from a haematogenous source is rare, but is seen with organisms such as *Staphylococcus aureus*, *Salmonella* species and *Mycobacterium tuberculosis*.

While virulence factors play a role in the ability of a pathogen to cause an infection (such as pili which facilitate bacterial ascent), most important are the body's natural defence mechanisms. These may be compromised in patients with diabetes, immunosuppression, urinary stone disease, some connective tissue diseases, hypo-oestrogenic states such as atrophic vaginitis in women, and bladder outlet obstruction from prostatic enlargement or stricture disease in men. Indwelling catheters are a common cause of bacterial colonisation and urinary tract infections.

Presentation

The presenting features of lower urinary tract infection include frequent urination or an urgent need to urinate, dysuria, suprapubic pain and turbid or foul smelling urine. Fever and non-specific lower back pain may be present. Loin pain accompanied by systemic symptoms such as fevers, rigors, nausea and vomiting may suggest an ascending infection or pyelonephritis. In elderly patients, confusion may be the only presenting symptom.

Symptoms consistent with cystitis may not always be due to infection. The differential diagnoses are numerous and include pelvic inflammatory disease, sexually transmitted diseases, urothelial carcinoma and bladder calculi. This highlights the importance of careful diagnosis and follow-up.

Initial evaluation of the patient

Urinary tract infections are classified by severity to aid clinical management.³ The aim of the history, examination and investigations should be to identify patients with complicated urinary tract infections or patients with risk factors who may require specific investigations or more prolonged treatment. An 'uncomplicated' urinary tract infection is one in which there are no structural or functional abnormalities within the urinary tract. A physical examination includes checking vital signs, as well as abdominal and flank examination. When required, external genital examination may show atrophic vaginitis in females and phimosis or meatal stenosis in men. Rectal examination may reveal an enlarged prostate or tenderness to suggest acute prostatitis in males. A urine dipstick (e.g. for nitrites, leukocyte esterases) can indicate the presence of a urinary tract infection.

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Key words

antibiotics, bacteriuria,
catheters, cystitis

Aust Prescr 2014;37:7–9



Investigations

Antibiotic treatment may be commenced empirically for symptomatic cystitis if clinically warranted. However, formal microscopy, culture and susceptibility testing should be performed in most circumstances to ensure patients receive appropriate antimicrobial therapy, especially given the rising incidence of antibiotic resistance. This is particularly important in men, pregnant women and patients with recurrent infections.

A midstream urine is considered clinically positive if there are more than 10^3 colony forming units (cfu)/mL in acute uncomplicated infections in women. In complicated urinary tract infections, more than 10^5 cfu/mL in a midstream sample of urine in women and more than 10^4 cfu/mL in men or in an in-out catheter urine in women are clinically significant.¹ There is usually an associated pyuria (>100 white blood cells/high power field). Contamination of the sample with epithelial cells is indicative of poor collection technique. Blood cultures should be taken if the patient has signs of sepsis or has an unusual organism in the urine, such as *S. aureus*, suggesting a haematogenous source.

Ultrasound of the urinary tract is indicated in patients with recurrent infections to check for upper tract abnormalities and urinary stones. It is also indicated in older men to check for bladder outlet obstruction and residual urine volume post-voiding. Patients with macroscopic haematuria or persistent microscopic haematuria following resolution of a urinary tract infection should have a cystoscopy and evaluation of the upper tracts. This is usually done with a CT urogram.

Treatment

Most urinary tract infections require antibiotics. However, there is progressive development of antimicrobial resistance to common antibiotics in Australia and overseas. Extended-spectrum beta-lactamase producing *E. coli* showing resistance to most antibiotics (except for the carbapenem class), are becoming more common.⁴ In some parts of the world, such as China and the Indian subcontinent, up to 80% of *E. coli* produce extended-spectrum beta lactamases.⁵ These strains are now increasingly seen locally in the elderly, especially those in long-term care facilities. Antibiotic choice is therefore guided by knowledge of local resistance patterns.

Uncomplicated urinary tract infections

Uncomplicated infections should almost always be treated with antibiotics to decrease duration and severity of symptoms.⁶ In Australia, trimethoprim, cephalexin, or amoxicillin with clavulanate can be used for the majority of acute, uncomplicated

infections, in the absence of previous antibiotic exposure or other risk factors such as recent travel to high-risk areas. Nitrofurantoin is an option in short-course therapy for cystitis, especially when drug resistance is present. However, long-term use should be avoided, especially in older patients as peripheral neuropathy can occur with impaired renal function. Fluroquinolones (for example norfloxacin and ciprofloxacin) should be considered second-line and restricted to patients with culture-proven resistant organisms. A 3–5 day course of therapy is associated with good outcomes for uncomplicated infections.

Recurrent urinary tract infections

Clinicians should confirm the diagnosis and look for a cause in adults with recurrent urinary tract infections. Risk factors include sexual activity (including anal intercourse), contraceptive devices (such as intrauterine devices), hormonal deficiency in postmenopausal women, diabetes, foreign objects (including bladder calculi), secretory type of certain blood groups⁷ and urinary tract obstruction (including benign prostatic hyperplasia or pelvic organ prolapse). Recurrent infections can be due to bacterial persistence or re-infections. It is important to have an adequate course of antibiotics and repeat urine microscopy, culture and susceptibility tests after treatment is completed to ensure clearance of the organism. Consider an ultrasound of the urinary tract to exclude structural abnormality and document complete bladder emptying. Therapeutic strategies include low-dose antibiotic prophylaxis and patient-initiated antibiotics guided by symptoms, although this should be only undertaken following comprehensive assessment as long-term antibiotics should preferably be avoided.

Strategies to prevent recurrence

Topical vaginal oestrogen therapy (especially in the presence of atrophic vaginitis) and alkalising agents may provide symptomatic relief and are often used as preventive strategies. However, they do not necessarily have any impact on reducing recurrent infections. Cranberry in the form of tablets and juice is often advocated for prevention but may not be effective.⁸ If recurrence is associated with sexual activity, advise bladder emptying immediately after sex.

Complicated urinary tract infections

When there is known or suspected stone disease, pyelonephritis, prostatitis, (epididymo)orchitis or neurogenic bladder, further evaluation is recommended to exclude anatomical abnormalities and urinary obstruction that may need surgery. Infections associated with urinary tract obstruction,

such as pyelonephritis due to an obstructing ureteric stone, are a medical emergency. These patients require urgent hospital admission and surgical drainage with placement of a nephrostomy tube or ureteric stenting. It is important that patients with complicated urinary tract infections are prescribed an adequate course of antibiotics – usually for at least 10–14 days. Therapy should be guided by culture results.

Asymptomatic patients

There is evidence to warrant screening and treatment of pregnant women for asymptomatic bacteriuria due to the risk of pyelonephritis causing preterm birth and low birth weight babies.⁹ Similarly, patients undergoing an invasive genitourinary procedure, such as a transurethral resection of the prostate, should have urine microscopy, culture and susceptibility tests pre-operatively.

There is no evidence that other patients should be routinely screened or treated for asymptomatic bacteriuria, including those with indwelling catheters, nursing home residents, women after menopause, the elderly, patients with diabetes or a spinal injury, or men with increased post-void residual volumes. In fact, treating asymptomatic infection is likely to increase the chance of developing an antibiotic-resistant infection.

Patients with a catheter

The urinary tract is the most common source of nosocomial infection, especially in patients with catheters.¹⁰ In these patients, bacteriuria is expected within a few days due to colonisation, although in the short term it is usually asymptomatic and from a single organism. Catheterisation for longer than 30 days is associated with colonisation with multiple organisms.

Catheterised patients with bacteriuria should only be treated if they are symptomatic or about to undergo a urological procedure. Such signs or symptoms may include fever, rigors, altered mental status, malaise, lethargy with no other identified cause, flank pain, acute haematuria, or pelvic discomfort. Pyuria alone is not diagnostic of catheter-associated infection.¹¹ The catheter should be changed at the time of antibiotic treatment.

Recurrent catheter-associated urinary tract infection may be reduced by careful catheter handling and management, removal of unnecessary catheters, and changing to a suprapubic catheter. The use of silver impregnated catheters seems only to decrease colonisation within the first week, although there has been some evidence they may reduce the risk of symptomatic urinary tract infection.¹² There is a role for low-dose prophylactic antibiotics in patients susceptible to severe infections or sepsis after common causes for recurrence, such as poor catheter care or bladder calculi, have been excluded. This should generally only be undertaken with specialist input due to the risks of long-term antibiotic use.

Conclusion

Most lower urinary tract infections are easy to identify and treat. However, with the rise in multiresistant organisms, the more challenging cases require careful consideration, investigation and discussion with a urologist or microbiologist rather than further prescription of empirical antibiotics. ◀

Conflict of interest: none declared



SELF-TEST QUESTIONS

True or false?

3. Fluroquinolones are first-line treatment for uncomplicated urinary tract infections.

4. Complicated urinary tract infections should be treated for at least 10–14 days with antibiotics.

Answers on page 35

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FURTHER READING

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