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Urinary tract infections in women: diagnosis and management in primary care

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Urinary tract infections are the second most common infections, causing considerable anxiety and morbidity in women. Care is not always optimal—prophylaxis is rarely considered and unnecessary investigations are requested. This evidence based approach to management of urinary tract infections in women highlights that some common recommendations, such as postcoital voiding, have no evidence base

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Cystitis is an infection of the lower urinary tract which causes pain when passing urine and causes frequency, urgency, haematuria, or suprapubic pain not associated with passing urine.[1]

Upper urinary tract infection (pyelonephritis) is suggested by the presence of fever, flank pain, nausea, or vomiting. White blood cells are usually present in the urine, and occasionally white blood cell casts are also seen on urine microscopy.[w1]

Who gets them?

Urinary tract infections affect up to 15% of women each year.[2 3] More than 25% of women who have had an infection will experience a recurrence.[w2]

The most important risk factors for acute cystitis in young women are a history of previous episodes of cystitis and frequent or recent sexual activity.[w3 w4] The relative odds of acute cystitis increase by a factor of 60 during the 48 hours after sexual intercourse.[w4] The use of spermicidal agents increases the odds of infection by *Escherichia coli* or by *Staphylococcus saprophyticus* by a factor of two to three, irrespective of whether the exposure occurs with the use of a diaphragm or a spermicide coated condom.[3 w5 w6]

Urinary tract infections are common during pregnancy. Infections, and untreated asymptomatic bacteriuria, during pregnancy have been associated with an increased risk of pyelonephritis, premature delivery, and fetal mortality. Because of hormonal changes associated with pregnancy, the incidence of pyelonephritis is highest at the end of the second and beginning of the third trimesters.[w7] All pregnant women should be screened for bacteriuria and subsequently treated with antibiotics.

How do I diagnose them?

Clinically differentiating between upper and lower urinary tract infection may be difficult. The best non-invasive technique for differentiating between bladder and kidney infections is the response to a short course of antibiotic therapy.[4 w8]

Clinical tips

- "Right" combinations of symptoms can substantially increase the likelihood of urinary tract infection, effectively ruling in the disease on the basis of the history alone
- Always ask women of childbearing age about the possibility of pregnancy; if the patient is unsure perform a pregnancy test and treat accordingly

History

Cystitis is characterised by

- Frequency (the average person urinates six times a day)
- Dysuria
- Urgency
- Strangury (a condition marked by slow, painful urination, caused by muscular spasms of the urethra and bladder)
- Haematuria
- Suprapubic pain
- A change in the smell of urine.

In acute pyelonephritis, symptoms are

- Fever
- Rigors
- Vomiting
- Loin pain or tenderness.

Onset of symptoms is typically rapid.

Examination

Examine the patient looking for fever, abdominal or loin tenderness, and renal mass (indicating tumour).

Patients with recurrent infections can accurately self diagnose a lower urinary tract infection.[5] Treating acute, uncomplicated cystitis by telephone consultation

References w1-w33 appear on bmj.com

When to perform a urine culture[4]

- Clinical features of pyelonephritis
- Failure to respond to empirical treatment
- Pregnancy
- Urolithiasis (calculi in the urinary tract)

Culture could also be considered if the patient is immunocompromised or diabetic.

Urine culture results

- A pure growth of $>10^5$ CFU/ml is diagnostic (CFU = colony forming units)
- If result is $<10^5$ CFU/ml and pyuria is indicated (>20 white blood cells/mm^3) or the patient has symptoms,[w16] the result may still be positive[w17]
- Cultured organisms are tested for sensitivity to a range of antibiotics

with the patient seems to be safe and effective.[6 w9-w11] Published protocols have included only women at low risk who have not recently had cystitis, who do not have symptoms suggesting vaginitis or cervicitis, and, in some institutions, who are less than 55 years old.[w9] Women who do not meet these criteria should usually be seen and examined.

Investigation

The probability of cystitis in a woman with dysuria, urinary frequency, or gross haematuria is about 50% in primary care settings.[5] Symptoms suggesting vaginitis or cervicitis, such as vaginal irritation or discharge, reduce the likelihood of a diagnosis of cystitis by about 20%. Specific combinations of symptoms (for example, dysuria and frequency without vaginal discharge or irritation) raise the probability of cystitis to more than 90%. When a woman who has previously had cystitis has symptoms suggesting a recurrence, there is an 84% to 92% chance that an infection is present.[7 8] Dipstick evaluation can be performed to confirm the diagnosis of cystitis in such women, but it may not be required.

In women with atypical symptoms, or with evidence of pyelonephritis or vaginal discharge, a more thorough evaluation is necessary and may include pelvic examination, urinalysis, and urine culture.[9] We need better evidence about the validity of dipstick analysis,[w12 w13] but a reasonable approach is to treat on the basis of dipstick findings (positive results for nitrite and/or leucocytes).[10 11 w14 w15] Dipstick testing that is positive for blood requires microscopic examination to delineate between haematuria and haemoglobinuria and for detection of casts to distinguish between lower and upper urinary tract infection. The presence of >20 epithelial cells per high powered field suggests urine contamination with vaginal secretions.

Urine culture is unnecessary for most patients with consistent symptoms and a positive dipstick test, unless any predisposing factors for upper tract or complicated infection (hydronephrosis or atonic bladder, for example) are present. However, a negative result on dipstick testing cannot reliably rule out an infection when the pretest likelihood is high, and in such instances it is advisable to obtain a culture. Cultures are also warranted to identify unusual or resistant organisms in women whose symptoms either do not abate or recur within two to four weeks of treatment.[w4]

Other investigations that should regularly be considered are testing for sexually transmitted diseases, such as *Chlamydia*[4] and measuring β human chorionic gonadotrophin if pregnancy is suspected; closer follow-up and different treatment will be needed.

Symptomatic treatment can allow time for microbiological investigation. It may help to reduce unnecessary prescribing of antibiotics in general and quinolones in particular.[w16]

Contamination of urine is common, but instructing patients on "the midstream clean catch technique" seems to be of little benefit.[12]

Underlying (correctable) anatomical abnormalities in women with recurrent lower urinary tract infections are uncommon. Further investigations, such as imaging studies (ultrasound or pyelography) or cystoscopy are thus recommended only in acute pyelonephritis, or if there are additional indications, such as persistent haematuria.[w18]

What else could these symptoms indicate?

- Vaginitis or vulvovaginal infections (for example *Gardnerella*, *Candida albicans*, *Trichomonas*, bacterial vaginosis)—ask about or examine for the presence of vaginal discharge
- Sexually transmitted diseases (ask about sexual activity, recent change of partner)
- Urethral syndrome[w19] is a complex of symptoms that indicate a urinary tract infection but usually without an underlying infection.[w20 w21] It is present in at least one quarter of patients presenting with lower urinary tract symptoms[w22]
- Interstitial cystitis (chronic pelvic pain syndrome of unknown aetiology; bladder wall is inflamed and irritated) is diagnosed by ruling out other diseases.[w23 w24] The basic criteria are urinary frequency, urgency, or pain for at least six months without a diagnosable aetiology[13]
- Dysmenorrhoea.

How should I treat urinary tract infections?

Empirical treatment of all patients with symptoms is considered by some to be the most effective policy, but implies unnecessary antibiotic prescriptions.[w25] When the impact of this strategy on antibiotic resistance is recognised, the dipstick strategy may be considered a superior strategy overall.[w10]

When history is typical (for example, dysuria and frequency without vaginal discharge or irritation; presence of risk factors), empirical treatment may be

Urinary tract infections in patients with renal failure

You can give amoxicillin in a reduced dose to patients with renal failure. You should avoid tetracyclines in patients with renal failure. You should also avoid nitrofurantoin in patients with renal failure: it is ineffective as it doesn't reach adequate urinary concentrations.

Quinolones

Avoid quinolones in patients with epilepsy—they can precipitate convulsions. Tendon damage (including rupture) has also been reported in patients taking quinolones. Elderly patients and those taking steroids are at increased risk.

appropriate.[5 11] The rationale for this approach is based on the highly predictable spectrum of aetiological agents causing urinary tract infections, and their antimicrobial resistance patterns.[w26]

Non-drug measures

Randomised trials indicate that drinking 200 ml to 750 ml of cranberry or lingonberry juice, or taking of cranberry concentrate tablets, reduces the risk of symptomatic, recurrent infection by 10% to 20%.[w27]

Studies show that postcoital voiding does not prevent cystitis.[14 w3] There is no evidence that poor urinary hygiene predisposes women to recurrent infections, and there is no rationale for giving women specific instructions regarding the frequency of urination, the timing of voiding, wiping patterns, douching, the use of hot tubs, or the wearing of pantyhose.[w4]

Drug measures

Trimethoprim is the first choice of treatment, except in women from communities with a high rate of resistance, when you should follow the local guidance.[15 w28] Trimethoprim resistance is most likely to occur in patients who have been exposed to trimethoprim or other antibiotics in the previous six months, and the risk of resistance increases with age. This information could be used to stratify women according to risk of infection by trimethoprim resistant bacteria.[16]

A three day course of antibiotic treatment should suffice for most women with lower urinary tract infection, including elderly patients.[17 w29] Single dose treatment is less effective, but has fewer side effects.[w30]

If despite treatment the patient's symptoms persist or worsen, do a urine culture and prescribe antibiotics according to the results of the culture and sensitivity tests.[11] Upper urinary tract infection can be treated with oral antibiotics for seven to 10 days, with an early review. Women who are systemically unwell should be admitted to hospital.

In pregnant women, treat asymptomatic and symptomatic bacteriuria with oral amoxicillin 250-500 mg/8 h for 10 days or with nitrofurantoin (100 mg twice daily for seven days for the monohydrate or macrocrystal formulation). Cephalexin or ampicillin are alternatives.[18 w7 w31] After treatment, follow with monthly urine cultures until delivery. Pregnant women with urinary group B streptococcal infection should be treated and should receive intrapartum prophylactic therapy.[w31] Paracetamol may be prescribed to relieve pain.

Asymptomatic bacteriuria rarely requires treatment and is not associated with increased morbidity in elderly patients. Treatment of asymptomatic bacteriuria in patients with diabetes is often recommended to prevent symptoms of urinary tract infections—but the management of asymptomatic bacteriuria in these patients is complex, with no single preferred approach.[w32]

Prevention

Health education leaflets are effective for reducing recurrent cystitis, but there is little evidence for many simple primary prevention measures.[16]

Sample questions

Here is a small sample of the questions that you can find at the end of this module. To see all the questions and to get the answers, go to www.bmjlearning.com/planrecord/servlet/ResourceSearchServlet?keyWord=urinary&resourceId=5003257&viewResource

1. A 62 year old woman with type 2 diabetes complains of frequency, urgency, and change in the smell of her urine. She has had similar episodes on six other occasions in the last year. What is the best option to prevent future infections?
   a. Oral hormone replacement therapy
   b. Patient initiated short course of antibiotic therapy at the onset of symptoms suggestive of cystitis
   c. Drinking plenty of fluids
   d. Good hygiene
2. Which is the optimal duration of treatment of lower urinary tract infection in women?
   a. Single dose
   b. Three days
   c. Seven days
   d. 10 days
3. You diagnose a 25 year old woman who is two months pregnant with a UTI (urinary tract infection). Which of the following treatments would you start?
   a. Trimethoprim
   b. Ciprofloxacin
   c. Amoxicillin
   d. Tetracycline
4. A 50 year old woman with moderate chronic renal failure develops a urinary tract infection. Which of the following antibiotics would be most appropriate?
   a. Tetracycline
   b. Amoxicillin
   c. Nitrofurantoin
5. A 40 year old woman with a history of epilepsy develops a UTI. The last time that she received penicillin her tongue became very swollen and she had trouble breathing. The infection is *E coli* and its sensitivity pattern is as follows:
   Ciprofloxacin - S
   Amoxicillin - S
   Trimethoprim - R
   Ofloxacin - S
   Nitrofurantoin - S
   Which of the following medications would you start?
   a. Ciprofloxacin
   b. Amoxicillin
   c. Cotrimoxazole
   d. Ofloxacin
   e. Nitrofurantoin
6. A 55 year old woman has a very sore heel. She is not your usual patient. She has a past history of COPD (chronic obstructive pulmonary disease), for which she takes prednisolone 7.5 mg daily as her COPD will not respond to any other agents. She also has recurrent urinary tract infections. On examination you diagnose a ruptured achilles tendon. Which one of the following drugs may have contributed to this problem?
   a. Trimethoprim
   b. Ciprofloxacin
   c. Amoxicillin
   d. Nitrofurantoin

Summary points

Urinary tract infections are the second most common infections, after respiratory infections, resulting in considerable anxiety and morbidity in women

Underlying anatomical abnormalities in women with recurrent lower urinary tract infections are uncommon, and further investigations such as imaging studies are rarely warranted

In women with three or more urinary tract infections a year, consider preventive medication

In postmenopausal women, topical vaginal oestrogen cream decreases the risk of recurrent urinary tract infections.[19 w33]

In women who have three or more urinary tract infections a year consider[20]:

- Patient initiated short course of antibiotic therapy at the onset of symptoms suggesting cystitis[8]
- Post-coital prophylaxis (single dose of trimethoprim 200 mg, nitrofurantoin, or a quinolone) if cystitis has been related to sexual intercourse
- Continuous daily or thrice weekly prophylaxis for a longer period (six months or more).

Prophylaxis should be started after active infection has been eradicated (confirmed by a negative urine culture at least one to two weeks after treatment is stopped).[w5] Prophylaxis does not make recurrent urinary tract infections less likely to recur. When prophylaxis is discontinued, even after having been taken for extended periods, more than 50% of women will have another infection within three months.

Follow-up

Routine follow-up is not needed for lower urinary tract infections but is recommended for upper urinary tract infections after the treatment is completed.

Management of urinary tract infections in pregnancy requires proper diagnostic workup and thorough understanding of antimicrobial agents to optimise maternal outcome, ensure safety to the fetus, and prevent complications in both the fetus and the mother.

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Primum non nocere

I was sitting in the outpatients clinic of the cardiology department the other day. A little boy in a wheelchair came in with his father. His father was greeted by the receptionist and whisked off for echocardiography. The little boy stayed in the waiting room and cruised around skilfully in his wheelchair. He had both legs partly encased in plaster with a metal bar between the two holding his legs in a fixed position.

Pictures of the heart decorated the walls of the waiting room; some were medical images generated from angiograms, but others were far more weird and wonderful, including wood, glass, and metal creations. The little boy was transfixed by them. I struck up a conversation with him about his legs and the content of the pictures. He was very enthusiastic and curious. Just before he left with his father I asked him if he wanted to be a doctor. His response surprised me. "No," he replied forcefully, "I don't want to hurt people."

Of course, he was right. Doctors are traditionally thought of as healers, but I have been surprised on my journey so far through medicine by how much of our time is spent inflicting pain on others with the intention of helping them in the end.

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