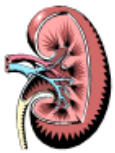

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in the interest of public health and patient education.
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URINARY TRACT INFECTIONS

The diagnosis of urinary tract infection – asymptomatic
By definition this is the isolation of the same organism with colony forming units >100/mm^3 (>100x10^6/L) on two consecutive urine clean catch MSUs, in a patient without symptoms.

Men an asymptomatic infection is diagnosed by a single clean catch specimen with a single organism grown on culture. External contamination is less likely in men, particularly if the foreskin is retracted prior to sampling. In the case of catheterised patients a bacterial count of >100/ml is considered diagnostic when a single organism is cultured.

Why should women get more infections?
The female's shorter urethra is considered the main reason UTIs being more common in women – the shorter distance for the bacteria to ascend from the perineum (source). Asymptomatic bacteriuria among healthy women increases with increasing age partly due to the change in vaginal flora with menopause. Asymptomatic urinary tract infections are more in sexually active women. In healthy young women asymptomatic bacteriuria is frequently transient and without treatment often spontaneously clears by a month. Approximately 10% of diabetic women will have asymptomatic bacteriuria. Asymptomatic urinary infections do not seem to be more frequent in diabetic men.

Treatment
Antibiotics
The choice of antibiotic for bacterial UTI is defined primarily by two factors: the local community bacterial predominance and sensitivities and the patient's adverse reaction and allergy profile. Common antibiotic regimens are in table 1. Antibiotic course duration varies. The shortest course is a stat dose for post-coital prophylaxis. The one day course and 3 day course have similar efficacy in management of a symptomatic UTI in the uncomplicated urinary tract. Shorter antibiotic courses are encouraged as they are more likely to be completed and probably have less adverse events.

Failure of successful treatment – either symptoms or culture positive in the follow-up MSU suggest factors such as: non-adherence to treatment regimen (antibiotic course and preventative measures); incomplete treatment course from adverse effects (e.g. nausea, vaginal thrush); or possibly an abnormal structure (e.g. stone or diverticulum) or function (incomplete bladder emptying).

A longer course of antibiotics is indicated in complicated UTI only. Failure to respond to the correctly completed treatment and prevention regimen should raise the suspicion of an abnormal urinary tract (UT) – and instigation of investigations.

Antifungal treatment
A course of anti-fungal treatment empirically for women who frequently develop vaginal candidal infections associated with UTI antimicrobial treatment is often indicated to ensure the antibiotic course is completed and assist in bacterial clearance to avoid relapse infections.

Table 1. Common antibiotics for treatment of Urinary Tract Infections

Antibiotic	Dose	Frequency	Duration	Comment
Amoxycillin	500mg	BD	5-7 days	3 day amoxycillin or amoxycillin / clavulanic acid courses are less effective than 3 day quinolone courses – hence 5-7 day duration recommended.
Amoxycillin / Clavulanic acid	625mg	BD	5-7 days	See amoxycillin comment above
Ciprofloxacin	250mg	BD	3 days	See amoxycillin comment above
Cotrimoxazole	480mg	BD	3 days	
Nitrofurantoin	100mg	BD to TDS	5 days	Take with food to reduce nausea
Norfloxacin	400mg	BD	3 days	See amoxycillin comment above
Trimethoprim	100mg	BD	3 days	

Fluid and Diet

A high fluid intake, preferably water but it can be flavoured with lime juice or a weak diluted solution of fruit juice for those that do not enjoy water. Similarly to prevention of kidney stones it is important that the volume of urine rather than the intake of fluid is the goal for therapy. In the hotter summer months or physically active people where perspiration may lead to significant fluid loss, urinary volume will reduce and increase the risk of urinary infections.

I recommend patients measure their urine volume for two or three 24-hour periods over one or two weeks to develop a concept of their urine volume. Another simple guide if measurement is difficult is to ensure that the urine is clear or a pale yellow colour. Dark urine (orange or yellow) is concentrated and suggestive of inadequate fluid intake. The diet high in protein will result in acid urine - phosphate and sulphate acids. Reduction in meat and protein intake can reduce the urine acidity, and limit acidophilic UTI organism survival. Bicarbonate sachets (Sodibic capsules or Ural) only assist in *Enterobacteriaceae* infections which like an acid urine. Bicarbonate drinks can assist in the required increase the fluid intake as they are often more palatable than water alone. Vegetarians and particularly vegans will produce alkaline urine - urinary alkalis are probably not of any benefit. Urinary alkalinisers are of little benefit in cases of alkalophilic urine organisms such as *Staph. saprophyticus* or *Proteus* (latter often associated with kidney stones).

Prevention (also see table 2 below)

Adherence to preventative regimens will reduce frequency to a tolerable level; and may eradicate recurrence altogether – especially if the renal tract is structurally and functionally normal.

Frequent preventative strategies include:

1. High urine output. This is relevant to men and women. This is an all too commonly under-estimated successful treatment. High flow / volume of urine leads to limited time for the infective organism to grow within the UTI. Patients who succeed with this regimen will often relax their fluid intake at sometime once their symptoms have settled. A subsequent UTI is a great reminder to reintroduce this therapy – often on its own adequate.
2. Loose fitting clothing. Clothing that fits snugly to the perineum in women is thought to increase the risk of UTIs from the action of walking and general movement assisting the spread of bacteria from the anus (being the source of most UTI bacteria) to the urethra. Loose fitting clothing (e.g. dresses) also allows more air flow and assists in keeping the perineum dry. A dry environment is lethal to the bacteria.
3. Natural fibre (cotton and linen) underclothing absorbs some of the moisture from the perineum helping to maintain a drier perineum. Nylon and similar man-made fibres do not breath and trap moisture in the perineum.
4. Double voiding is the act of consciously emptying the bladder again after a first time. When the first micturition is finished the person rests for a few moments, and then attempts to empty the bladder again. The two voids are performed at the same visit. Double voiding is useful in the patient who may not completely empty their

bladder on first micturition. This may be identified on the bladder ultrasound scan – not that an USS is indicated in everyone (see investigations of UT section). Some people rush going to the toilet, or because of symptoms – especially dysuria - may not completely empty the bladder, and therefore retain bacteria to further grow within the UT.

5. Perineal hygiene. In women it is important to use the front to back" wipe action with toilet tissue. The reverse will assist bacterial contamination from the anus forward in the perineum. Uncircumcised men should retract the foreskin completely each time they micturate. The glans should be washed when showering and dried completely before the foreskin is replaced. Recurrent UTI – particularly with phimosis – may be an indication for circumcision.
6. Post-coital micturition. As UTIs, and more importantly recurrent UTIs, are common occurrences soon after sexual intercourse in women; post-coital micturition is a technique to limit the infection. The theory is the act of coitus assists the bacterial translocation to the urethra; and sexual arousal leads a moist environment also assisting bacterial survival and reproduction. Anal sex is a risk factor for UTI in both women and men – especially in uncircumcised men.
7. Avoidance of spermicidal creams. Spermicidal loaded diaphragms and condoms, and spermicidal creams can change the vaginal flora reducing the natural barrier to UTI infection causing bacteria. In women with a UTI, they should at least stop the spermicidal cream around the infection time to assist the natural vaginal flora to re-establish. In cases of recurrent UTIs other forms of contraception should be considered.
8. Cranberry juice and D-mannose are discussed in detail below.

Table 2: Prevention of UTI (see text for details and explanation)

High urine output (at least 1.5L per 24 hours)
Loose fitting clothing
Natural fibre (cotton and linen) underclothing
Double voiding
Perineal hygiene
Post-coital micturition
Avoidance of spermicidal creams
Cranberry juice
D-mannose

<u>D-mannose and cranberry juice</u>

Some people get benefit from D-mannose and a few may get benefit from the cranberry and D-mannose combined if either alone has not worked. Cranberry is extremely successful in some people with recurrent UTIs. It is important to use high strength cranberry. It is bitter and not readily available in its pure form. The high concentration (18% cranberry juice or higher) of cranberry drink available in the supermarket is recommended although an alternative is cranberry capsules.

Some people take D-mannose powder or cranberry in capsule form. I recommend the cranberry capsules are taken one or two at night. There is such variation in concentration of cranberry capsules and drink it is difficult to give advice. Usually one capsule per night (especially for UTI prevention) is adequate however if it one capsule is not controlling the symptoms or recurrent infections then two capsules when retiring for the evening is worth trying. D-mannose and cranberry are often well received by people who may be pregnant.

D-mannose and cranberry are thought to have a similar effect. The fimbria on the cell walls projections which assist the *E. coli* organism to adhere to the urothelium are interfered with reducing the chance of the bacteria adhering to the urinary tract. This is the benefit of taking the agent at bedtime when urinary stasis is more common. During the day the high fluid intake and high urine output help to flush the bacteria from the UT – possibly reducing the requirement for cranberry throughout the day. The dose of D-mannose is 1tsp dissolved in water every 2 or 4 hours. Duration of treatment is usually 2-3 days. The frequency throughout the day of dosing of D-mannose is less attractive to some. D-mannose and cranberry can be used less frequently in lower doses as preventative therapy in recurrent urinary tract infection patients.

Acute urethral syndrome

This is more common in women and associated with a low white count (10-100x10^6/L) on urine microscopy. They will have no pyuria on supra-pubic bladder aspiration. These situations respond well to antimicrobial therapy, but often the course needs to be longer – sometimes longer than a week. Positive culture of the urine is often only 2 to 3 cfu, but should be treated as a UTI in the presence of symptoms. *Chlamydia trachomatis* is a common culprit in both genders.

The special case of young women with urinary tract infections

The symptomatic woman with pyuria who is considered to have an uncomplicated cystitis (infrequent urinary tract infections, or has recently become sexually active, or has a new sexual partner) can be managed by an empiric course, usually 3 days duration, of antibiotics. This does not require a urine culture. The choice of antibiotic is guided by the patient's allergy profile (if appropriate), and local microbiological culture sensitivity patterns. Your local laboratory will be able to provide the local sensitivity profile on request. If this is not available then see table 1 for suggested empirical antibiotic options. If the patient fails to respond or represents within a month (a relapse or recurrent urinary tract infection) then a formal culture of an MSU should be performed.

Recurrent urinary infections

Recurrent infection is less common than relapse. Recurrent UTIs more than annual frequency is seen in less than 1% of the population. Some infections can be prevented. UTI relapse is defined as the same organism and sensitivities on culture within two weeks of completion of eradication treatment.
Re-infection, is the development of a UTI following treatment and eradication (proven by no growth on a follow-up urine culture), even if the same organism is grown. Lower UTIs (cystitis) are usually re-infection.

In structurally normal urinary tracts that also function normally there is no risk of progressive renal disease or hypertension from recurrent UTIs. Most recurrent UTIs are re-infection however relapse from incomplete treatment is common.

Men are less likely to suffer recurrent UTI. Underlying functional or anatomical abnormalities are more likely to be identified in men with recurrent UTIs; and such cases should be investigated. Incomplete bladder emptying secondary to prostatic obstruction is a common cause of recurrent UTIs in older men. The remainder of this section will focus on women, although much of the information applies to both genders.

Symptomatic recurrent UTIs are problematic for the individual affected with sick days from family and work; and may be a challenge for the medical practitioner. The affected individual may consult out-of-hours services for symptomatic relief resulting in disjoint care. The follow-up MSU to ensure eradication of the infective organism may be missed. Once the symptoms have settled, the course of antibiotics may not be completed fully; or side effects (particularly vaginal thrush) may lead to incomplete antibiotic courses. An MSU culture for diagnosis confirmation may not be performed, especially in out-of-hours consultations. It is reasonable to not culture the first presentation of a UTI in women, especially when mitigating circumstances (e.g. new sexual partner) are identified in the history. A repeat and subsequent presentation does require a formal MSU culture as the results will assist in clarification of the repeat infection(s) being relapses from incomplete treatment courses or resistant organisms. The relapse infection when appropriate therapy has been given (organism sensitive to the antibiotic), adherence to the treatment regimen (completed course) and preventative procedures (see table) followed will require more investigation.

Relapse of UTI requires more intensive investigation. A treatable underlying cause may well be found, including UT stone, bladder diverticulum, or incomplete bladder emptying from outflow obstruction (prostatic hypertrophy, vaginal prolapse) are common occurrences.

Recurrent UTI are more common in young women, particularly when they first become sexually active. Recurrence is more common with *E. Coli* infection than the other UTI organisms frequently cultured in younger women (e.g. *Staphylococcus saprophyticus*). Approximately 25% of cases will suffer re-infection in the six months following their first *E.coli* UTI infection. Recurrent UTIs in women often occur in clusters of several months duration. It is for this reason, long term prophylaxis is often indicated through the expected cluster duration – usually less than six months.

Table 3: Factors that increase recurrent UTIs (women)

Spemicidal creams
Frequent sexual intercourse and multiple partners
Mother with history of UTIs
New sexual partner
First UTI before age 15 years

Topical oestrogen creams in the post-menopausal woman with recurrent UTIS is extremely successful. Initially applied twice a week initially then weekly for several months. Similar to prophylactic antibiotics, courses of topical oestrogen should be reviewed and ceased within 6-9 months.

Lactobacillus probiotics have been shown to reduced UTI recurrence in one study. No study has shown the direct colonisation of the vagina by these probiotics – the mechanism by which their reduction in UTI frequency is thought to occur. Similar to oestrogen in the post-menopausal women, probiotics are an option as an alternative to antibiotics particularly in cases of UTIs with multi-resistant bacteria.

Urological investigation is not indicated in most women. Ultrasound scan of the urinary tract including pre- and post-micturition bladder scan is the typical initial radiological investigation. Rarely will this miss a cause of recurrent UTIs that a cystoscopy will detect. Anyone with repeat UTIs, and persistent haematuria following successful treatment/eradication of the infective organism, however, requires a cystoscopy.

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