SIGN

Scottish Intercollegiate Guidelines Network

NHS Quality Improvement Scotland

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Management of suspected bacterial urinary tract infection in adults

A national clinical guideline

July 2006

KEY TO EVIDENCE STATEMENTS AND GRADES OF RECOMMENDATIONS

LEVELS OF EVIDENCE

1^{++}	High quality meta-analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias
1^{+}	Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1^{-}	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2^{++}	High quality systematic reviews of case control or cohort studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2^{+}	Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2^{-}	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, eg case reports, case series
4	Expert opinion

GRADES OF RECOMMENDATION

Note: The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation.

A	At least one meta-analysis, systematic review of RCTs, or RCT rated as 1^{++} and directly applicable to the target population*; or* A body of evidence consisting principally of studies rated as 1^{+}, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2^{++}, directly applicable to the target population, and demonstrating overall consistency of results*; or* Extrapolated evidence from studies rated as 1^{++} or 1^{+}
C	A body of evidence including studies rated as 2^{+}, directly applicable to the target population and demonstrating overall consistency of results*; or* Extrapolated evidence from studies rated as 2^{++}
D	Evidence level 3 or 4*; or* Extrapolated evidence from studies rated as 2^{+}

GOOD PRACTICE POINTS

☑	Recommended best practice based on the clinical experience of the guideline development group
	Supplementary material available on our website **www.sign.ac.uk**

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1 Introduction

1.1 THE NEED FOR A GUIDELINE

Urinary tract infection (UTI) is the second most common clinical indication for empirical antimicrobial treatment in primary and secondary care, and urine samples constitute the largest single category of specimens examined in most medical microbiology laboratories.[1] Healthcare practitioners regularly have to make decisions about prescription of antibiotics for urinary tract infection. Criteria for the diagnosis of urinary tract infection vary greatly in the UK, depending on the patient and the context. There is considerable evidence of practice variation in use of diagnostic tests, interpretation of signs or symptoms and initiation of antibiotic treatment, [2-5] with continuing debate regarding the most appropriate diagnosis and management.[1,6]

The diagnosis of UTI is particularly difficult in elderly patients, who are more likely to have asymptomatic bacteriuria as they get older.[7] The prevalence of bacteriuria may be so high that urine culture ceases to be a diagnostic test.[8] Elderly institutionalised patients frequently receive unnecessary antibiotic treatment for asymptomatic bacteriuria despite clear evidence of adverse effects with no compensating clinical benefit.[9,10]

Existing evidence based guidelines tend to focus on issues of antibiotic treatment (drug selection, dose, duration and route of administration) with less emphasis on clinical diagnosis or the use of near patient tests or are limited to adult, non-pregnant women with uncomplicated, symptomatic UTI.[11,12]

For patients with symptoms of urinary tract infection and bacteriuria the main aim of treatment is relief of symptoms. Secondary outcomes are adverse effects of treatment or recurrence of symptoms. For asymptomatic patients the main outcome from treatment is prevention of future symptomatic episodes.

Unnecessary use of tests and antibiotic treatment may be minimised by developing simple decision rules, diagnostic guidelines or other educational interventions.[13-16] Prudent antibiotic prescribing is a key component of the UK's action plans for reducing antimicrobial resistance.[17,18] Unnecessary antibiotic treatment of asymptomatic bacteriuria is associated with significantly increased risk of clinical adverse events.[19,20]

1.2 REMIT OF THE GUIDELINE

This guideline provides recommendations based on current evidence for best practice in the management of adults with community acquired urinary tract infection. It includes adult women (including pregnant women) and men of all ages, patients with catheters and patients with comorbidities such as diabetes. It excludes children and patients with hospital acquired infection. The guideline does not address prophylaxis to prevent UTI after instrumentation or surgery, or treatment of recurrent UTI.

This guideline will be of interest to healthcare professionals in primary and secondary care, officers in charge of residential and care homes, antibiotic policy makers, clinical effectiveness leads, carers and patients.

Additional epidemiological and statistical information to accompany this guideline is available as supplementary material on the SIGN website **www.sign.ac.uk**

1.3 DEFINITIONS

asymptomatic bacteriuria	presence of bacteriuria in urine revealed by quantitative culture or microscopy in a sample taken from a patient without any typical symptoms of lower or upper urinary tract infection. In contrast with symptomatic bacteriuria, the presence of asymptomatic bacteriuria should be confirmed by two consecutive urine samples.[21]
bacteraemia	presence of bacteria in the blood diagnosed by blood culture.
bacteriuria	presence of bacteria in urine revealed by quantitative culture or microscopy.
empirical treatment	treatment based on clinical symptoms or signs unconfirmed by urine culture.
haematuria	blood in the urine either visible (macroscopic haematuria) or invisible (microscopic haematuria).
long term catheter	an indwelling catheter left in place for over 28 days.
lower urinary tract infection (LUTI)	evidence of urinary tract infection with symptoms suggestive of cystitis (dysuria or frequency without fever, chills or back pain).
medium term catheter	an indwelling catheter left in place for 7-28 days.
near patient testing	tests that are done at the point of consultation and do not have to be sent to a laboratory.
pyuria	occurrence of $\geq 10^4$ white blood cells (WBC)/ml in a freshly voided specimen of urine.[22] Higher numbers of WBC are often found in healthy asymptomatic women. Pyuria is present in 96% of symptomatic patients with bacteriuria of $> 10^5$ colony forming units (cfu)/ml, but only in $< 1\%$ of asymptomatic, abacteriuric patients.[22] Pyuria in the absence of bacteriuria may be caused by the presence of a foreign body, for example, a urinary catheter, urinary stones or neoplasms, lower genital tract infection or, rarely, renal tuberculosis.
short term catheter	an indwelling catheter left in place for 1-7 days.
significant bacteriuria	$\geq 10^5$ cfu/ml of a single bacterial species in a freshly voided specimen of urine. For laboratory purposes the widely applied definition in the UK is 10^4 cfu/ml. For some specific patient groups there is evidence for lower thresholds: ▪ women with symptomatic UTI $\geq 10^2$ cfu/ml ▪ men $\geq 10^3$ cfu/ml (if 80% of the growth is due to a single organism).
symptomatic bacteriuria	presence of bacteriuria in urine revealed by quantitative culture or microscopy in a sample taken from a patient with typical symptoms of lower or upper urinary tract infection. The presence of symptomatic bacteriuria can be established with a single urine sample.
upper urinary tract infection (UUTI)	evidence of urinary tract infection with symptoms suggestive of pyelonephritis (loin pain, flank tenderness, fever, rigors or other manifestations of systemic inflammatory response).

1.4 KEY MESSAGES ABOUT BACTERIAL UTI

Bacteriuria is not a disease

- The normal flora of the human body are extremely important as a key part of host defences against infection and because of their influence on nutrition.[23]
- In people less than 65 years of age bacteriuria is abnormal in the sense that most people do not suffer from it (*see Table 1*). Bacteriuria is common in some populations of institutionalised women[24] and people with long term indwelling urinary catheters (*see section 5*).

Tests for bacteriuria or pyuria do not establish the diagnosis of UTI

- The diagnosis of UTI is primarily based on symptoms and signs (*see section 2.1*).
- Tests that suggest or prove the presence of bacteria or white cells in the urine may contribute additional information to inform management but rarely have important implications for diagnosis (*see sections 2.2, 3.1.3, 4.1, 5.2*).

Bacteriuria alone is rarely an indication for antibiotic treatment

- Bacteriuria can only be an absolute indication for antibiotic treatment when there is convincing evidence that eradication of bacteriuria results in meaningful health gain at acceptable risk (*see sections 2.4, 5.3, 5.4*). In particular, in elderly patients, asymptomatic bacteriuria is common and there is evidence that treatment is more harmful than beneficial.[9,10] In contrast, during pregnancy there is evidence that treatment of bacteriuria does more good than harm.[25]
- The main value of urine culture is to identify bacteria and their sensitivity to antibiotics (*see sections 2.3, 2.4.1, 3.1.2, 4.1, 5.4.1*).
- Indirect indicators of the presence of bacteria (for example, urinary nitrites) are likely to be much less valuable than urine culture (*see sections 2.2.3, 3.1.3, 4.1, 5.2.2*).

There is a risk of false positive results in all tests for diagnosis of bacteriuria other than the gold standard

- The gold standard test for diagnosis of bacteriuria is culture of bladder urine obtained by needle aspiration of the bladder as it minimises the risk of contamination of the urine specimen (*see section 3.1.2*).
- All other techniques (urethral catheter and midstream specimens of urine) carry a higher risk of contamination and therefore produce some false positive results (*see section 3.1.2*).
- The significance of false positive results is greatest when testing for bacteriuria in people with low pre-test probability (for example, screening for asymptomatic bacteriuria in the first trimester of pregnancy, *see section 3.1.2*).

Routine urine culture is not required to manage LUTI in women

- Women with symptomatic LUTI should receive empirical antibiotic treatment (*see section 2.4.1*).
- All urine samples taken for culture will be from patients that are not responding to treatment and will bias the results of surveillance for antibiotic resistance (*see section 7.4*).

1.5 EPIDEMIOLOGY

1.5.1 PREVALENCE OF ASYMPTOMATIC BACTERIURIA

In women asymptomatic bacteriuria becomes increasingly common with age. The limited data about healthy men shows that the prevalence of bacteriuria also increases with age, although the prevalence in men is always lower than for women of the same age[26-28] (*see Table 1 and supplementary material section S2.1.2*).

Table 1: Prevalence of asymptomatic bacteriuria in adult men and women

Country	Age (years)	Men (%)	Women (%)
Japan[26]	50-59	0.6	2.8
	60-69	1.5	7.4
	70+	3.6	10.8
Sweden[27]	72	6.0	16.0
	79	6.0	14.0
Scotland[28]	65-74	6.0	16.0
	>75	7.0	17.0

1.5.2 RISK FACTORS FOR ASYMPTOMATIC BACTERIURIA

Table 2: Risk factors for asymptomatic bacteriuria

Risk factor	Effect on prevalence of asymptomatic bacteriuria
Female sex	Increases prevalence (*see Table 1*).
Sexual activity	May increase prevalence (higher in married women than in nuns, [29] *see supplementary material section S2.1.1*).
Comorbid diabetes	Increases prevalence in women less than 65 years of age with diabetes from 2-6% to 7.9-17.7%.[30-34]
Age	Increases prevalence in women and men[26-28,35-38] (*see Table 1 and supplementary material section S2.1.2*).
Institutionalisation	Increases prevalence (in people over 65 years of age) from 6-16% to 25-57% for women[19,39-42] and from1-6% to 19-37% for men.[40-43]
Presence of catheter	3-6% of people acquire bacteriuria with every day of catheterisation. All patients with long term catheters have bacteriuria.[43,44]

1.5.3 PREVALENCE OF SYMPTOMATIC BACTERIURIA

Combined figures from nine studies show that women under 50 years of age with acute symptoms such as dysuria, urgency or frequency (suggesting lower urinary tract infection) or loin pain (suggesting upper urinary tract infection) are extremely likely to have bacteriuria (*see Table 3 and supplementary material section S2.2*)[45-53] The prevalence of symptomatic bacteriuria in pregnant women, men and catheterised patients is discussed in sections 3.1, 4.1 and 5.1.

Table 3: Prevalence of bacteriuria in non-pregnant women under 50 years of age with acute symptoms of UTI[45-53]

Total number of women	Number with bacteriuria	% with bacteriuria	Lower confidence interval (CI)	Upper confidence interval (CI)
4,135	2,960	71.6%	70.2%	73.0%

1.6 STATEMENT OF INTENT

This guideline is not intended to be construed or to serve as a standard of medical care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement regarding a particular clinical procedure or treatment plan must be made by the appropriate healthcare professional in light of the clinical data presented by the patient and the diagnostic and treatment options available. It is advised, however, that significant departures from the national guideline or any local guidelines derived from it should be fully documented in the patient's case notes at the time the relevant decision is taken.

2 Management of bacterial UTI in adult women

The management of symptomatic bacterial UTI in adult non-pregnant women is summarised in Annex 1 (LUTI) and Annex 2 (UUTI).

2.1 DIAGNOSIS

Symptoms suggestive of acute urinary tract infection are one of the most common reasons for women to visit healthcare professionals. Although the clinical encounter typically involves taking a history and performing a physical examination, the diagnostic accuracy of the clinical assessment for UTI remains uncertain.[12,54]

The prior probability of bacteriuria in otherwise healthy women who present to their general practitioner (GP) with symptoms of acute UTI is estimated at between 50-80%.[12]

If dysuria and frequency are both present, then the probability of UTI is increased to >90% and empirical treatment with antibiotic is indicated.[12]

If vaginal discharge is present, the probability of bacteriuria falls. Alternative diagnoses such as sexually transmitted diseases (STDs) and vulvovaginitis, usually due to candida, are likely and pelvic examination is indicated.[12] Rarer causes include local vaginal and cervical pathology including erosions and very rarely cancer.

2++

C **In otherwise healthy women presenting with symptoms or signs of UTI, empirical treatment with an antibiotic should be considered.**

C **In women with symptoms of vaginal itch or discharge, explore alternative diagnoses and consider pelvic examination.**

The presence of back pain or fever increases the probability of UUTI and urine culture should be considered as the clinical risks associated with treatment failure are increased. Increasing bacterial resistance means that no antibiotic is sufficiently reliable for empirical treatment of UUTI.[55,56]

☑ In patients presenting with symptoms or signs of UTI who have a history of fever or back pain the possibility of UUTI should be considered. Empirical treatment with an antibiotic should be started and urine culture performed to guide the choice of antibiotic.

2.2 NEAR PATIENT TESTING

Near patient tests may include the appearance of the urine sample, microscopy and testing by means of dipsticks.

2.2.1 APPEARANCE OF URINE

Urine turbidity has been shown to have a specificity of 66.4% and sensitivity of 90.4% for predicting symptomatic bacteriuria. When examined against a bright background, a turbid sample is positive, whereas a clear sample is negative.[57] Visual appearance is prone to observer error and may not be a useful discriminator.

2++

2.2.2 URINE MICROSCOPY

There is wide variation in sensitivity (60-100%) and specificity (49-100%) of urine microscopy to predict significant bacteriuria in symptomatic ambulatory women.[58,59]

2++

Near patient testing by microscopy raises concerns about health and safety at work, maintenance of equipment and training of staff which does not justify its use.

☑ Urine microscopy should not be undertaken in clinical settings in primary or secondary care.

2.2.3 DIPSTICK TESTS

The quality of evidence for near patient testing with dipstick tests (reagent strip tests) was poor.[12,60] The care setting varied across the studies, for example, accident and emergency, genitourinary medicine and hospital inpatients. Individual reagent responses were reported in a variable and incomplete way.

A meta-analysis of the accuracy of dipstick testing to predict UTI looked at four categories of tests: nitrite only; leucocyte esterase (LE) only; disjunctive pairing (dipstick positive if either nitrite or LE or both are positive) and conjunctive pairing (dipstick positive only if both nitrite and LE are positive).[60] The study found the disjunctive pair test to be significantly more accurate than the LE test alone ($p = 0.0001$). [60] A urine sample positive for dipstick tests for LE or nitrite is less likely to predict bacteriuria than combinations of symptoms and signs, particularly combinations of confirmatory symptoms (dysuria, frequency) and absence of features that suggest alternative diagnoses (vaginal discharge and irritation).[12] 2^{++}

Dipstick tests are only indicated for women who have minimal signs and symptoms and whose prior probability of UTI is in the intermediate range (around 50%). Where only one symptom or sign is present, a positive dipstick test (LE or nitrite) is associated with a high probability of bacteriuria (80%) and negative tests are associated with much lower probability (around 20%).[60]

Negative tests do not exclude bacteriuria. A randomised controlled trial (RCT) of near patient testing in adult women who were symptomatic but had a negative dipstick test showed that antibiotics (trimethoprim 300 mg daily for three days) improved symptoms with the median duration of constitutional symptoms being reduced by four days. Although the probability of UTI is reduced to less than 20% by a negative dipstick test, the evidence suggests that women still derive symptomatic benefit from antibiotics, number needed to treat (NNT) of 4.[61] For statistical methods see supplementary material section S1. These issues should be considered and explained to symptomatic women with a negative dipstick test. Clinical judgement should be used to decide whether to obtain urine for culture or invite the patient to return if symptoms persist or worsen.[60] 1^{+} 2^{++}

B **Dipstick tests should only be used to diagnose bacteriuria in women with limited symptoms and signs** *(no more than two symptoms).*

- **Women with limited symptoms of UTI who have negative dipstick urinalysis** *(LE or nitrite)* **should be offered empirical antibiotic treatment.**
- **The risks and benefits of empirical treatment should be discussed with the patient and managed accordingly.**
- **If a woman remains symptomatic after a single course of treatment, she should be investigated for other potential causes.**

No robust evidence was identified describing LE or nitrite testing in elderly, institutionalised patients.

☑ In elderly patients (over 65 years of age), diagnosis should be based on a full clinical assessment, including vital signs.

2.3 URINE CULTURE

The quality of a urine sample will affect the ability to detect bacteria and confirm a diagnosis of UTI. Specimens can be divided into those with high risk of contamination (clean catch or midstream urine samples; MSU), or low risk (suprapubic aspirate; SPA or operatively obtained urine from ureter or kidney). Standard laboratory processing of urine samples is confined to a single initial specimen per patient, which detects conventional aerobic bacteria, normally at a value of $\geq 10^5$ cfu/ml. There is no bacterial count that can be taken as an absolute "gold standard" for the diagnosis of UTI.

The criterion for the presence of significant bacteria was established from early work comparing SPA against MSU specimens in women suffering either from acute UUTI or who had asymptomatic UTI during pregnancy. A single positive MSU reliably determined the presence of a UTI at 10^5 cfu/ml in 80% of cases studied with two samples improving this to 95%.[62-64]

For women experiencing symptoms of urinary tract infection lower numbers of colony forming units may also reflect significant bacteria. A study comparing SPA against MSU specimens found that the best diagnostic criterion in women was $\geq 10^2$ cfu/ml (sensitivity 95%, specificity 85%).[65]

The laboratory interpretation of a urine culture depends upon a combination of factors. These include the number of isolates cultured and their predominance, the specimen type, the clinical details, the presence or absence of pyuria and the numbers of organisms present. Conventional laboratory practice in the UK detects aerobic bacteria at a value of $\geq 10^4$ cfu/ml.[22]

2.4 ANTIBIOTIC TREATMENT

2.4.1 SYMPTOMATIC BACTERIURIA, LUTI

In a randomised controlled trial of non-pregnant women with dysuria, frequency or urgency and positive LE tests but no symptoms or signs of UUTI and no significant comorbidity, 95% had $\geq 10^5$ bacteria per ml of urine. Treatment with a single dose of either cefixime, co-trimoxazole or ofloxacin was equally effective.[66] 1+

Another trial enrolled non-pregnant women aged 15-54 with dysuria and frequency, and detected pyuria (method not specified) but no symptoms or signs of UUTI and no significant comorbidity. A three day regimen of nitrofurantoin significantly shortened time to resolution of symptoms.[67] 1++

A **Non-pregnant women with symptoms or signs of acute LUTI, and either high probability of or proven bacteriuria, should be treated with antibiotics.**

Three to six days of antibiotic treatment for uncomplicated LUTI in women aged 60 or over is as effective as treatment for 7-14 days. [68,69] 1++

Guidelines from the Infectious Diseases Society of America (IDSA)[11] and Health Protection Agency (HPA)[55] recommend three days treatment with trimethoprim for LUTI. There is more direct evidence for three days treatment with co-trimoxazole but it is reasonable to infer that trimethoprim is equally effective as co-trimoxazole.[11] 1+ 4

Three days of treatment with nitrofurantoin has been shown to be effective in non-pregnant adult women with uncomplicated UTI.[67] The IDSA recommends seven days treatment with nitrofurantoin.[11] There is no direct evidence comparing three days nitrofurantoin with seven days nitrofurantoin. 1++ 1+

B **Non-pregnant women of any age with symptoms or signs of acute LUTI should be treated with trimethoprim or nitrofurantoin for three days.**

☑ Women with renal impairment should not be treated with nitrofurantoin as:

- an effective concentration of antibiotic in the urine is not achievable
- a toxic concentration of antibiotic can occur in the plasma.

Urinary pH affects the activity of nitrofurantoin. Nitrofurantoin is effective against *E. coli* at a concentration of 100 mg/l as the concentration of antibiotic greatly exceeds the minimum inhibitory concentration (MIC or lowest concentration of antibiotic that regularly inhibits growth of the bacterium in vitro). The MIC increases twenty fold from pH5.5 to pH8.0 (*see Table 4*) [70] and at pH8.0 bacterial growth occurs with 25 mg/l of nitrofurantoin. A similar situation is seen with *P. mirabilis* although it has a higher MIC than most strains of *E. coli*. | 4

D **Women with LUTI, who are prescribed nitrofurantoin, should be advised not to take alkalinising agents** *(such as potassium citrate).*

Table 4: The effect of pH on the MIC of nitrofurantoin on E. coli and P. mirabilis[70]

	Minimum inhibitory concentration of nitrofurantoin (mg/l)		
	pH 5.5	**pH 7.0**	**pH 8.0**
E. coli	2.5	10.0	50.0
P. mirabilis	15.0	50.0	100.0

Resistance is increasing to all of the antibiotics used to treat UTI and there is no clear first choice alternative to trimethoprim or nitrofurantoin.[11] | 1+

B **Patients who do not respond to trimethoprim or nitrofurantoin should have urine taken for culture to guide change of antibiotic.**

☑ Quinolones should not be used for empirical treatment of LUTI.

2.4.2 SYMPTOMATIC BACTERIURIA, UUTI

Upper urinary tract infection can be accompanied by bacteraemia, making it a life threatening infection.[11]

Nitrofurantoin is an ineffective treatment for UUTI because it does not achieve effective concentrations in the blood. Resistance to trimethoprim is too common to recommend this drug for empirical treatment of a life threatening infection.[55] | 4

One week of treatment with ciprofloxacin is as effective as two weeks treatment with co-trimoxazole.[71] | 1++

A **Non-pregnant women with symptoms or signs of acute UUTI should be treated with ciprofloxacin for seven days.**

As resistance to quinolones is increasing, the HPA suggests that patients started on ciprofloxacin should have urine sent for culture and that patients should be admitted to hospital if there is no response to treatment within 24 hours.[55] | 4

D **Urine should be taken for culture before immediate empirical treatment is started and treatment changed if there is an inadequate response to the antibiotic.**

☑ Alternative treatments include co-trimoxazole, pivmecillinam, co-amoxiclav and cefixime.

One week of treatment with pivmecillinam is less effective than two weeks treatment.[11] | 1+

Evidence about the effectiveness of less than two weeks treatment with co-amoxiclav, cefixime and co-trimoxazole is lacking.

☑ Patients should be admitted to hospital if systemic symptoms appear.

2.4.3 ASYMPTOMATIC BACTERIURIA

There is no evidence that treatment of asymptomatic bacteriuria in adult women significantly reduces the risk of symptomatic episodes, either in women without comorbidity or with underlying diabetes or primary biliary cirrhosis.[20,72,73] 1++ 1+

In women with diabetes, antibiotic treatment of asymptomatic bacteriuria significantly increases the risk of adverse events without significant clinical benefit, such as shortening duration of symptoms.[20] 1+

A **Non-pregnant women with asymptomatic bacteriuria should not receive antibiotic treatment.**

In elderly women (over 65 years of age), treatment of asymptomatic bacteriuria does not reduce mortality or significantly reduce symptomatic episodes.[19,74] Antibiotic treatment significantly increases the risk of adverse events, such as rashes and gastrointestinal symptoms (number needed to harm; NNTH 3; confidence interval; CI 2 –10. *For statistical methods see supplementary material section S1).*[19] 1+

A **Elderly women** *(over 65 years of age)* **with asymptomatic bacteriuria should not receive antibiotic treatment.**

2.5 NON-ANTIBIOTIC TREATMENT

Recurrent UTIs are a common and debilitating problem. Repeated or prolonged treatment with antibiotics is likely to contribute to the problem of antimicrobial resistance. Effective alternatives to antibiotics have the potential to improve public health.

Alternatives to antibiotics offer an opportunity for patients to self manage the prevention of recurrent UTIs, which may improve their quality of life.

2.5.1 CRANBERRY PRODUCTS

Cranberry products (juice, tablets, capsules) are not regulated and the concentration of active ingredients is not known. Concentrations may also fluctuate between batches of the same product.

Most of the high strength preparations (tablet/capsule form) in the UK quote 200 mg of cranberry extract, equivalent to 5,000 mg of fresh cranberries (25:1 concentration).

There is good evidence to support the effectiveness of cranberry products for preventing symptomatic UTI in adult women with a history of recurrent UTI (NNT to prevent one symptomatic infection in six months 6.4, CI 3.7-25.9.[75] *For statistical methods see supplementary material section S1).* The effectiveness of cranberry products in other patients is not known. The optimal dose and route of administration has not been addressed. 1++

There has been no direct comparison between cranberry products and antibiotic prophylaxis for preventing recurrent UTI. The NNTs for cranberry products are higher than for nightly antibiotic prophylaxis for six months,[76] or postcoital antibiotic prophylaxis for six months.[77]

A **Women with recurrent UTI should be advised to take cranberry products to reduce the frequency of recurrence.**

☑ Women should be advised that cranberry capsules may be more convenient than juice and that high strength capsules may be most effective.

There is no evidence to support the effectiveness of cranberry products for treating symptomatic episodes of UTI.[78] 1++

No serious adverse effects to cranberry products were reported, although the high drop out rate in clinical trials suggests that long term treatment with cranberry products may not be well tolerated. The mechanism of action of cranberry products is unclear.

By 2003 the Committee on Safety of Medicines (CSM) received 12 reports of suspected interactions involving warfarin and cranberry juice. In eight of these cases there was an increase in International Normalized Ratio (INR) of the prothrombin time.[79] 4

In October 2004 the CSM advised that patients taking warfarin should avoid taking cranberry products unless the health benefits are considered to outweigh any risks.

D **Patients taking warfarin should avoid taking cranberry products unless the health benefits are considered to outweigh any risks.**

☑ Increased medical supervision and INR monitoring should be considered for any patient taking warfarin with a regular intake of cranberry products.

One clinical trial addressed the cost effectiveness of cranberry products for preventing UTI in non-pregnant women (*see supplementary material section S4.1*).[80]

☑ Women with recurrent UTI should be advised that cranberry products are not available on the NHS, but are readily available from pharmacies, health food shops, herbalists and supermarkets.

2.5.2 METHENAMINE HIPPURATE

A systematic review of methenamine hippurate identified considerable heterogeneity between trials and concluded that interpretation of these data should be done cautiously, due to the small sample sizes and poor methodology of the studies involved.[81]

Methenamine hippurate may be effective at preventing UTI in patients without known upper renal tract abnormalities. Adverse events caused by methenamine were rare.[81] 1++

Two trials show that methenamine is less effective at preventing symptomatic UTI than nightly prophylaxis with either nitrofurantoin or trimethoprim.[82] 1++

B **Methenamine hippurate may be used to prevent symptomatic UTI in patients without known upper renal tract abnormalities.**

2.5.3 OESTROGEN

Genitourinary atrophy may increase the risk of bacteriuria and the role of oestrogen therapy in reducing the risk of symptomatic UTI has been investigated.

Evidence for the efficacy of oestrogen in comparison with placebo is inconsistent. There is good evidence that this treatment is less effective than antibiotic prophylaxis.[83] A trial comparing nine months treatment with oral nitrofurantoin versus estriol pessaries in post menopausal women reported a significantly reduced risk of symptomatic UTI with nitrofurantoin.[83] Two systematic reviews of vaginal oestrogen administration both reported considerable unexplained heterogeneity of results with some studies reporting significant reduction in risk of recurrent UTI while others report no significant effect or even a trend towards harmful effects.[84,85] 1++ 1+

A **Oestrogens are not recommended for routine prevention of recurrent UTI in postmenopausal women.**

Treatment with oestrogens may be appropriate for some women.

2.5.4 ANALGESIA

No evidence was found for the use of analgesics for symptomatic relief of uncomplicated UTIs.

☑ Women with uncomplicated UTIs may wish to use over the counter remedies to try and relieve symptoms.

2.6 REFERRAL

Recurrent UTI is a common reason for referral of women to urologists but no evidence was found describing criteria for referral or about which investigations to undertake.

There is good evidence to support prevention of recurrent bacterial UTI in women with antibiotics[82] and cranberry products (*see section 2.5.1*). These strategies should be explored before referral for specialist investigation.

2.7 COST-EFFECTIVE TREATMENT IN PRIMARY CARE

There are two key issues in the economic evaluation of strategies for managing suspected UTI:

- Antibiotics account for only 13% of the total primary care costs for patients with lower urinary tract infection and only 2-8% of the costs for patients with upper urinary tract infection. Visits to the GP account for the majority of costs.[86]
- Management strategies that minimise healthcare costs may transfer costs to the patient. A decision analysis of management strategies for acute uncomplicated lower urinary tract infection in primary care concluded that empiric antibiotic treatment without urine culture was the preferred strategy.[87] This strategy, however, prolongs the average duration of symptoms because it takes longer to identify women whose infections are caused by antibiotic resistant bacteria.[86]

2.7.1 GP CONSULTATION

Three decision analyses comparing empiric antibiotic treatment with or without urine culture concluded that taking a urine culture routinely for all patients will cost more but is likely to reduce symptom days by between 0.04 and 0.32 days.[87-89] This is achieved through a combination of reducing risk of adverse effects, by stopping treatment if the culture is negative and early identification of infections caused by antibiotic resistant bacteria. There is considerable variation in the estimates of the incremental cost effectiveness of urine culture.

One study estimated the cost per symptom day prevented as £215.[89] The estimated cost per QALY (quality adjusted life year) gained was £215,000.[89] It is unlikely that routine culture of urine will be cost effective unless the prevalence of bacteriuria in symptomatic women is < 30%.[89] This is well below the lowest figure reported in epidemiology studies (*see Table 1*).

Dipstick testing was shown to save fewer symptom days at greater cost than urine culture.[88,89] Dipstick strategies only became cost effective if both the sensitivity of the test and the risk of antibiotic side effects were maximised to unrealistic levels.[88,89] Dipstick testing is only likely to be cost effective in symptomatic women with low probability of bacteriuria (< 50%, for example, with only one symptom) and urine culture is only likely to be cost effective in women with very low probability (< 20%, for example, with only one symptom and negative dipstick test).

2.7.2 TELEPHONE CONSULTATION

Evidence from a controlled before and after study (CBA) and an RCT showed that telephone consultation by nurse practitioners is as effective and safe as standard consultation in a medical practitioner's office, is preferred by a majority of women and is likely to be cost saving.[15,90] Implementation of telephone consultation in an American population with 147,000 women aged 18 to 55 years was estimated to save one health plan $367,000 per year.[15] There was a marked trend towards increase in return visits for STDs (relative risk of return visit for STD after nurse telephone consultation 1.79, CI 0.92-3.50).[15]

Although telephone consultation and antibiotic prescribing by nurse practitioners could be a cost-effective alternative to a general practitioner visit it goes against one of four key recommendations made to primary care by the Department of Health: Standing Medical Advisory Committee, which was to "limit antibiotic prescribing over the telephone".[91] The available evidence also raises serious questions about the safety of telephone consultations for excluding STDs. Telephone consultation cannot be recommended as an alternative to a standard consultation.

3 Management of bacterial UTI in pregnant women

The management of symptomatic bacterial UTI in pregnant women is summarised in Annex 3.

3.1 DIAGNOSIS

3.1.1 SYMPTOMATIC BACTERIURIA

Symptomatic bacteriuria occurs in 17–20% of pregnancies.[25] There are pathophysiological grounds to support a link to pre-labour, premature rupture of membranes (PPROM) and pre-term labour.[92] Untreated upper urinary tract infection in pregnancy also carries well documented risks of morbidity, and rarely, mortality to the pregnant woman.[92]

Two to nine percent of pregnant women are bacteriuric in the first trimester, a similar prevalence to non-pregnant women of the same age.[21,93] 10-30% of women with bacteriuria in the first trimester develop upper urinary tract infection in the second or third trimester.

3.1.2 THE GOLD STANDARD FOR DIAGNOSIS IN PREGNANCY

The gold standard method for diagnosis of bacteriuria is culture of urine obtained by suprapubic needle aspiration. A catheter specimen of urine is less reliable than suprapubic needle aspiration, although more reliable than two MSU samples.[94] Many studies report using single MSU samples. In women with acute symptoms of UTI the presence of $\geq 10^5$ bacteria per ml of a single MSU sample has about 80% specificity in comparison with the gold standard while a single specimen (MSU or CSU) has a false positive rate of up to 40% for diagnosis of asymptomatic bacteriuria in pregnancy (*see supplementary material section S3.1*).[94,95]

3.1.3 NEAR PATIENT TESTING

A systematic review of studies comparing urine culture with near patient tests reported that no studies used the gold standard for diagnosis of asymptomatic bacteriuria in pregnancy.[92] In the only study to establish the diagnosis of bacteriuria with two consecutive urine samples at the first antenatal visit, 8.3% of pregnant women had asymptomatic bacteriuria while 12.1% had a positive dipstick test with sensitivity and specificity of 92.0% and 95.0%.[96] Five false negative dipstick tests were for patients who had bacteriuria with gram-positive bacteria (three group B streptococci and two enterococci) which do not cause upper UTI, but are implicated in causing premature delivery. 1+

Dipstick testing (LE or nitrate) is not sufficiently sensitive to be used as a screening test. Urine culture should be the investigation of choice.

A **Standard quantitative urine culture should be performed routinely at first antenatal visit.**

A **The presence of bacteriuria in urine should be confirmed with a second urine culture.**

A **Dipstick testing should not be used to screen for bacterial UTI at first or subsequent antenatal visits.**

☑ Dipsticks to test only for proteinuria and the presence of glucose in the urine should be used for screening at the first and subsequent antenatal visits as a more cost-effective alternative to multi-reagent dipsticks that detect the presence of nitrite, leucocyte esterase and blood in addition to protein and glucose.

3.2 ANTIBIOTIC TREATMENT

RCTs addressing treatment of UTI in pregnant women frequently include patients with asymptomatic bacteriuria and symptomatic bacteriuria, upper and lower UTI. There is often poor definition of long term outcomes.

3.2.1 SYMPTOMATIC BACTERIURIA

In pregnant women with symptoms of both UUTI and LUTI there is evidence that a range of antibiotic regimens achieve cure.[97-101] There is no clear evidence of benefit by reduction of long term renal damage or pre-term labour as most studies are heterogeneous with respect to LUTI and UUTI and did not specifically address these outcomes. 1++ 1+ 2+

There is no clear evidence that any particular antibiotic or dosage regimen has any advantage.[25] None of the studies addressed the risk of treatment, but apart from the hazards of adverse reactions or anaphylaxis caused by an inappropriate antibiotic, the risks are likely to be small compared to the proven benefit.[25] 1+

B **Pregnant women with symptomatic UTI should be treated with an antibiotic.**

☑ A single urine sample should be taken for culture before empiric antibiotic treatment is started.

Nitrofurantoin is not an effective treatment for UUTI because it does not achieve effective concentrations in the blood.[55] 4

☑ Refer to local guidance for the safest, cheapest, effective antibiotic for pregnant women.

☑ Given some antibiotics are toxic in pregnancy, refer to the British National Formulary (BNF) for contraindications.

☑ Given the risks of symptomatic bacteriuria in pregnancy, a urine culture should be performed seven days after completion of antibiotic treatment as a test of cure.

3.2.2 ASYMPTOMATIC BACTERIURIA

A systematic review concluded that antibiotic treatment of asymptomatic bacteriuria in pregnancy reduces the risk of upper urinary tract infection, pre-term delivery and low birth weight babies (*see supplementary material section S3.1*).[102]

Most of the trials in this review were of continuous antibiotic therapy from diagnosis of asymptomatic bacteriuria until the end of pregnancy.[102] This is not standard care in the NHS in Scotland, where asymptomatic bacteriuria is usually treated with a short course (3-7 days) of antibiotics. The evidence suggests that 3-7 days treatment is as effective as continuous antibiotic therapy.[102] 1++

There is insufficient evidence to compare the effectiveness of single dose treatment with a 3-7 day course[103] or a three day with a seven day course.

A **Asymptomatic bacteriuria detected during pregnancy should be treated with an antibiotic.**

☑ Refer to local guidance for the safest, cheapest, effective antibiotic for pregnant women.

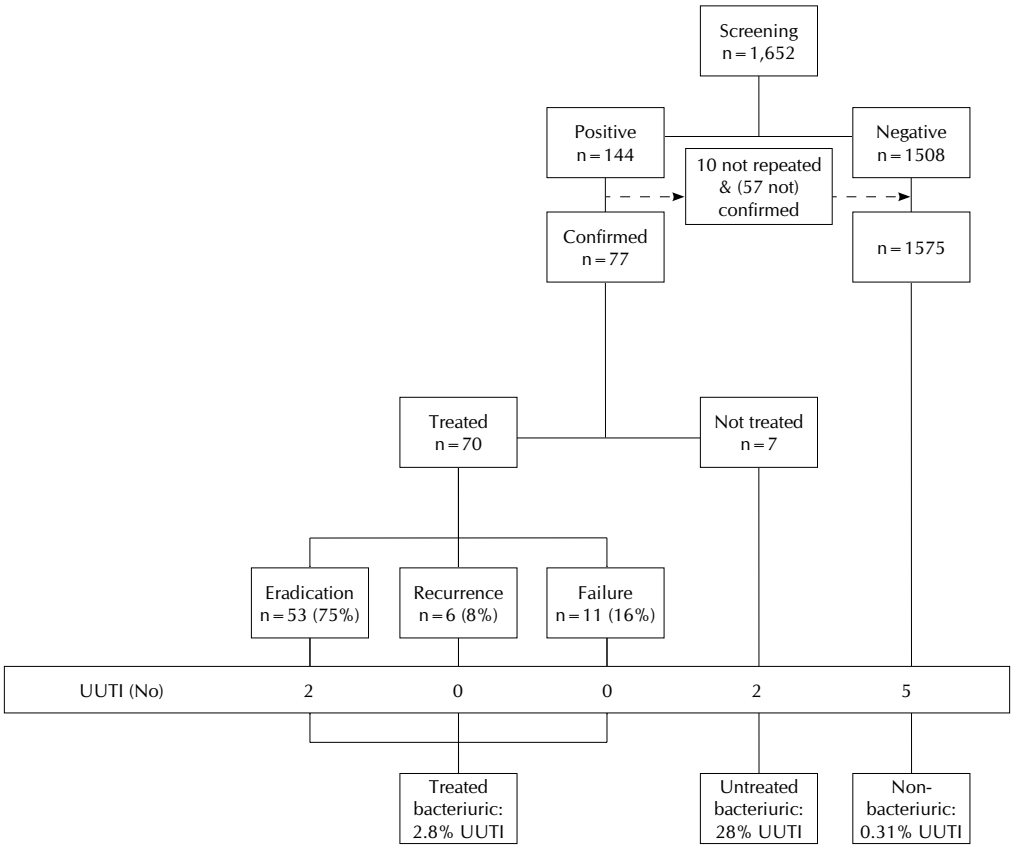
There is no need for empirical treatment in this group of patients as all women have urine culture before treatment.

The benefits and risks of antibiotic treatment of symptomatic bacteriuria in pregnant women apply equally to pregnant women with asymptomatic bacteriuria.

3.3 SCREENING DURING PREGNANCY

A large observational study demonstrated the effectiveness of a screening programme based on diagnosis of asymptomatic bacteriuria with two urine cultures in the first trimester (*see Figure 2*).[95] 2+

Figure 2: Frequency of asymptomatic bacteriuria, response to treatment and subsequent development of upper urinary tract infection. Adapted from Gratacos et al 1994.[95]



C **Women with bacteriuria confirmed by a second urine culture should be treated and have repeat urine culture at each antenatal visit until delivery.**

☑ Women who do not have bacteriuria in the first trimester should not have repeat urine cultures.

There is inconsistent evidence regarding the cost effectiveness of screening pregnant women for asymptomatic bacteriuria (*see supplementary material section S4.2*).[92,95,104-106]

4 Management of bacterial UTI in adult men

The management of symptomatic bacterial UTI in men is summarised in Annex 4.

4.1 DIAGNOSIS

Urinary tract infections in men are generally viewed as complicated because they result from an anatomic or functional anomaly or instrumentation of the genitourinary tract.[107]

Conditions like prostatitis, chlamydial infection and epididymitis should be considered in the differential diagnosis of men with acute dysuria or frequency and appropriate diagnostic tests should be considered.

There is no evidence to suggest the best method of diagnosing bacterial UTI in men. Evidence from studies of women cannot be extrapolated.

☑ Urine microscopy should not be undertaken in clinical settings in primary or secondary care.

☑ In all men with symptoms of UTI a urine sample should be taken for culture.

☑ In patients with a history of fever or back pain the possibility of UUTI should be considered and urine culture should guide the choice of antibiotic.

Obtaining a clean-catch sample of urine in men is easier than in women and a colony count of $\geq 10^3$ cfu/ml may be sufficient to diagnose UTI in a man with signs and symptoms as long as 80% of the growth is of one organism.[108] | 3

A threshold of $\geq 10^3$ cfu/ml for diagnosing UTI is below the threshold of detection for some commonly used laboratory methods, which only detect between 10^4 and 10^5 cfu/ml.

☑ Methods for detecting lower levels of bacteria in urine samples should be developed and implemented.

The culture of expressed prostatic secretion and semen has no clinical benefit and is no longer common practice.[109] | 4

4.2 ANTIBIOTIC TREATMENT

No high quality evidence for the treatment of bacterial UTI in men was identified.

At least 50% of men with recurrent UTI[110] and over 90% of men with febrile UTI[111] have prostate involvement, which may lead to complications such as prostatic abscess or chronic bacterial prostatitis.

4.2.1 SYMPTOMATIC BACTERIURIA

Given the difficulty of excluding prostatitis in men with symptoms suggestive of UTI, the current standard of care is a two week course of antibiotic likely to be effective for prostatitis.[111] Due to their ability to penetrate prostatic fluid, quinolones rather than nitrofurantoin or cephalosporins are indicated. A two week course of treatment was shown to be as effective as a four week course for patients with febrile UTI.[111] | 2+

C **Bacterial UTI in men should be treated empirically with a two week course of quinolone.**

☑ Alternative treatments include trimethoprim, deoxycycline and co-amoxiclav.

Evidence about the effectiveness of treatment with trimethoprim, deoxycycline and co-amoxiclav is lacking.

☑ Patients who do not respond to antibiotic treatment should be investigated for prostatitis.

4.2.2 ASYMPTOMATIC BACTERIURIA

In elderly men (over 65 years of age), treatment of asymptomatic bacteriuria does not reduce mortality or significantly reduce symptomatic episodes.[19,74] Antibiotic treatment significantly increases the risk of adverse events, such as rashes and gastrointestinal symptoms (NNTH 3; CI 2 - 10.[19] *For statistical methods see supplementary material section S1).* | 1+

A **Elderly men** *(over 65 years of age)* **with asymptomatic bacteriuria should not receive antibiotic treatment.**

4.3 REFERRAL

Recurrent UTI is a common reason for referral to urologists. There are no trials about the effectiveness of antibiotics or cranberry products for preventing recurrent UTI in men. There are no evidence based guidelines for referral or about which investigations to undertake.

Expert opinion suggests that men should be investigated if they have symptoms of upper urinary tract infection, fail to respond to appropriate antibiotics or have recurrent UTI (two or more episodes in three months).[112] | 4

D **Men should be referred for urological investigation if they have symptoms of upper urinary tract infection, fail to respond to appropriate antibiotics or have recurrent UTI.**

Urodynamic techniques, such as pressure/flow videocystography revealed significant underlying lower urinary tract abnormalities (mainly involving bladder outflow obstruction) in 80% of adult males presenting with simple or recurrent urinary tract infections, but without prior urinary symptoms or disorders.[113] | 2+

☑ Renal and post-void bladder ultrasound and a kidneys, ureters and bladder (KUB) plain X-ray of the abdomen may be used to look for relevant abnormalities.

5 Management of bacterial UTI in patients with catheters

5.1 DIAGNOSIS

Between 2% and 7% of patients with indwelling urethral catheters acquire bacteriuria each day, even with the application of best practice for insertion and care of the catheter.[114] All patients with a long term indwelling catheter are bacteriuric, often with two or more organisms.[115,116] The catheter provides a focus for bacterial biofilm formation. The majority of data comes from studies in elderly patients with long term indwelling catheters. There is no evidence to suggest that the prevalence in younger short or long term catheterised patients, such as those with multiple sclerosis or spinal cord injury, is any different.[117]

Duration of catheterisation is strongly associated with the risk of infection. The longer the catheter is in place the greater the likelihood of infection.[118] Intermittent catheterisation is associated with a lower incidence of asymptomatic bacteriuria.[117]

The presence of a short or long term indwelling catheter is associated with a greater incidence of fever of urinary tract origin. Fever without any localising signs is a common occurrence in catheterised patients and urinary tract infection accounts for about a third of these episodes.[117,119,120] In patients with short or long term catheters fever is associated with a higher occurrence of local urinary tract and systemic complications such as bacteraemia.[117,119,121,122]

Although mortality appears to be higher in patients with long term indwelling catheters, there is no causative link with catheterisation or urinary tract infection.[123]

Urinary tract infection is the most common hospital acquired infection in the UK, accounting for 23% of all infections and the majority of these are associated with catheters.[124] Catheter associated UTI is the source for 8% of hospital acquired bacteraemia.[125]

In catheterised patients the common occurrence of fever, the consistent presence of bacteriuria, and the variable presence of a broad range of other associated clinical manifestations (new onset confusion, renal angle tenderness or suprapubic pain, chills/rigors etc) makes the diagnosis of symptomatic UTI difficult.[24,126,127]

Current suggested criteria for diagnosing UTI in catheterised patients are not evidence based.[126] A clinical algorithm for suspected UTI in catheterised and non-catheterised residents in nursing homes suggests that the presence of one of the following symptoms should stimulate antibiotic therapy:[128]

- new costovertebral tenderness
- rigors
- new onset delirium
- fever greater than 37.9°C or 1.5°C above baseline on two occasions during 12 hours.

No particular constellation of symptoms or clinical signs, for example, fever or chills, new flank or suprapubic tenderness, change in character of urine or worsening of mental or functional status, appears to increase the likelihood of a symptomatic urinary tract infection in catheterised patients. The positive predictive value (PPV) of bacteriuria for febrile urinary tract infection identified by clinical criteria has been measured as 11%.[119] The most common symptom, fever, is a non-specific presenting symptom in symptomatic urinary tract infection.[117,119,121] The absence of fever does not appear to exclude urinary tract infection. 1++ 3

D **Clinical symptoms or signs are not recommended for predicting the likelihood of symptomatic UTI in catheterised patients.**

☑ In catheterised patients who present with fever:
- look for associated localising (loin or suprapubic tenderness) or systemic features
- exclude other potential sources of infection
- send off an appropriately taken urine sample for culture to determine the infecting organism and susceptibilities
- consider antibiotic therapy taking into account the severity of the presentation and any comorbid factors.

☑ Urine samples should only be sent for laboratory culture if the patient has clinical sepsis, not because the appearance or smell of the urine suggests that bacteriuria is present.

5.2 NEAR PATIENT TESTING

5.2.1 URINE MICROSCOPY

The value of microscopy of urine samples from catheterised patients is limited in diagnosing symptomatic UTI as all patients will have bacteriuria. There is no relationship between the level of pyuria and infection in patients with indwelling catheters, since the presence of the catheter invariably induces pyuria without the presence of infection.[129] 2+

C **Laboratory microscopy should not be used to diagnose UTI in catheterised patients.**

5.2.2 DIPSTICK TESTS

Symptomatic UTI cannot be differentiated from asymptomatic bacteriuria on the basis of urine analysis with dipstick tests. Pyuria is common in catheterised patients and its level has no predictive value.[129,130] 2++

There is no evidence to suggest that detecting pyuria by urine analysis is of any value in differentiating symptomatic UTI from asymptomatic UTI (bacteriuria) in catheterised patients.[129-131] 2+ 3

B **Dipstick testing should not be used to diagnose UTI in catheterised patients.**

5.3 ANTIBIOTIC PROPHYLAXIS TO PREVENT CATHETER RELATED UTI

A meta-analysis of antimicrobial prophylaxis for UTI in catheterised patients with spinal cord dysfunction included patients with acute (less than 90 days after spinal cord injury) and non-acute (greater than 90 days after spinal cord injury) spinal cord dysfunction and neurogenic bladder.[132] The majority of patients had intermittent catheterisation. Antimicrobial prophylaxis did not significantly decrease symptomatic infections. Prophylaxis was associated with the reduction of asymptomatic bacteriuria among acute patients ($p < 0.05$). There was no significant reduction among non-acute patients. On average 3.57 weeks of treatment were required to prevent one episode of asymptomatic bacteriuria in a patient with acute spinal cord injury. Overall there was an approximately twofold increase in antimicrobial resistant bacteria except in the group who received methenamine. 1++ 1+

This agrees with a systematic review of antibiotic prophylaxis in multiple sclerosis and spinal cord injury patients with neurogenic bladder.[117]

A **Antibiotic prophylaxis is not recommended for the prevention of symptomatic UTI in catheterised patients.**

☑ Antimicrobial prophylaxis may be considered in patients for whom the number of infections are of such frequency or severity that they chronically impinge on function and well-being.

☑ Antibiotic prophylaxis in catheterised patients may reduce the occurrence of asymptomatic bacteriuria but at the risk of increasing antibiotic resistance.

5.4 ANTIBIOTIC TREATMENT

5.4.1 SYMPTOMATIC BACTERIURIA

Symptoms that may suggest UTI in patients with catheters include fever, flank or suprapubic discomfort, change in voiding patterns, nausea, vomiting, malaise or confusion.[126,128]

No studies were identified that evaluated the prognostic value of individual or combinations of signs or symptoms, with the exception of fever. The occurrence of febrile episodes in patients with long term indwelling catheters is associated with the development of abnormalities such as calculi and complications in the kidney.[133] 1+

Evidence for antibiotic treatment of symptomatic UUTI in non-pregnant women is applicable to catheterised patients with symptomatic UTI and has been extrapolated to give the following good practice points (*see section 2.4.2*).

☑ Catheterised patients with symptoms or signs of acute UUTI should be treated with ciprofloxacin or co-amoxiclav for seven days.

☑ Patients should be admitted to hospital if systemic symptoms, such as fever, rigors, chills, vomiting or confusion appear.

Patients with long term indwelling catheters, who have the catheter changed before starting antibiotic treatment for symptomatic UTI, have a decreased duration of fever, are more likely to be cured or improved after three days and are less likely to have recurrence of acute symptoms within one month of treatment.[134] 1+

B **Patients with long term indwelling catheters should have the catheter changed before starting antibiotic treatment for symptomatic UTI.**

☑ Urine should be taken for culture before the catheter is changed and treatment is started. Treatment should be changed if the organism is resistant to the chosen antibiotic.

5.4.2 ASYMPTOMATIC BACTERIURIA

Single dose antibiotic treatment of women with asymptomatic bacteriuria after short term catheterisation significantly reduces the risk of symptomatic episodes in the subsequent two weeks (number needed to benefit; NNTB 7, CI 4-25.[20] *For statistical methods see supplementary material section S1).* Given that the prevalence of bacteriuria should be <20%,[135] this means that over 100 women may need to be screened to prevent one symptomatic episode through treatment. Several studies addressed the cost effectiveness of screening for asymptomatic bacteriuria in catheterised patients *(see supplementary material section S4.3).* [89,135-137] 1+

B **Screening of women with asymptomatic bacteriuria after short term catheterisation is not recommended.**

There is inconsistent evidence of benefit from repeated treatment of asymptomatic bacteriuria in patients with long term catheters.[115,138,139] 1++ 1+ 1-

There is evidence that repeated treatment of asymptomatic bacteriuria increases the risk of colonisation by drug resistant bacteria.[139] 1++

B **Catheterised patients with asymptomatic bacteriuria should not receive antibiotic treatment.**

5.5 MANAGEMENT OF BACTERIAL UTI IN PATIENTS WITH URINARY STOMAS

There is no evidence to support the management of bacterial UTI in patients with urinary stomas but issues that affect catheterised patients are likely to apply. The prevalence of bacteriuria is likely to be 100% in patients with urinary stomas. Culture of urine from patients with symptoms suggestive of UTI should only be carried out to test the susceptibility of potential pathogens.

☑ Urine samples should only be sent for laboratory culture if the patient has clinical sepsis, not because the appearance or smell of the urine suggests that bacteriuria is present.

6 Information for discussion with patients and carers

6.1 NOTES FOR DISCUSSION WITH PATIENTS AND CARERS

The following points were drawn up by the guideline development group to reflect the issues most likely to be of concern to patients and carers following a diagnosis of suspected bacterial urinary tract infection in adult non-pregnant women. These points are provided for use by health professionals when discussing bacterial UTI with patients and in guiding the production of locally produced patient information materials.

6.2 KEY ISSUES

- There is a need to balance the accuracy of a diagnosis with the speed in which results (and treatment, if necessary) are delivered to the patient. Patients get very frustrated waiting for "official" results to merit treatment of a painful, uncomfortable situation that is preventing normal daily activities.
- Many professionals are interested in the accuracy of the assessment, in order not to prescribe inappropriate or unnecessary treatment, which can prolong symptoms.
- Patients are aware that dipsticks are not always accurate and that waiting for laboratory analysis can delay time to diagnosis and treatment.
- Patients know that factors such as their mood and communication of discomfort also are important in signalling infection.
- Patients perceive that the best healthcare professionals are those who consider the factors that the patient finds signal infection.
- Many patients want information and clear explanation of questions such as:

  'Why doesn't this treatment seem to be working?'

  'How long until I feel better?'

  'Can something alleviate my symptoms (and pain!) in the meantime, or at least ensure a level of comfort so that I can resume normal daily activities (for example, go to work, sleep at night)?'

  'What could happen if I don't comply fully (for example, if I forget to take the full course of treatment)?'

  'Will this drug react/interact with any other drugs/medicines/herbal medicines I am taking?'

6.3 GENERAL ADVICE

Healthcare professionals should offer:

- information on cranberries. Patients should be advised that further research is required to determine the best way to take cranberries, for example, juice, tablets, or a combination; in what concentration; routinely or preventatively; and how often (*see section 2.5.1*).
- advice on "complicated" versus "uncomplicated" infections. The distinction between a 3-day versus a 7-day course of pills and the reasons for using one or the other should also be explained to the patient. These issues could affect concordance.
- contraception advice. This and the role of sexual activity is a critical issue for women, and one which may affect concordance. This issue should be explicitly dealt with by healthcare professionals prescribing and dispensing treatment.
- a reminder to patients and carers that the presence of bacteriuria does not always indicate disease. Especially in elderly patients, asymptomatic bacteriuria is a normal condition and should not be treated with antibiotics.

Given that there is no conclusive association between lifestyle factors, such as diet, hydration, clothing, toileting activity and sexual activity, and susceptibility to bacterial UTI in adult, non-pregnant women, there is no evidence to support healthcare professionals giving routine advice to patients about lifestyle factors.[140-143] There may be a link between second UTI and sexual activity.[140]

☑ Routine advice about adopting or discontinuing any particular lifestyle factors should not be offered to patients with bacterial UTI.

☑ For an individual with recurrent and/or complicated urinary tract infection, healthcare professionals may wish to discuss the features of the patient's own situation which may particularly contribute to the problem.

6.4 SOURCES OF FURTHER INFORMATION FOR PATIENTS AND CARERS

Age Concern Scotland
13 Rose Street, Edinburgh EH2 3DT
Tel: 0131 220 3345 • Freephone information line: 0800 00 99 66
Website: www.ageconcernscotland.org.uk

Association for Continence Advice
Mr Jim Torrance, Chairman ACA Scotland, Borders Primary Care NHS Trust
Nursing Services, Dingleton Hospital, Melrose, Selkirkshire TD6 9HN
Tel: 01896 750027 • Fax: 01896 759491

A national organisation working towards raising standards of continence care with many professional members offering advice and treatment.

Bladder Pain Syndrome Association
54 Sutherland Road, Belvedere, Kent DA17 6JR
Tel: 0208 310 8729
Website: www.b-p-s-a.org.uk

Provides information and support to sufferers of bladder pain syndromes (including interstitial cystitis and other related disorders/syndromes).

Continence Foundation
307 Hatton Square, 16 Baldwins Gardens, London EC1N 7RJ
Tel: 020 7404 6875 • Helpline: 020 7831 9831 • Fax: 020 7404 6876
Email: continence.foundation@dial.pipex.com • Website: www.continence-foundation.org.uk

Offers expert advice to people with bladder and bowel problems, their carers and professionals in the field. The nurses who run the helpline also have details of all incontinence advice services and of all products on the UK market.

Cystitis and Overactive Bladder Foundation
76 High Street, Stony Stratford, Buckinghamshire MK11 1AH
Tel: 0190 856 9169
Website: www.cobfoundation.org

Provides information, leaflets and support to people with all forms of lower urinary tract infection and overactive bladders.

Family Planning and Reproductive Health Care
The Sandyford Initiative, 6 Sandyford Place, Sauchiehall Street, Glasgow G3 7NB
Tel: 0141 211 8600

Family Planning Association Scotland
Unit 10, Firhill Business Centre, 76 Firhill Road, Glasgow G20 7BA
Tel: 0141 576 5088 • Helpline: 0141 576 5088
(Monday to Thursday 9am - 5pm, Friday 9am - 4.30pm)

Incontact (National Action on Incontinence)
Ms Cathy McKerrell, Project Manager (Scotland), 31 Brownshill Avenue,
Coatbridge, Lanarkshire ML5 5JF
Tel: 0870 770 3248 • Fax 0870 770 3248
Email: cathy@incontact.org • Website: www.incontact.org

Aims to provide information and support to people affected by bladder and bowel continence problems, to increase awareness about incontinence difficulties and encourage those affected to seek professional help.

National Childbirth Trust
Alexandra House, Oldham Terrace, Acton, London W3 6NH
Tel: 0870 7703236 • Enquiry Line: 0870 444 8707 • Fax: 0870 770 3237
Email: enquiries@national-childbirth-trust.co.uk • Website: www.nctpregnancyandbabycare.com

National Kidney Federation
Helpline: 0845 601 02 09

A charity run by kidney patients for kidney patients, it provides patient support services to patients and their families.

NHS24
Tel: 0854 24 24 24 • Textphone: 18001 0854 24 24 24
Website: www.nhs24.com

NHS 24 is a nurse-led helpline providing confidential healthcare advice and information.

PRODIGY
Website: www.prodigy.nhs.uk

A source of evidence based clinical knowledge about the common conditions and symptoms managed by primary healthcare professionals. Patient information leaflets form an integral part of PRODIGY.

Urostomy Association
Hazel Pixley, National Secretary, Central Office, 18 Foxglove Avenue, Uttoxeter,
Staffordshire ST14 8UN
Tel: 0870 770 7931 • Fax: 0870 770 7932
Email: infor.u.a@classmail.co.uk • Website: www.uagbi.org

Women's Health Concern Ltd.
Whitehall House, 41 Whitehall, London SW1A 2BY
Tel: 020 7451 1377
Email: info@womens-health-concern.org • Website: www.womens-health-concern.org

Women's Health
52 Featherstone Street, London EC1Y 8RT
Helpline: 020 7251 6333 (9.30am –1.30pm weekdays) • Fax: 020 7250 4152
Email: womenshealth@pop3.poptel.org.uk • health@womenshealthlondon.org.uk
Website: www.womenshealthlondon.org.uk

7 Recommendations for implementation, audit, surveillance and research

7.1 LOCAL IMPLEMENTATION

Implementation of national clinical guidelines is the responsibility of local NHS organisations and is an essential part of clinical governance. It is acknowledged that not every guideline can be implemented immediately on publication, but mechanisms should be in place to ensure that the care provided is reviewed against the guideline recommendations and the reasons for any differences assessed and, where appropriate, addressed. These discussions should involve both clinical staff and management. Local arrangements may then be made to implement the national guideline in individual hospitals, units and general practices, and to monitor compliance. This may be done by a variety of means including patient-specific reminders, continuing education and training, and clinical audit. Implementing the new general practice contract will provide opportunities to introduce such elements of good practice.

7.2 KEY AREAS FOR AUDIT

7.2.1 KEY AREAS FOR AUDIT IN PRIMARY CARE

The management of patients with acute urinary symptoms should be audited against the appropriate algorithm (*see Annexes 1 to 4*).

7.2.2 KEY AREAS FOR AUDIT IN SECONDARY CARE

- Audit of clinical evidence of infection in patients with long term catheters who have been treated with antibiotics or had catheter urine samples sent for culture.
- Audit of elderly patients (typically confused, with a cough, who are positive for nitrite in the urine) treated with augmentin or equivalent and frusemide (so called elderly "coamilofrus" regimen) with no documented evidence of symptoms of UUTI or LUTI.

7.3 IMPLEMENTATION AND AUDIT OF THE RECOMMENDATIONS

7.3.1 MANAGEMENT OF BACTERIAL UTI IN ADULT WOMEN

		Recommendation	Implementation or audit
2.1	C	**In otherwise healthy women presenting with symptoms or signs of UTI, empirical treatment with an antibiotic should be considered.**	Implementation of care pathways in primary and secondary care including minimum data to be recorded in assessing a woman with symptoms of LUTI. Audit of practice against care pathway.
2.1	C	**In women with symptoms of vaginal itch or discharge, explore alternative diagnoses and consider pelvic examination.**	
2.1	☑	In patients presenting with symptoms or signs of UTI who have a history of fever or back pain the possibility of UUTI should be considered. Empirical treatment with an antibiotic should be started and urine culture performed to guide the choice of antibiotic.	
2.2.2	☑	Urine microscopy should not be undertaken in clinical settings in primary or secondary care.	Environmental infection control audits in primary and secondary care should ensure that urine microscopy is not being undertaken.

		Recommendation	Implementation or audit
2.2.3	B	**Dipstick tests should only be used to diagnose bacteriuria in women with limited symptoms and signs (no more than two symptoms).**	Implementation of care pathways in primary and secondary care including minimum data to be recorded in assessing a woman with symptoms of LUTI. Audit of practice against care pathway
2.2.3	B	**Women with limited symptoms of UTI who have negative dipstick urinalysis (LE or nitrite) should be offered empirical antibiotic treatment.**	
2.2.3	B	**The risks and benefits of empirical treatment should be discussed with the patient and managed accordingly.**	
2.2.3	B	**If a woman remains symptomatic after a single course of treatment, she should be investigated for other potential causes.**	
2.2.3	☑	In elderly patients (over 65 years of age), diagnosis should be based on a full clinical assessment, including vital signs.	
2.4.1	A	**Non-pregnant women with symptoms or signs of acute LUTI and either high probability of or proven bacteriuria should be treated with antibiotics.**	
2.4.1	B	**Non-pregnant women of any age with symptoms or signs of acute LUTI should be treated with trimethoprim or nitrofurantoin for three days.**	Measurement of length of treatment with trimethoprim or nitrofurantoin on "PRISMS for Practices" project, comparison of local practices' percentage of three day courses with national data. Percentage of prescribed courses of trimethoprim or nitrofurantoin for LUTI that are for three days
2.4.1	B	**Patients who do not respond to trimethoprim or nitrofurantoin should have urine taken for culture to guide change of antibiotic.**	Audit of management of patients with repeat visits within 28 days of prescription of trimethoprim for LUTI.
2.4.1	☑	Quinolones should not be used for empirical treatment of LUTI.	Percentage of LUTI treated with quinolones with no prior episode of UTI in the past 28 days and no urine culture sent.
2.4.2	A	**Non-pregnant women with symptoms or signs of acute UUTI should be treated with ciprofloxacin for seven days.**	Implementation of care pathway for UUTI in primary and secondary care with audit of practice against recommendations.
2.4.2	D	**Urine should be taken for culture before immediate empirical treatment is started and treatment changed if there is an inadequate response to the antibiotic.**	
2.4.3	A	**Non-pregnant women with asymptomatic bacteriuria should not receive antibiotic treatment.**	Percentage of women treated in secondary care for "UTI" with no documented evidence of symptoms of UUTI or LUTI.
2.4.3	A	**Elderly women (over 65 years of age) with asymptomatic bacteriuria should not receive antibiotic treatment.**	

7.3.2 MANAGEMENT OF BACTERIAL UTI IN PREGNANT WOMEN

		Recommendation	Implementation or audit
3.1.3	A	**Standard quantitative urine culture should be performed routinely at first antenatal visit**	Care pathway for detection and management of asymptomatic bacteriuria of pregnancy with audit against targets.
3.1.3	A	**The presence of bacteriuria in urine should be confirmed with a second urine culture.**	
3.1.3	A	**Dipstick testing should not be used to screen for bacterial UTI at first or subsequent antenatal visits.**	
3.1.3	☑	Dipsticks to test only for proteinuria and the presence of glucose in the urine should be used for screening at the first and subsequent antenatal visits as a more cost-effective alternative to multi-reagent dipsticks that detect the presence of nitrite, leucocyte esterase and blood in addition to protein and glucose.	Removal of dipsticks for leucocytes and nitrites from antenatal clinics.
3.2.1	B	**Pregnant women with symptomatic UTI should be treated with an antibiotic.**	Care pathway for detection and management of asymptomatic bacteriuria of pregnancy with audit against targets.
3.2.1	☑	Given some antibiotics are toxic in pregnancy, refer to the British National Formulary (BNF) for contraindications.	
3.2.1	☑	A single urine sample should be taken for culture before empiric antibiotic treatment is started.	
3.2.1	☑	Given the risks of symptomatic bacteriuria in pregnancy, a urine culture should be performed seven days after completion of antibiotic treatment as a test of cure.	
3.2.1 and 3.2.2	☑	Refer to local guidance for the safest, cheapest, effective antibiotic for pregnant women.	Audit of antibiotics prescribed to pregnant women against local guidance.
3.2.2	A	**Asymptomatic bacteriuria detected during pregnancy should be treated with an antibiotic.**	Care pathway for detection and management of asymptomatic bacteriuria of pregnancy with audit against targets.
3.3	C	**Women with bacteriuria confirmed by a second urine culture should be treated and have repeat urine culture at each antenatal visit until delivery.**	
3.3	☑	Women who do not have bacteriuria in the first trimester should not have repeat urine cultures.	

7.3.3 MANAGEMENT OF BACTERIAL UTI IN PATIENTS WITH CATHETERS

		Recommendation	Implementation or audit
5.1	D	**Clinical symptoms or signs are not recommended for predicting the likelihood of symptomatic UTI in catheterised patients.**	Care pathway for diagnosis of symptomatic UTI in catheterised patients with audit against practice.
5.1	☑	In a catheterised patient who presents with a fever: ▪ look for associated localising (loin or suprapubic tenderness) or systemic features ▪ exclude other potential sources of infection ▪ send off an appropriately taken urine sample for culture to determine the infecting organism and susceptibilities ▪ consider antibiotic therapy taking into account the severity of the presentation and any comorbid factors.	
5.1 and 5.5	☑	Urine samples from patients with catheters or ureteric stomas should only be sent for laboratory culture if the patient has clinical sepsis, not because the appearance or smell of the urine suggests that bacteriuria is present.	Audit of clinical evidence of infection in patients with long term catheters or ureteric stomas who have been treated with antibiotics or had urine samples sent for culture.
5.2.1	C	**Laboratory microscopy for diagnosing UTI in catheterised patients is not recommended.**	Care pathway for diagnosis of symptomatic UTI in catheterised patients with audit against practice.
5.2.2	B	**Dipstick testing should not be used to diagnose UTI in catheterised patients.**	
5.3	A	**Antibiotic prophylaxis is not recommended for the prevention of symptomatic UTI in catherised patients.**	Percentage of patients with long term catheters who receive antibiotics with no clinical evidence of symptomatic UTI.
5.4.1	☑	Catheterised patients with symptoms or signs of acute UUTI should be treated with ciprofloxacin or co-amoxiclav for seven days.	Antibiotic selection for patients with symptomatic UTI compared with local policy recommendations.
5.4.1	☑	Urine should be taken for culture before treatment is started, treatment should be changed if the organism is resistant to the chosen antibiotic.	
5.4.1	B	**Patients with long term indwelling catheters should have the catheter changed before starting antibiotic treatment for symptomatic UTI.**	Audit of catheter change prior to commencing antibiotic.
5.4.2	B	**Catheterised patients with asymptomatic bacteriuria should not receive antibiotic treatment.**	Audit of clinical evidence of infection in patients with long term catheters or ureteric stomas who have been treated with antibiotics or had urine samples sent for culture.

7.4 RECOMMENDATIONS FOR SURVEILLANCE

There should be routine sampling of urine for culture from all patients presenting with acute urinary symptoms in some selected practices to establish the true level of resistance in bacteria causing acute UTI in general practice. Primary research may be required to provide evidence to support details of surveillance (for example, sample sizes, frequency of surveillance studies and geographical location of practices).

There should be surveillance of catheter associated urinary tract infection (CAUTI) using the Scottish Surveillance of Healthcare Associated Infection Programme (SSHAIP) developed audit tool (www.show.scot.nhs.uk/scieh/) to allow measurement of catheterisation and catheter care practice against the best practice statement "Urinary Catheterisation and Catheter Care" [144] which was developed and implemented by the Scottish Ministerial Healthcare Associated Infection (HAI) Task Force.

7.4.1 USEFUL WEBSITES FOR SURVEILLANCE AND INFECTION CONTROL

NHS Scotland e-library HAI Managed Knowledge Network portal: www.elib.scot.nhs.uk

British Society for Antimicrobial Chemotherapy (BSAC): www.bsac.org.uk/

SACAR (Department of Health's Specialist Advisory Committee on Antimicrobial Resistance): www.advisorybodies.doh.gov.uk/sacar

National Electronic Library of Infection: www.neli.org.uk

7.5 RECOMMENDATIONS FOR RESEARCH

- What is the risk of misdiagnosis, including STDs, after patients with suspected UTI have telephone consultation and antibiotic prescribing by nurse practitioners?
- How effective are near patient tests when compared to a reliable method for diagnosing asymptomatic bacteriuria in pregnant women?
- Which antibiotics are most effective for prevention and treatment of recurrent UTI in men?
- Are cranberry products effective for prevention and treatment of recurrent UTI in men?
- Is methenamine prophylaxis effective for the prevention of symptomatic UTI in elderly, institutionalised, catheterised patients?
- What are the most effective ways of questioning patients to elicit the most relevant information to aid diagnosis and treatment?
- What are the most effective methods of communication between healthcare professionals and patients about symptoms and factors that relate to a potential infection?
- What is the impact of UTI and its treatment (including side effects) on patients' quality of life?
- What are patients' attitudes and expectations towards treatment and what personal strategies do they have for self care?

8 Development of the guideline

8.1 INTRODUCTION

SIGN is a collaborative network of clinicians, other healthcare professionals and patient organisations and is part of NHS Quality Improvement Scotland. SIGN guidelines are developed by multidisciplinary groups using a standard methodology based on a systematic review of the evidence. Further details about SIGN and the guideline development methodology are contained in "SIGN 50; A Guideline Developer's Handbook", available at **www.sign.ac.uk**

8.2 THE GUIDELINE DEVELOPMENT GROUP

Professor Peter Davey (Chair)	*Professor of Pharmoeconomics, Medicines Monitoring Unit, Ninewells Hospital and Medical School, Dundee*
Dr Derek Byrne	*Consultant Surgeon and Urologist, Ninewells Hospital and Medical School, Dundee*
Ms Norma Craig	*Lead Nurse - Continence, Whitehills Health and Community Care Centre, Forfar*
Dr David Evans	*Consultant Obstetrician, Dr Gray's Hospital, Elgin*
Professor Tom Fahey	*Professor of General Practice, University of Dundee*
Dr Ian Gould	*Consultant in Clinical Microbiology, Aberdeen Royal Infirmary*
Mr Robin Harbour	*Quality and Information Director, SIGN*
Ms Karen Harkness	*Principal Pharmacist, Ninewells Hospital and Medical School, Dundee*
Dr Roberta James	*Programme Manager, SIGN*
Ms Brin Jardine	*Lay representative, Edinburgh*
Dr Ross Langlands	*General Practitioner, Newton Port Surgery, East Lothian*
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Professor Dilip Nathwani	*Consultant Physician, Infection Unit, Ninewells Hospital and Medical School, Dundee*
Dr Erica Peters	*Special Registrar in Infectious Diseases, Brownlea Centre, Gartnavel Hospital, Glasgow*
Ms Valerie Sillito	*Community Pharmacist, Woodend Hospital, Aberdeen*
Ms Doreen Simpson	*Community Staff Nurse, Green Street Surgery, Forfar*

The membership of the guideline development group was confirmed following consultation with the member organisations of SIGN. All members of the guideline development group made declarations of interest and further details of these are available on request from the SIGN Executive. Guideline development and literature review expertise, support and facilitation were provided by the SIGN Executive.

8.3 ACKNOWLEDGEMENTS

SIGN is grateful to the following former members of the guideline development group and others who have contributed to the development of this guideline.

Ms Fiona Brandt	*Practice Nurse, Aberlour*
Dr Ali El-Ghorr	*Programme Manager, SIGN*
Dr Michael Power	*Clinical Knowledge Author, Guideline Developer and Informatician, Prodigy Knowledge, Newcastle*
Dr Kate Woodman	*Lay representative, Edinburgh*

8.4 SYSTEMATIC LITERATURE REVIEW

The evidence base for this guideline was synthesised in accordance with SIGN methodology. A systematic review of the literature was carried out using an explicit search strategy devised by the SIGN Information Officer in collaboration with members of the guideline development group.

Literature searches were initially conducted in Medline, Embase, Cinahl, and the Cochrane Library using the year range 1994-2002. The literature search was extended from 1966-2003 for RCTs and diagnostic studies. The National Economic Evaluation Database (NEED) was searched for economic studies to cover the period up to January 2004. Key websites on the Internet were also searched. These searches were supplemented by the reference lists of relevant papers and group members' own files. The Medline version of the main search strategies can be found on the SIGN website.

8.5 CONSULTATION AND PEER REVIEW

8.5.1 NATIONAL OPEN MEETING

A national open meeting is the main consultative phase of SIGN guideline development, at which the guideline development group presents its draft recommendations for the first time. The national open meeting for this guideline was held on 30 April 2004 and was attended by representatives of all the key specialties relevant to the guideline. The draft guideline was also available on the SIGN website for a limited period at this stage to allow those unable to attend the meeting to contribute to the development of the guideline.

8.5.2 SPECIALIST REVIEW

This guideline was also reviewed in draft form by the following independent expert referees, who were asked to comment primarily on the comprehensiveness and accuracy of interpretation of the evidence base supporting the recommendations in the guideline. SIGN is very grateful to all of these experts for their contribution to the guideline.

Dr James Beattie	*Director of Guidelines Development, Royal College of General Practitioners/General Practitioner, Aberdeenshire*
Mr Graeme Conn	*Consultant Urological Surgeon, Southern General Hospital, Glasgow*
Mrs Beatrice Grant	*Lay Reviewer, Larbert*
Dr Mary Hanson	*Consultant Microbiologist, Western General Hospital, Edinburgh*
Dr Diana Holton	*Hospital Practitioner, Roodlands Hospital, East Lothian*
Ms Cathy McKerrell	*Project Manager (Scotland), Incontact, Lanarkshire*
Dr Allan Merry	*General Practitioner, South Beach Surgery, Ardrossan*
Dr Dorothy Moir	*Director of Public Health, NHS Lanarkshire*
Professor Sigvard Molstad	*Professor of General Practice, Primärvardens FoU-enhet, Sweden*
Dr Lindsay Nicolle	*Professor of Internal Medicine and Medical Microbiology, University of Manitoba, Canada*
Dr Ewan Olson	*Consultant Microbiologist, Royal Infirmary of Edinburgh*
Professor Raul Raz	*Director, Infectious Diseases Unit, Haemek Medical Centre, Israel*
Dr Maureen Simpson	*General Practitioner, Townhead Practice, Montrose*
Professor Francisco Soriano	*Professor of Microbiology, Fundacion Jimenez Diaz, Madrid*
Dr Charles Swainson	*Medical Director, Lothian NHS Board, Edinburgh*
Dr Alex Watson	*General Practitioner, West Gate Health Centre, Dundee*
Dr Craig Williams	*Consultant Medical Microbiologist, Yorkhill NHS Trust, Glasgow*

8.5.3 SIGN EDITORIAL GROUP

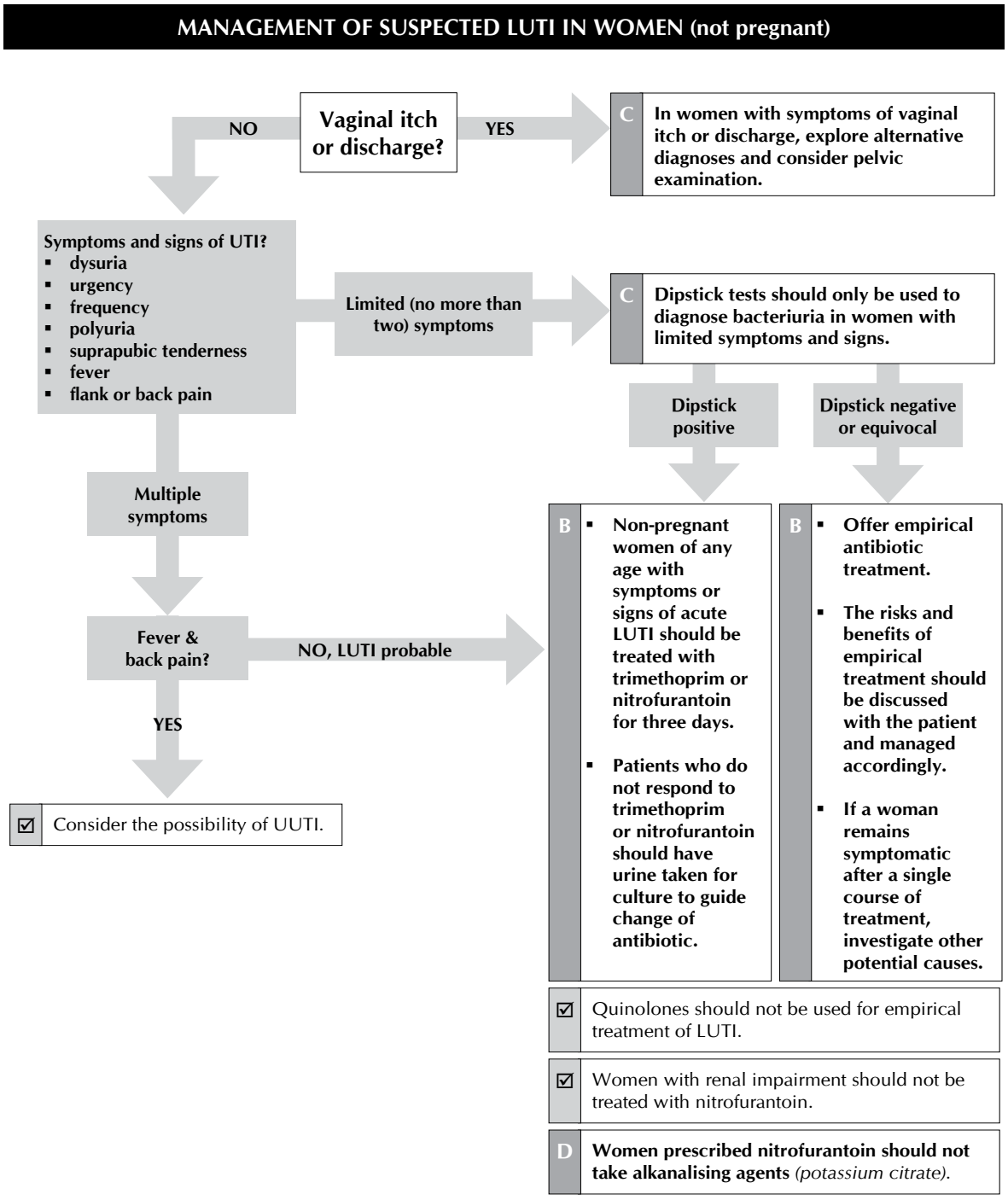
As a final quality control check, the guideline is reviewed by an editorial group comprising the relevant specialty representatives on SIGN Council to ensure that the specialist reviewers' comments have been addressed adequately and that any risk of bias in the guideline development process as a whole has been minimised. The editorial group for this guideline was as follows:

Professor Gordon Lowe	*Chair of SIGN; Co-Editor*
Dr David Alexander	*General Practitioner, Nethertown Surgery, Dunfermline*
Dr Bill Reith	*Royal College of General Practitioners, General Practitioner, Aberdeen*
Dr Safia Qureshi	*SIGN Programme Director; Co-Editor*
Dr Sara Twaddle	*Director of SIGN; Co-Editor*

Abbreviations

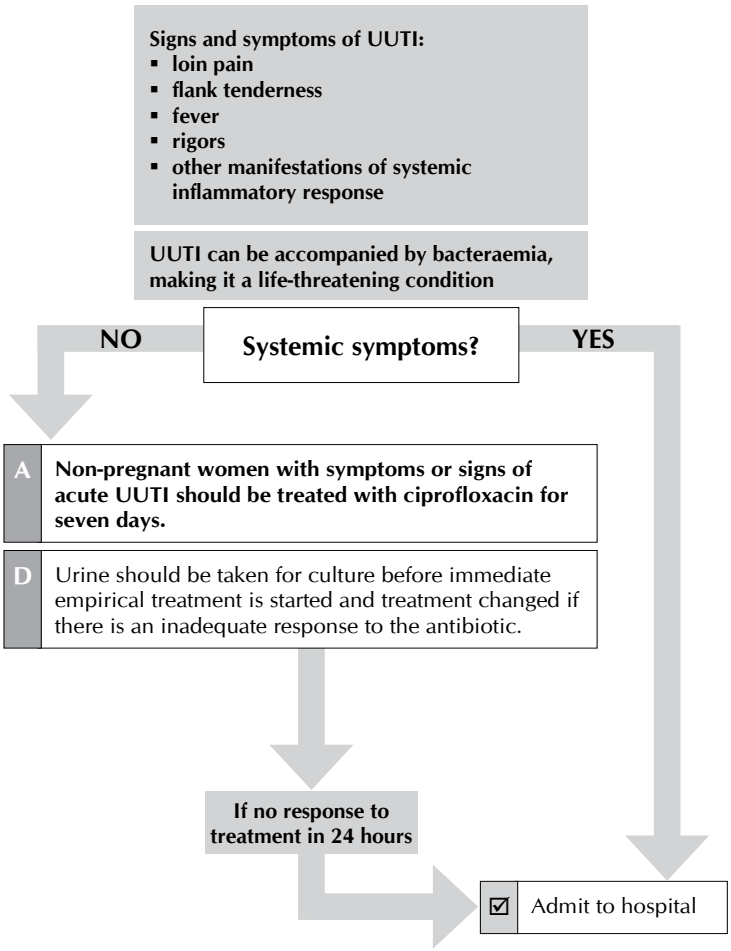
BNF	British National Formulary
BSAC	British Society for Antimicrobial Chemotherapy
CAUTI	catheter associated urinary tract infection
CBA	controlled before and after study
cfu	colony forming units
CI	confidence interval
CSM	Committee on Safety of Medicines
CSU	catheter specimen of urine
GP	general practitioner
HAI	healthcare associated infection
HPA	Health Protection Agency
IDSA	Infectious Diseases Society of America
INR	International Normalized Ratio
KUB	kidneys, ureters and bladder
LE	leucocyte esterase
LUTI	lower urinary tract infection
MIC	minimum inhibitory concentration
MSU	midstream specimen of urine
NeLI	National electronic Library of Infection
NNT	number needed to treat
NNTB	number needed to benefit
NNTH	number needed to harm
PPROM	pre-labour, premature rupture of membranes
PPV	positive predictive value
QALY	quality adjusted life year
RCT	randomised controlled trial
SACAR	Department of Health's Specialist Advisory Committee on Antimicrobial Resistance
SIGN	Scottish Intercollegiate Guidelines Network
SPA	suprapubic aspirate
SSHAIP	Scottish Surveillance of Healthcare Associated Infection Programme
STD	sexually transmitted disease
UTI	urinary tract infection
UUTI	upper urinary tract infection
WBC	white blood cells

Annex 1


MANAGEMENT OF SUSPECTED LUTI IN WOMEN (not pregnant)
Vaginal itch or discharge?
NO
YES
C
In women with symptoms of vaginal itch or discharge, explore alternative diagnoses and consider pelvic examination.
Symptoms and signs of UTI?
dysuria
urgency
frequency
polyuria
suprapubic tenderness
fever
flank or back pain
Limited (no more than two) symptoms
C
Dipstick tests should only be used to diagnose bacteriuria in women with limited symptoms and signs.
Dipstick positive
Dipstick negative or equivocal
Multiple symptoms
Fever & back pain?
NO, LUTI probable
YES
B
Non-pregnant women of any age with symptoms or signs of acute LUTI should be treated with trimethoprim or nitrofurantoin for three days.
Patients who do not respond to trimethoprim or nitrofurantoin should have urine taken for culture to guide change of antibiotic.
B
Offer empirical antibiotic treatment.
The risks and benefits of empirical treatment should be discussed with the patient and managed accordingly.
If a woman remains symptomatic after a single course of treatment, investigate other potential causes.
Consider the possibility of UUTI.
Quinolones should not be used for empirical treatment of LUTI.
Women with renal impairment should not be treated with nitrofurantoin.
D
Women prescribed nitrofurantoin should not take alkanalising agents (potassium citrate).

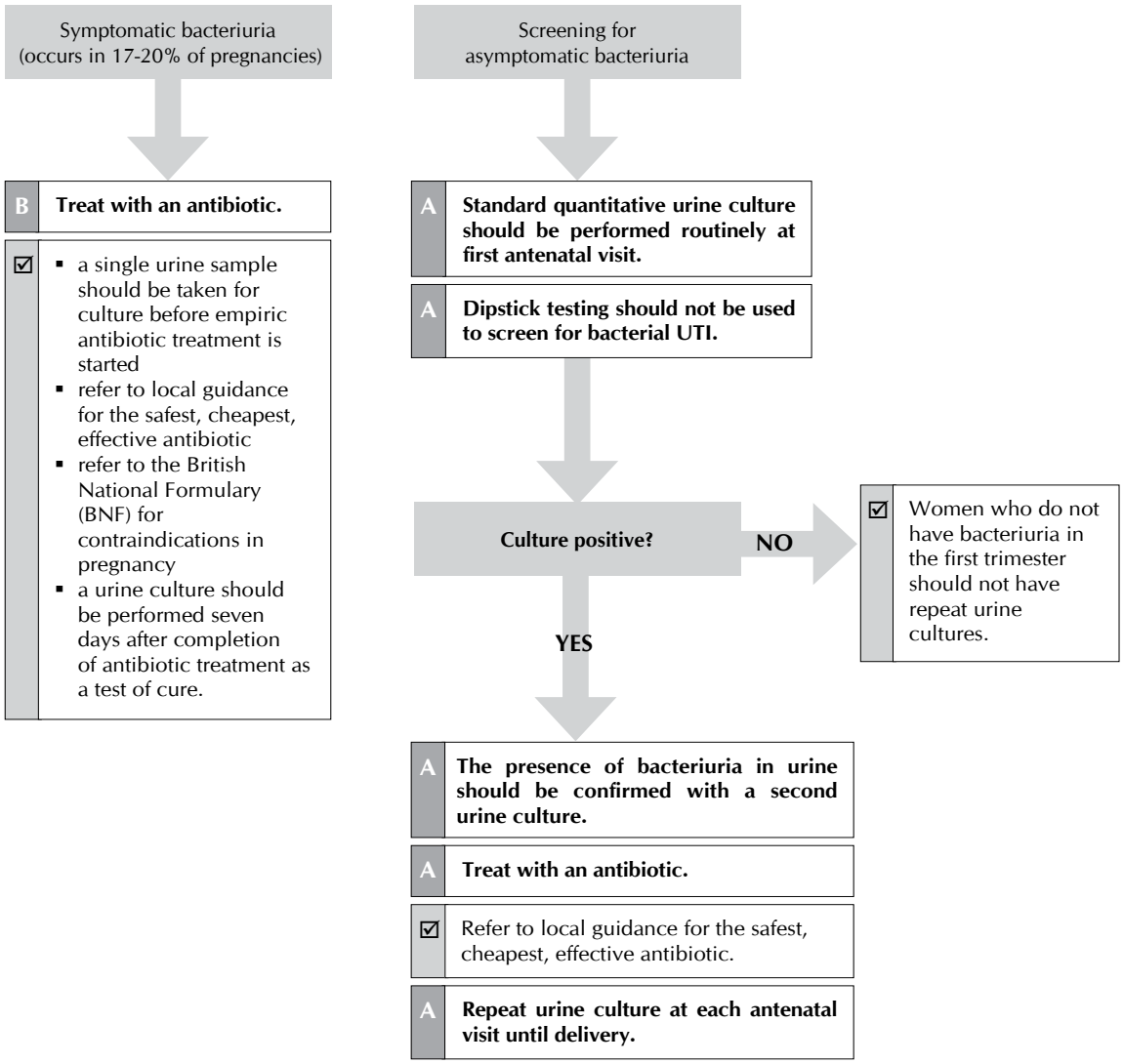
Annex 2

MANAGEMENT OF SUSPECTED UUTI IN WOMEN (not pregnant)



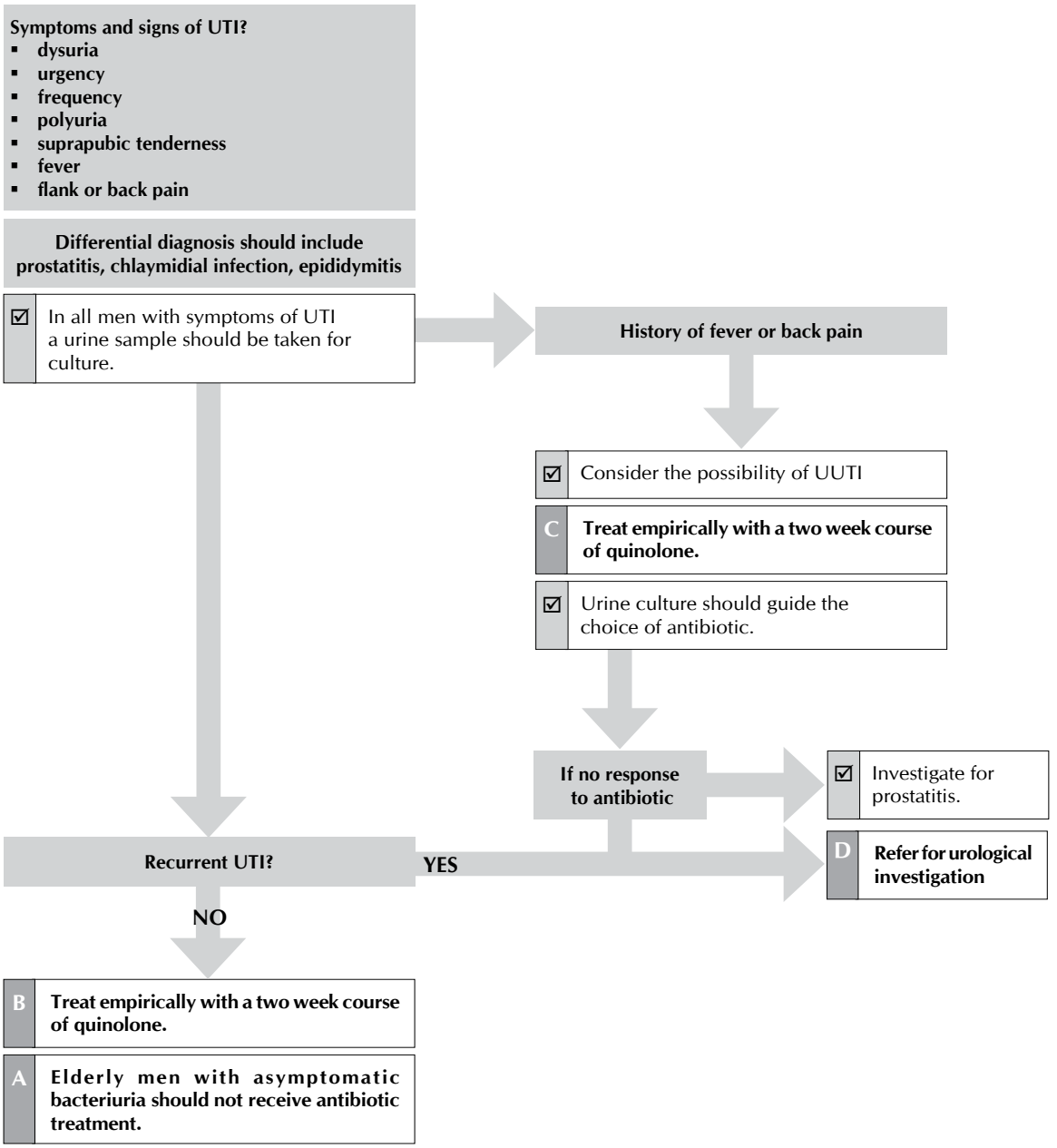
Annex 3

MANAGEMENT OF SUSPECTED LUTI IN PREGNANT WOMEN



Annex 4

MANAGEMENT OF SUSPECTED UTI IN ADULT MEN



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MANAGEMENT OF SUSPECTED BACTERIAL URINARY TRACT INFECTION IN ADULTS

MANAGEMENT OF SUSPECTED LUTI IN WOMEN (not pregnant)

Vaginal itch or discharge?

NO

YES

C In women with symptoms of vaginal itch or discharge, explore alternative diagnoses and consider pelvic examination.

Symptoms and signs of UTI?
- dysuria
- urgency
- frequency
- polyuria
- suprapubic tenderness
- fever
- flank or back pain

Limited (no more than two) symptoms

C Dipstick tests should only be used to diagnose bacteriuria in women with limited symptoms and signs.

Dipstick positive

Dipstick negative or equivocal

Multiple symptoms

Fever & back pain?

NO, LUTI probable

YES

☑ Consider the possibility of UUTI.

B
- Non-pregnant women of any age with symptoms or signs of acute LUTI should be treated with trimethoprim or nitrofurantoin for three days.
- Patients who do not respond to trimethoprim or nitrofurantoin should have urine taken for culture to guide change of antibiotic.

B
- Offer empirical antibiotic treatment.
- The risks and benefits of empirical treatment should be discussed with the patient and managed accordingly.
- If a woman remains symptomatic after a single course of treatment, investigate other potential causes.

☑ Quinolones should not be used for empirical treatment of LUTI.

☑ Women with renal impairment should not be treated with nitrofurantoin.

D **Women prescribed nitrofurantoin should not take alkanalising agents** *(potassium citrate)*.

MANAGEMENT OF SUSPECTED UUTI IN WOMEN (not pregnant)

Signs and symptoms of UUTI:
- loin pain
- flank tenderness
- fever
- rigors
- other manifestations of systemic inflammatory response

UUTI can be accompanied by bacteraemia, making it a life-threatening condition

NO

Systemic symptoms?

YES

A Non-pregnant women with symptoms or signs of acute UUTI should be treated with ciprofloxacin for seven days.

D Urine should be taken for culture before immediate empirical treatment is started and treatment changed if there is an inadequate response to the antibiotic.

If no response to treatment in 24 hours

☑ Admit to hospital