National Institute for Health and Care Excellence

Final

Prostatitis (acute): antimicrobial prescribing guideline

Evidence review

NICE guideline 110

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1 Context

1.1 Background

1.1.1 Overview

Acute bacterial prostatitis is a potentially serious bacterial infection of the prostate, which is accompanied by infection of the urinary tract and may be associated with epididymitis or urethritis. It can occur spontaneously, or following urethral instrumentation or prostate biopsy, trauma, bladder outflow obstruction, or dissemination of infection from elsewhere in the body (NICE Clinical Knowledge Summary: prostatitis – acute [2014]; National guidelines for the management of prostatitis, British Association for Sexual Health and HIV [BASHH] [2001]; Sexually transmitted infections in primary care, Royal College of General Practice [RCGP]/BASHH [2013]).

Prostatitis is stratified into 4 categories, with category I being acute bacterial prostatitis (which is rare). Category II is chronic bacterial prostatitis (which accounts for less than 5% of all prostatitis diagnoses). Category III is chronic prostatitis or chronic pelvic pain syndrome (which accounts for more than 90% all prostatitis diagnoses); and category IV is asymptomatic inflammatory prostatitis (Sexually transmitted infections in primary care, RCGP/BASHH, 2013).

In some studies a distinction has been made between spontaneous acute bacterial prostatitis and prostate biopsy-related acute bacterial prostatitis. An observational study by Kim et al. (2015) in patients (n=135) hospitalised in Korea for acute prostatitis identified that acute prostatitis acquired after biopsy is associated with a greater risk of serious infectious complications and is less likely to respond to antibiotic treatment due to higher levels of antibiotic resistance compared with spontaneous acute prostatitis.

Etienne et al (2008) outlined in their retrospective multicentre survey in France (n=371) that community-acquired acute bacterial prostatitis was 3 times more common than hospital-acquired acute bacterial prostatitis.

Acute bacterial prostatitis is caused by urinary tract pathogens, most commonly gram negative organisms such as *Escherichia coli* (*E. coli*), *Proteus species*, *Klebsiella species* and *Pseudomonas species*. Other pathogens include *Enterococci*, *Staphylococcus aureus*, and rarely *Bacteroides species*. Rarely acute prostatitis can occur secondary to a sexually transmitted infection such as chlamydia, gonorrhoea or Trichomonas. Men who have acute prostatitis following manipulation or instrumentation are more likely to be infected with pathogens other than *E. coli*, have multiple infections, and develop a prostatic abscess (Prostatitis – acute, NICE Clinical Knowledge Summary, 2014; National guidelines for the management of prostatitis, BASHH, 2001; Sexually transmitted infections in primary care, RCGP/BASHH; European Association of Urology guidelines on urological infections, 2017).

Complications of acute prostatitis include acute urinary retention secondary to prostatic oedema, chronic prostatitis, prostatic abscess, bacteraemia, epididymitis and pyelonephritis. Around 10% of men with acute bacterial prostatitis will later develop chronic prostatitis and about 2% will develop a prostatic abscess (Prostatitis – acute, NICE Clinical Knowledge Summary, 2014; National guidelines for the management of prostatitis, BASHH, 2001; Sexually transmitted infections in primary care, RCGP/BASHH, 2013; European Association of Urology guidelines on urological infections, 2017, Lipsky et al. 2010).

1.1.2 Diagnosis

Acute bacterial prostatitis is diagnosed based on clinical symptoms and signs, and positive urine cultures. It should be suspected in a man who presents with (Prostatitis – acute, NICE Clinical Knowledge Summary, 2014; National guidelines for the management of prostatitis, BASHH, 2001; Sexually transmitted infections in primary care, RCGP/BASHH, 2013):

- feverish illness of sudden onset
- symptoms of prostatitis including low back pain, suprapubic pain, and perineal, penile or sometimes rectal pain
- symptoms of urinary tract infection including dysuria, frequency, or urgency, or acute urinary retention
- exquisitely tender prostate on rectal examination.

Diagnostics for acute bacterial prostatitis include a mid-stream urine sample for dipstick testing, then culture for bacteria and antibiotic sensitivity. Blood cultures for bacteria and antibiotic sensitivity may also be required if the man presents with clinical signs suggesting bloodstream infection (Prostatitis – acute, NICE Clinical Knowledge Summary, 2014; National guidelines for the management of prostatitis, BASHH, 2001; Sexually transmitted infections in primary care, RCGP/BASHH, 2013). A study by Etienne et al. (2008) suggested that urine dipstick testing (for nitrites and leukocytes) in acute prostatitis has a positive predictive value of approximately 95%, but a negative predictive value of approximately 70%. Therefore other conditions with similar presentations should also be considered when making a diagnosis of acute prostatitis, such as sexually transmitted infections, prostatic abscess, chronic prostatitis (if the symptoms have been present for several weeks or months), lower or upper urinary tract infection (if there are no symptoms suggesting that the prostate is affected).

It is recommended not to collect prostatic secretions as prostatic massage could lead to septicaemia or a prostatic abscess, and may be very painful. Prostatic secretions are not needed for the diagnosis because infection is confirmed with urine culture (Prostatitis – acute, NICE Clinical Knowledge Summary, 2014; National guidelines for the management of prostatitis, BASHH, 2001; Sexually transmitted infections in primary care, RCGP/BASHH, 2013).

1.1.3 Prognostic factors

Boeri et al. (2017) outlined in a retrospective univariate and multivariate analysis that a history of urinary tract infection or prostatitis, presence of comorbidities, and recent use of antibiotics were significant predictors of infectious complications after prostatic biopsy. Lee et al. (2015) outlined in a retrospective cohort study that large prostate volume was a statistically significant risk factor for infectious complications after prostatic biopsy (OR 1.008, 95%CI 1.001 to 1.015; p=0.021).

Etienne et al. (2008) outlined in their retrospective multicentre survey in France (n=371) that there was a significant difference in the rates of bacteriological failure at follow-up between community-acquired and hospital-acquired acute bacterial prostatitis (19% versus 48%, respectively; p=0.002) and that those aged 49 and over had a significantly higher risk of clinical failure at follow-up compared with those under 49 (90% versus 60%, respectively; p<0.0001).

1.2 Managing infections that require antibiotics

Acute bacterial prostatitis is not a self-limiting infection and will require antibiotic therapy. In some instances the condition of the patient may necessitate prompt effective antibiotic

treatment within 1 hour of diagnosis (or as soon as possible) in patients who have sepsis or life threatening infection. In these patients therapy should not be delayed but urine and/or blood samples for culture should, if possible, be obtained prior to treatment.

In line with the Department of Health guidance (Start Smart Then Focus) and the NICE guideline on antimicrobial stewardship consider reviewing intravenous antibiotic prescriptions at 48 to 72 hours, documenting response to treatment and any available microbiology results to determine if the antibiotic should be continued or switched to a narrower spectrum or an oral antibiotic.

1.2.1 Self-care

The NICE guideline on antimicrobial stewardship: changing risk-related behaviours in the general population recommends that people should be given verbal advice and written information that they can take away about how to manage their infection themselves at home with self-care if it is safe to do so.

Self-care options that have been used to relieve pain in acute prostatitis include regular paracetamol or ibuprofen and, for severe pain, codeine with paracetamol. However, the combination of a fluoroquinolone antibiotic and a non-steroidal anti-inflammatory drug (NSAID) should be used with caution because there is a possible increased risk of convulsions when fluoroquinolones are given with NSAIDs (Prostatitis – acute, NICE Clinical Knowledge Summary, 2014; BNF August 2018).

1.2.2 Antibiotic prescribing strategies

The NICE guideline on antimicrobial stewardship: systems and processes for effective antimicrobial medicine use recommends that when antimicrobials are prescribed, prescribers should:

- Consider supplying antimicrobials in pack sizes that correspond to local (where available) and national guidelines on course lengths.
- Follow local (where available) or national guidelines on prescribing the shortest effective course, the most appropriate dose, and route of administration.
- Undertake a clinical assessment and document the clinical diagnosis (including symptoms) in the patient's record and clinical management plan.
- Document in the patient's records (electronically wherever possible):
  - the reason for prescribing an antimicrobial
  - the plan of care as discussed with the patient, their family member or carer (as appropriate), including the planned duration of any treatment.
- Take into account the benefits and harms for an individual patient associated with the particular antimicrobial, including:
  - possible interactions with other medicines or any food and drink
  - the patient's other illnesses, for example, the need for dose adjustment in a patient with renal impairment
  - any drug allergies (these should be documented in the patient's record)
  - the risk of selection for organisms causing healthcare associated infections, for example, *C. difficile*.
- Document in the patient's records the reasons for the any decision to prescribe outside local (where available) or national guidelines.

The NICE guideline on antimicrobial stewardship: changing risk-related behaviours in the general population recommends that resources and advice should be available for people

who are prescribed antimicrobials to ensure they are taken as instructed at the correct dose, via the correct route, for the time specified. Verbal advice and written information that people can take away about how to use antimicrobials correctly should be given, including:

- not sharing prescription-only antimicrobials with anyone other than the person they were prescribed or supplied for
- not keeping them for use another time
- returning unused antimicrobials to the pharmacy for safe disposal and not flushing them down toilets or sinks.

1.3 Safety netting advice

The NICE guideline on antimicrobial stewardship: changing risk-related behaviours in the general population recommends that safety netting advice should be shared with everyone who has an infection (regardless of whether or not they are prescribed or supplied with antimicrobials. This should include:

- how long symptoms are likely to last with and without antimicrobials
- what to do if symptoms get worse
- what to do if they experience adverse effects from the treatment
- when they should ask again for medical advice.

The NICE clinical knowledge summary on acute prostatitis suggests that men with acute prostatitis should undergo a reassessment in primary care after 24-48 hours to check symptoms are responding to treatment, and review the urinary culture result to ensure that the appropriate antibiotic is being used. An urgent referral to urology should be made if the infection is not responding to antibiotic treatment, and the man admitted to hospital if they become severely ill or symptoms are deteriorating despite antibiotic treatment. If a sexually transmitted infection is identified, an urgent referral to a genito-urinary medicine clinic should be made. Men should be advised to seek urgent medical advice if the condition deteriorates before the follow-up appointment. Following recovery, referral for investigation is suggested to exclude structural abnormality of the urinary tract.

1.4 Symptoms and signs of a more serious illness or condition (red flags)

The NICE clinical knowledge summary on acute prostatitis suggests that men with acute prostatitis should be admitted to hospital if they are unable to take oral antibiotics, are severely ill (see the NICE guideline on sepsis), or are in acute urinary retention (where suprapubic catheterisation is required). Urgent referral should also be considered for men who are immunocompromised, have diabetes, or have a pre-existing urological condition (such as benign prostatic hypertrophy or an indwelling catheter).

Prostatic abscess formation represents a rare but severe complication of acute prostatitis (Prostatitis - NHS choices). A retrospective study indicated that voiding disturbances and symptom duration were risk factors for abscess formation in men with acute prostatitis, and the presence of prostate abscess can result in longer treatment periods with antibiotics (Lee et al. 2016).

Approximately 10% of men with an episode of acute bacterial prostatitis will go on to have chronic bacterial prostatitis, and similarly, 10% will progress to have chronic prostatitis or chronic pelvic pain syndrome. Diabetes, prior manipulation, not doing cystostomy, urethral catheterisation and prostate volume were identified in a retrospective study as significant

factors ($p<0.05$) in the progression of acute prostatitis to chronic prostatitis (Yoon et al. 2012).

The BASHH national guidelines for the management of prostatitis (2001) recommend that if men with acute prostatitis fail to respond fully to antibiotic treatment, the diagnosis of a prostatic abscess should be considered. The guidelines state that if acute prostatitis is managed correctly the prognosis is good and cure likely, and at least 4 weeks of antibiotic therapy is recommended in all patients to try to prevent chronic bacterial prostatitis.

1.5 Current guidelines on managing acute prostatitis

Acute prostatitis is a potentially serious infection that requires antimicrobial treatment. However, evidence assessing the efficacy and safety of antimicrobial treatments for acute prostatitis, or the optimal dose, duration and route of administration has not been identified in current guidelines. Rather guidelines make recommendations based on expert consensus, overviews of the current literature on antimicrobial pharmacokinetics and prostate penetration, and antimicrobial resistance patterns, and other observational research. An overview of these guidelines, and the underpinning evidence where identified, is presented.

The general consensus across the identified guidelines is that the management of acute prostatitis requires the use of high doses of antibiotics such as a broad-spectrum penicillin, a third-generation cephalosporin or a fluoroquinolone, which may be combined with an aminoglycoside. The recommended route of administration depends on the severity of symptoms, with parenteral delivery recommended where required, moving on to oral delivery when appropriate.

The European Association of Urology guidelines on urological infections (2017), which include a section on acute bacterial prostatitis, are based on expert consensus and make specific reference to 5 studies, none of which are randomised controlled trials (RCTs) (Wagenlehner et al. 2013; Gill et al. 2016; Schaeffer et al. 2003; Bjerklund Johansen et al. 1998; Naber et al. 2003). These guidelines divide treatment approaches into the management of acute febrile bacterial prostatitis with symptoms and fever, and acute afebrile prostatitis with symptoms or after fever. For acute febrile bacterial prostatitis with symptoms and fever they recommend parenteral levofloxacin (500 mg once daily), ciprofloxacin (500 mg twice daily), ceftriaxone (2 g once daily), piperacillin/tazobactam (4.5 g three times a day) or cefepime (2 g twice a day) until fever is reduced. All of these antibiotics can be given with an aminoglycoside (gentamicin or amikacin). For acute afebrile prostatitis with symptoms or after fever they recommend oral therapy with levofloxacin (500 mg once daily), ciprofloxacin (500 mg twice daily or 1000 mg once a day), trimethoprim (200 mg twice a day) or co-trimoxazole (960 mg twice a day) for 2-4 weeks. Doxycycline (100 mg twice a day) for 10 days is recommended for *Chlamydia trachomatis* or mycoplasma infections only.

BASHH national guidelines for the management of prostatitis (2001) are based on expert consensus and discussion of identified studies, none of which are RCTs (Luzzi et al 1996; Millan-Rodriguez et al 1995; Katoh et al 1992; Arakawda et al 1994; Andriole et al 1994; Naber et al 1991; Suzuki et al 1984). The guidelines give general advice to maintain adequate hydration, rest and use analgesics such as NSAIDs. They recommend immediate empirical parenteral or oral therapy according to the patient's clinical condition. If there is any deterioration or failure to respond to oral treatment, urgent admission for parenteral therapy is recommended. Recommended parenteral antibiotics are a high dose of a broad spectrum cephalosporin (such as cefuroxime, cefotaxime or ceftriaxone plus gentamicin) with a switch to oral treatment according to sensitivities. For oral treatment, fluoroquinolones are recommended (ciprofloxacin 500 mg twice a day or ofloxacin 200 mg twice a day for 28 days). For men unable to take a fluoroquinolone, co-trimoxazole (960 mg twice a day) or trimethoprim (200 mg twice a day) for 28 days is recommended.

The RCGP/BASHH Sexually transmitted infections in primary care guidelines (2013) also recommend empirical treatment with ciprofloxacin 500 mg twice a day or ofloxacin 200 mg twice a day for 28 days; or trimethoprim 200 mg twice a day for 28 days if fluoroquinolones are contraindicated.

1.5.1 Antimicrobial susceptibility

The current guidelines include reference to studies from various countries regarding antibiotic sensitivity (Millan-Rodriguez et al. 1995; Sang et al. 2010; Park et al. 2014; Park et al. 2016; Lee et al. 2011; Millan-Rodriguez et al. 2006; Lipsky et al. 2010; Schaeffer et al. 2016). All studies identified *E. coli* as the most common pathogen in men with culture confirmed acute prostatitis. Within these studies *E. coli* sensitivity was more than 80% for fluoroquinolones (including norfloxacin, ciprofloxacin and ofloxacin); first, second and third generation cephalosporins (including cefotaxime and ceftazidime), carbapenems (including imipenem), aminoglycosides (including amikacin and gentamicin), aztreonam and fosfomycin.

1.5.2 Antimicrobial pharmacokinetics and prostate penetration

Many antimicrobials penetrate the prostate gland poorly, and antibiotic choice is often based on pharmacokinetic properties. However, in acute prostatitis, where there is intense inflammation of the prostate gland, antibiotic penetration can be better than in chronic prostatitis (National guidelines for the management of prostatitis, BASHH, 2001). The European Association of Urology guidelines on urological infections (2017), state that fluoroquinolones, such as ciprofloxacin and levofloxacin, are considered drugs of choice because of their favourable pharmacokinetic properties and excellent prostate penetration (Bjerklund Johansen et al. 1998).

Pharmacokinetic data from Micromedex (Truven Health Analytics) states that ciprofloxacin and ofloxacin reach high concentrations in prostatic fluid. Ciprofloxacin prostatic fluid levels often exceed serum levels with data outlining prostatic fluid levels ranging from 0.02 to 5.5 micrograms/mL compared with serum levels of 1 to 2.5 micrograms/mL, 2 to 4 hours after oral administration. Ofloxacin also demonstrates high prostatic fluid concentrations of 3.22 to 4.25 micrograms/g, 1 to 4 hours after oral administration. Trimethoprim also reaches good concentrations in prostatic tissue, with peak prostate concentration reported to be 2.3 micrograms/g, 280 minutes after an oral dose compared with serum levels of 2.2 micrograms/mL, 125 minutes after an oral dose.

A review of bacterial prostatitis by Lipsky et al. (2010) states that antibiotics that penetrate the prostate are those with high lipid solubility, a low degree of ionization, high dissociation constant, low protein binding, and small molecular size. They go on to discuss that fluoroquinolones have emerged as the preferred antibiotics for treating bacterial prostatitis because, compared with concentrations in plasma, drug levels are generally higher in urine, similar in seminal fluid and prostatic tissue, and lower (but still therapeutic) in prostatic fluid. However, where fluoroquinolone resistance is a concern, other antibiotics that may be useful include:

- a third-generation cephalosporin (such as ceftazidime or ceftriaxone), which can attain therapeutic levels in prostatic fluid or tissue
- a carbapenem (such as aztreonam, imipenem or ertapenem) and some aminoglycosides, which can attain levels in prostatic tissue that exceed the minimum inhibitory concentrations of most Enterobacteriaceae
- piperacillin, which has good prostatic tissue concentrations and has been used successfully to treat chronic bacterial prostatitis

- minocycline and doxycycline, which have prostatic concentrations of least 40% of the corresponding serum concentrations
- erythromycin (and probably other macrolides), which can develop high prostate concentrations.
- clindamycin and trimethoprim, which readily enter prostatic fluid, and may have prostatic fluid levels exceeding plasma levels.

Lipsksy et al. (2010) state that the prostatic concentration of sulfamethoxazole is much lower, raising doubts that it synergizes with trimethoprim; and nitrofurantoin prostatic levels are likely to be non-therapeutic. Local drug resistance patterns should always be considered and therapy should be adjusted based on culture results.

1.5.3 Antibiotic prophylaxis and prostate biopsy

The literature search identified 5 retrospective case reviews that provided some non-comparative data on the efficacy of prophylactic antibiotics in the prevention of acute prostatitis after prostate biopsy (Park et al. 2014, Campeggi et al. 2014; Sang et al. 2010; Chambo et al. 2015 and Shakil et al. 2014). These studies were excluded from the clinical evidence review because they were non-comparative studies. However, they do provide additional background information on antibiotic prophylaxis in prostate biopsy, in addition to the studies in the clinical evidence review.

These studies considered the efficacy of prophylactic third generation cephalosporins (IV, and oral cefixime); fluoroquinolones (oral ofloxacin, and oral or IV ciprofloxacin) and ertapenem for men with multidrug-resistant *E.coli*. The definition and rate of complications after biopsy varied between studies, with some authors reporting no cases of acute prostatitis and others reporting rates of 0.65% for infective complications (0.2% for acute prostatitis), 0.67% for acute prostatitis, and 2% for acute prostatitis. In 1 French study, the results of urine cultures in men with acute prostatitis after prostate biopsy indicated a high level (>70%) of *E. coli* resistance to fluoroquinolones, amoxicillin, co-amoxiclav and co-trimoxazole, and lower levels (<25%) of resistance to a third generation cephalosporin and amikacin. No resistance to imipenem was reported.

2 Evidence selection

A range of evidence sources are used to develop antimicrobial prescribing guidelines. These fall into 2 broad categories:

- Evidence identified from the literature search (see section 2.1 below)
- Evidence identified from other information sources. Examples of other information sources used are shown in the interim process guide (2017).

See appendix A: evidence sources for full details of evidence sources used for acute sinusitis.

2.1 Literature search

The search was developed to identify evidence for the effectiveness and safety of interventions for managing acute prostatitis (see appendix C: literature search strategy for full details). The literature search identified 1101 references. These references were screened using their titles and abstracts and 179 full text references of systematic reviews, randomised controlled trials (RCTs) and observational studies were obtained and assessed for relevance. Five full text references (1 RCT and 4 retrospective cohort studies) were assessed as relevant to the guideline review question (see appendix B: review protocol) and included in this evidence review (see appendix E: included studies). The remaining 174 references were excluded these are listed in appendix H: excluded studies with reasons for their exclusion. Ten percent of studies were screened to establish inter-rater reliability, and this was within the required threshold of 90%.

The methods for identifying, selecting and prioritising the best available evidence from the literature search are described in the interim process guide (2017).

See also appendix D: study flow diagram.

2.2 Summary of included studies

A summary of the included studies is shown in table 1. Details of the study citation can be found in appendix E: included studies. An overview of the quality assessment of each included study is shown in appendix F: quality assessment of included studies.

Table 1: Summary of included studies: antimicrobials

Study	Number of participants	Population	Intervention	Comparison(s)	Primary outcome
Antibiotic prophylaxis					
Dadashpour et al. 2016 DB RCT Iran Follow-up 2 days post biopsy	n=412	Men undergoing prostate biopsy	Oral ciprofloxacin and metronidazole from 3 days before biopsy, plus IV ceftazidime on the biopsy day; lidocaine and povidone-iodine as a gel injected into rectum	Oral ciprofloxacin and metronidazole from 3 days before biopsy, plus IV ceftazidime and amikacin on the biopsy day; lidocaine and povidone-iodine as a gel injected into rectum	Presence of clinical symptoms of acute prostatitis (fever, chills, dysuria and frequent urination)
Chiang et al. 2007 Retrospective cohort study Taiwan Follow-up not stated	n=1,875	Men undergoing prostate biopsy	Oral pipemidic acid for 3 days from the day of biopsy	Oral levofloxacin single dose on the biopsy day	Major complications requiring hospitalisation (fever, haematuria, acute prostatitis, acute urinary retention, rectal bleeding, epididymitis, sepsis and vasovagal syncope)
Lee et al. 2015 Retrospective cohort study South Korea Follow-up not stated	n=5,577	Men undergoing prostate biopsy	Single dose of IV ceftriaxone before biopsy, plus oral fluoroquinolone for 3 days starting 12 hours before biopsy Single dose of IV ceftriaxone before biopsy, plus an oral fluoroquinolone for >7 days starting 12 hours before biopsy	Oral fluoroquinolone for 3 days starting 12 hours before biopsy	Infectious complications (fever >38ºC, leucocytosis, a urinary tract infection or acute prostatitis)
Ryu et al. 2016	n=1,450	Men undergoing prostate biopsy	Targeted antibiotic with povidone-iodine rectal cleansing	Empirical antibiotic (fluoroquinolone)	Infectious complications (fever >37.8ºC, febrile urinary

Study	Number of participants	Population	Intervention	Comparison(s)	Primary outcome
Retrospective cohort study South Korea Follow-up not stated (3 comparisons)			Targeted antibiotic with povidone-iodine rectal cleansing	Empirical antibiotic (fluoroquinolone) with povidone-iodine rectal cleansing	tract infection, acute prostatitis, bacteraemia or sepsis)
			Empirical antibiotic (fluoroquinolone) with povidone-iodine rectal cleansing	Empirical antibiotic (fluoroquinolone)	
Duration of antibiotic treatment					
Bulut et al. 2015 Retrospective cohort Turkey Follow-up not stated	n=367	Men undergoing prostate biopsy	Oral ciprofloxacin for 1 day before biopsy	Oral ciprofloxacin for ≥ 3 days before biopsy	Complications (haematuria, fever >38ºC without local infection and with negative urine culture, acute prostatitis [defined as fever >39ºC, dysuria, frequency, perineal pain or discomfort with positive urine culture])
Lee et al 2015 Retrospective cohort South Korea Follow-up not stated	n=3,834	Men undergoing prostate biopsy	Single dose IV ceftriaxone before biopsy, plus an oral fluoroquinolone for >7 days starting 12 hours before biopsy	Single dose IV ceftriaxone before biopsy, plus an oral fluoroquinolone for 3 days starting 12 hours before biopsy	Infectious complications (fever >38ºC, leucocytosis, a urinary tract infection or acute prostatitis)
Abbreviations: DB, Double blind; IV, Intravenous; RCT, Randomised controlled trial					
[a] Targeted treatment across this group (n=679) was: a fluoroquinolone (71.1%), ceftriaxone (24.3%), ceftriaxone plus an aminoglycoside (1.6%), carbapenem (2.7%), aminoglycoside (0.3%)					

3 Clinical effectiveness

Full details of clinical effectiveness are shown in appendix G: GRADE profiles. The main results are summarised below.

3.1 Non-pharmacological interventions

No systematic reviews, randomised controlled trials (RCTs) or observational studies were identified that assessed the efficacy of non-pharmacological interventions for managing of acute prostatitis.

3.2 Non-antimicrobial pharmacological interventions

No systematic reviews, RCTs or observational studies were identified that assessed the efficacy of non-antimicrobial pharmacological interventions for treating acute prostatitis.

3.3 Antimicrobials

The evidence review for antimicrobials is based on 1 RCT and 4 observational studies. The included studies all focused on antibiotic prophylaxis to prevent complications (including acute prostatitis) after prostate biopsy, and cover antibiotics versus other antibiotics and the duration of antibiotic treatment. No evidence was identified for treating men with a diagnosis of acute prostatitis.

All the observational studies were retrospective analyses of medical records, often with non-concurrent controls. The prophylactic antibiotics given varied, but most studies used a fluoroquinolone with some studies using some form of voluntary or procedural rectal cleansing. How post-biopsy complications, including acute prostatitis, were defined and diagnosed also varied from clinical symptoms (fever >38°C or >39°C, chills, dysuria, frequent urination and pelvic pain), abnormal digital rectal examination or urine analysis.

3.3.1 Choice of antibiotic prophylaxis in men undergoing prostate biopsy

One double blind RCT (Dadashpour et al. 2016) and 3 cohort studies (Lee et al. 2015; Chiang et al. 2007 and Ryu et al. 2016) assessed the efficacy of antibiotic prophylaxis in reducing the incidence of acute prostatitis or other infectious complications after prostate biopsy.

Dadashpour et al. (2016) compared the efficacy of antibiotic prophylaxis regimens for prostate biopsy with and without the addition of amikacin (500 mg intravenous [IV] single dose). Men (n=412) were randomised to either prophylaxis with ciprofloxacin (500 mg orally twice a day) and metronidazole (250 mg orally three times a day) from 3 days before biopsy, plus ceftazidime (500 mg IV single dose) and amikacin (500 mg IV single dose) on the morning of biopsy (n=210), or the same prophylaxis without amikacin (n=202). The removal of amikacin did not result in a significant change in acute prostatitis infection rates (0.5% [n=1] versus 0.9% [n=2]; p=0.58).

Lee et al. (2015) compared the medical records of men who underwent prostate biopsy (n=5,577) and compared 3 different antibiotic prophylaxis regimens given at different time periods. Men treated between 2005 and 2009 received oral fluoroquinolone only, whereas those treated between 2010 and 2012 also received an IV cephalosporin. Participants were split into 3 groups:

- group 1 (n=1,743): fluoroquinolone (500 mg orally twice a day) for 3 days starting 12 hours before biopsy
- group 2 (n=2,723): single dose ceftriaxone (2 g IV) before biopsy plus a fluoroquinolone (500 mg orally twice a day) for 3 days starting 12 hours before biopsy
- group 3 (n=1,111) single dose ceftriaxone (2 g IV) before biopsy plus a fluoroquinolone (500 mg orally twice a day) for more than 7 days starting 12 hours before biopsy.

All patients self-administered an enema the day before the biopsy and underwent an enema in hospital on the day of the biopsy. A total of 27 patients (0.3%) had infectious complications, none of which were acute prostatitis. A multivariable analysis found that the combination of an oral fluoroquinolone for 3 days and a single dose of IV ceftriaxone significantly lowered the odds of an infectious complication compared with an oral fluoroquinolone alone for 3 days (0.26% [n=7] versus 1% [n=18]; odds ratio [OR] 0.27, 95% CI 0.11 to 0.65; p=0.003; very low quality evidence). Adding a single dose of IV ceftriaxone and extending the duration of oral fluoroquinolone treatment to 7 days also significantly reduced the chances of an infectious complication after biopsy compared with an oral fluoroquinolone alone for 3 days (0.18% [n=2] versus 1% [n=18]; OR 0.19, 95% CI 0.04 to 0.84; p=0.028; very low quality evidence).

Chiang et al. (2007) compared the medical records of men who underwent prostate biopsy (n=1,875) and sought to determine the associated risk factors of men who experienced major complications, which included acute prostatitis. Participants undergoing prostate biopsy between 2000 and 2004 received prophylaxis with oral pipemidic acid (500 mg twice a day) for 3 days from the day of biopsy; those from 2005 onwards received a single oral dose of levofloxacin (500 mg) on the morning of the biopsy. Major complications after biopsy were experienced by 6.6% (n=124) of men, of which 3.8% (n=55) had acute prostatitis. There was no significant difference in the total complication rate (7% [n=96] versus 5.6% [n=28]) or acute prostatitis infection rate (3.27% [n=45] versus 1.99% [n=10]) between antibiotic prophylactic regimens (both p>0.05; very low quality evidence).

Ryu et al (2016) evaluated medical records of men undergoing prostate biopsy (n=1,450), and compared infectious complications after biopsy in 3 different antibiotic regimens:

- group 1 (n=192): empirical prophylaxis with a fluoroquinolone
- group 2 (n=579): empirical prophylaxis with a fluoroquinolone plus povidone-iodine rectal cleansing
- group 3 (n=679): targeted antibiotic prophylaxis (based on culture of rectal swabs taken 2 weeks before biopsy) with rectal cleansing with povidone-iodine plus. Targeted antibiotic prophylaxis was as follows: a fluoroquinolone (71.1%), ceftriaxone (24.3%), ceftriaxone plus an aminoglycoside (1.6%); a carbapenem (2.7%); or an aminoglycoside (0.3%).

Most patients took antibiotics for 3 days or more. Infectious complications were experienced by 33 patients (7 [3.6%] in group a, 17 [2.9%] in group b and 9 [1.3%] in group c). Targeted antibiotic prophylaxis plus povidone-iodine rectal cleansing significantly reduced the incidence of urinary tract infection or acute prostatitis compared with empirical prophylaxis with a fluoroquinolone alone (0.88% versus 3.10%; relative risk [RR] 0.28, 95%CI 0.09 to 0.87; very low quality evidence) and empirical prophylaxis with a fluoroquinolone plus povidone-iodine rectal cleansing (0.88% versus 2.4%; RR 0.37, 95%CI 0.14 to 0.94; very low quality evidence).

3.3.2 Antibiotic course length

One retrospective cohort study (Bulut et al. 2015) reviewed the medical records of 367 men undergoing prostate biopsy to assess the impact that the duration of prophylactic antibiotic

regimens has on the incidence of complications after biopsy. Participants were retrospectively divided into 2 groups:

- 1 group who received oral ciprofloxacin (750 mg twice a day) for 3 or more days (n=243)
- 1 group who received the same dose of oral ciprofloxacin for 1 day (n=124).

There was no significant difference in the total complication rate or infection rate between the antibiotic regimens. Only 1 patient had acute prostatitis in the group who received antibiotic prophylaxis for 1 day.

One retrospective cohort study (Lee et al. 2015) in men undergoing prostate biopsy found no significant difference in infectious complications after biopsy between 3 days and more than 7 days of fluoroquinolone prophylaxis (500 mg orally twice a day starting 12 hours before biopsy), in addition to a single dose of ceftriaxone (2 g IV).

4 Safety and tolerability

Details of safety and tolerability outcomes from studies included in the evidence review are shown in appendix G: GRADE profiles. The main results are summarised below.

See the summaries of product characteristics and British National Formulary (BNF) for information on contraindications, cautions and adverse effects of individual medicines, and for appropriate use and dosing in specific populations, for example, hepatic impairment, and renal impairment.

4.1 Non-pharmacological interventions

No systematic reviews, randomised controlled trials (RCTs) or observational studies were identified in the review which used non-pharmacological interventions

4.2 Non-antimicrobial pharmacological interventions

No systematic reviews, RCTs or observational studies were identified in the review which used non-antimicrobial pharmacological interventions. For the management of pain, paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) and codeine with paracetamol are used. However, the combination of fluoroquinolone antibiotics and NSAIDs should be used with caution because there is a possible increased risk of convulsions when fluoroquinolones are given with NSAIDs (BNF August 2018).

4.3 Antimicrobials

Acute prostatitis is not a self-limiting infection and usually symptoms and signs have a bacterial origin meaning antibiotics are required.

About 10% of the general population claim to have a penicillin allergy; this has often been because of a skin rash that occurred during a course of penicillin in childhood. Fewer than 10% of people who think they are allergic to penicillin are truly allergic. People with a history of immediate hypersensitivity to penicillins may also react to cephalosporins and other beta-lactam antibiotics (BNF August 2018). See the NICE guideline on drug allergy: diagnosis and management for more information.

Fluoroquinolones, including levofloxacin, cause arthropathy in the weight-bearing joints of immature animals and are generally not recommended in children or young people who are growing. Fluoroquinolones also have warnings about tendon damage, photosensitivity reactions, convulsions, and use in people with epilepsy or a predisposition to QT interval prolongation. Common side effects include nausea, vomiting and diarrhoea (BNF August 2018). Following a review of disabling and potentially long-lasting side effects mainly involving muscles, tendons, bones and the nervous system, the European Medicines Agency's Pharmacovigilance Risk Assessment Committee (press release October 2018) has recommended restricting the use of fluoroquinolone antibiotics.

Aminoglycosides are not absorbed from the gut and must be given by injection for systemic infections. Gentamicin is the aminoglycoside of choice in the UK loading and maintenance doses are calculated on the basis of the patient's weight and renal function, with adjustments made according to serum-gentamicin concentrations. Whenever possible treatment should not exceed 7 days. Amikacin is used in the treatment of serious infections caused by gentamicin-resistant Gram-negative bacilli (BNF August 2018).

Co-trimoxazole is currently under restriction for use in the UK. It is advised that it should only be used in urinary tract infections where there is bacteriological evidence of sensitivity to co-trimoxazole. Co-trimoxazole should be used with caution in those with asthma, or people with blood disorders, GP6D deficiency or infants under 6 weeks (except for treatment or prophylaxis of pneumocystis pneumonia). Side effects such as diarrhoea, headache, hyperkalaemia, nausea and rash occur in 1 to 10% of people, however vomiting is uncommon (BNF August 2018).

4.3.1 Antibiotic prophylaxis in men undergoing prostate biopsy

No safety or tolerability data was presented in the RCT by Dadashpour et al. (2016) or the observational studies by Lee et al. (2015), Chiang et al. (2007), Ryu et al. (2016) and Bulut et al. (2015), which all considered the efficacy of prophylactic antibiotics for reducing complications, including acute prostatitis, after prostate biopsy.

5 Antimicrobial resistance

The consumption of antimicrobials is a major driver for the development of antibiotic resistance in bacteria, and the 3 major goals of antimicrobial stewardship are to:

- optimise therapy for individual patients
- prevent overuse, misuse and abuse, and
- minimise development of resistance at patient and community levels.

The NICE guideline on antimicrobial stewardship: systems and processes for effective antimicrobial medicine use recommends that the risk of antimicrobial resistance for individual patients and the population as a whole should be taken into account when deciding whether or not to prescribe an antimicrobial.

When antimicrobials are necessary to treat an infection that is not life-threatening, a narrow-spectrum antibiotic should generally be first choice. Indiscriminate use of broad-spectrum antibiotics creates a selective advantage for bacteria resistant even to these 'last-line' broad-spectrum agents, and also kills normal commensal flora leaving people susceptible to antibiotic-resistant harmful bacteria such as *C. difficile*. For infections that are not life-threatening, broad-spectrum antibiotics (for example, co-amoxiclav, fluoroquinolones and cephalosporins) need to be reserved for second-choice treatment when narrow-spectrum antibiotics are ineffective (CMO report 2011).

The English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report reported that antimicrobial consumption declined significantly between 2014 and 2015, with community prescribing from general and dental practice decreasing by more than 6%. Antibiotic prescribing in primary care in 2015 was at the lowest level since 2011, with broad-spectrum antibiotic use (antibiotics that are effective against a wide range of bacteria) continuing to decrease in primary care.

In acute prostatitis, the most common causative pathogens are urinary tract pathogens namely Gram negative organisms, most commonly *Escherichia coli (E. coli), Proteus species, Klebsiella species and Pseudomonas species*, *Enterococci*, *Staphylococcus aureus* and rarely anaerobes such as *Bacteroides species* can be the cause (National guidelines for the management of prostatitis, BASHH, 2001). Data from the ESPAUR report 2016 on the antibiotic susceptibility of pathogens causing bacteraemia show that between 2010 and 2014 the rate of bloodstream infections caused by *E.coli* and *Klebsiella pneumoniae* increased by 15.6% and 20.8% respectively, and between 2014 and 2015 bloodstream infections increased by a further 4.6% and 9% respectively.

Overall, there is wide variation in the rates of resistance to antibiotics across England. For example, by CCG, trimethoprim resistance in Gram-negative urinary tract infection ranges from 16.3% to 66.7%.

Wagenlehner et al (2004) outlined that in *E.coli* and *Kelbsiella species* resistance to ciprofloxacin was 15% and 4-10% respectively. The European Centre for Disease Prevention and Control reported in its 2014 report that more than half of the *E. coli* isolates reported to the European Antimicrobial Resistance Surveillance Network in 2014 were resistant to at least one antimicrobial. It also indicated that resistance to aminopenicillins and fluoroquinolones was the most commonly reported, both as single resistance and as combinations with other antimicrobial groups. Wagenlehner et al (2014) identified a number of studies in a narrative review that outlined a consistent trend towards greater complications after prostate biopsy with risk factors including faecal fluoroquinolone-resistant *E. coli*.

6 Other considerations

6.1 Resource impact

Acute prostatitis is a serious but rare bacterial infection of the prostate that requires antimicrobial treatment. It can occur spontaneously, or following urethral instrumentation or prostate biopsy, trauma, bladder outflow obstruction, or dissemination of infection from elsewhere in the body. Together acute and chronic bacterial prostatitis account for less than 5% of all prostatitis diagnosis. It is estimated that 1 in 10 men with acute bacterial prostatitis will later develop chronic prostatitis, a condition that is associated with a reduced quality of life, which can require longer-term treatment and management. Prostatic abscess formation represents a severe complication of acute prostatitis, which can result in longer treatment periods with antibiotics (Lee et al. 2016).

Men with acute prostatitis will require hospital admission if they are unable to take oral antibiotics, are severely ill, or are in acute urinary retention (where suprapubic catheterisation is required).

This evidence review provided limited information to inform the resource impact of acute prostatitis. However, the role of targeted prophylactic antibiotics to reduce the risk of infectious complications (including acute prostatitis) following prostate biopsy may have resource implications in terms of hospital stay and the risk of chronic prostatitis and prostatic abscess.

Recommended antibiotics are available as generic formulations, see Drug Tariff for costs.

6.2 Medicines adherence

Medicines adherence may be a problem for some people with medicines that require frequent dosing (for example, some antibiotics) (NICE guideline on medicines adherence). Longer treatment durations for an acute illness may also cause problems with medicines adherence for some people.

7 Recommendation for research

The guideline committee has made the following recommendation for research.

7.1 Choice of antibiotic for managing acute prostatitis

Which antibiotics (at what dose and for what duration) are effective and safe in treating acute prostatitis, and preventing complications?

7.1.1 Why this is important?

Evidence underpinning current guidelines regarding the efficacy and safety of antibiotic treatment (including appropriate dose and duration) for acute prostatitis is limited to expert consensus and pharmacokinetic data. The evidence review undertaken to inform this guideline identified no evidence that considered the comparative efficacy and safety of different antibiotics for treating acute prostatitis and preventing complications, such as chronic prostatitis or prostatic abscess. The limited evidence that was identified focused on antibiotic prophylaxis to prevent infectious complications, including acute prostatitis, after prostate biopsy. Treating acute prostatitis often involves the use of broad spectrum antibiotics, such as fluoroquinolones, for 14 to 28 days. More research in this area would inform decision-making regarding appropriate antibiotic treatment regimens for acute prostatitis, and contribute to the current antimicrobial stewardship agenda. NICE guidelines on antimicrobial stewardship recommend that prescribers should follow local (where available) or national guidelines on prescribing the shortest effective course, the most appropriate dose, and route of administration.

7.1.2 Evidence needed to address the research recommendation

Criterion	Explanation
Population	Adult men with a diagnosis of acute prostatitis
Intervention and comparator	Antibiotic compared with another antibiotic(s) for the same duration Shorter course of an antibiotic (14 days) compared with a longer course of an antibiotic (28 days)
Outcomes	Clinical outcomes such as: • mortality • infection cure or improvement in symptoms (duration or severity) • complication rates • adverse events • patient reported outcomes such as medicines adherence, patient experience and patient satisfaction. • health and social care-related quality of life such as ability to carry out activities of daily living. • health and social care utilisation such as length of stay, antimicrobial use and re-consultation rates • antimicrobial resistance
Study design	Randomised controlled trials
Timeframe	A follow up period of at least 4 weeks after treatment of the acute infection

Appendices

Appendix A: Evidence sources

Key area	Key question(s)	Evidence sources
Background	• What is the natural history of the infection? • What is the expected duration and severity of symptoms with or without antimicrobial treatment? • What are the most likely causative organisms? • What are the usual symptoms and signs of the infection? • What are the known complication rates of the infection, with and without antimicrobial treatment? • Are there any diagnostic or prognostic factors to identify people who may or may not benefit from an antimicrobial?	• NICE clinical knowledge summary on prostatitis – acute (2014) • National guidelines for the management of prostatitis, British Association for Sexual Health and HIV (BASHH) (2001) • Sexually transmitted infections in primary care, Royal College of General Practice (RCGP) / BASHH (2013) • Guidelines on urological infections, European Association of Urology (EAU) (2017) • Boeri et al. (2017) • Etienne et al. (2008) • Kim et al. (2015) • Lee et al. (2015) • Lipsky et al. (2010) Men undergoing prostate biopsy: • Campeggi et al. (2014) • Chambo et al. (2015) • Park et al. (2014) • Sang et al. (2010) • Shakil et al. (2014) Antibiotic susceptibility: • Lee et al. (2011) • Lipsky et al. (2010)

Key area	Key question(s)	Evidence sources
		• Millan-Rodriguez et al. (1995) • Millan-Rodriguez et al. (2006) • Park et al. (2014) • Park et al. (2016) • Sang et al. (2010) • Schaeffer et al. (2016) • Antibiotic pharmacokinetics and prostate penetration: • National guidelines for the management of prostatitis, BASHH (2001) • Guidelines on urological infections, European Association of Urology (EAU) (2017) • Micromedex pharmacokinetic data, Truven Health Analytics (2017) • Lipsky et al. (2010)
Safety netting	• What safety netting advice is needed for managing the infection?	• NICE guideline NG63: Antimicrobial stewardship: changing risk-related behaviours in the general population (2017) • NICE clinical knowledge summary on prostatitis – acute (2014) • Committee experience
Red flags	• What symptoms and signs suggest a more serious illness or condition (red flags)?	• NICE guideline NG51: Sepsis: recognition, diagnosis and early management (2016) • NICE clinical knowledge summary on prostatitis – acute (2014) • National guidelines for the management of prostatitis, BASHH (2001) • NHS Choices: Prostatitis (2017) • Lee et al. (2016)

Evidence sources

Key area	Key question(s)	Evidence sources
		• Yoon et al. (2012) • Committee experience
Non-pharmacological interventions	• What is the clinical effectiveness and safety of non-pharmacological interventions for managing the infection or symptoms?	• No evidence identified
Non-antimicrobial pharmacological interventions	• What is the clinical effectiveness and safety of non-antimicrobial pharmacological interventions for managing the infection or symptoms?	• No evidence identified
Antimicrobial prescribing strategies	• What is the clinical effectiveness and safety of antimicrobial prescribing strategies (including back-up prescribing) for managing the infection or symptoms?	• No evidence identified
Antimicrobials	• What is the clinical effectiveness and safety of antimicrobials for managing the infection or symptoms?	• Evidence review – see appendix E for included studies • British National Formulary (BNF) (August 2018) • Summary of product characteristics
	• Which people are most likely to benefit from an antimicrobial?	• Evidence review – see appendix E for included studies
	• Which antimicrobial should be prescribed if one is indicated (first, second and third line treatment, including people with drug allergy)?	• Evidence review – see appendix E for included studies
	• What is the optimal dose, duration and route of administration of antimicrobials?	• Evidence review – see appendix E for included studies • BNF (August 2018) • Summary of product characteristics
Antimicrobial resistance	• What resistance patterns, trends and levels of resistance exist both locally and nationally for the causative organisms of the infection • What is the need for broad or narrow spectrum antimicrobials?	• NICE guideline NG15: Antimicrobial stewardship: systems and processes for effective antimicrobial medicine use (2015)

Evidence sources

Key area	Key question(s)	Evidence sources
	• What is the impact of specific antimicrobials on the development of future resistance to that and other antimicrobials?	• English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report (2016) • Chief medical officer (CMO) report (2011) • National guidelines for the management of prostatitis, BASHH (2001) • Wagenlehner et al. (2004) • Wagenlehner et al. (2014)
Resource impact	• What is the resource impact of interventions (such as escalation or de-escalation of treatment)?	• Drug Tariff (September 2018) • Lee et al. (2016)
Medicines adherence	• What are the problems with medicines adherence (such as when longer courses of treatment are used)?	• NICE guideline NG76: Medicines adherence: involving patients in decisions about prescribed medicines and supporting adherence (2009)
Regulatory status	• What is the regulatory status of interventions for managing the infection or symptoms?	• Summary of product characteristics

Appendix B: Review protocol

Review protocol for recurrent urinary tract infections			Notes
I	Review question	What pharmacological (antimicrobial and non-antimicrobial) and non-pharmacological interventions are effective in managing acute prostatitis?	• antimicrobial includes antibiotics • non-antimicrobial includes analgesia • search will include terms for acute prostatitis
II	Types of review question	Intervention questions will primarily be addressed through the search.	These will, for example, also identify natural history in placebo groups and causative organisms in studies that use laboratory diagnosis, and relative risks of differing management options.
III	Objective of the review	To determine the effectiveness of prescribing and other management interventions in managing acute prostatitis in line with the major goals of antimicrobial stewardship. This includes interventions that lead prescribers to: • optimise outcomes for individuals • reduce overuse, misuse or abuse of antimicrobials All of the above will be considered in the context of national antimicrobial resistance patterns where available, if not available committee expertise will be used to guide decision-making.	The secondary objectives of the review of studies will include: • indications for prescribing an antimicrobial (for example 'red flags' and illness severity), thresholds for treatment and individual patient factors affecting choice of antimicrobial • indications for no or delayed antimicrobial • indications for non-antimicrobial interventions • antimicrobial choice, optimal dose, duration (specifically length of treatment) and route for specified antimicrobial(s) • the natural history of the infection
IV	Eligibility criteria – population/ disease/ condition/ issue/ domain	Population: Male adults with, or at risk of developing, acute prostatitis (signs and symptoms for less than several weeks or months) of any severity. Studies that use for example symptoms or signs (prognosis), clinical diagnosis or microbiological methods for diagnosing the condition.	Subgroups of interest, those: • with protected characteristics under the Equality Act 2010 • with true allergy • with chronic kidney disease or pre-existing urological conditions (such as benign prostatic hypertrophy or an indwelling catheter) or who have diabetes or are immunocompromised • post prostatic biopsy

			• people with risk factors for increased resistance[1]
V	Eligibility criteria – intervention(s)/ exposure(s)/ prognostic factor(s)	The review will include studies which include: • Non-pharmacological interventions[2]. • Non-antimicrobial pharmacological interventions[3]. • Antimicrobial pharmacological interventions[4]. For the treatment and prophylaxis (post prostatic biopsy) of acute prostatitis in primary, secondary or other care settings (for example walk-in-centres, urgent care, and minor ailment schemes) either by prescription or by any other legal means of supply of medicine (for example Patient Group Direction).	Limited to those interventions commonly in use (as agreed by the committee)
VI	Eligibility criteria – comparator(s)/ control or reference (gold) standard	Any other plausible strategy or comparator, including: • Placebo or no treatment • Non-pharmacological interventions • Non-antimicrobial pharmacological interventions • Antimicrobial pharmacological interventions	
VII	Outcomes and prioritisation	a) Clinical outcomes such as: • mortality • infection cure rates (number or proportion of people with resolution of symptoms at a given time point, incidence of escalation of treatment) • time to clinical cure (mean or median time to resolution of illness)	The committee has agreed that the following outcomes are critical: • reduction in symptoms (duration or severity) for example difference in time to substantial improvement • time to clinical cure (mean or median time to resolution of illness)

[1] Risk factors for increased resistance include: care home resident, recurrent UTI, previous hospitalisation, unresolving urinary symptoms, recent travel to country with increased resistance, previous UTI resistant to antibiotics (previous antibiotic use [trimethoprim]) (Source PHE management of infection guidance)
[2] Non-pharmacological interventions include: prostatic massage
[3] Non-antimicrobial pharmacological interventions include: analgesics
[4] Antimicrobial pharmacological interventions include: narrow or broad spectrum, single, dual or triple therapy, escalation or de-escalation of treatment. Antibiotics included in the search include those named in current guidance (plus the class to which they belong) plus other antibiotics agreed by the committee

		• reduction in symptoms (duration or severity) • rate of complications with or without treatment • safety, tolerability, and adverse effects. b) Thresholds or indications for antimicrobial treatment (which people are most, or least likely to benefit from antimicrobials) c) Changes in antimicrobial resistance patterns, trends and levels as a result of treatment. d) Patient-reported outcomes, such as medicines adherence, patient experience and patient satisfaction. e) Ability to carry out activities of daily living. f) Service user experience. g) Health and social care related quality of life, including long-term harm or disability. h) Health and social care utilisation (including length of stay, planned and unplanned contacts). The Committee considered which outcomes should be prioritised when multiple outcomes are reported (critical and important outcomes). Additionally, the Committee was asked to consider what clinically important features of study design may be important for this condition (for example length of study follow-up, treatment failure/recurrence, important outcomes of interest such as sequela or progression to more severe illness).	• rate of complications[5] (including mortality) with or without treatment, including escalation of treatment • health and social care utilisation (including length of stay, ITU stays, planned and unplanned contacts). • thresholds or indications for antimicrobial treatment (which people are most, or least likely to benefit from antimicrobials) • an individual's risk factors for resistance and choice of antibiotic The committee has agreed that the following outcomes are important: • patient-reported outcomes, such as medicines adherence, patient experience • changes in antimicrobial resistance patterns, trends and levels as a result of treatment • concentrations of antibiotic in the prostatic fluid
VIII	Eligibility criteria – study design	The search will look for: • Systematic reviews of randomised controlled trials (RCTs) • RCTs If insufficient evidence is available progress to: • Controlled trials • Systematic reviews of non-randomised controlled trials	Committee to advise the NICE project team on the inclusion of information from other condition specific guidance and on whether to progress due to insufficient evidence.

[5] Chronic prostatitis, recurrent UTI, bacteraemia

		• Non-randomised controlled trials • Observational and cohort studies • Pre and post intervention studies (before and after) • Time series studies	
IX	Other inclusion exclusion criteria	The scope sets out what the guidelines will and will not include (exclusions). Further exclusions specific to this guideline include: • non-English language papers, studies that are only available as abstracts • for antimicrobial resistance non-UK papers. • Chronic prostatitis (more than several weeks or months)	
X	Proposed sensitivity/ sub-group analysis, or meta-regression	The search may identify studies in population subgroups (for example adults, older adults, children (those aged under 18 years of age), and people with co-morbidities or characteristics that are protected under the Equality Act 2010 or in the NICE equality impact assessment). These will be analysed within these categories to enable the production of management recommendations.	
XI	Selection process – duplicate screening/ selection/ analysis	All references from the database searches will be downloaded, de-duplicated and screened on title and abstract against the criteria above. A randomly selected initial sample of 10% of records will be screened by two reviewers independently. The rate of agreement for this sample will be recorded, and if it is over 90% then remaining references will screened by one reviewer only. Disagreement will be resolved through discussion. Where abstracts meet all the criteria, or if it is unclear from the study abstract whether it does, the full text will be retrieved. If large numbers of papers are identified and included at full text, the Committee may consider prioritising the evidence for example, evidence of higher quality in terms of study type or evidence with critical or highly important outcomes.	
XII	Data management (software)	Data management will be undertaken using EPPI-reviewer software. Any pairwise meta-analyses will be performed using Cochrane Review	

		Manager (RevMan5). 'GRADEpro' will be used to assess the quality of evidence for each outcome.	
XIII	Information sources – databases and dates	Medline; Medline in Process; Embase; Cochrane database of systematic reviews (CDSR); Database of abstracts of effectiveness (DARE) (legacy); Cochrane Central Register of Controlled Trials (CENTRAL); Health Technology Assessment (HTA) database; Clinicaltrials.gov • All the above to be searched from 2000 to present day. • Filters for systematic reviews; RCTs and comparative studies to be applied, unless numbers without filters are low • Searches to be limited to studies reported in English. • Animal studies and conference abstracts to be excluded Medicines and Healthcare products Regulatory Agency (MHRA) website; European Medicines Agency (EMA) website; U.S. Food and Drug Administration (FDA) website; Drug Tariff; MIMs • The above to be searched for advice on precautions, warnings, undesirable effects of named antimicrobials.	
XIV	Identify if an update	Not applicable at this time.	
XV	Author contacts	Web: https://www.nice.org.uk/guidance/indevelopment/gid-apg10002	
XVI	Highlight if amendment to previous protocol	Email: infections@nice.org.uk	
XVII	Search strategy – for one database	For details please see the interim process guide (2017).	
XVIII	Data collection process – forms/ duplicate	For details see appendix C.	

XIX	Data items – define all variables to be collected	GRADE profiles will be used, for details see appendix G.	
XX	Methods for assessing bias at outcome/study level	Standard study checklists will be used to critically appraise individual studies. For details see the interim process guide (2017). The risk of bias across all available evidence will be evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group http://www.gradeworkinggroup.org/	
XXI	Criteria for quantitative synthesis (where suitable)	For details please see the interim process guide (2017).	
XXII	Methods for analysis – combining studies and exploring (in)consistency	For details please see the interim process guide (2017).	
XXIII	Meta-bias assessment – publication bias, selective reporting bias	For details please see the interim process guide (2017).	
XXIV	Assessment of confidence in cumulative evidence	For details please see the interim process guide (2017).	
XXV	Rationale/ context – Current management	For details please see the introduction to the evidence review in the guideline.	

XXVI	Describe contributions of authors and guarantor	A multidisciplinary committee developed the guideline. The committee was convened by NICE and chaired by Dr Tessa Lewis in line with the interim process guide (2017). Staff from NICE undertook systematic literature searches, appraised the evidence, conducted meta-analysis and cost-effectiveness analysis where appropriate, and drafted the guideline in collaboration with the committee. For details please see the methods chapter of the full guideline.	
XXVII	Sources of funding/support	Developed and funded by NICE.	
XXVIII	Name of sponsor	Developed and funded by NICE.	
XXIX	Roles of sponsor	NICE funds and develops guidelines for those working in the NHS, public health, and social care in England.	

Appendix C: Literature search strategy

Database(s): Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present
Search Strategy: acute prostatitis

1	prostatitis/	5053
2	prostatiti*.ti,ab.	5116
3	1 or 2	6663
4	Trimethoprim/	6281
5	(Trimethoprim* or Monotrim*).ti,ab.	14562
6	Nitrofurantoin/	2517
7	(Nitrofurantoin* or Genfura* or Macrobid*).ti,ab.	2981
8	Fosfomycin/	1688
9	(Fosfomycin* or Phosphomycin* or Fosfocina* or Monuril* or Monurol* or Fomicyt*).ti,ab.	2376
10	Methenamine/	1045
11	(Methenamine* or hexamine* or hippurate* or Hiprex*).ti,ab.	2407
12	Gentamicins/	17272
13	(Gentamicin* or Cidomycin*).ti,ab.	21969
14	Amikacin/	3752
15	(amikacin* or Amikin*).ti,ab.	8115
16	Tobramycin/	3971
17	(tobramycin* or Nebcin*).ti,ab.	6197
18	Amoxicillin/	8667
19	(Amoxicillin* or Amoxil*).ti,ab.	12538
20	Ampicillin/	12937
21	ampicillin*.ti,ab.	20488
22	Amoxicillin-Potassium Clavulanate Combination/	2307
23	(co-amoxiclav* or Coamoxiclav* or Amox-clav* or Amoxicillin-Clavulanic Acid* or Amoxicillin-Potassium Clavulanate Combination* or Amoxi-Clavulanate* or Clavulanate Potentiated Amoxycillin Potassium* or Clavulanate-Amoxicillin Combination* or Augmentin*).ti,ab.	13392
24	Amdinocillin Pivoxil/	206
25	(pivmecillinam* or Pivamdinocillin* or Selexid*).ti,ab.	268
26	Cefalexin/	1976
27	(Cefalexin* or Cephalexin* or Keflex*).ti,ab.	2608
28	Cefotaxime/	5102
29	cefotaxime*.ti,ab.	7491
30	Cefixime/	711
31	(cefixime* or Suprax*).ti,ab.	1439
32	Ceftriaxone/	5222

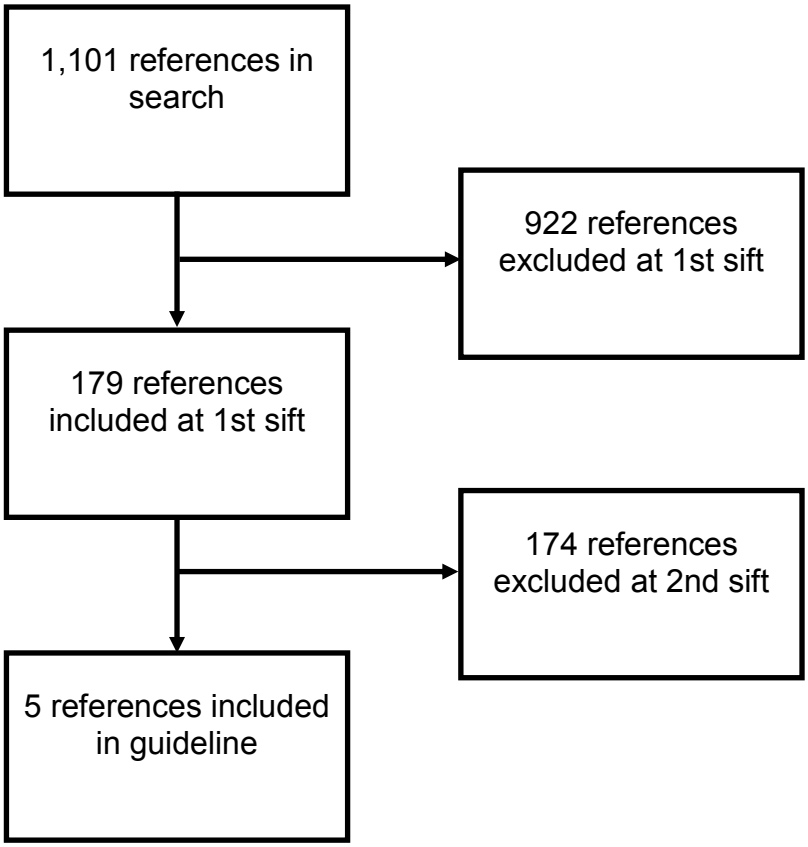
33	(ceftriaxone* or Rocephin*).ti,ab.	8835
34	Ciprofloxacin/	11586
35	(Ciprofloxacin* or Ciproxin*).ti,ab.	21626
36	Ofloxacin/	5795
37	(ofloxacin* or Tarivid*).ti,ab.	6241
38	Colistin/	3075
39	(Colistin* or Colistimethate* or Colimycin* or Coly-Mycin* or Colymycin* or Colomycin* or Promixin*).ti,ab.	4290
40	(Ertapenem* or Invanz*).ti,ab.	1135
41	Doxycycline/	8519
42	(Doxycycline* or Efracea* or Periostat* or Vibramycin*).ti,ab.	11271
43	Trimethoprim, Sulfamethoxazole Drug Combination/	6308
44	(Septrin* or Co-trimoxazole* or Cotrimoxazole* or Sulfamethoxazole Trimethoprim Comb* or Trimethoprim Sulfamethoxazole Comb*).ti,ab.	5502
45	Chloramphenicol/	18963
46	(Chloramphenicol* or Cloranfenicol* or Kemicetine* or Kloramfenikol*).ti,ab.	24993
47	Piperacillin/	2429
48	(Tazocin* or Piperacillin* or Tazobactam*).ti,ab.	6225
49	Aztreonam/	1337
50	(Aztreonam* or Azactam*).ti,ab.	2746
51	(Temocillin* or Negaban*).ti,ab.	236
52	(Tigecycline* or Tygacil*).ti,ab.	2337
53	Vancomycin/	11855
54	(Vancomycin* or Vancocin*).ti,ab.	22439
55	Teicoplanin/	2069
56	(Teicoplanin* or Targocid*).ti,ab.	3235
57	Linezolid/	2428
58	(Linezolid* or Zyvox*).ti,ab.	4567
59	Cefuroxime/	2038
60	(Cefuroxime* or Cephuroxime* or Zinacef* or Zinnat* or Aprokam*).ti,ab.	3923
61	Cefradine/	540
62	(Cefradine* or Cephradine* or Nicef*).ti,ab.	699
63	Ceftazidime/	3463
64	(Ceftazidime* or Fortum* or Tazidime*).ti,ab.	7727
65	Levofloxacin/	2716
66	(Levofloxacin* or Evoxil* or Tavanic*).ti,ab.	6111
67	or/4-66	214209
68	3 and 67	619
69	exp aminoglycosides/	142405
70	exp penicillins/	76800
71	exp cephalosporins/	39256
72	exp quinolones/	41178

73	exp Carbapenems/	8730
74	exp Tetracyclines/	44532
75	(Aminoglycoside* or Penicillin* or Cephalosporin* or Quinolone* or Carbapenem* or Tetracycline*).ti,ab.	120890
76	or/69-75	359341
77	3 and 76	723
78	Anti-Infective Agents, Urinary/ or anti-infective agents/ or exp anti-bacterial agents/ or exp anti-infective agents, local/	846362
79	(antibacter* or anti-bacter* or antibiot* or anti-biot* or antimicrobial* or anti-microbial*).ti,ab.	401504
80	78 or 79	1018899
81	3 and 80	1672
82	Acetaminophen/	15865
83	(paracetamol* or acetaminophen* or Panadol* or perfalgan* or calpol*).ti,ab.	20779
84	Ibuprofen/	7589
85	(ibuprofen* or arthrofen* or ebufac* or rimafen* or brufen* or calprofen* or feverfen* or nurofen* or orbifen*).ti,ab.	11197
86	Naproxen/	3732
87	(Naproxen* or Naprosyn* or Stirlescent*).ti,ab.	5451
88	Codeine/	4235
89	(codeine* or Galcodine*).ti,ab.	4406
90	Diclofenac/	6825
91	(Diclofenac* or Voltarol* or Dicloflex* or Econac* or Fenactol* or Volsaid* or Enstar* or Diclomax* or Motifene* or Rhumalgan* or Pennsaid*).ti,ab.	9697
92	(nsaid* or analgesic*).ti,ab.	87171
93	((nonsteroid* or non steroid*) adj3 (anti inflammator* or antiinflammator*)).ti,ab.	34156
94	analgesics/	43508
95	exp analgesics, non-narcotic/	300121
96	analgesics, short-acting/	8
97	or/82-96	400209
98	3 and 97	144
99	68 or 77 or 81 or 98	1849
100	limit 99 to yr="2000 -Current"	946
101	limit 100 to english language	697
102	Animals/ not (Animals/ and Humans/)	4293271
103	101 not 102	659
104	limit 103 to (letter or historical article or comment or editorial or news)	53
105	103 not 104	606
106	Meta-Analysis.pt.	75093
107	Meta-Analysis as Topic/	15469
108	Network Meta-Analysis/	37
109	Review.pt.	2232406

110	exp Review Literature as Topic/	9202
111	(metaanaly* or metanaly* or (meta adj3 analy*)).ti,ab.	109511
112	(review* or overview*).ti.	389922
113	(systematic* adj5 (review* or overview*)).ti,ab.	109664
114	((quantitative* or qualitative*) adj5 (review* or overview*)).ti,ab.	7347
115	((studies or trial*) adj2 (review* or overview*)).ti,ab.	36038
116	(integrat* adj3 (research or review* or literature)).ti,ab.	8774
117	(pool* adj2 (analy* or data)).ti,ab.	22115
118	(handsearch* or (hand adj3 search*)).ti,ab.	7551
119	(manual* adj3 search*).ti,ab.	4721
120	or/106-119	2488701
121	105 and 120	163
122	Randomized Controlled Trial.pt.	448955
123	Controlled Clinical Trial.pt.	91953
124	Clinical Trial.pt.	508322
125	exp Clinical Trials as Topic/	304867
126	Placebos/	34209
127	Random Allocation/	89909
128	Double-Blind Method/	143424
129	Single-Blind Method/	23798
130	Cross-Over Studies/	40917
131	((random* or control* or clinical*) adj3 (trial* or stud*)).ti,ab.	1003828
132	(random* adj3 allocat*).ti,ab.	28625
133	placebo*.ti,ab.	190016
134	((singl* or doubl* or trebl* or tripl*) adj (blind* or mask*)).ti,ab.	153137
135	(crossover* or (cross adj over*)).ti,ab.	74294
136	or/122-135	1722276
137	105 and 136	164
138	137 not 121	126
139	Observational Studies as Topic/	1978
140	Observational Study/	32032
141	Epidemiologic Studies/	7374
142	exp Case-Control Studies/	835884
143	exp Cohort Studies/	1625788
144	Cross-Sectional Studies/	235522
145	Controlled Before-After Studies/	220
146	Historically Controlled Study/	98
147	Interrupted Time Series Analysis/	246
148	Comparative Study.pt.	1770671
149	case control*.ti,ab.	102734
150	case series.ti,ab.	52521
151	(cohort adj (study or studies)).ti,ab.	133515

152	cohort analy*.ti,ab.	5459
153	(follow up adj (study or studies)).ti,ab.	43242
154	(observational adj (study or studies)).ti,ab.	70413
155	longitudinal.ti,ab.	186156
156	prospective.ti,ab.	454734
157	retrospective.ti,ab.	381364
158	cross sectional.ti,ab.	245632
159	or/139-158	3931716
160	105 and 159	222
161	160 not (121 or 137)	121
162	105 not (121 or 137 or 161)	196

Appendix D: Study flow diagram



Appendix E: Included studies

Bulut V, Sahin A-F, Yavuz B, et al. (2015) The efficacy of duration of prophylactic antibiotics in transrectal ultrasound guided prostate biopsy. International Brazilian Journal of Urology 41(5): 906-10

Chiang I-Ni, Chang S-J, Pu Y-S, et al. (2007) Major complications and associated risk factors of transrectal ultrasound guided prostate needle biopsy: a retrospective study of 1875 cases in Taiwan. Journal of the Formosan Medical Association 106(11): 929-34

Dadashpour M, Bagheri SM (2016) Acute prostatitis after transrectal ultrasound-guided prostate biopsy: comparing two different antibiotic prophylaxis regimen. Biomedical and Pharmacology Journal 9(2): 593-7

Lee C, You D, Jeong IG, et al. (2015) Antibiotic prophylaxis with intravenous ceftriaxone and fluoroquinolone reduces infectious complications after transrectal ultrasound-guided prostatic biopsy. Korean Journal of Urology 56(6): 466-72

Ryu JW, Jung SI, Ahn JH, et al. (2016) Povidone-iodine rectal cleansing and targeted antimicrobial prophylaxis using rectal swab cultures in men undergoing transrectal ultrasound-guided prostate biopsy are associated with reduced incidence of postoperative infectious complications. International Urology and Nephrology 48(11): 1763-70

Appendix F:Quality assessment of included studies

F.1 Antimicrobials

Table 1: Overall risk of bias/quality assessment – randomised controlled trials (RCT checklist)

Study reference	Dadashpour et al. 2016
Did the trial address a clearly focused issue?	Yes
Was the assignment of patients to treatments randomised?	Yes
Were patients, health workers and study personnel blinded?	Yes
Were the groups similar at the start of the trial?	Yes
Aside from the experimental intervention, were the groups treated equally?	Yes
Were all of the patients who entered the trial properly accounted for at its conclusion?	Yes
How large was the treatment effect?	See GRADE profiles
How precise was the estimate of the treatment effect?	See GRADE profiles
Can the results be applied in your context? (or to the local population)	Unclear[a]
Were all clinically important outcomes considered?	Yes
Are the benefits worth the harms and costs?	See GRADE profiles
[a] Unclear if this study can be generalised to a UK setting	

Table 2: Overall risk of bias/quality assessment – cohort study (cohort checklist)

Study reference	Chiang et al. 2007
Did the trial address a clearly focused issue?	Yes
Was the cohort recruited in an acceptable way?	No
Was the exposure accurately measured to minimise bias?	Unclear[a]
Was the outcome accurately measured to minimise bias?	Yes
Have the authors identified all important confounding factors?	Yes
Have they taken account of the confounding factors in the design and/or analysis?	Yes
Was the follow up of the subjects complete enough?	Unclear[b]
Was the follow up of the subject long enough?	Unclear[c]

Study reference	Chiang et al. 2007
What are the results of this study?	See GRADE profiles
How precise are the results?	See GRADE profiles
Do you believe the results?	See GRADE profiles
Can the results be applied to the local population?	Unclear[d]
Do the results of this study fit with other available evidence	Yes[e]
What are the implications of this study for practice	See GRADE profiles

[a] Retrospective cohort that utilised medical records unclear from study methodology if exposure was measured to minimum bias or not
[b] No follow-up period has been specified
[c] No follow-up period has been specified
[d] Unclear if this study can be generalised to a UK setting
[e] The evidence related to acute prostatitis is limited but the role of antibiotic prophylaxis to reduce infections post biopsy is well established for chronic prostatitis

Table 3: Overall risk of bias/quality assessment – cohort study (cohort checklist)

Study reference	Lee et al. 2011
Did the trial address a clearly focused issue?	Yes
Was the cohort recruited in an acceptable way?	No
Was the exposure accurately measured to minimise bias?	Unclear[a]
Was the outcome accurately measured to minimise bias?	Yes
Have the authors identified all important confounding factors?	Yes
Have they taken account of the confounding factors in the design and/or analysis?	Yes
Was the follow up of the subjects complete enough?	Unclear[b]
Was the follow up of the subject long enough?	Unclear[c]
What are the results of this study?	See GRADE profiles
How precise are the results?	See GRADE profiles
Do you believe the results?	See GRADE profiles
Can the results be applied to the local population?	Unclear[d]
Do the results of this study fit with other available evidence	Yes[e]
What are the implications of this study for practice	See GRADE profiles

[a] Retrospective cohort that utilised medical records unclear from study methodology if exposure was measured to minimum bias or not
[b] No follow-up period has been specified

Study reference	Lee et al. 2011
[c] No follow-up period has been specified [d] Unclear if this study can be generalised to a UK setting [e] The evidence related to acute prostatitis is limited but the role of antibiotic prophylaxis to reduce infections post biopsy is well established for chronic prostatitis	

Table 4: Overall risk of bias/quality assessment – cohort study (cohort checklist)

Study reference	Bulut et al. 2015
Did the trial address a clearly focused issue?	Yes
Was the cohort recruited in an acceptable way?	No
Was the exposure accurately measured to minimise bias?	Unclear[a]
Was the outcome accurately measured to minimise bias?	Yes
Have the authors identified all important confounding factors?	Yes
Have they taken account of the confounding factors in the design and/or analysis?	No
Was the follow up of the subjects complete enough?	Unclear[b]
Was the follow up of the subject long enough?	Unclear[c]
What are the results of this study?	See GRADE profiles
How precise are the results?	See GRADE profiles
Do you believe the results?	See GRADE profiles
Can the results be applied to the local population?	Unclear[d]
Do the results of this study fit with other available evidence	Yes[e]
What are the implications of this study for practice	See GRADE profiles
[a] Retrospective cohort that utilised medical records unclear from study methodology if exposure was measured to minimum bias or not [b] No follow-up period has been specified [c] No follow-up period has been specified [d] Unclear if this study can be generalised to a UK setting [e] The evidence related to acute prostatitis is limited but the role of antibiotic prophylaxis to reduce infections post biopsy is well established for chronic prostatitis	

Table 5: Overall risk of bias/quality assessment – cohort study (cohort checklist)

Study reference	Ryu et al. 2016
Did the trial address a clearly focused issue?	Yes
Was the cohort recruited in an acceptable way?	No
Was the exposure accurately measured to minimise bias?	Unclear[a]

Study reference	Ryu et al. 2016
Was the outcome accurately measured to minimise bias?	Yes
Have the authors identified all important confounding factors?	Yes
Have they taken account of the confounding factors in the design and/or analysis?	Yes
Was the follow up of the subjects complete enough?	Unclear[b]
Was the follow up of the subject long enough?	Unclear[c]
What are the results of this study?	See GRADE profiles
How precise are the results?	See GRADE profiles
Do you believe the results?	See GRADE profiles
Can the results be applied to the local population?	Unclear[d]
Do the results of this study fit with other available evidence	Yes[e]
What are the implications of this study for practice	See GRADE profiles

[a] Retrospective cohort that utilised medical records unclear from study methodology if exposure was measured to minimum bias or not
[b] No follow-up period has been specified
[c] No follow-up period has been specified
[d] Unclear if this study can be generalised to a UK setting
[e] The evidence related to acute prostatitis is limited but the role of antibiotic prophylaxis to reduce infections post biopsy is well established for chronic prostatitis

Appendix G: GRADE profiles

G.1 Antibiotic prophylaxis in men undergoing prostate biopsy

Table 6: GRADE profile: Ciprofloxacin, metronidazole and ceftazidime without or with amikacin

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Treatment[1] without amikacin	Treatment[1] plus amikacin (500 mg IV single dose)	Relative (95% CI)	Absolute		
Incidence of acute prostatitis post biopsy												
1[2]	randomised trials	no serious risk of bias	N/A	serious[3]	very serious[4]	none	1/202 (0.5%)	2/210 (0.9%)	RR 0.52 (0.05 to 5.69)	2 fewer per 1000 (from 5 fewer to 23 more)	⊕OOO VERY LOW	IMPORTANT
Abbreviations: CI, confidence interval; IV, Intravenous; N/A, Not applicable; RR, Relative risk												

[1] Treatment was ciprofloxacin 500 mg orally twice a day and metronidazole 250 mg orally three times a day from 3 days before biopsy, plus ceftazidime 500 mg IV single dose
[2] Dadashpour et al. 2016
[3] Downgraded 1 level - study focuses on prophylactic use of antibiotics to prevent acute prostatitis post biopsy
[4] Downgraded 2 levels - at a default minimal important difference (MID) of 25%, data are consistent with no meaningful difference, appreciable benefit or appreciable harm

Table 7: GRADE profile: Pipemidic acid versus levofloxacin

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Pipemidic acid	Levofloxacin	Relative (95% CI)	Absolute		
Incidence of major complications (including acute prostatitis post biopsy)												
1[1]	observational studies	serious[2]	N/A	serious[3]	serious[4]	none	96/1373 (7%)	28/502 (5.6%)	RR 1.25 (0.83 to 1.89)	14 more per 1000 (from 9 fewer to 50 more)	⊕OOO VERY LOW	IMPORTANT
Incidence of acute prostatitis												
1[1]	Observational studies	serious[2]	N/A	serious[3]	serious[4]	none	45/1373 (3.27%)	10/502 (1.99%)	RR 1.65 (0.84 to 3.24)	13 more per 1000 (from 3 fewer to 45 more)	⊕OOO VERY LOW	IMPORTANT
Abbreviations: CI, confidence interval; N/A, Not applicable; RR, Relative risk												

[1] Chiang et al. 2007
[2] Downgraded 1 level - retrospective cohort study, treatment versus treatment with no control; sample retrospective assessment of medical records. Methods not clearly described
[3] Downgraded 1 level - study focused on prophylactic use of antibiotics to prevent infectious complications post prostate biopsy
[4] Downgraded 1 level - at a default minimal important difference (MID) of 25%, data are consistent with no meaningful difference or appreciable benefit with levofloxacin. Methods not clearly described

Table 8: GRADE profile: Fluoroquinolone plus ceftriaxone versus fluoroquinolone alone

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Fluoroquinolone plus ceftriaxone (3 days)	Fluoroquinolone alone (3 days)	Relative (95% CI)	Absolute		
Infectious complications post biopsy including acute prostatitis: ceftriaxone and fluoroquinolone (3 days) versus fluoroquinolone (3 days)												
1[1]	observational studies	serious[2]	N/A	serious[3]	no serious imprecision	none	7/2723 (0.26%)	18/1743 (1%)	OR 0.27 (0.11 to 0.65) NICE analysis: RR 0.25 (0.10 to 0.59)	8 fewer per 1000 (from 4 fewer to 9 fewer)	⊕OOO VERY LOW	IMPORTANT
Infectious complication including acute prostatitis: ceftriaxone and fluoroquinolone (7 days) versus fluoroquinolone (3 days)												
1[1]	observational studies	serious[2]	N/A	serious[3]	serious[4]	none	2/1111 (0.18%)	18/1743 (1.0%)	OR 0.19 (0.04 to 0.84) NICE analysis: RR 0.17 (0.04 to 0.75)	8 fewer per 1000 (from 2 fewer to 10 fewer)	⊕OOO VERY LOW	IMPORTANT
Abbreviations: CI, confidence interval; N/A, Not applicable; OR, Odds ratio; RR, Relative risk												

[1] Lee et al. 2015
[2] Downgraded 1 level – retrospective cohort study, treatment versus treatment with no control; sample retrospective assessment of medical records. Methods not clearly described
[3] Downgraded 1 level - study focuses on prophylactic use of antibiotics to prevent acute prostatitis post prostate biopsy
[4] Downgraded 1 level - at a default minimal important difference (MID) of 25%, data are consistent with no meaningful difference or appreciable benefit with fluoroquinolone plus ceftriaxone

Table 9: GRADE profile: Targeted antibiotic with povidone-iodine rectal cleansing versus empirical antibiotic

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Targeted antibiotic for ≥3 days[1] with povidone-iodine rectal cleansing	Empirical antibiotic (fluoroquinolone) for ≥3 days	Relative (95% CI)	Absolute		
Incidence of urinary tract infection or acute prostatitis post biopsy												
1[2]	observational studies	serious[3]	N/A	serious[4]	serious[5]	none	6/679 (0.88%)	6/192 (3.10%)	RR 0.28 (0.09 to 0.87)	15 fewer per 1000 (from 1 fewer to 21 fewer)	⊕OOO VERY LOW	IMPORTANT
Abbreviations: CI, confidence interval; N/A, Not applicable; RR, Relative risk												

[1] Targeted antibiotics based on culture of rectal swabs taken 2 weeks before biopsy were: fluoroquinolone (71%), ceftriaxone (24.3%), ceftriaxone + aminoglycoside (1.6%), carbapenem (2.7%), aminoglycoside (0.3%)
[2] Ryu et al. 2016
[3] Downgraded 1 level – retrospective cohort study, treatment duration versus treatment duration with no control; sample retrospective assessment of medical records. Methods not clearly described
[4] Downgraded 1 level - study focuses on prophylactic use of antibiotics to prevent acute prostatitis post prostate biopsy
[5] Downgraded 1 level - at a default minimal important difference (MID) of 25%, data are consistent with no meaningful difference or appreciable benefit with targeted antibiotic plus povidone-iodine rectal cleansing

Table 10: GRADE profile: Targeted antibiotics with povidone-iodine rectal cleansing versus empirical antibiotic with povidone-iodine rectal cleansing

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Targeted antibiotic[1] with povidone-iodine rectal cleansing	Empirical antibiotic (fluoroquinolone) with povidone-iodine rectal cleansing	Relative (95% CI)	Absolute		
Incidence of urinary tract infection or acute prostatitis post biopsy												
1[2]	observational studies	serious[3]	N/A	serious[4]	serious[5]	none	6/679 (0.88%)	14/579 (2.4%)	RR 0.37 (0.14 to 0.94)	23 fewer per 1000 (from 4 fewer to 28)	⊕OOO VERY LOW	IMPORTANT
Abbreviations: CI, confidence interval; N/A, Not applicable; RR, Relative risk												

[1] Targeted prophylactic antibiotics based on culture of rectal swabs taken 2 weeks before biopsy were: fluoroquinolone (71%), ceftriaxone (24.3%), ceftriaxone plus aminoglycoside (1.6%), carbapenem (2.7%), aminoglycoside (0.3%)
[2] Ryu et al. 2016
[3] Downgraded 1 level - retrospective cohort study, treatment duration versus treatment duration with no control; sample retrospective assessment of medical records. Methods not clearly described
[4] Downgraded 1 levels - study focuses on prophylactic use of antibiotics to prevent acute prostatitis post prostate biopsy
[5] Downgraded 1 level - at a default minimal important difference (MID) of 25%, data are consistent with no meaningful difference or appreciable benefit with targeted antibiotic plus povidone-iodine rectal cleansing

Table 11: GRADE profile: Empirical antibiotic with povidone-iodine rectal cleansing versus empirical antibiotic

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Empirical antibiotic (fluoroquinolone) with povidone-iodine rectal cleansing	Empirical antibiotic (fluoroquinolone)	Relative (95% CI)	Absolute		
Incidence of urinary tract infection or acute prostatitis post biopsy												
1[1]	observational studies	serious[1]	N/A	serious[3]	very serious[4]	none	14/579 (2.4%)	6/192 (3.1%)	RR 0.77 (0.30 to 1.97)	7 fewer per 1000 (from 22 fewer to 30 more)	⊕OOO VERY LOW	IMPORTANT
Abbreviations: CI, confidence interval; N/A, Not applicable; RR, Relative risk												

[1] Ryu et al. 2016
[2] Downgraded 1 levels - retrospective cohort study, treatment duration versus treatment duration with no control; sample retrospective assessment of medical records. Methods not clearly described
[3] Downgraded 1 levels - study focuses on prophylactic use of antibiotics to prevent acute prostatitis post prostate biopsy
[4] Downgraded 2 levels - at a default minimal important difference (MID) of 25%, data are consistent with no meaningful difference, appreciable benefit or appreciable harm

Table 12: GRADE profile: Longer course antibiotic (≥ 3 days) versus shorter course antibiotic (1 day)

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Longer course antibiotic (ciprofloxacin for ≥ 3 days)**	**Shorter course antibiotic (ciprofloxacin for 1 day)**	**Relative (95% CI)**	**Absolute**		
Incidence of acute prostatitis post biopsy												
1[1]	observational studies	serious[2]	N/A	serious[3]	very serious[4]	none	0/243 (0%)	1/124 (0.81%)	RR 0.17 (0.01 to 4.16)	7 fewer per 1000 (from 8 fewer to 25 more)	⊕OOO VERY LOW	IMPORTANT
Abbreviations: CI, confidence interval; N/A, Not applicable; RR, Relative risk												

[1] Bulut et al. 2015
[2] Downgraded 1 level - retrospective cohort study, treatment duration versus treatment duration with no control; sample retrospective assessment of medical records. Methods not clearly described
[3] Downgraded 1 level - study focuses on prophylactic use of antibiotics to prevent acute prostatitis post prostate biopsy
[4] Downgraded 2 levels - at a default minimal important difference (MID) of 25%, data are consistent with no meaningful difference, appreciable benefit or appreciable harm

Appendix H: Excluded studies

Study reference	Reason for exclusion
Ali N S (2000) Protocol for evaluation and management of Urinary Tract Infection in adults. Pakistan Journal of Medical Sciences 16(4), 251-254	Not a relevant publication or study type
Anonymous (2002) CME Assessment test: Advances in the diagnosis and treatment of protatitis. Urology 60(6 SUPPL. A), 47-49	Not a relevant publication or study type
Antsupova V, Norgaard N, Bisbjerg R, Jensen J N, Boel J, Jarlov J O, and Arpi M (2014) Antibiotic prophylaxis for transrectal prostate biopsy-a new strategy. Journal of Antimicrobial Chemotherapy 69(12), 3372-3378	Not a relevant population
Bajpayee Pranav, Kumar Kaushal, Sharma Sakshee, Maurya Naveen, Kumar Peeyush, Singh Rajendra, and Lal Champa (2012) Prostatitis: prevalence, health impact and quality improvement strategies. Acta poloniae pharmaceutica 69(4), 571-9	Not a relevant publication or study type
Bang J H, Choe H S, Lee D S, Lee S J, and Cho Y H (2013) Microbiological characteristics of acute prostatitis after transrectal prostate biopsy. Korean Journal of Urology 54(2), 117-122	Not a relevant intervention
Bates D, Parkins M, Hellweg R, Gibson K, and Bugar J M (2012) Tigecycline treatment of urinary tract infection and prostatitis: Case report and literature review. Canadian Journal of Hospital Pharmacy 65(3), 209-215	Not a relevant publication or study type
Benelli A, Hossain H, Pilatz A, and Weidner W (2017) Prostatitis and its Management. European Urology, and Supplements 16(4), 132-137	Not a relevant publication or study type
Benway B M, and Moon T D (2008) Bacterial Prostatitis. Urologic Clinics of North America 35(1), 23-32	Not a relevant publication or study type
Bergman J, and Zeitlin S I (2007) Prostatitis and chronic prostatitis/chronic pelvic pain syndrome. Expert Review of Neurotherapeutics 7(3), 301-307	Not a relevant publication or study type
Boeri L, Fontana M, Gallioli A, Zanetti S P, Catellani M, Longo F, Mangiarotti B, and Montanari E (2017) Rectal culture-guided targeted antimicrobial prophylaxis reduces the incidence of post-operative infectious complications in men at high risk for infections submitted to transrectal ultrasound prostate biopsy -results of a cross-sectional study. PLoS ONE 12(1), no pagination	Not a relevant population
Brand T C, Thibault G P, and Basler J W (2006) Dealing with non-cancerous findings on prostate biopsy. Current Urology Reports 7(3), 186-192	Not a relevant publication or study type
Brede C M, and Shoskes D A (2011) The etiology and management of acute prostatitis. Nature Reviews Urology 8(4), 207-212	Not a relevant publication or study type
Briffaux R, Merlet B, Normand G, Coloby P, Leremboure H, Bruyère F, Pires C, Ouaki F, Doré B, and Irani J (2009) [Short or long schemes of antibiotic prophylaxis for prostate biopsy. A multicentre prospective randomised study]. Progrès en urologie : journal de l'Association française d'urologie et de la Société française d'urologie 19(1), 39-46	Not a relevant publication or study type
Briffaux Raphael, Coloby Patrick, Bruyere Franck, Ouaki Frederic, Pires Christophe, Dore Bertrand, and Irani Jacques (2009) One preoperative dose randomized against 3-day antibiotic prophylaxis	No relevant outcomes reported

Study reference	Reason for exclusion
for transrectal ultrasonography-guided prostate biopsy. BJU international 103(8), 1069-1073	
Brook Itzhak (2004) Urinary tract and genito-urinary suppurative infections due to anaerobic bacteria. International journal of urology : official journal of the Japanese Urological Association 11(3), 133-41	Not a relevant publication or study type
Bruyere F, D'Arcier B F, Boutin J M, and Haillot O (2010) Is urine culture routinely necessary before prostate biopsy?. Prostate Cancer and Prostatic Diseases 13(3), 260-262	Not a relevant intervention
Bruyere F, Malavaud S, Bertrand P, Decock A, Cariou G, Doublet J D, Bernard L, Bugel H, Conquy S, Sotto A, Boiteux J P, Pogu B, Rebillard X, Mongiat-Artus P, and Coloby P (2014) Prosbiotate: A Multicenter, Prospective Analysis of Infectious Complications after Prostate Biopsy. Journal of Urology , no pagination	No relevant outcomes reported
Bruyere Franck, Malavaud Sandra, Bertrand Philippe, Decock Aliette, Cariou Gerard, Doublet Jean Dominique, Bernard Louis, Bugel Hubert, Conquy Sophie, Sotto Albert, Boiteux Jean Paul, Pogu Bertrand, Rebillard Xavier, Mongiat-Artus Pierre, and Coloby Patrick (2015) Prosbiotate: a multicenter, prospective analysis of infectious complications after prostate biopsy. The Journal of urology 193(1), 145-50	No relevant outcomes reported
Bulbul Muhammad A, Wazzan Wassim, Hijaz Adonis, and Shaar Ahmad (2002) The effect of antibiotics on elevated serum prostate specific antigen in patients with urinary symptoms and negative digital rectal examination: a pilot study. Le Journal medical libanais. The Lebanese medical journal 50(1-2), 23-5	No relevant outcomes reported
Buommino Elisabetta, Scognamiglio Monica, Donnarumma Giovanna, Fiorentino Antonio, and D'Abrosca Brigida (2014) Recent advances in natural product-based anti-biofilm approaches to control infections. Mini reviews in medicinal chemistry 14(14), 1169-82	No relevant outcomes reported
Busato W F, Almeida G L, Geraldo J, and Busato F S (2015) Does PSA reduction after antibiotic therapy permits postpone prostate biopsy in asymptomatic men with PSA levels between 4 and 10 ng/mL?. International braz j urol : official journal of the Brazilian Society of Urology 41(2), 329-336	No relevant outcomes reported
Campeggi A, Ouzaid I, Xylinas E, Lesprit P, Hoznek A, Vordos D, Abbou C C, Salomon L, De la Taille , and A (2013) Acute bacterial prostatitis after transrectal ultrasound-guided prostate biopsy: Epidemiological, bacteria and treatment patterns from a 4-year prospective study. International Journal of Urology , no pagination	Duplicate
Campeggi Alexandre, Ouzaid Idir, Xylinas Evanguelos, Lesprit Philippe, Hoznek Andras, Vordos Dimitri, Abbou Claude-Clement, Salomon Laurent, de la Taille , and Alexandre (2014) Acute bacterial prostatitis after transrectal ultrasound-guided prostate biopsy: epidemiological, bacteria and treatment patterns from a 4-year prospective study. International journal of urology : official journal of the Japanese Urological Association 21(2), 152-5	Not a relevant publication or study type
Chambo Renato Caretta, Tsuji Fabio Hissachi, Yamamoto Hamilton Akihissa, and Jesus Carlos Marcio Nobrega de (2015) Short-term prophylaxis with ciprofloxacin in extended 16-core prostate biopsy. International braz j urol : official journal of the Brazilian Society of Urology 41(1), 46-56	Not a relevant publication or study type
Choe Wonsick, Chung Moon-Hyun, Kim Won-Hong, Kim Sungeun, Kan Ryu, Ji , Jin Kang, Kyung , and Suh Jun-Kyu (2002) Imaging	Not a relevant publication or study type

Study reference	Reason for exclusion
prostatitis with Tc-99m ciprofloxacin. Clinical nuclear medicine 27(7), 527-9	
Chou D S, and Manyak M J (2001) The enigma of prostatitis. Recent advances in classification and management. Advance for nurse practitioners 9(11), 63-73	Not a relevant publication or study type
Chow R D (2001) Prostatitis: Work-up and treatment of men with telltale symptoms. Geriatrics 56(4), 32-36	Not a relevant publication or study type
Coker T J, and Dierfeldt D M (2016) Acute bacterial prostatitis: Diagnosis and management. American Family Physician 93(2), 114-120	Not a relevant publication or study type
Coker Timothy J, and Dierfeldt Daniel M (2016) Acute Bacterial Prostatitis: Diagnosis and Management. American family physician 93(2), 114-20	Not a relevant publication or study type
Cook I, Angel J B, Vera P L, Demos J, and Preston D (2015) Rectal swab testing before prostate biopsy: Experience in a VA Medical Center urology practice. Prostate Cancer and Prostatic Diseases 18(4), 365-369	Not a relevant population
Cussans A, Somani B K, Basarab A, and Dudderidge T J (2016) The role of targeted prophylactic antimicrobial therapy before transrectal ultrasonography-guided prostate biopsy in reducing infection rates: A systematic review. BJU International 117(5), 725-731	Not a relevant publication or study type
David Richard D, DeBlieux Peter M. C, and Press Robert (2005) Rational antibiotic treatment of outpatient genitourinary infections in a changing environment. The American journal of medicine 118 Suppl 7A, 7S-13S	Not a relevant publication or study type
de la Taille , and A (2013) Therapeutic Approach: The Importance of Controlling Prostatic Inflammation. European Urology, and Supplements 12(5), 116-122	Not a relevant population
Delcaru C, Alexandru I, Podgoreanu P, Grosu M, Stavropoulos E, Chifiriuc M C, and Lazar V (2016) Microbial biofilms in urinary tract infections and prostatitis: Etiology, pathogenicity, and combating strategies. Pathogens 5(4), no pagination	Not a relevant publication or study type
Demonchy Elisa, Dufour Jean-Charles, Gaudart Jean, Cervetti Emmanuel, Michelet Pierre, Poussard Nicolas, Levraut Jacques, and Pulcini Celine (2014) Impact of a computerized decision support system on compliance with guidelines on antibiotics prescribed for urinary tract infections in emergency departments: a multicentre prospective before-and-after controlled interventional study. The Journal of antimicrobial chemotherapy 69(10), 2857-63	Not a relevant intervention
Denes E, Prouzergue J, Ducroix-Roubertou S, Aupetit C, and Weinbreck P (2012) Antibiotic prescription by general practitioners for urinary tract infections in outpatients. European journal of clinical microbiology & infectious diseases 31(11), 3079-83	Not a relevant intervention
Deshpande A, Haleblian G, and Rapose A (2013) Prostate abscess: MRSA spreading its influence into Gram-negative territory: Case report and literature review. BMJ Case Reports , no pagination	Not a relevant publication or study type
Dimitrakov J, Diemer T, Ludwig M, and Weidner W (2001) Recent developments in diagnosis and therapy of the prostatitis. Current Opinion in Urology 11(1), 87-91	Not a relevant publication or study type
Drusano G L, Preston S L, Van Guilder , M , North D, Gombert M, Oefelein M, Boccumini L, Weisinger B, Corrado M, and Kahn J (2000) A population pharmacokinetic analysis of the penetration of	No relevant outcomes reported

Study reference	Reason for exclusion
the prostate by levofloxacin. Antimicrobial agents and chemotherapy 44(8), 2046-51	
Ekici Sinan, Cengiz Melahat, Turan Guven, and Alis Esra Ergun (2012) Fluoroquinolone-resistant acute prostatitis requiring hospitalization after transrectal prostate biopsy: effect of previous fluoroquinolone use as prophylaxis or long-term treatment. International urology and nephrology 44(1), 19-27	Not a relevant publication or study type
Erol H, Beder N, Caliskan T, Dundar M, Unsal A, and Culhaci N (2006) Can the effect of antibiotherapy and anti-inflammatory therapy on serum PSA levels discriminate between benign and malign prostatic pathologies?. Urologia Internationalis 76(1), 20-26	No relevant outcomes reported
Etienne M, Chavanet P, Sibert L, Michel F, Levesque H, Lorcerie B, Doucet J, Pfitzenmeyer P, and Caron F (2008) Acute bacterial prostatitis: Heterogeneity in diagnostic criteria and management. Retrospective multicentric analysis of 371 patients diagnosed with acute prostatitis. BMC Infectious Diseases 8, no pagination	No relevant outcomes reported
Etienne Manuel, Chavanet Pascal, Sibert Louis, Michel Frederic, Levesque Herve, Lorcerie Bernard, Doucet Jean, Pfitzenmeyer Pierre, and Caron Francois (2008) Acute bacterial prostatitis: heterogeneity in diagnostic criteria and management. Retrospective multicentric analysis of 371 patients diagnosed with acute prostatitis. BMC infectious diseases 8, 12	Duplicate
Fahmy A M, Kotb A, Youssif T A, Abdeldiam H, Algebaly O, and Elabbady A (2016) Fosfomycin antimicrobial prophylaxis for transrectal ultrasound-guided biopsy of the prostate: A prospective randomised study. Arab Journal of Urology 14(3), 228-233	No relevant outcomes reported
Fan Y, Guo D, Wei Q, Tang Z, Cao D H, Yang L, Liu L R, Liu Z H, Li X, Xue W B, and Lei J H (2016) Antibiotics has incapability of reducing unnecessary prostate biopsies: A meta-analysis involving 2,035 patients. International Journal of Clinical and Experimental Medicine 9(2), 4958-4973	No relevant outcomes reported
Flannery M T, and Humphrey D (2012) Case report of a prostatic abscess with a review of the literature. Case Reports in Medicine 2012, no pagination	Not a relevant publication or study type
Fowler Jackson E, and Jr (2002) Antimicrobial therapy for bacterial and nonbacterial prostatitis. Urology 60(6 Suppl), 24-26	Not a relevant population
Game Xavier, Vincendeau Sebastien, Palascak Robert, Milcent Stephane, Fournier Robert, and Houlgatte Alain (2003) Total and free serum prostate specific antigen levels during the first month of acute prostatitis. European urology 43(6), 702-5	No relevant outcomes reported
Gardiner B J, Mahony A A, Ellis A G, Lawrentschuk N, Bolton D M, Zeglinski P T, Frauman A G, and Grayson M L (2014) Is fosfomycin a potential treatment alternative for multidrug-resistant gram-negative prostatitis?. Clinical Infectious Diseases 58(4), e101-e105	No relevant outcomes reported
Gill Bradley C, and Shoskes Daniel A (2016) Bacterial prostatitis. Current opinion in infectious diseases 29(1), 86-91	Not a relevant publication or study type
Grummet J (2015) A high PSA level in a man with suspected prostatitis. It's just due to inflammation, right?. Medicine Today 16(5), 61-62	Not a relevant publication or study type
Guay David R. P (2009) Cranberry and urinary tract infections. Drugs 69(7), 775-807	No relevant outcomes reported

Study reference	Reason for exclusion
Gupta A, Birhman K, Raheja I, Sharma S K, and Kar H K (2016) Quercetin: A wonder bioflavonoid with therapeutic potential in disease management. Asian Pacific Journal of Tropical Disease 6(3), 248-252	Not a relevant publication or study type
Gurunadha Rao Tunuguntla, H S, and Evans C P (2002) Management of prostatitis. Prostate Cancer and Prostatic Diseases 5(3), 172-179	Not a relevant publication or study type
Ha U S, Kim M E, Kim C S, Shim B S, Han C H, Lee S D, and Cho Y H (2008) Acute bacterial prostatitis in Korea: clinical outcome, including symptoms, management, microbiology and course of disease. International Journal of Antimicrobial Agents 31(SUPPL. 1), 96-101	Duplicate
Ha U Syn, Kim Min Eui, Kim Chul Sung, Shim Bong Suk, Han Chang Hee, Lee Sang Don, and Cho Yong-Hyun (2008) Acute bacterial prostatitis in Korea: clinical outcome, including symptoms, management, microbiology and course of disease. International journal of antimicrobial agents 31 Suppl 1, S96-101	No relevant outcomes reported
Habermacher G M, Chason J T, and Schaeffer A J (2006) Prostatitis/chronic pelvic pain syndrome. Annual Review of Medicine 57, 195-206	Not a relevant publication or study type
Hara N, Koike H, Ogino S, Okuizumi M, and Kawaguchi M (2004) Application of serum PSA to identify acute bacterial prostatitis in patients with fever of unknown origin or symptoms of acute pyelonephritis. Prostate 60(4), 282-288	Not a relevant publication or study type
Hong-Yu Z (2000) Clinical efficacy of sparfloxacin in the treatment of venereal prostatitis. [Chinese]. Chinese Journal of Antibiotics 25(5), 399-400	Not a relevant publication or study type
Horcajada Juan P, Vilana Ramon, Moreno-Martinez Antonio, Alvarez-Vijande Ricardo, Bru Concepcion, Bargallo Xavier, Bunesch Laura, Martinez Jose Antonio, and Mensa Josep (2003) Transrectal prostatic ultrasonography in acute bacterial prostatitis: findings and clinical implications. Scandinavian journal of infectious diseases 35(2), 114-20	Not a relevant publication or study type
Hua Vi N, and Schaeffer Anthony J (2004) Acute and chronic prostatitis. The Medical clinics of North America 88(2), 483-94	Not a relevant publication or study type
Ishiguro H, and Kawahara T (2014) Nonsteroidal anti-inflammatory drugs and prostatic diseases. BioMed Research International 2014, no pagination	Not a relevant publication or study type
Jeon Seong Soo, Woo Seung-Hyo, Hyun Ji-Hwan, Choi Han Yong, and Chai Soo Eung (2003) Bisacodyl rectal preparation can decrease infectious complications of transrectal ultrasound-guided prostate biopsy. Urology 62(3), 461-6	No relevant outcomes reported
Kam Sung Chul, Choi See Min, Yoon Sol, Choi Jae Hui, Lee Seong Hyun, Hwa Jeong Seok, Chung Ky Hyun, and Hyun Jae Seog (2014) Complications of transrectal ultrasound-guided prostate biopsy: impact of prebiopsy enema. Korean journal of urology 55(11), 732-6	Not a relevant intervention
Kandil H, Cramp E, and Vaghela T (2016) Trends in Antibiotic Resistance in Urologic Practice. European Urology Focus 2(4), 363-373	Not a relevant publication or study type
Kawada Y, and Ohmori H (2002) Clinical studies of gatifloxacin, a new fluoroquinolone, in genitourinary tract infections. Japanese Journal of Chemotherapy 50(10), 700-718	Not a relevant publication or study type

Study reference	Reason for exclusion
Kawakami J, Siemens D R, and Nickel J C (2004) Prostatitis and prostate cancer: Implications for prostate cancer screening. Urology 64(6), 1075-1080	No relevant outcomes reported
Kim Jong Wook, Oh Mi Mi, Bae Jae Hyun, Kang Seok Ho, Park Hong Seok, and Moon Du Geon (2015) Clinical and microbiological characteristics of spontaneous acute prostatitis and transrectal prostate biopsy-related acute prostatitis: Is transrectal prostate biopsy-related acute prostatitis a distinct acute prostatitis category?. Journal of infection and chemotherapy : official journal of the Japan Society of Chemotherapy 21(6), 434-7	No relevant outcomes reported
Kim Sang Hoon, Ha U Syn, Yoon Byung Il, Kim Sun Wook, Sohn Dong Wan, Kim Hyun Woo, Cho Su Yeon, and Cho Yong-Hyun (2014) Microbiological and clinical characteristics in acute bacterial prostatitis according to lower urinary tract manipulation procedure. Journal of infection and chemotherapy : official journal of the Japan Society of Chemotherapy 20(1), 38-42	No relevant outcomes reported
Kodner C (2003) Sexually transmitted infections in men. Primary Care - Clinics in Office Practice 30(1), 173-191	No relevant outcomes reported
Kravchick S, Cytron S, Agulansky L, and Ben-Dor D (2004) Acute prostatitis in middle-aged men: a prospective study. BJU international 93(1), 93-6	No relevant outcomes reported
Krieger J N (2003) Prostatitis revisited new definitions, new approaches. Infectious Disease Clinics of North America 17(2), 395-409	Not a relevant publication or study type
Krieger John N, and Thumbikat Praveen (2016) Bacterial Prostatitis: Bacterial Virulence, Clinical Outcomes, and New Directions. Microbiology spectrum 4(1),	No relevant outcomes reported
Lacquaniti S, Fulcoli V, Weir J M, Pisanti F, Servello C, and Destito A (2000) Bacterial prostatitis: urine and spermatic fluid culture. Archivio italiano di urologia, and andrologia : organo ufficiale [di] Societa italiana di ecografia urologica e nefrologica 72(1), 21-3	Not a relevant intervention
Lavigne Jean-Philippe, Bruyere Franck, Bernard Louis, Combescure Christophe, Ronco Esthel, Lanotte Philippe, Coloby Patrick, Thibault Michel, Cariou Gerard, Desplaces Nicole, Costa Pierre, and Sotto Albert (2016) Resistance and virulence potential of uropathogenic Escherichia coli strains isolated from patients hospitalized in urology departments: a French prospective multicentre study. Journal of medical microbiology 65(6), 530-7	No relevant outcomes reported
Le B V, and Schaeffer A J (2009) Genitourinary Pain Syndromes, Prostatitis, and Lower Urinary Tract Symptoms. Urologic Clinics of North America 36(4), 527-536	Not a relevant publication or study type
Lee Dong Sup, Choe Hyun-Sop, Kim Hee Youn, Kim Sun Wook, Bae Sang Rak, Yoon Byung Il, and Lee Seung-Ju (2016) Acute bacterial prostatitis and abscess formation. BMC urology 16(1), 38	Not a relevant intervention
Lee D S, Choe H S, Kim H Y, Kim S W, Bae S R, Yoon B I, and Lee S J (2016) Acute bacterial prostatitis and abscess formation. BMC Urology 16(1), no pagination	Not a relevant intervention
Lee S J, Lee D H, Park Y Y, and Shim B S (2011) A comparative study of clinical symptoms and treatment outcomes of acute bacterial prostatitis according to urine culture. Korean Journal of Urology 52(2), 119-123	No relevant outcomes reported

Study reference	Reason for exclusion
Lee Shaun Wen Huey, Liong Men Long, Yuen Kah Hay, Leong Wing Seng, Khan Nurzalina, Cheah Phaik Yeong, and Krieger John N (2009) Prostatitis-like symptoms: diagnosis and management in a Malaysian primary care population. Urologia internationalis 82(1), 32-7	No relevant outcomes reported
Lee Y S, and Lee K S (2013) Chlamydia and male lower urinary tract diseases. Korean Journal of Urology 54(2), 73-77	Not a relevant publication or study type
Lipsky B A, Byren I, and Hoey C T (2010) Treatment of bacterial prostatitis. Clinical Infectious Diseases 50(12), 1641-1652	Not a relevant publication or study type
Liu Hans, and Mulholland S Grant (2005) Appropriate antibiotic treatment of genitourinary infections in hospitalized patients. The American journal of medicine 118 Suppl 7A, 14S-20S	No relevant outcomes reported
Loeb S, and Sandhu J S (2011) Use of empiric antibiotics in the setting of an increased prostate specific antigen. Journal of Urology 186(1), 17-19	No relevant outcomes reported
Loeb Stacy, Gashti Sara N, and Catalona William J (2009) Exclusion of inflammation in the differential diagnosis of an elevated prostate-specific antigen (PSA). Urologic oncology 27(1), 64-6	Not a relevant publication or study type
Ludwig M (2008) Diagnosis and therapy of acute prostatitis, epididymitis and orchitis. Andrologia 40(2), 76-80	Not a relevant publication or study type
Lummus W E, and Thompson I (2001) Prostatitis. Emergency medicine clinics of North America 19(3), 691-707	Not a relevant publication or study type
Luong B, Danforth T, Visnjevac O, Suraf M, Duff M, and Chevli K K (2015) Reduction in hospital admissions with the addition of prophylactic intramuscular ceftriaxone before transrectal ultrasonography-guided prostate biopsies. Urology 85(3), 511-516	No relevant outcomes reported
Luzzi G (2010) Prostatitis and male chronic pelvic pain. Medicine 38(6), 314-317	No relevant outcomes reported
Magri V, Trinchieri A, Perletti G, and Marras E (2008) Activity of Serenoa repens, lycopene and selenium on prostatic disease: Evidences and hypotheses. Archivio Italiano di Urologia e Andrologia 80(2), 65-78	No relevant outcomes reported
Mari M (2012) Single dose versus 5-day course of oral prulifloxacin in antimicrobial prophylaxis for transrectal prostate biopsy. Minerva urologica e nefrologica [Italian journal of urology and nephrology] 59(1), 1-10	Not a relevant publication or study type
Millan-Rodriguez Felix, Palou J, Bujons-Tur Anna, Musquera-Felip Mireia, Sevilla-Cecilia Carlota, Serrallach-Orejas Marc, Baez-Angles Carlos, and Villavicencio-Mavrich Humberto (2006) Acute bacterial prostatitis: two different sub-categories according to a previous manipulation of the lower urinary tract. World journal of urology 24(1), 45-50	Duplicate
Martinez M A, Inglada L, Ochoa C, Villagrasa J R, The Spanish Study Group on Antibiotic, and Treatments (2007) Assessment of antibiotic prescription in acute urinary tract infections in adults. Journal of Infection 54(3), 235-244	No relevant outcomes reported
Mateos J J, Velasco M, Lomena F, Horcajada J P, Setoain F J, Martin F, Ortega M, Fuster D, Piera C, Pons F, and Mensa J (2002) 111Indium labelled leukocyte scintigraphy in the detection of acute prostatitis. Nuclear medicine communications 23(11), 1137-42	Not a relevant publication or study type

Study reference	Reason for exclusion
Mateos Jose J, Lomena Francisco, Velasco Maria, Horcajada Juan Pablo, Ortega Marisa, Fuertes Silvia, and Pons Francisca (2003) Diagnosis and follow-up of acute bacterial prostatitis and orchiepididymitis detected by In-111-labeled leukocyte imaging. Clinical nuclear medicine 28(5), 403-4	Not a relevant publication or study type
McLeod N P, and Brooks A J (2011) Prostatitis: A significant challenge. Medicine Today 12(4), 16-26	Not a relevant publication or study type
Millan-Rodriguez F, Palou J, Bujons-Tur A, Musquera-Felip M, Sevilla-Cecilia C, Serrallach-Orejas M, Baez-Angles C, and Villavicencio-Mavrich H (2006) Acute bacterial prostatitis: Two different sub-categories according to a previous manipulation of the lower urinary tract. World Journal of Urology 24(1), 45-50	Not a relevant intervention
Minamida S, Satoh T, Tabata K, Kimura M, Tsumura H, Kurosaka S, Matsumoto K, Fujita T, Iwamura M, and Baba S (2011) Prevalence of fluoroquinolone-resistant Escherichia coli before and incidence of acute bacterial prostatitis after prostate biopsy. Urology 78(6), 1235-1239	No relevant outcomes reported
Mishra P P, Prakash V, Singh K, Mog H, and Agarwal S (2016) Bacteriological profile of isolates from urine samples in patients of benign prostatic hyperplasia and or prostatitis showing lower urinary tract symptoms. Journal of Clinical and Diagnostic Research 10(10), DC16-DC18	Not a relevant population
Mohammed A, and Chinegwundoh F (2008) Prostatitis syndrome, an overview. Archivio Italiano di Urologia e Andrologia 80(3), 115-122	Not a relevant publication or study type
Mrkoci D K, and Chretien K C (2012) Diagnostic error - mini review and case report of patient death resulting from delayed diagnosis of acute prostatitis. Open Urology and Nephrology Journal 6(1), 31-35	Not a relevant publication or study type
Naber K G (2001) Prostatitis. Nephrology Dialysis Transplantation 16(SUPPL. 6), 132-134	No relevant outcomes reported
Naber K G (2001) Prostatitis. Nephrology, dialysis, and transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association 16 Suppl 6, 132-4	Not a relevant publication or study type
Naber K G (2004) Levofloxacin in the treatment of urinary tract infections and prostatitis. Journal of chemotherapy (Florence, and Italy) 16 Suppl 2, 18-21	Not a relevant publication or study type
Naber K G, Bergman B, Bishop M C, Bjerklund-Johansen T E, Botto H, Lobel B, Cruz F J, and Selvaggi F P (2001) EAU guidelines for the management of urinary and male genital tract infections: Urinary Tract Infection (UTI) Working Group of the Health Care Office (HCO) of the European Association of Urology (EAU). European Urology 40(5), 576-588	Not a relevant publication or study type
Naber Kurt G (2008) Management of bacterial prostatitis: what's new?. BJU international 101 Suppl 3, 7-10	Not a relevant publication or study type
Naide Yorio, Ishikawa Kiyohito, Tanaka Toshiyuki, Ando Shin, Suzuki Keizo, and Hoshinaga Kiyotaka (2006) A proposal of subcategorization of bacterial prostatitis: NIH category I and II diseases can be further subcategorized on analysis by therapeutic and immunological procedures. International journal of urology : official journal of the Japanese Urological Association 13(7), 939-46	No relevant outcomes reported
Neill M C, Appu S, and Zlotta A R (2009) Strategies to preserve prostate health. Drugs of Today 45(1), 63-80	No relevant outcomes reported

Study reference	Reason for exclusion
Nguyen N (2014) Treating prostatitis effectively: A challenge for clinicians. U.S. Pharmacist 39(4), 35-40	Not a relevant publication or study type
Nickel C J (2000) Prostatitis syndromes: an update for urologic practice. The Canadian journal of urology 7(5), 1091-8	Not a relevant publication or study type
Nickel J C (2000) Prostatitis: Lessons from the 20th century. BJU International 85(2), 179-185	Not a relevant publication or study type
Nickel J C (2006) The overlapping lower urinary tract symptoms of benign prostatic hyperplasia and prostatitis. Current Opinion in Urology 16(1), 5-10	No relevant outcomes reported
Nieuwkoop C, van't Wout Jw, Assendelft Wj, Elzevier Hw, Leyten Em, Koster T, Wattel-Louis Gh, Delfos Nm, Ablij Hc, Kuijper Ej, Pander J, Blom Jw, Spelt Ic, and Dissel Jt (2009) Treatment duration of febrile urinary tract infection (FUTIRST trial): a randomized placebo-controlled multicenter trial comparing short (7 days) antibiotic treatment with conventional treatment (14 days). BMC infectious diseases 9, 131	Not a relevant intervention
Novo-Veleiro I, Hernandez-Cabrera M, Canas-Hernandez F, Pisos-Alamo E, Frances-Urmeneta A, Delgado-Yague M, Alvela-Suarez L, and Perez-Arellano J L (2013) Paucisymptomatic infectious prostatitis as a cause of fever without an apparent origin. A series of 19 patients. European journal of clinical microbiology & infectious diseases : official publication of the European Society of Clinical Microbiology 32(2), 263-8	Not a relevant intervention
Osborn D, Kaufman M, Reynolds W S, and Dmochowski R (2013) Prostate Related Urinary Tract Infections. Current Bladder Dysfunction Reports 8(3), 197-202	Not a relevant publication or study type
Ozden Ender, Bostanci Yakup, Yakupoglu Kamil Y, Akdeniz Ekrem, Yilmaz Ali F, Tulek Necla, and Sarikaya Saban (2009) Incidence of acute prostatitis caused by extended-spectrum beta-lactamase-producing Escherichia coli after transrectal prostate biopsy. Urology 74(1), 119-23	Not a relevant publication or study type
Pace Gianna, Carmignani Luca, Marenghi Carlo, Mombelli Gabriella, and Bozzini Giorgio (2012) Cephalosporins periprostatic injection: are really effective on infections following prostate biopsy?. International urology and nephrology 44(4), 1065-70	Not a relevant population
Palmas Artur Sabugueiro, Coelho Manuel Ferreira, and Fonseca Julio Fidalgo (2010) Color Doppler ultrasonographic scanning in acute bacterial prostatitis. Archivio italiano di urologia, and andrologia : organo ufficiale [di] Societa italiana di ecografia urologica e nefrologica 82(4), 271-4	Not a relevant publication or study type
Park D S, Hwang J H, Choi D K, Gong I H, Hong Y K, Park S, and Oh J J (2014) Control of infective complications of transrectal prostate biopsy. Surgical Infections 15(4), 431-436	No relevant outcomes reported
Park M G, Cho M C, Cho S Y, and Lee J W (2016) Clinical and Microbiological Features and Factors Associated with Fluoroquinolone Resistance in Men with Community-Acquired Acute Bacterial Prostatitis. Urologia Internationalis 96(4), 443-448	Not a relevant publication or study type
Parsons C L (2003) Prostatitis, interstitial cystitis, chronic pelvic pain, and urethral syndrome share a common pathophysiology: Lower urinary dysfunctional epithelium and potassium recycling. Urology 62(6), 976-982	Not a relevant population

Study reference	Reason for exclusion
Peters Hj, and Breitling P (2003) [Antibiotic prophylaxis in transrectal prostate biopsy. Short-term vs. long-term therapy]. Der Urologe. Ausg. A 42(1), 91-4	Not a relevant publication or study type
Pirzada A M, Ali H H, Naeem M, Latif M, Bukhari A H, and Tanveer A (2015) Cyperus rotundus L.: Traditional uses, phytochemistry, and pharmacological activities. Journal of Ethnopharmacology 174, 540-560	No relevant outcomes reported
Potts J M (2015) Male Pelvic Pain Syndrome: Escaping the Snare of Prostatocentric Thinking. Current Bladder Dysfunction Reports 10(1), 75-80	Not a relevant publication or study type
Prezioso D, Naber K G, Lobel B, Weidner W, Algaba F, Denis L J, and Griffiths K (2006) Changing concepts on prostatitis. Archives of Medical Science 2(2), 71-84	Not a relevant publication or study type
Prezioso D, Naber K G, Lobel B, Weidner W, Algaba F, Denis L J, and Griffiths K (2006) The enigma of prostatitis. Some historical perspectives on the pathogenesis of prostatitis. Archives of Medical Science 2(4), 213-220	Not a relevant publication or study type
Puig Jordi, Darnell Anna, Bermudez Patricia, Malet Antoni, Serrate Guadalupe, Bare Marisa, and Prats Joan (2006) Transrectal ultrasound-guided prostate biopsy: is antibiotic prophylaxis necessary?. European radiology 16(4), 939-43	Not a relevant population
Ramakrishnan Kalyanakrishnan, and Salinas Robert C (2010) Prostatitis: acute and chronic. Primary care 37(3), 547-ix	Not a relevant publication or study type
Rizzo M, Marchetti F, Travaglini F, Trinchieri A, and Nickel J C (2003) Prevalence, diagnosis and treatment of prostatitis in Italy: a prospective urology outpatient practice study. BJU international 92(9), 955-9	No relevant outcomes reported
Roberts M J, Williamson D A, Hadway P, Doi S A. R, Gardiner R A, and Paterson D L (2014) Baseline prevalence of antimicrobial resistance and subsequent infection following prostate biopsy using empirical or altered prophylaxis: A bias-adjusted meta-analysis. International Journal of Antimicrobial Agents 43(4), 301-309	No relevant outcomes reported
Sang J K, Sun I K, Hyun S A, Jong B C, Young S K, and Se J K (2010) Risk factors for acute prostatitis after transrectal biopsy of the prostate. Korean Journal of Urology 51(6), 426-430	Not a relevant publication or study type
Schaeffer A J, Montorsi F, Scattoni V, Perroncel R, Song J, Haverstock D C, and Pertel P E (2007) Comparison of a 3-day with a 1-day regimen of an extended-release formulation of ciprofloxacin as antimicrobial prophylaxis for patients undergoing transrectal needle biopsy of the prostate. BJU International 100(1), 51-57	Not a relevant population
Schaeffer E M (2012) Re: Prevalence of fluoroquinolone-resistant escherichia coli before and incidence of acute bacterial prostatitis after prostate biopsy. Journal of Urology 188(1), 122-123	Not a relevant publication or study type
Schiller Daryl S, and Parikh Ashish (2011) Identification, pharmacologic considerations, and management of prostatitis. The American journal of geriatric pharmacotherapy 9(1), 37-48	Not a relevant publication or study type
Schultz Pamela L, and Donnell Robert F (2004) Prostatitis: the cost of disease and therapies to patients and society. Current urology reports 5(4), 317-9	No relevant outcomes reported
Serretta V, Catanese A, Daricello G, Liotta R, Allegro R, Martorana A, Aragona F, and Melloni D (2008) PSA reduction (after antibiotics)	No relevant outcomes reported

Study reference	Reason for exclusion
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Sharp V J, Takacs E B, and Powell C R (2010) Prostatitis: Diagnosis and treatment. American Family Physician 82(4), 397-406	Not a relevant publication or study type
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Shoskes D A, Katske F, and Kim S (2001) Diagnosis and management of acute and chronic prostatitis. Urologic nursing 21(4), 255-4	Not a relevant publication or study type
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Tatokoro M (2014) Editorial Comment to Acute bacterial prostatitis after transrectal ultrasound-guided prostate biopsy: Epidemiological, bacterial and treatment patterns from a 4-year prospective study. International Journal of Urology 21(2), 156	Not a relevant publication or study type
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Touma N J, and Nickel J C (2011) Prostatitis and chronic pelvic pain syndrome in men. Medical Clinics of North America 95(1), 75-86	Not a relevant publication or study type
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Wagenlehner F M. E, Naber K G, Bschleipfer T, Brahler E, and Weidner W (2009) Prostatitis and male pelvic pain syndrome: Diagnosis and treatment. Deutsches Arzteblatt 106(11), 175-183	Not a relevant publication or study type
Wagenlehner F M. E, Pilatz A, Bschleipfer T, Diemer T, Linn T, Meinhardt A, Schagdarsurengin U, Dansranjavin T, Schuppe H C, and Weidner W (2013) Bacterial prostatitis. World Journal of Urology 31(4), 711-716	Not a relevant publication or study type
Wagenlehner F M. E, Weidner W, and Naber K G (2006) Chlamydial infections in urology. World Journal of Urology 24(1), 4-12	Not a relevant publication or study type
Wagenlehner Florian M. E, Pilatz Adrian, Bschleipfer Thomas, Diemer Thorsten, Linn Thomas, Meinhardt Andreas, Schagdarsurengin Undraga, Dansranjavin Temujin, Schuppe Hans-Christian, and Weidner Wolfgang (2013) Bacterial prostatitis. World journal of urology 31(4), 711-6	Not a relevant publication or study type
Wagenlehner Florian M. E, Weidner Wolfgang, and Naber Kurt G (2007) Therapy for prostatitis, with emphasis on bacterial prostatitis. Expert opinion on pharmacotherapy 8(11), 1667-74	Not a relevant publication or study type
Wagenlehner Florian M. E, Weidner Wolfgang, Pilatz Adrian, and Naber Kurt G (2014) Urinary tract infections and bacterial prostatitis in men. Current opinion in infectious diseases 27(1), 97-101	Not a relevant publication or study type

Study reference	Reason for exclusion
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Yamamoto Shingo, Ishitoya Satoshi, Segawa Takehiko, Kamoto Toshiyuki, Okumura Kazuhiro, and Ogawa Osamu (2008) Antibiotic prophylaxis for transrectal prostate biopsy: a prospective randomized study of tosufloxacin versus levofloxacin. International journal of urology : official journal of the Japanese Urological Association 15(7), 604-6	Not a relevant intervention
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Yang S, Liu Y, Kong C, and Li M (2004) [Investigation of sildenafil in the treatment of prostatitis-related sexual dysfunction]. Zhonghua nan ke xue = National journal of andrology 10(6), 451-4	Not a relevant publication or study type
Yoon B I, Kim S, Han D S, Ha U S, Lee S J, Kim H W, Han C H, and Cho Y H (2012) Acute bacterial prostatitis: How to prevent and manage chronic infection?. Journal of Infection and Chemotherapy 18(4), 444-450	No relevant outcomes reported
Yoon Byung Il, Kim Seol, Han Dong-Seok, Ha U Syn, Lee Seung-Ju, Kim Hyun Woo, Han Chang-Hee, and Cho Yong-Hyun (2012) Acute bacterial prostatitis: how to prevent and manage chronic infection?. Journal of infection and chemotherapy : official journal of the Japan Society of Chemotherapy 18(4), 444-50	Duplicate
Zeitlin S I (2011) Is prostatitis a vascular disease? Journal of Urology 186(3), 781-782	Not a relevant publication or study type