Acute Bacterial Prostatitis in Adults - Microbiology Full Clinical Guideline

Reference number: CG-ANTI/2023/046

Introduction

- Bacterial invasion of the prostate - with an abrupt onset of symptoms and signs - is termed acute bacterial prostatitis.
- The commonest cause of acute bacterial prostatitis is *Escherichia coli*.
- *Proteus*, *Klebsiella*, and *Pseudomonas* species are other relatively common bacterial causes.
- Less common causes include *Chlamydia trachomatis* and *Neisseria gonorrhoeae*.
- The pathogens of acute bacterial prostatitis are most commonly inoculated through reflux of urine: from the urethra, through the prostatic ducts, and into the prostate.
- Less commonly, pathogen inoculation is via iatrogenic mechanisms of transmission, e.g. transrectal prostate biopsy, transurethral catheterisation, and cystoscopy.
- Symptoms and signs of acute bacterial prostatitis include perineal-scrotal pain, urgency, frequency, dysuria, pyuria, prostate tenderness, and prostatomegaly.
- Temperatures > 38 ° C or < 36 ° C, respiratory rate > 20 breaths/minute, heart rate > 90 beats/minute, and hypotension can denote progression of localised infectious disease into sepsis and septic shock.

Diagnosis

- Urgency, frequency, dysuria, and pyuria are manifestations that overlap with other urinary tract pathologies, including cystitis and pyelonephritis.
- Prostate tenderness and prostate bogginess can be distinguishing features of acute bacterial prostatitis.
- NB If acute bacterial prostatitis is diagnosed or in the differential, prostatic massage is contraindicated, because of the risk of bacteraemia.

Investigation

Past

- Review the past microbiology results, with specific reference to previous genito-urinary samples:
    - Culture positive for *Escherichia coli*, and *Proteus*, *Klebsiella*, and *Pseudomonas* species:
        - Noting susceptibility or resistance to first and second line options for acute bacterial prostatitis.

Present: microbiology

Before starting antibiotics:

- Mid-stream urine for microscopy, culture, and susceptibilities (MC&S).
- ± Blood cultures:
    - If there are temperature spikes, episodes of haemodynamic instability, and/or criteria for intravenous antibiotics.
- If the differential diagnosis includes chlamydia and/or gonorrhoea:

    - First-pass urine (FPU) for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* polymerase chain reactions (PCR):
        - Volume of urine (as per manufacturer's instruction) in yellow top cobas® PCR Media.
    - If purulent discharge, urethral swab for *Neisseria gonorrhoeae* culture and susceptibilities:
        - In Amies charcoal medium.

Present: blood sciences

- Full blood count (FBC), C reactive protein (CRP), ± lactate, urea and electrolytes (U&Es), liver function tests (LFTs), and clotting (prothrombin time and APTT).

Treatment

Please note:

- The antibiotic sections include fluoroquinolone usage.
- The empiric/directed per oral/intravenous regimens include ciprofloxacin/levofloxacin hyperlinked to the British National Formulary.
- For extra information on fluoroquinolone side-effects, please also note the Medicines & Healthcare products Regulatory Agency:
    - Healthcare professional information; and
    - Patient leaflet.

Intravenous versus per oral antibiotics; community versus hospital

- Criteria for intravenous:
    - (1) Progression of symptoms and signs after 48 hours of per oral antibiotics.
    - (2) Intolerant of per oral antibiotics.
    - (3) Acute urinary retention.
    - (4) Sepsis.
    - (5) Septic shock.
- Intravenous versus per oral antibiotics, and community versus hospital health care:
    - No criteria for intravenous:
        - Per oral antibiotics in the community.
    - Criteria (1) or (2) for intravenous:
        - Consider intravenous therapy in hospital or via the outpatient parenteral antimicrobial therapy (OPAT) team in the community.
    - Criteria (3) for intravenous:
        - Intravenous therapy in hospital.
    - Criteria (4) for intravenous:
        - Intravenous therapy in hospital ± in the intensive care unit (ICU).
    - Criteria (5) for intravenous:
        - Intravenous therapy in the ICU.

Empiric, per oral antibiotics: <u>without</u> a differential diagnosis of chlamydia/gonorrhoea

- If there is no history of a urogenital procedure/surgery with fluoroquinolone prophylaxis:
    - First line:
        - Ciprofloxacin 500 mg 12 hourly.

- If there is a history of a urogenital procedure/surgery with fluoroquinolone prophylaxis, or if ciprofloxacin is contraindicated:
    - First line:
        - Trimethoprim* 200 mg 12 hourly.
    - Second line:
        - Co-amoxiclav* 625 mg 8 hourly **PLUS** amoxicillin 500 mg 8 hourly.
    - Third line:
        - Fosfomycin** 3 g 24 hourly for 7 days; thereafter, 3 g 48 hourly.
- * Trimethoprim and co-amoxiclav's spectrums include common bacterial causes of acute bacterial prostatitis; however, there is no anti-pseudomonal activity.
- ** Fosfomycin and this dosage are unlicensed for acute bacterial prostatitis.

Empiric, outpatient parenteral antimicrobial therapy (OPAT): without a differential diagnosis of chlamydia/gonorrhoea

- Options may include:
    - Ceftriaxone* 2 g intravenously 24 hourly.
    - Ertapenem* 1 g intravenously 24 hourly.
    - Piperacillin tazobactam 18 g infuser 24 hourly.
- * Ceftriaxone and ertapenem's spectrums include common bacterial causes of acute bacterial prostatitis; however, there is no anti-pseudomonal activity.

Empiric, intravenous antibiotics: without a differential diagnosis of chlamydia/gonorrhoea

- If there is no history of a urogenital procedure/surgery with fluoroquinolone prophylaxis:
    - First line: ciprofloxacin 400 mg 12 hourly.
- If there is a history of a urogenital procedure/surgery with fluoroquinolone prophylaxis, or if ciprofloxacin is contraindicated:
    - First line:
        - Ceftriaxone 2 g 24 hourly; **and**
        - Tobramycin stat, dose as per hospital guidelines.
    - Second line, if ceftriaxone is contraindicated:
        - Co-trimoxazole 960 mg 12 hourly; **and**
        - Tobramycin stat, dose as per hospital guidelines.
    - Third line, if ceftriaxone and co-trimoxazole are contraindicated:
        - Co-amoxiclav 1.2 g 8 hourly; **and**
        - Tobramycin stat, dose as per hospital guidelines.
    - Fourth line, if ceftriaxone, co-trimoxazole, and co-amoxiclav are contraindicated:
        - Fosfomycin* 4 g 8 hourly; **and**
        - Tobramycin stat, dose as per hospital guidelines.
- * Fosfomycin and this dosage are unlicensed for acute bacterial prostatitis.

Empiric, per oral and intramuscular antibiotics: with a differential diagnosis of chlamydia/gonorrhoea

- If there is no history of a urogenital procedure/surgery with fluoroquinolone prophylaxis:
    - First line, if no penicillin allergy or if non-immediate without systemic involvement penicillin allergy or if nature of penicillin allergy unknown:
        - Ceftriaxone 1 g intramuscular or intravenous single dose; **and**
        - Ciprofloxacin 500 mg per oral 12 hourly; **and**

        - Doxycycline 100 mg per oral 12 hourly.
    - Second line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
        - Ciprofloxacin 500 mg per oral 12 hourly; **and**
        - Doxycycline 100 mg per oral 12 hourly.
- If there is a history of a urogenital procedure/surgery with fluoroquinolone prophylaxis, or if ciprofloxacin is contraindicated:
    - First line:
        - Co-amoxiclav* 625 mg 8 hourly **PLUS** amoxicillin 500 mg 8 hourly; **and**
        - Doxycycline 100 mg per oral 12 hourly (or, if doxycycline is contraindicated, azithromycin 1 g per oral on day 1, 500 mg on day 2, and 500 mg on day 3).
- * Co-amoxiclav's spectrum includes common bacterial causes of acute bacterial prostatitis; however, there is no anti-pseudomonal activity.
- NB1 Please refer the patient to a sexual health clinic (0800 328 3383; https://www.yoursexualhealthmatters.org.uk/), to enable screening for other sexually transmitted infections and also to facilitate tracing of sexual contacts.
- NB2 Please recommend the patient abstain from sexual intercourse, whilst on empiric antibiotics and whilst awaiting a sexual health appointment, to reduce the risk of ongoing transmission.

Empiric, intravenous and per oral antibiotics: with a differential diagnosis of chlamydia/gonorrhoea

- If there is no history of a urogenital procedure/surgery with fluoroquinolone prophylaxis:
    - First line, if no penicillin allergy or if non-immediate without systemic involvement penicillin allergy or if nature of penicillin allergy unknown:
        - Ceftriaxone 1 g intravenous single dose; **and**
        - Ciprofloxacin 400 mg intravenously 12 hourly; **and**
        - Doxycycline 100 mg per oral 12 hourly.
- If there is a history of a urogenital procedure/surgery with fluoroquinolone prophylaxis:
    - First line, if no penicillin allergy or if non-immediate without systemic involvement penicillin allergy or if nature of penicillin allergy unknown:
        - Ceftriaxone 2 g 24 hourly; **and**
        - Tobramycin stat, dose as per hospital guidelines; **and**
        - Doxycycline 100 mg per oral 12 hourly (or, if doxycycline is contraindicated, azithromycin 1 g per oral on day 1, 500 mg on day 2, and 500 mg on day 3).
    - Second line, if no penicillin allergy or if non-immediate without systemic involvement penicillin allergy or if nature of penicillin allergy unknown, and if ceftriaxone is contraindicated:
        - Meropenem 1 g intravenously 8 hourly; **and**
        - Doxycycline 100 mg per oral 12 hourly (or, if doxycycline is contraindicated, azithromycin 1 g per oral on day 1, 500 mg on day 2, and 500 mg on day 3).
    - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
        - Ciprofloxacin 400 mg intravenously 12 hourly; **and**
        - Doxycycline 100 mg per oral 12 hourly.

- NB1 Please refer the patient to a sexual health clinic (0800 328 3383; https://www.yoursexualhealthmatters.org.uk/), to enable screening for other sexually transmitted infections and also to facilitate tracing of sexual contacts.
- NB2 Please recommend the patient abstain from sexual intercourse, whilst on empiric antibiotics and whilst awaiting a sexual health appointment, to reduce the risk of ongoing transmission.

Directed, intravenous antibiotics (with susceptibilities)

- *Enterobacterales* (e.g. *Escherichia coli*, *Proteus* species, and *Klebsiella* species), according to susceptibilities:
    - First line:
        - Ciprofloxacin 400 mg 12 hourly.
    - Second line, if ciprofloxacin is contraindicated:
        - Ceftriaxone 2 g 24 hourly.
    - Third line, if ciprofloxacin and ceftriaxone are contraindicated:
        - Co-trimoxazole 960 mg 12 hourly.
    - Fourth line, if ciprofloxacin, ceftriaxone, and co-trimoxazole are contraindicated:
        - Narrowest spectrum of amoxicillin or co-amoxiclav or piperacillin tazobactam standard dosage.
    - Fifth line, if ciprofloxacin, ceftriaxone, co-trimoxazole, and amoxicillin/co-amoxiclav/piperacillin tazobactam are contraindicated:
        - Fosfomycin* 4 g 8 hourly.
- *Pseudomonas aeruginosa*, according to susceptibilities:
    - First line:
        - Ciprofloxacin 400 mg 8 hourly.
    - Second line, if ciprofloxacin is contraindicated:
        - Ceftazidime 2 g 8 hourly.
    - Third line, if ciprofloxacin and ceftazidime are contraindicated:
        - Piperacillin tazobactam 4.5 g 6 hourly.
- *Neisseria gonorrhoeae*:
    - First line:
        - Ciprofloxacin 400 mg 12 hourly.
    - Second line, if ciprofloxacin is contraindicated:
        - Ceftriaxone 2 g 24 hourly.
    - Third line, if ciprofloxacin and ceftriaxone are contraindicated:
        - Amoxicillin 1 g 8 hourly.
- *Chlamydia trachomatis*:
    - First line:
        - If available, azithromycin 500 mg 24 hourly.
    - Second line, if intravenous azithromycin is unavailable:
        - Levofloxacin 500 mg 12 hourly.
    - Third line, if levofloxacin is contraindicated:
        - Amoxicillin 1 g 8 hourly.
- * Fosfomycin and this dosage are unlicensed for acute bacterial prostatitis.

Directed, per oral antibiotics (with susceptibilities)

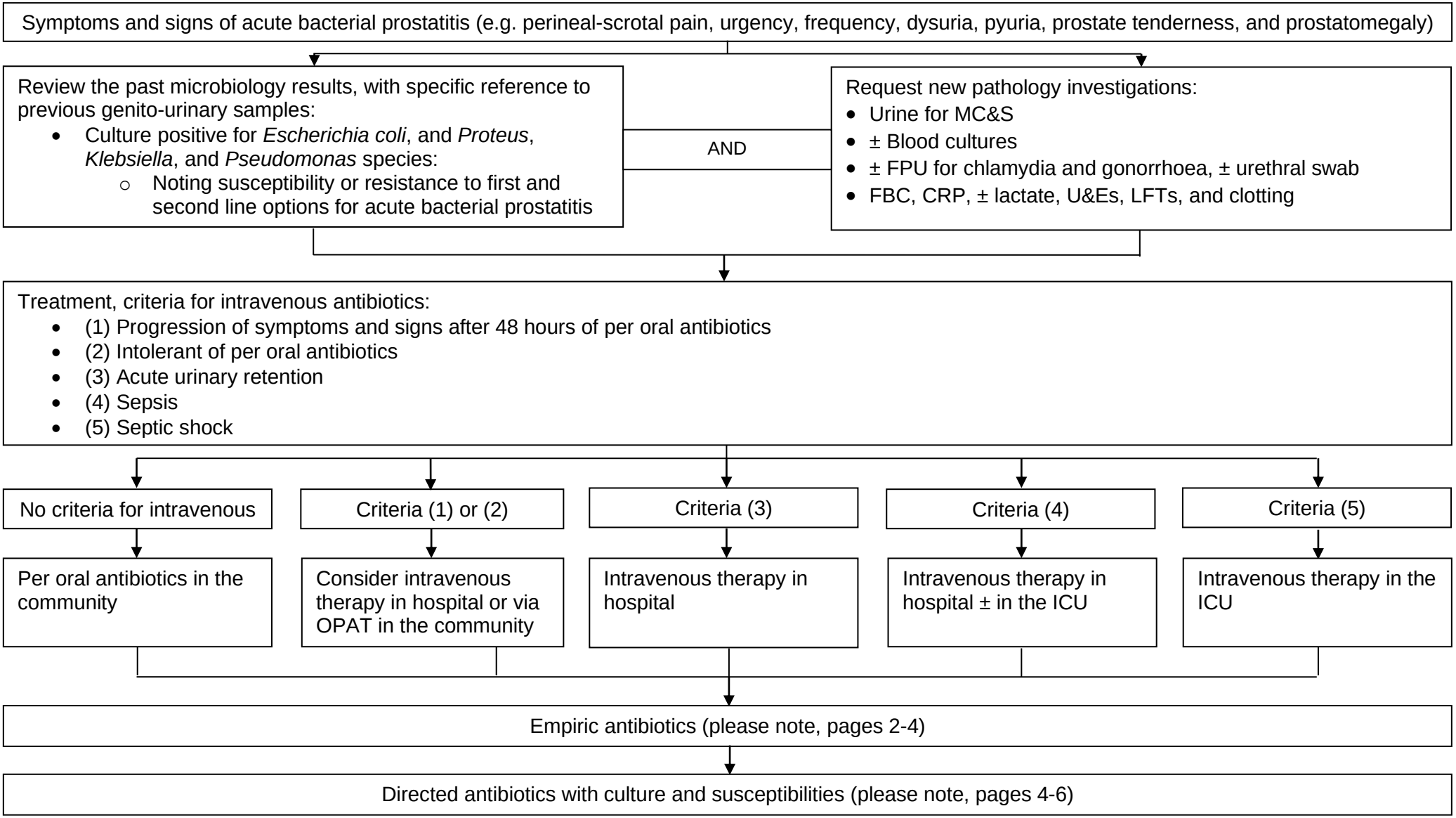
- *Enterobacterales* (e.g. *Escherichia coli*, *Proteus* species, and *Klebsiella* species), according to susceptibilities:
    - First line:
        - Ciprofloxacin 500 mg 12 hourly.
    - Second line, if ciprofloxacin is contraindicated:
        - Trimethoprim 200 mg 12 hourly.

    - Third line, if ciprofloxacin and trimethoprim are contraindicated:
        - Narrowest spectrum of:
            - Amoxicillin 1 g 8 hourly; **or**
            - Co-amoxiclav 625 mg 8 hourly **PLUS** amoxicillin 500 mg 8 hourly.
    - Fourth line, if ciprofloxacin, trimethoprim, and amoxicillin/co-amoxiclav are contraindicated:
        - Fosfomycin* 3 g 24 hourly for 7 days, thereafter, 3 g 48 hourly.
- *Pseudomonas aeruginosa*, according to susceptibilities:
    - Ciprofloxacin 750 mg 12 hourly.
- *Neisseria gonorrhoeae*:
    - First line:
        - Ciprofloxacin 500 mg 12 hourly.
    - Second line, if ciprofloxacin is contraindicated:
        - Amoxicillin 1 g 8 hourly.
    - Third line, if ciprofloxacin and amoxicillin are contraindicated:
        - Azithromycin 1 g on day 1, 500 mg on day 2, and 500 mg on day 3; thereafter, 1 g weekly.
- *Chlamydia trachomatis*:
    - First line:
        - Azithromycin 1 g on day 1, 500 mg on day 2, and 500 mg on day 3; thereafter, 1 g weekly.
    - Second line, if azithromycin is contraindicated:
        - Doxycycline 100 mg per oral 12 hourly.
    - Third line, if azithromycin and doxycycline are contraindicated:
        - Levofloxacin 500 mg 12 hourly.
- * Fosfomycin and this dosage are unlicensed for acute bacterial prostatitis.

Duration of antibiotics

- *Enterobacterales* (e.g. *Escherichia coli*, *Proteus* species, and *Klebsiella* species), *Pseudomonas aeruginosa*, and *Neisseria gonorrhoeae*:
    - 2-4 weeks:
        - In general, the symptoms and signs of acute bacterial prostatitis settle over 1 month:
            - If possible, review with the medical/surgical team (or, with the general practitioner in the community) after 2 weeks of antibiotics:
                - If resolution of symptoms and signs and if bloods (FBC, CRP) and urine are indicative of resolved 'prostatitis', stop antimicrobial chemotherapy:
                    - The initial symptoms and signs could have been consistent with cystitis, pyelonephritis, etc., rather than acute bacterial prostatitis.
                - If symptoms and signs are ongoing or if bloods (FBC, CRP) or urine are indicative of persisting prostatitis, prolong antimicrobial chemotherapy for an extra 2 weeks.
- *Chlamydia trachomatis*:
    - With azithromycin (1 g per oral on day 1, 500 mg on day 2, and 500 mg on day 3; thereafter, 1 g per oral weekly) 4 weeks.
    - With doxycycline or levofloxacin 2 weeks.

Management


Symptoms and signs of acute bacterial prostatitis (e.g. perineal-scrotal pain, urgency, frequency, dysuria, pyuria, prostate tenderness, and prostatomegaly)
Review the past microbiology results, with specific reference to previous genito-urinary samples:
• Culture positive for Escherichia coli, and Proteus, Klebsiella, and Pseudomonas species:
○ Noting susceptibility or resistance to first and second line options for acute bacterial prostatitis
AND
Request new pathology investigations:
• Urine for MC&S
• ± Blood cultures
• ± FPU for chlamydia and gonorrhoea, ± urethral swab
• FBC, CRP, ± lactate, U&Es, LFTs, and clotting
Treatment, criteria for intravenous antibiotics:
• (1) Progression of symptoms and signs after 48 hours of per oral antibiotics
• (2) Intolerant of per oral antibiotics
• (3) Acute urinary retention
• (4) Sepsis
• (5) Septic shock
No criteria for intravenous
Criteria (1) or (2)
Criteria (3)
Criteria (4)
Criteria (5)
Per oral antibiotics in the community
Consider intravenous therapy in hospital or via OPAT in the community
Intravenous therapy in hospital
Intravenous therapy in hospital ± in the ICU
Intravenous therapy in the ICU
Empiric antibiotics (please note, pages 2-4)
Directed antibiotics with culture and susceptibilities (please note, pages 4-6)

References

Bennett, J. E., Dolin, R., and Blaser, M. J. 2015. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases, 8th Edition. Elsevier.
Bonkat, G., Pickard, R., Bartoletti, R., Cai, T., Bruyere, F., Geerlings, S. E., Koves, B., and Wagenlehner, F. 2022. EAU Guidelines on Urological Infections. Available at: EAU-Guidelines-on-Urological-Infections-2022.pdf (d56bochluxqnz.cloudfront.net).
Johns Hopkins ABX Guide. 2016. Prostatitis, Acute Bacterial. Available at: Prostatitis, Acute Bacterial | Johns Hopkins ABX Guide (hopkinsguides.com).
Karaiskos, I., Galani, L., Sakka, V., Gkoufa, A., Sopilidis, O., Chalikopoulos, D., Alivizatos, G., and Giamarellou, E. 2019. Oral fosfomycin for the treatment of chronic bacterial prostatitis. Journal of Antimicrobial Chemotherapy.
Meyrier, A. and Fekete, T. 2022. Acute bacterial prostatitis. Available at: Acute bacterial prostatitis - UpToDate.
National Institute for Health and Care Excellence (NICE). 2018. Prostatitis (acute): antimicrobial prescribing. Available at: Prostatitis (acute): antimicrobial prescribing (nice.org.uk).
Sanford Guide Antimicrobial Therapy. 2022. Prostatitis, Bacterial Acute. Available at: https://www.sanfordguide.com/products/digital-subscriptions/.

Document control

Development of guidelines:	Kayleigh Lehal, Dr Peter Slovak, Dr Hayley Wood
Consultation with:	Consultant Genitourinary Medicine, Lead Antimicrobial Pharmacist, Microbiology Consultant,
Version:	2
Approval date:	Antimicrobial Stewardship Group - 25/04/2023 Surgical division - 11/05/2023
Changes from previous version:	Introduction: reworded (minor) and reformatted (minor). Diagnosis: reworded (minor) and reformatted (minor). Investigation: reworded (minor) and reformatted (minor). Treatment: reworded (minor) and reformatted (minor). Management: reworded (minor) and reformatted (minor). References: updated (minor).
Date uploaded:	24/05/2023
Next review date:	June 2026
Key contacts:	Dr Peter Slovak, Microbiology Consultant p.slovak@nhs.net Kayleigh Lehal, Lead Antimicrobial Pharmacist kayleigh.lehal@nhs.net