Acute bacterial prostatitis is an acute infection of the prostate gland that causes pelvic pain and urinary tract symptoms, such as dysuria, urinary frequency, and urinary retention, and may lead to systemic symptoms, such as fevers, chills, nausea, emesis, and malaise. Although the true incidence is unknown, acute bacterial prostatitis is estimated to comprise approximately 10% of all cases of prostatitis. Most acute bacterial prostatitis infections are community acquired, but some occur after transurethral manipulation procedures, such as urethral catheterization and cystoscopy, or after transrectal prostate biopsy. The physical examination should include abdominal, genital, and digital rectal examination to assess for a tender, enlarged, or boggy prostate. Diagnosis is predominantly made based on history and physical examination, but may be aided by urinalysis. Urine cultures should be obtained in all patients who are suspected of having acute bacterial prostatitis to determine the responsible bacteria and its antibiotic sensitivity pattern. Additional laboratory studies can be obtained based on risk factors and severity of illness. Radiography is typically unnecessary. Most patients can be treated as outpatients with oral antibiotics and supportive measures. Hospitalization and broad-spectrum intravenous antibiotics should be considered in patients who are systemically ill, unable to voluntarily urinate, unable to tolerate oral intake, or have risk factors for antibiotic resistance. Typical antibiotic regimens include ceftriaxone and doxycycline, ciprofloxacin, and piperacillin/tazobactam. The risk of nosocomial bacterial prostatitis can be reduced by using antibiotics, such as ciprofloxacin, before transrectal prostate biopsy. (Am Fam Physician. 2016;93(2):114-120. Copyright © 2016 American Academy of Family Physicians.)

Microbiology

Acute bacterial prostatitis is most frequently caused by Escherichia coli, followed by Pseudomonas aeruginosa, and Klebsiella, Enterococcus, Enterobacter, Proteus, and Serratia species. \(^3,5,7,10\) In sexually active men, Neisseria gonorrhoeae and Chlamydia trachomatis should be considered. \(^12\) Patients who are immunocompromised (e.g., persons with human immunodeficiency virus) are more likely to have uncommon causes for prostatitis, such as Salmonella, Candida, and Cryptococcus species (Table 2). \(^3,7,10,12\)

Infections that occur after transurethral manipulation are more likely to be caused by Pseudomonas species, which have higher rates of resistance to cephalosporins and carbapenems. \(^7\) Transrectal prostate biopsies can cause postoperative infections. Perioperative antibiotics have reduced the rates of
postoperative prostatitis to between 0.67% and 2.10% of cases, but have increased the incidence of prostatitis caused by fluoroquinolone-resistant bacteria and extended spectrum beta-lactamase–producing E. coli.13-18

Clinical Presentation

Patients with acute bacterial prostatitis often present with acute onset of irritative (e.g., dysuria, urinary frequency, urinary urgency) or obstructive (e.g., hesitancy, incomplete voiding, straining to urinate, weak stream) voiding symptoms. Patients may report suprapubic, rectal, or perineal pain.6,9,11 Painful ejaculation, hematospermia, and painful defecation may be present as well.19 Systemic symptoms, such as fever, chills, nausea, emesis, and malaise, commonly occur, and their presence should prompt physicians to determine if patients meet clinical criteria for sepsis.

The physical examination should include an abdominal examination to detect a distended bladder and costovertebral angle tenderness, a genital examination, and a digital rectal examination. A digital rectal examination should be performed gently because vigorous prostatic massage can induce bacteremia, and subsequently, sepsis.9,11,20

In a patient with acute bacterial prostatitis, the prostate will often be tender, enlarged, or boggy. If there is concern for obstructed voiding, postvoid residual urine volumes should be measured using ultrasonography. Several conditions present with similar symptoms and should be ruled out.

### Table 1. Risk Factors for Acute Bacterial Prostatitis

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Common</th>
<th>Uncommon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign prostatic hypertrophy*</td>
<td>Immuno compromised</td>
<td>Chlamydia trachomatis</td>
</tr>
<tr>
<td>Genitourinary infections*</td>
<td>Phimosis</td>
<td>Fungi (Aspergillus, Candida, Cryptococcus, and Histoplasma species)</td>
</tr>
<tr>
<td>Epididymitis</td>
<td>Prostate manipulation*</td>
<td>Mycobacterium tuberculosis</td>
</tr>
<tr>
<td>Orchitis</td>
<td>Cystoscopy</td>
<td>Mycoplasma genitalium</td>
</tr>
<tr>
<td>Urethritis</td>
<td>Transrectal prostate biopsy</td>
<td>Neisseria gonorrhoeae</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>Transurethral surgery</td>
<td>Salmonella species</td>
</tr>
<tr>
<td>High-risk sexual behavior</td>
<td>Urethral catheterization</td>
<td>Staphylococcus species</td>
</tr>
<tr>
<td>History of sexually transmitted diseases*</td>
<td>Urodynamic studies</td>
<td>Streptococcus species</td>
</tr>
<tr>
<td></td>
<td>Urethral stricture</td>
<td>Trichomonas vaginalis</td>
</tr>
</tbody>
</table>

*—Higher risk for infection.

Information from references 4 through 10.

### Table 2. Pathogens in Acute Prostatitis

<table>
<thead>
<tr>
<th>Common*</th>
<th>Uncommon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli (&gt; 50% of cases)</td>
<td>Chlamydia trachomatis</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>Fungi (Aspergillus, Candida, Cryptococcus, and Histoplasma species)</td>
</tr>
<tr>
<td>Klebsiella species</td>
<td>Mycobacterium tuberculosis</td>
</tr>
<tr>
<td>Enterococcus species</td>
<td>Mycoplasma genitalium</td>
</tr>
<tr>
<td>Enterobacter species</td>
<td>Neisseria gonorrhoeae</td>
</tr>
<tr>
<td>Proteus species</td>
<td>Salmonella species</td>
</tr>
<tr>
<td>Serratia species</td>
<td>Staphylococcus species</td>
</tr>
<tr>
<td></td>
<td>Treponema pallidum</td>
</tr>
</tbody>
</table>

*—Listed in approximate order of frequency.

Information from references 3, 7, 10, and 12.
Acute Bacterial Prostatitis

must be differentiated from acute bacterial prostatitis (Table 3).

Evaluation

A convincing history and physical examination are typically sufficient to diagnose acute bacterial prostatitis. Physicians should obtain a urinalysis and midstream urine culture to support the clinical diagnosis before administering antibiotics. 

Blood cultures should be collected before initiating antibiotics in patients with a body temperature greater than 101.1°F (38.4°C), a possible hematogenous source of infection (e.g., endocarditis with *Staphylococcus aureus*), complicated infections (e.g., sepsis), or who are immunocompromised. 

Although blood and urine cultures can aid in diagnosis and management, up to 35% of urine cultures in patients with acute prostatitis will fail to grow an organism. 

In men younger than 35 years who are sexually active, and in men older than 35 years who engage in high-risk sexual behavior, a Gram stain of urethral swabs, a culture of urethral discharge, or a DNA amplification test should be obtained to evaluate for *N. gonorrhoeae* and *C. trachomatis*. 

Urine testing before and after prostatic massage (also known as the Meares-Stamey 2-glass or 4-glass test) is useful in diagnosing chronic prostate and pelvic disorders; however, such testing should not be performed in patients with suspected acute bacterial prostatitis because prostatic massage increases the risk of bacteremia, and subsequently, sepsis.

PROGNOSTIC FACTORS

A 2014 study of patients with acute bacterial prostatitis identified age older than 65 years, body temperature greater than 100.4°F (38°C), benign prostatic hypertrophy, urinary retention, and transurethral catheterization as factors associated with poor outcomes. These outcomes included septic shock, positive blood culture, and prostatic abscess. In patients with any of these factors, the physician should strongly consider ordering a complete blood count and a basic metabolic panel. In the same study, a white blood cell count greater than 18,000 per mm$^3$ ($18 \times 10^9$ per L) and a blood urea nitrogen level greater than 19 mg per dL (6.8 mmol per L) were independently associated with severe cases of acute bacterial prostatitis. Inflammatory markers, such as C-reactive protein and erythrocyte sedimentation rate, will likely be elevated, but these tests have minimal clinical or diagnostic utility.

Prostate-specific antigen (PSA) levels are not indicated in the workup of acute bacterial prostatitis. Approximately 70% of men will have a spurious PSA elevation due to disruption of prostatic architecture caused by inflammation. Elevated PSA levels can persist for one to two months after treatment. If PSA levels remain elevated for more than two months, prostate cancer should be considered because 20% of persistent elevations are associated with malignancy.

IMAGING

Imaging studies are usually unnecessary during the initial evaluation, but may help when the diagnosis remains unclear or when patients do not respond to adequate antibiotic therapy. Patients who remain febrile after 36 hours or whose symptoms do not improve with antibiotics should undergo transrectal ultrasonography to evaluate for prostatic abscess. Alternatively, noncontrast computed tomography (CT) or magnetic resonance imaging (MRI) of the pelvis could be considered. Prostate biopsy should not be performed to avoid inducing septicemia.

Management

Management of acute bacterial prostatitis should be based on severity of symptoms, risk factors, and local antibiotic resistance patterns (Figure 1). Most patients can be treated with outpatient antibiotics; fewer than one in six patients will require hospitalization. Admission criteria are listed in Table 4.

Initial empiric antibiotic therapy should be based on the suspected mode of infection and the presumed
infecting organism (Table 5). Antibiotics should be adjusted based on culture and sensitivity results, when available. Men younger than 35 years who are sexually active and men older than 35 years who engage in high-risk sexual behavior should be treated with regimens that cover *N. gonorrhoeae* and *C. trachomatis*. Patients with risk factors for

### Table 4. Admission Criteria for Acute Bacterial Prostatitis

- Failed outpatient management
- Inability to tolerate oral intake
- Resistance risk factors
- Recent fluoroquinolone use
- Recent transurethral or transrectal prostatic manipulation
- Systemically ill or septicemia
- Urinary retention

**Management of Acute Bacterial Prostatitis**

**History and physical examination**

Order urinalysis and urine cultures for all patients plus postvoid residual measurement if urinary obstruction suspected. Consider admission criteria (Table 4).

**Outpatient management**

- **At risk for sexually transmitted infections?**
  - Yes: Antibiotic group A (Table 5)
  - No: Antibiotic group B (Table 5)

  Adjust antibiotics based on culture results. If symptoms persist after 2 weeks, reorder culture and extend antibiotic therapy for another 2 weeks.

**Inpatient management**

- **Consider blood cultures**

  Not severely ill and no resistance risk factors: Antibiotic group C (Table 5)
  - Yes: Transrectal ultrasonography (noncontrast CT or MRI of the pelvis are alternatives)
  - No: Urology consultation for drainage

  Yes: Urology consultation for drainage
  - No: Broaden antibiotic coverage

  Adjust antibiotics based on culture results

  Transition to oral regimen when patient is stable
  Treat for another 2 to 4 weeks with oral antibiotics
  Repeat urine culture 1 week after cessation of antibiotics

**Abscess?**

- Yes: Broaden differential diagnosis and obtaining additional blood and urine cultures

  Adjust antibiotics based on culture results

**Fever persists more than 36 hours?**

- Yes: Antibiotic group D (Table 5)
- No: Antibiotic group E (Table 5)

**Figure 1. Management of acute bacterial prostatitis. (CT = computed tomography; MRI = magnetic resonance imaging.)**
Acute Bacterial Prostatitis

Antibiotic resistance require intravenous therapy with broad-spectrum regimens because of the high likelihood of complications.\textsuperscript{7,8,15,24}

The duration of antibiotic therapy for mild infections is typically 10 to 14 days (with a two-week extension if the patient remains symptomatic), or four weeks for severe cases.

### Table 5. Antibiotic Regimens for Acute Bacterial Prostatitis

<table>
<thead>
<tr>
<th>Group</th>
<th>Primary regimen</th>
<th>Alternative regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Single dose of ceftriaxone (Rocephin), 250 mg intramuscularly, or single dose of cefixime (Suprax), 400 mg orally then Doxycycline, 100 mg orally twice daily for 10 days</td>
<td>—</td>
</tr>
<tr>
<td>B</td>
<td>Ciprofloxacin, 500 mg orally twice daily for 10 to 14 days or Levofloxacin (Levaquin), 500 to 750 mg orally daily for 10 to 14 days</td>
<td>Trimethoprim/sulfamethoxazole, 160/800 mg orally twice daily for 10 to 14 days</td>
</tr>
<tr>
<td>C</td>
<td>Ciprofloxacin, 400 mg IV every 12 hours or Levofloxacin, 500 to 750 mg IV every 24 hours</td>
<td>Ceftriaxone, 1 to 2 g IV every 24 hours plus Levofloxacin, 500 to 750 mg IV every 24 hours or Piperacillin/tazobactam (Zosyn), 3.375 g IV every 6 hours</td>
</tr>
<tr>
<td>D</td>
<td>Piperacillin/tazobactam, 3.375 g IV every 6 hours plus aminoglycosides* or Cefotaxime (Claforan), 2 g IV every 4 hours plus aminoglycosides* or Ceftazidime (Fortaz), 2 g IV every 8 hours plus aminoglycosides*</td>
<td>Fluoroquinolone (group C) plus Aminoglycosides* or Ertapenem (Invanz), 1 g IV every 24 hours or Imipenem/cilastatin (Primaxin), 500 mg IV every 6 hours or Meropenem (Merrem IV), 500 mg IV every 8 hours</td>
</tr>
<tr>
<td>E</td>
<td>Transrectal manipulation—fluoroquinolone resistance and extended spectrum beta-lactamase–producing \emph{Escherichia coli} Piperacillin/tazobactam, 3.375 g IV every 6 hours plus aminoglycosides* Ertapenem, 1 g IV every 24 hours or Imipenem/cilastatin, 500 mg IV every 6 hours</td>
<td>Fluoroquinolone (group C)† or Imipenem/cilastatin, 500 mg IV every 6 hours or Meropenem, 500 mg IV every 8 hours</td>
</tr>
<tr>
<td></td>
<td>Transurethral manipulation—\emph{Pseudomonas} species Piperacillin/tazobactam, 3.375 g IV every 6 hours† or Ceftazidime, 2 g IV every 8 hours† or Cefepime, 2 g IV every 12 hours†</td>
<td>Ceftazidime, 1 g IV every 24 hours† or Ertapenem, 1 g IV every 24 hours</td>
</tr>
<tr>
<td></td>
<td>Fluoroquinolone exposure—fluoroquinolone resistance Piperacillin/tazobactam, 3.375 g IV every 6 hours† or Ceftazidime, 2 g IV every 8 hours† or Cefepime, 2 g IV every 12 hours†</td>
<td>—</td>
</tr>
</tbody>
</table>

\textit{IV = intravenously.}

—Dosing instructions: gentamicin, 7 mg per kg IV every 24 hours, peak 16 to 24 mcg per mL, trough less than 1 mcg per mL; amikacin, 15 mg per kg IV every 24 hours, peak 56 to 64 mcg per mL, trough less than 1 mcg per mL.

†—Aminoglycosides should be added to regimen if patient is clinically unstable.

Information from references 5, 7 through 9, 15 through 17, 24, and 25.
Infections. Febrile patients should generally become afebrile within 36 hours of starting antibiotic therapy. Otherwise, imaging with transrectal ultrasonography, CT, or MRI is required to rule out prostatic abscess. After severe infections improve and the patient is afebrile, antibiotics should be transitioned to oral form and continued for another two to four weeks. Repeat urine cultures should be obtained one week after cessation of antibiotics to ensure bacterial clearance.

Supportive measures include providing antipyretics, hydrating fluids, and pain control. Acute urinary retention occurs in approximately one in 10 patients with acute bacterial prostatitis. Relieving urinary obstruction is an important treatment consideration in clearing the infection and providing pain relief. However, the best approach to this intervention has not been determined. Cystostomy provides good relief and may prevent chronic infection, but urethral catheterization is an easier option for relieving obstruction.

### Considerations

Regimen covers *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infections in addition to other common bacterial pathogens

Extend treatment for 2 weeks if patient remains symptomatic

Continue treatment until patient is afebrile, then transition to oral regimen (group B) for an additional 2 to 4 weeks

Digitally image prostate, and be treated

Carbapenems can be used if patient is unstable

If patient is stable, follow primary regimen while awaiting culture results

### Complications

Prostatic abscesses occur in 2.7% of patients with acute bacterial prostatitis and require urology consultation for drainage. Risk factors for prostatic abscess include long-term urinary catheterization, recent urethral manipulation, and an immunocompromised state.

Approximately 13% of patients with acute bacterial prostatitis experience recurrence necessitating a longer course of antibiotics. Patients with persistent or recurrent symptoms should have a repeat urine culture to evaluate for repeat bacterial prostatitis and be treated based on culture results. After three months of persistent or recurrent symptoms, patients should be evaluated and treated based on chronic prostatitis guidelines. Approximately one in nine patients with acute bacterial prostatitis will develop chronic bacterial prostatitis or chronic pelvic pain syndrome.

### Prevention

Although there are no known strategies for preventing community-acquired acute bacterial prostatitis, nosocomial infections can be reduced by avoiding unnecessary manipulation of the prostate, such as transrectal biopsy or urethral catheterization. Administering antibiotics before transrectal prostate biopsies reduces postoperative complications such as urinary tract infections, acute prostatitis, bacteriuria, and bacteremia; new approaches to prevention are needed to reduce fluoroquinolone resistance and extended spectrum beta-lactamase–producing *E. coli* infections. A 500-mg oral dose of ciprofloxacin 12 hours before transrectal prostate biopsy with a repeat dose at the time of biopsy is the typical prophylactic regimen. Preoperative enemas do not reduce infection rates. In patients who are at increased risk of
Acute Bacterial Prostatitis

harboring fluoroquinolone-resistant bacteria, preoperative stool cultures may allow for tailoring of antibiotics at the time of the procedure.\textsuperscript{12,30}

Data Sources: A PubMed search was completed in Clinical Queries using the keywords acute prostatitis, title words acute prostatitis, and prostatitis [MeSH] AND acute. The search included meta-analyses, randomized controlled trials, clinical trials, and reviews. Also searched were the Agency for Healthcare Research and Quality evidence reports, Cochrane Database of Systematic Reviews, National Guideline Clearinghouse, Essential Evidence Plus, and UpToDate. Search Dates: November 19, 2014, and October 20, 2015.

The opinions and assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the U.S. Air Force Medical Department or the U.S. Air Force at large.

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