**NOTE:** This guideline does not apply to chronic or recurrent pyelonephritis.

**Patient presents with symptoms of pyelonephritis:**
- Fever ≥ 100.4°F
- CVA tenderness
- Shaking chills/ripgors
- New onset of delirium
- Dysuria
- Urinary urgency and/or frequency
- Suprapubic or flank pain

*Note: See OSUWMC Urinary Tract Infection in Adult Patients: Diagnosis and Management guideline.*

**Consider alternative diagnosis:**
- Tube-ovarian abscess
- Nephrolithiasis
- Appendicitis
- Pancreatitis
- Perforated viscus
- Tubal pregnancy
- Pelvic inflammatory disease
- Lower lobe pneumonia

**Indications for observation / admission?**
- Inability to take PO fluids or medications
- Significant dehydration
- Uncertainty about the diagnosis
- Severe illness (high fevers: ≥ 100.4°F; abnormal vital signs: HR < 90 bpm, BP >120/80 mmHg, RR > 20 breath per minute)
- High likelihood of non-compliance with outpatient therapy
- Poor access to resources
- Immunosuppression

**Discharge to home**
- Collect urine culture (prior to antibiotics)
- Give first dose of antibiotics
  - See Table 1 for recommended empiric antibiotics
- Follow up on cultures and sensitivities

**UNCOMPLICATED Pyelonephritis**
- Begin antibiotic regimen
  - See Table 1 for recommended empiric antibiotics
- Imaging generally not indicated*
- Transition to oral therapy as soon as tolerated
- Follow up on cultures and sensitivities and de-escalate therapy as appropriate

**Complicating factors?**
- Renal transplantation
- Obstruction
- Nephrolithiasis
- Anatomic abnormality
- Neurogenic bladder
- Pregnancy
- Indwelling urinary catheter
- Failed outpatient therapy
- Healthcare-associated infection
- Recent instrumentation (ureteral stent, cystoscopy)

*Note: See ACR Appropriateness Criteria® for Acute Pyelonephritis*
Table 1. Empiric Antibiotics Recommended for UNCOMPLICATED Pyelonephritis

- Due to increasing prevalence of resistance in *E. coli*, TMP/SMX, ciprofloxacin, and ampicillin are generally not recommended for therapy, but may be an option when susceptibilities are known.
- First-generation cephalosporins can be used based on OSUWMC's current antibiogram.
- Cephalosporins are ineffective for the treatment of *Enterococcus*.
- Doses are for patients with normal renal function.
  - Modified doses may be required in renal insufficiency.

<table>
<thead>
<tr>
<th>Medication*</th>
<th>Dose</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cephalexin</td>
<td>500-1000 mg Q6-8 hrs. X 10-14 days (Oral)</td>
<td>One-time dose of ceftriaxone is required in addition per IDSA dosing.</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>1 g every 24 hrs. (IV or IM)</td>
<td></td>
</tr>
<tr>
<td>Cefdinir</td>
<td>300 mg Q12 hrs. X 7 days (Oral)</td>
<td></td>
</tr>
<tr>
<td>Cefazolin</td>
<td>1 g Q8 hrs. X 7 days (IV)</td>
<td></td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>750 mg Q24 hrs. X 7 days (IV or Oral)</td>
<td>Caution in patients who are elderly or who have history of multiple urinary tract infections due to increased resistance. Should be reserved for use in patients that are penicillin allergic.</td>
</tr>
</tbody>
</table>

*Listed in order of preference

Table 2. Empiric Antibiotics Recommended for COMPLICATED Pyelonephritis

- Cephalosporins are ineffective for the treatment of *Enterococcus*.
- Doses are for patients with normal renal function. Modified doses may be required in renal insufficiency.
- Initial treatment should be modified based upon the results of urine culture and sensitivity.
- Extended spectrum beta-lactamase organisms (ESBL) risk factors: history of ESBL infection, nursing home resident exposure to multiple antibiotics.

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piperacillin / tazobactam (preferred)</td>
<td>4.5 g Q8 hrs. X 14 days (IV)</td>
<td>β-lactamase inhibitor (tazobactam) may provide broader coverage for some Gram-negative enterics. Recommended if ampicillin-susceptible <em>Enterococcus</em> or pseudomonas suspected.</td>
</tr>
<tr>
<td>Cefepime</td>
<td>1 g Q12 hrs. X 14 days (IV)</td>
<td>Use for penicillin allergy.</td>
</tr>
</tbody>
</table>
References

- International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Acute Cystitis and Acute Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society for America and the European Society for Microbiology and Infectious Diseases. *Clinical Infectious Diseases* 2011; 52:e103-e120.

Order Sets

- OSU IP GU: Admission Urology (aka pyelonephritis)
- OSU IP ED: CDU/OBS Pyelonephritis

Quality Measures

For ICU and Non-ICU patients:
- Percent of patients with CT imaging
- Appropriate antibiotics ordered based on urine or blood work

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Guideline Approved


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