**Urinary Tract Infections (UTI) in Older Adults**

**Approach to Urinary Tract Infections (UTIs):** Judicious use of antibiotics is important to prevent adverse events & antibiotic resistance.

- **Ensure the older adult is symptomatic prior to culture.** Do not culture if asymptomatic. Differentiate symptomatic versus asymptomatic bacteriuria by looking for symptoms (see "Criteria for Symptomatic Bacteriuria", right).

**ASYMPTOMATIC Bacteriuria:**

- **Routine screening & treatment is NOT recommended in asymptomatic older adults** except for individuals undergoing genitourinary surgery/procedures. Choosing Wisely
- A positive urinalysis or culture in the absence of symptoms (see below) indicates colonization, not infection (i.e. asymptomatic bacteriuria).
- Changes in the urine (e.g. smell, cloudiness) or mental status alone, without localized genitourinary symptoms, does NOT indicate a UTI.
- There is a high prevalence of asymptomatic bacteriuria in older adults (the bladder is normally colonized in many older adults).
  - The prevalence of asymptomatic bacteriuria in adults >70 years:
    - In the community: up to 19%
    - In long-term care: up to 50%
    - Individuals with a long-term indwelling catheter: 100%
- Asymptomatic bacteriuria does not ↑ risk of mortality, & treatment does not ↓ risk of symptomatic UTI but can ↑ risk of adverse events & antimicrobial resistance. Choosing Wisely

**The Many Risks Associated with Unnecessary Antibiotic Use**

- ↑ Risk of adverse effects (e.g. *C. difficile*-associated diarrhea).
- ↑ Risk of antibiotic resistance.
  - Antibiotic resistance results in difficult to treat individuals:
    - Individuals will likely be ill or require treatment for a longer period of time
    - ↑ chance antibiotic resistance and/or illness will spread to others (especially in LTC homes via residents, staff, family or other visitors)
- ↑ Risk of drug interactions (e.g. SMX/TMP + warfarin = ↑ INR).
- Unnecessary medication cost (~$20 to $40/course for oral treatment).

**It’s HARD to Ignore a Positive (Culture & Sensitivity) C&S Test Result!**

- Asymptomatic bacteriuria will produce a positive urine C&S (and urinalysis may be positive, too) despite the absence of an active infection.
- In individuals with a long-term indwelling catheter, a urine culture loses its diagnostic abilities as the prevalence of asymptomatic bacteriuria nears 100%. The presence of symptoms must be relied upon for diagnosis, and a urine culture only serves to direct antibacterial selection.
- Over-testing (testing when symptoms are not present) combined with the prevalent colonization of the bladder in older adults will not only result in unnecessary antibiotics but may result in clinicians overlooking the real diagnosis of a non-specific symptom.

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**Criteria for SYMPTOMATIC Bacteriuria (i.e. UTI) in LTC Residents (What to look for)**

No Indwelling Catheter, Intermittent Catheterization, Condom Catheter

ONE of the following:

- Acute dysuria (pain on urination) OR acute pain, swelling or tenderness of the testes, epididymis or prostate
- Fever (oral temperature >37.8°C or 1.1°C above baseline) OR chills OR leukocytosis AND at least one of the following:
  - New or increased urinary urgency OR frequency OR incontinence
  - New gross hematuria
  - New flank/costovertebral angle OR suprapubic pain/tenderness
- At least 2 or more of the following symptoms:
  - New or increased urinary urgency OR frequency OR incontinence
  - Gross hematuria
  - New flank/costovertebral angle OR suprapubic pain/tenderness

Indwelling Catheter (21 of the following):

ONE of the following:

- Fever (oral temperature >37.8°C or 1.1°C above baseline) OR new onset hypotension with no alternate site of infection OR rigors
- Leukocytosis AND acute change in mental status OR acute functional decline
- New flank/costovertebral angle OR suprapubic pain/tenderness
- Purulent discharge from around the catheter OR acute pain, swelling or tenderness of the testes, epididymis or prostate
- Fever: older adults may not present with a fever, & may instead even be hypothermic. Assess if the individual recently received any medication(s) that can mask a fever or lower baseline temperature (e.g. acetaminophen TYLENOL, NSAIDs).

**Clinical Challenge:** Residents with impaired communication or dementia may be unable to report symptoms. In very old or frail or long-term care residents, cognitive impairment, delirium, falls, urinary incontinence, anorexia, or malaise may be the only initial or only clinical manifestation of UTI. If no other reason(s) for such clinical changes can be determined, the individual may need to be treated with antibiotics as they may have systemic effects of bacteriuria.³

Do not let non-specific symptoms complicate the assessment as these symptoms may be due to a variety of causes other than a UTI.

- Foul smelling or cloudy urine are not symptoms of a urinary tract infection but rather may be related to diet, dehydration, medication or hygiene.
- A change in mental status, fatigue, or a fall may be due to: pain, depression, constipation, dehydration, poor sleep, pneumonia, metabolic imbalance (e.g. low sodium), head trauma, environmental change or medication side effects.

It is important to consider a range of possible causes to prevent missing the real diagnosis. Causes of non-specific symptoms may be evaluated by doing the following:

- Monitor vital signs and symptoms for several days; encourage fluid intake if appropriate
- Watch closely for progression of symptoms or change in clinical status
Urinary Tract Infections (UTI) in Older Adults

- In a **symptomatic** individual, send a urine sample for culture & sensitivity (C&S) prior to starting empiric antibiotic therapy, to guide antibiotic selection.
  - If the resident has had an indwelling catheter ≥14 days, **change catheter prior** to obtaining urine sample (often, removal of catheter & hydration all that is required).
    - When symptoms of a UTI develop in a catheterized individual, changing the catheter before collecting urine improves the accuracy of urine culture results. Changing the catheter may also improve the response to antibiotic therapy by removing the biofilm that likely contains the infecting organisms and that can serve as a nidus (or source) for reinfection. Biofilms can also have persistent infections that are resistant to antimicrobial therapy. If unable to obtain a urine sample from a resident that does not have an indwelling catheter, use a condom catheter in men & in women.
  - If the resident has had an indwelling catheter <14 days, collect urine via aspiration of the catheter tubing port (i.e. do not collect from the urine/collection bag).
  - If unable to obtain a urine sample from a resident that does not have an indwelling catheter, use a condom catheter in men & in-and-out catheterization in women.

**Dip stick:** A negative dip stick result **rules out a UTI**; a positive dip stick result for leukocyte esterase, blood or nitrite is **NOT diagnostic for a UTI** but may assist in directing further testing (e.g. urine for C&S). The regular use of dip sticks is **not recommended**.

**Consider starting empiric antibiotic therapy.** Base empiric therapy on the following:

- **UTI treatment algorithms** (see following pages)
  - Short-term indwelling catheters (<30 days): *E. coli* is the most common pathogen
  - Long-term indwelling catheters (≥30 days): usually polymicrobial
  - Local antibiograms/resistance rates, when available
  - Presence of antibiotic allergies
  - **Recent antibiotic use (note any antibiotic therapy used over the past 3 months, and avoid using these agents to minimize the risk of resistance)**
  - Estimated calculated CrCl, e.g. CrCl = [(140 – age) ÷ SCR] x 90 (and x 0.85 for females)
- **Consider drug-drug interaction potential** (caution: sulfonylureas or insulin associated hyperglycemia, warfarin SMX/TMP associated ↑ bleed risk, or K+/ACEI/ARB TMP associated ↑K+)
- **Local LTC drug formulary or the individual’s drug coverage**

**Determine the antibiotic duration of treatment (see below).** 6, 7, 8, 9, 10, 11, 12, 13
- Lower UTIs in LTC: 7 days, then review symptoms to ensure resolution of UTI
- Pyelonephritis or complicated urinary tract infection: 7 to 10 days, then review to determine if treatment needs to be extended.
- All elderly men: treat for 10 days, then review symptoms to ensure resolution of UTI
- Considered complicated UTIs due to potential prostate involvement. **Note:** Chronic prostatitis may require prolonged therapy (see alternate reference for treatment regimens).
- **Older females living independently in the community with uncomplicated UTIs:** Treat with short courses of antibiotics, providing local resistance rates to empiric therapy are low (e.g. nitrofurantoin x 5 days, SMX/TMP x 3 days, cipro x 3 days)

**Review urine C&S results once available.**
- If bacteria is present in the urine, use the narrowest spectrum antibiotic as per C&S
- If bacteria is not present in the urine, discontinue empirically started antibiotics
- A urine sample is contaminated if the urine C&S shows ≥3 organisms (will be reported as “mixed flora on C&S”)
- **DO NOT repeat C&S** (i.e. “test of cure”) after treatment completion when the older adult is asymptomatic

**Recurrent Uncomplicated UTIs in Women** 14,15 - SGOC 2017, 16 - European 2015
- **Recurrent UTIs:** ≥2 culture positive UTIs in 6 months or ≥3 in 12 months (same or different organism) in **women** with no structural/functional abnormalities or other complicating factors (e.g. urinary catheters, nephrolithiasis, neuropathic bladder voiding disturbances).
  - **Antibiotics:** Individualize prophylaxis options based on patient characteristics. SGOC 17
    - **Acute self-treatment:** Consider in those able to recognize symptoms. Prescribe 1st line regimen for uncomplicated UTIs (see below) to have on hand at home. High concordance between self-diagnosis & culture in appropriately selected individuals.
    - **Post-coital prophylaxis:** Consider in those where UTI routinely presents within 24 to 48 hours of intercourse. Single dose (e.g. nitrofurantoin 50 to 100mg x 1, TMP/SMX 200/40mg x 1, TMP 100mg x 1) should be taken within 2 hours of coitus.
    - **Continuous prophylaxis:** Is effective for UTI prophylaxis (NNT=2 to 8) but may result in AEs (NNH=14). Repeat culture 1 to 2 weeks after acute treatment completion to ensure UTI eradication prior to initiating prophylaxis (e.g. TMP/SMX 200/40mg daily or 400/80mg 3 times weekly, TMP 100mg daily, and cephalexin 50 to 100mg daily).
  - **Cranberry Products:** Cranberry products inhibit adherence of *Escherichia coli* to the urogenital mucosa in pre-clinical trials; however, clinical utility is uncertain. Current evidence does not support the use of cranberry juice/tablets for the prevention of UTIs. However, opinions vary. SGOC 17
    - A Cochrane review of 24 RCTs that looked at both the juice/concentrate. 13 RCTs & tabs/caps 10 RCTs – 1 looked at both found no significant difference in the number of recurrent UTIs (including the elderly and catheterized patients). 22 Another meta-analysis of 13 RCTs looked at both the juice/concentrate. 8 RCTs & tabs/caps 4 RCTs – 1 looked at both found a NNT of 12 to avoid a recurrent UTI over ~6 months. 23
    - **Other considerations:** Cranberry juice/cocktail costs ~$0.45, contains 120 to 150 calories/250mL. Assuming 2 cups/day & the most positive data. A 1 in 12 chance of avoiding an UTI over 6 months would cost ~$180 & ~45,000 calories (5.8kg potential weight gain). Also, check sugar content → risk of hyperglycemia.
  - **Vaginal Estrogen:** May be of benefit in postmenopausal women with recurrent UTIs and guidelines recommend offering for these individuals. SGOC 17 Vaginal estrogens (creams, tabs, ring) reduced UTIs by up to ~35 to 75% in 2 RCTs. The optimal duration of treatment is unknown (trial durations were 8 and 9 months) and vaginal irritation occurred in ~20% of women. Other routes (e.g. oral, transdermal) are not recommended (oral estrogens did not reduce UTIs compared to placebo). 26
  - **Probiotics:** Not recommended as further research is required. SGOC 17 Probiotics did not reduce UTIs vs placebo in meta-analyses, but data is limited. 27, 28-Cochrane 2017, 2005
### Empiric Therapy for UNCOMPLICATED UTIs

- **Treatment duration typically 7 days:** however may treat with shorter course if older female living independently in the community (e.g. nitrofurantoin x 5 days).
- **Note:** All UTIs in men are considered complicated UTIs due to potential prostate involvement (see following page for Complicated UTIs).

### 1ST LINE THERAPY

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dose</th>
<th>Considerations for Older Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrofurantoin</strong></td>
<td>100mg BID <a href="#">MACKROBID</a> or 50 to 100mg QID <a href="#">MACRODANTIN</a></td>
<td>CrCl &lt;30mL/min: not recommended. Historically avoid if &lt;60mL/min; Beers’15 update changed recommendation to avoid if &lt;30mL/min.²⁹</td>
</tr>
<tr>
<td>Give with food</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sulfamethoxazole &amp; Trimethoprim (SMX/TMP)</strong>[†]</td>
<td>1 DS (double strength) tablet 800/160mg BID, or 2 single strength tablets of 400/80mg BID</td>
<td>CrCl 15 to 30mL/min: ⌡ the dose CrCl&lt;15mL/min: not recommended</td>
</tr>
<tr>
<td><strong>Trimethoprim (TMP)</strong><a href="#">PROLOPRIN</a></td>
<td>200mg daily or 100mg BID</td>
<td>CrCl 15 to 30mL/min: ⌡ the dose CrCl&lt;15mL/min: not recommended</td>
</tr>
<tr>
<td><strong>Fosfomycin</strong><a href="#">MONUROL</a></td>
<td>3g powder sachet x 1 dose (dissolve powder in ½ cup of water; orange flavoured); no dose ↓ required for 1 dose</td>
<td></td>
</tr>
<tr>
<td><strong>Amoxicillin</strong><a href="#">ARODIL</a></td>
<td>500mg TID or 1 gram BID</td>
<td>CrCl &lt;50mL/min: 500mg BID</td>
</tr>
<tr>
<td>In Sk, not for empiric use due to high resistance rates for E.coli</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cephalexin</strong><a href="#">REXIL</a></td>
<td>250 to 500mg QID</td>
<td>CrCl 10 to 50mL/min: 250 to 500mg BID to TID CrCl &lt;10mL/min: 250 to 500mg daily to BID</td>
</tr>
</tbody>
</table>

### 2ND LINE THERAPY

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dose</th>
<th>Considerations for Older Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amoxicillin/Clavulanate</strong></td>
<td>875/125mg BID or 500/125mg TID</td>
<td>CrCl &lt;30mL/min: 500/125mg BID</td>
</tr>
<tr>
<td><strong>Ciprofloxacin</strong><a href="#">CIPRO, CIPRO XL</a></td>
<td>250mg BID or 500mg XL daily</td>
<td>no dose ↓ required for uncomplicated UTI</td>
</tr>
<tr>
<td><strong>Levofloxacin</strong><a href="#">LEVAQUIN</a></td>
<td>250mg daily</td>
<td>no dose ↓ required for uncomplicated UTI</td>
</tr>
<tr>
<td><strong>Norfloxacin</strong><a href="#">NOROXIN</a></td>
<td>400mg BID</td>
<td>CrCl 10 to 50mL/min: 400mg daily - BID CrCl &lt;10mL/min: 400mg daily</td>
</tr>
</tbody>
</table>

* See column to the right regarding concerns with resistance rates to E.coli.

### Additional Potential Antibiotics Options for Uncomplicated UTIs:

- **Cefixime**[SUPREX] 400mg daily (if CrCl <20mL/min: 200mg [½ tablet] daily)

### Antibiotics to **AVOID** for UTIs:

- **Moxifloxacin**[AVELOX]: **DOES NOT CONCENTRATE IN THE URINE**; do NOT use to treat UTIs.

### Considerations for Older Adults

- **TMP resistance not routinely assessed in Canada**
- **Historically avoid if CrCl <3 mL/min:**
  - Avoid if CrCl <3 mL/min:
  - Do NOT use to treat UTIs.
- **Observe for increased serum levels in patients with renal impairment:**
  - **Caution if high K** & taking medications that ↑ K*: (e.g. ACEI, ARB)
  - Saskatchewan SMX/TMP resistance rates for E.coli: “20-30%”
  - **Caution with empiric use in regions with high resistance rates**
  - **Avoid in individuals with a SULFA ALLERGY** (SMX component)
  - **Caution if high K** or taking medications that ↑ K*: (e.g. ACEI, ARB)
  - Saskatchewan SMX/TMP resistance rates for E.coli: “20-30%”

### Fluoroquinolones

<table>
<thead>
<tr>
<th>Antibiotic</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Ciprofloxacin</strong><a href="#">CIPRO, XL</a></td>
<td></td>
</tr>
<tr>
<td><strong>Levofloxacin</strong><a href="#">LEVAQUIN</a></td>
<td></td>
</tr>
<tr>
<td><strong>Norfloxacin</strong><a href="#">NOROXIN</a></td>
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</table>

* See below note on moxifloxacin

### Nitrofurantoin

<table>
<thead>
<tr>
<th>Antibiotic</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrofurantoin</strong><a href="#">MACKROBID</a> / <a href="#">MACRODANTIN</a></td>
<td>100mg BID or 50 to 100mg QID</td>
<td>CrCl &lt;30mL/min: not recommended. Historically avoid if &lt;60mL/min; Beers’15 update changed recommendation to avoid if &lt;30mL/min.²⁹</td>
</tr>
</tbody>
</table>

### For more detailed medication information, see the RxFiles Drug Comparison Charts
Urinary Tract Infections (UTI) in Older Adults continued - 3rd Edition

Empiric Therapy for COMPLICATED or PYELONEPHRITIS

- Treatment duration typically 7 to 10 days. May extend up to 14 days in some cases.
- Complicated UTIs: any UTI in older males or females with a structural abnormality, urinary catheter, kidney stone, urinary retention, renal or perinephric abscess formation, diabetes, or who are immunosuppressed.
- Upper UTIs: any UTI with constitutional symptoms (e.g. fever, chills, flank pain).

1ST LINE THERAPY

Sulfamethoxazole & Trimethoprim (SMX/TMP)*

- 1 DS (double strength) tablet 800/160mg BID, or 2 single strength tablets of 400/80mg BID
- CrCl 15 to 30mL/min: ½ the dose
- CrCl<15mL/min: not recommended

Ciprofloxacin Cipro, Cipro XL *

- 500mg BID or 1 gram XL daily
- CrCl ≤30mL/min: max 500mg/day

Levofloxacin Levaquin *

- 500 to 750mg daily
- CrCl 20 to 49mL/min: 500mg x 1, then 250mg daily
- CrCl 10 to 19mL/min: 500 to 750mg x 1, then 250 to 500mg every 48 hours

2ND LINE THERAPY

Amoxicillin/Clavulanate Clavulin

- 500/125mg TID or 875/125mg BID
- CrCl <30mL/min: 500/125mg BID

Norfloxacin Noroxin *

- 400mg BID
- CrCl 10 to 50mL/min: 400mg daily to BID
- CrCl <10mL/min: 400mg daily

Trimethoprim (TMP) Proloprim *

- 200mg daily or 100mg BID for upper UTI
- 200mg BID for complicated UTI
- CrCl 15 to 30mL/min: ½ the dose
- CrCl<15mL/min: not recommended

FLUOROQUINOLONES

Ciprofloxacin Cipro, XL

- CrCl ≤30mL/min: max 500mg/day

Levofloxacin Levaquin *

- CrCl ≤30mL/min: max 500mg/day

Norfloxacin Noroxin *

- 500 to 750mg daily
- CrCl 20 to 49mL/min: 500mg x 1, then 250mg daily
- CrCl 10 to 19mL/min: 500 to 750mg x 1, then 250 to 500mg every 48 hours

Why is it important to obtain a urine culture & sensitivity (C&S) in older adults?

- A urine C&S confirms the pathogen and antibiotic susceptibility. Treatment algorithms & local antibiograms are helpful when selecting empiric antibiotic therapy, but both have caveats to consider:
  - Treatment algorithms may include broad geographic resistance rates versus local data.
  - Local antibiograms may report sensitivities for all isolates versus separating out by urine specimens or population (e.g. LTC residents). Urine samples are more likely to be collected in complicated UTIs which may skew data for uncomplicated UTIs.
- Amoxicillin, cefalaxin, fluoroquinolones & SMX/TMP are treatment options for UTIs, but antibiotic resistance rates to E.coli are high in certain geographic areas.
- 2010 IDSA Guideline suggests selecting alternative empiric therapy if local resistance is >20% with SMX/TMP for uncomplicated UTI & >10% with FQs for upper UTI treatment. A Canadian study found a national SMX/TMP resistance rate to E.coli of 16%. This rate was ↑ to 21.4% in females ≤50 years of age & ↓ to 10.7% in females >50 years of age.
- Once C&S is confirmed, ensure antibiotic therapy suitable for C&S results. This may require changing from the empiric antibiotic to an antibiotic to which the bacteria is sensitive.

Antibiotics for COMPLICATED or PYELONEPHRITIS (listed alphabetically)

<table>
<thead>
<tr>
<th>Antibiotic</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin/Clavulanate Clavulin</td>
<td>When the medication may be an option:</td>
</tr>
<tr>
<td>Ciprofloxacin Cipro, XL</td>
<td>1st Line: for COMPLICATED OR PYELONEPHRITIS when low resistance levels or UTI in SYMPTOMATIC CHRONIC CATHETERIZED individuals</td>
</tr>
<tr>
<td>Levofloxacin Levaquin</td>
<td>2nd Line: for an UNCOMPLICATED UTI</td>
</tr>
<tr>
<td>Norfloxacin Noroxin</td>
<td>Ciprofloxacin: UTI caused by Pseudomonas aeruginosa</td>
</tr>
</tbody>
</table>

For more detailed medication information, see the RxFiles Drug Comparison Charts
In community-dwelling older adults who present with a UTI (symptomatic bacteriuria) and are not receiving antibiotics, the vast majority of microbial isolates are members of the Enterobacteriaceae family, specifically Escherichia coli, Proteus mirabilis, and Klebsiella pneumoniae; Enterococcus spp. may also be isolated, but at a lower frequency than gram-negative bacilli.

Hospital Care (Yoshikawa T, Norman D, JAGS 2017)
- Treat empirically on parenteral antibiotics: 3rd generation cephalosporin (e.g. ceftriaxone, ceftazidime) or a fluoroquinolone (e.g. ciprofloxacin, levofloxacin).
- If drug-resistant organisms are suspected, consider: ertapenem, meropenem, or piperacillin-tazobactam.
- If clinical response is seen within 24-48 hours, parenteral therapy can be continued for 3-5 days, and then 10-14 days of oral antibiotic.
- Individuals with catheter-related infection who have a prompt response to the antibiotic should be treated for only 7 days because the objective is to achieve a clinical response, not microbiological eradication (catheter will soon become recolonized with bacteria after cessation of antibiotics).
- If no clinical response after 3-5 days of appropriate (based on culture and sensitivity data) parenteral therapy, evaluate for possible urinary obstruction, intrarenal abscess, perinephric abscess, or nephrolithiasis using ultrasonography or computed tomography.
- A repeat urine culture 3-5 days after completion of antibiotic therapy is generally not necessary.

Recurrent UTI (SOGC 2017)
- Antibiotic prophylaxis regimens for women with recurrent urinary tract infections
  - Continuous prophylaxis (6-12 months therapy):
    - TMP-SMX 40/200mg/d, TMP-SMX 40/200mg 3x/week, TMP 100mg daily, Nitrofurantoin 50-100mg daily, cephalexin 125-250mg daily, cefaclor 250mg daily, norfloxacin 200mg daily, ciprofloxacin 125mg daily, cinoxacin 250-500mg daily
  - Post-coital prophylaxis (single dose)
    - TMP-SMX 40/200mg, TMP-SMX 80/400mg, nitrofurantoin macrocrystal (Macroductin) 50-100mg/d, cephalexin 125-250mg, cinoxacin 250mg, ciprofloxacin 125mg, norfloxacin 200mg, ofloxacin 100mg
  - Acute self-treatment
    - TMP-SMX 160/800mg bid x 3 days, ciprofloxacin 250mg bid x 3 days, norfloxacin 200mg bid x 3 days

GERI-RXFILES UTI REFERENCES


Additional References: