
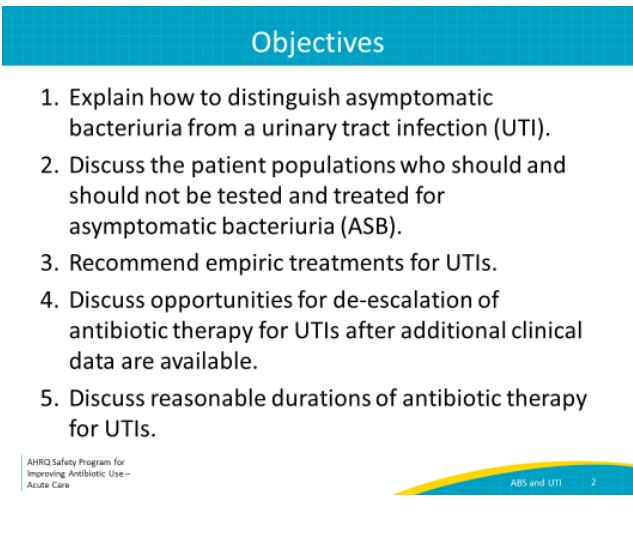


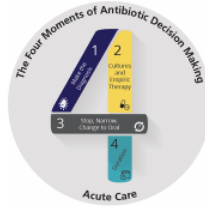
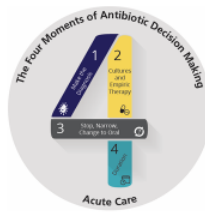
AHRQ Safety Program for Improving Antibiotic Use



Best Practices in the Diagnosis and Treatment of Asymptomatic Bacteriuria and Urinary Tract Infections Acute Care

Slide Title and Commentary	Slide Number and Slide
<p>Asymptomatic Bacteriuria and Urinary Tract Infections Acute Care</p> <p>SAY:</p> <p>This presentation will address best practices in the diagnosis and treatment of asymptomatic bacteriuria and urinary tract infections.</p>	<p>Slide 1</p> 
<p>Objectives:</p> <p>SAY:</p> <p>By the end of this presentation you will be able to—</p> <ul style="list-style-type: none"> • Explain how to distinguish asymptomatic bacteriuria from a urinary tract infection or UTI • Discuss the patient populations who should and should not be tested and treated for asymptomatic bacteriuria • Recommend empiric treatments for UTIs • Discuss opportunities for de-escalation of antibiotic therapy for UTIs after additional clinical data are available • Discuss reasonable durations of antibiotic therapy for UTIs 	<p>Slide 2</p> 



Slide Title and Commentary	Slide Number and Slide
<p>The Four Moments of Antibiotic Decision Making</p> <p>SAY:</p> <p>We will review the diagnosis and management of sepsis using the Four Moments of Antibiotic Decision Making framework.</p> <p>As a reminder, the Four Moments include:</p> <p>Moment 1: Does my patient have an infection that requires antibiotics?</p> <p>Moment 2: Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?</p> <p>Moment 3: A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from intravenous to oral therapy?</p> <p>Moment 4: What duration of antibiotic therapy is needed for my patient’s diagnosis?</p>	<p>Slide 3</p> <p>The Four Moments of Antibiotic Decision Making</p>  <ol style="list-style-type: none"> 1. Does my patient have an infection that requires antibiotics? 2. Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate? 3. A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy? 4. What duration of antibiotic therapy is needed for my patient's diagnosis? <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ABS and UTI 3</p>
<p>Moment 1 — Asymptomatic Bacteriuria and Pyuria</p> <p>SAY:</p> <p>When considering asymptomatic bacteriuria in the context of the four moments of antibiotic decision making, management of asymptomatic bacteriuria largely falls under just the first moment: does my patient have an infection that requires antibiotics? By definition, asymptomatic bacteriuria is not an infection. In rare cases where treatment is recommended—pregnant women and patients about to undergo a urological procedure involving the mucosa—the prescription of antibiotics should be considered prophylaxis against subsequent infection, rather than treatment of infection.</p>	<p>Slide 4</p> <p>The Four Moments of Antibiotic Decision Making</p>  <ol style="list-style-type: none"> 1. Does my patient have an infection that requires antibiotics? <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ABS and UTI 4</p>

Slide Title and Commentary

Asymptomatic Bacteriuria

SAY:

Asymptomatic bacteriuria is defined as the isolation of significant colony counts of bacteria in the urine from a person *without* symptoms of a urinary tract infection.

Common symptoms of cystitis are dysuria, frequency, urgency, and suprapubic pain.

Common symptoms of pyelonephritis are fever and flank pain.

Common symptoms of catheter-associated urinary tract infection, or CAUTI, are fever and suprapubic tenderness. In addition, a severe CAUTI can lead to pyelonephritis, in which patients will then have fever and flank pain.

Foul-smelling or cloudy urine does not indicate a UTI. Further, mental status changes alone in the absence of other evidence of UTI do not indicate a UTI. Pyuria can be seen in patients with a UTI but is not diagnostic of a UTI in the absence of relevant symptoms.

Asymptomatic Bacteriuria, Continued

SAY:

Asymptomatic bacteriuria is common.

This table shows the prevalence of asymptomatic bacteriuria in certain populations. Asymptomatic bacteriuria increases with age, particularly in women. It is also common in nursing home residents and people with diabetes or on hemodialysis. The majority of people with long-term indwelling urinary catheters will grow bacteria in urine cultures because of bacterial colonization, also known as biofilm formation, on the catheter.

Slide Number and Slide

Slide 5

Asymptomatic Bacteriuria

- Definition
 - Isolation of significant colony counts of bacteria in the urine from a person **WITHOUT** symptoms of a UTI.
- Remember:
 - Common symptoms of cystitis are dysuria, frequency, urgency, and suprapubic pain.
 - Common symptoms of pyelonephritis are fever and flank pain.
 - Common symptoms of catheter-associated UTI are fever and suprapubic tenderness.
 - Foul-smelling or cloudy urine does not indicate a UTI.
 - Mental status changes alone do not indicate a UTI.
 - Pyuria can be seen in patients with a UTI but is not diagnostic of a UTI in the absence of urinary symptoms.



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ASB and UTI 5

Slide 6

Asymptomatic Bacteriuria Continued

- Asymptomatic bacteriuria (ASB) is **COMMON**.¹⁻⁴


Population	Prevalence
Healthy premenopausal women	1-5%
Women 70–90 years old	11–16%
Female long-term care residents	25–50%
Male long-term care residents	15–50%
Females with diabetes	9–29%
Males with diabetes	1-11%
People receiving hemodialysis	25%
People with long-term indwelling urinary catheters	> 90%

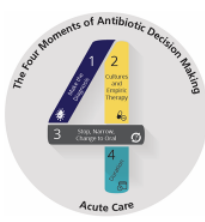
AHRQ Safety Program for Improving Antibiotic Use – Acute Care


ASB and UTI 6


Slide Title and Commentary	Slide Number and Slide																
<p>Asymptomatic Pyuria</p> <p>SAY:</p> <p>Pyuria is also common in patients with asymptomatic bacteriuria. The table shows the prevalence of pyuria in patient populations with asymptomatic bacteriuria. The presence of pyuria is not enough to diagnose a UTI and is not an indication for antibiotic therapy. If you have a patient with pyuria, you should consider whether the patient might have another cause, such as a sexually transmitted infection or interstitial nephritis.</p>	<p>Slide 7</p> <p style="text-align: center;">Asymptomatic Pyuria</p> <ul style="list-style-type: none"> Pyuria is COMMON in patients with ASB.⁵ <table border="1" data-bbox="932 365 1495 562"> <thead> <tr> <th>Population With ASB</th> <th>Prevalence of Pyuria</th> </tr> </thead> <tbody> <tr> <td>Young women</td> <td>32%</td> </tr> <tr> <td>Pregnant women</td> <td>30–70%</td> </tr> <tr> <td>Women with diabetes</td> <td>70%</td> </tr> <tr> <td>Elderly institutionalized patients</td> <td>90%</td> </tr> <tr> <td>Dialysis patients</td> <td>90%</td> </tr> <tr> <td>Patients with short-term catheters</td> <td>30–75%</td> </tr> <tr> <td>Patients with long-term catheters</td> <td>50-100%</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Pyuria in patients with asymptomatic bacteriuria is not an indication for antibiotic therapy. Other causes of pyuria to consider: sexually transmitted infections and interstitial nephritis. <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p style="text-align: right;"><small>ASB and UTI 7</small></p>	Population With ASB	Prevalence of Pyuria	Young women	32%	Pregnant women	30–70%	Women with diabetes	70%	Elderly institutionalized patients	90%	Dialysis patients	90%	Patients with short-term catheters	30–75%	Patients with long-term catheters	50-100%
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<p>Treatment of ASB Is Not Beneficial</p> <p>SAY:</p> <p>Randomized controlled trials have been performed in many populations to assess whether there is any benefit to treating asymptomatic bacteriuria. Treatment did not decrease the risk of subsequent UTI in healthy women, diabetic women, patients with long-term indwelling urinary catheters, older women in the community, elderly nursing home residents, or renal transplant patients. Treatment did not prevent subsequent joint infection in patients undergoing orthopedic surgery.</p>	<p>Slide 8</p> <p style="text-align: center;">Treatment of ASB Is Not Beneficial</p> <ul style="list-style-type: none"> Randomized, controlled trials have demonstrated a LACK of benefit of antibiotic treatment of ASB in the following populations:⁶⁻¹³ <ul style="list-style-type: none"> Healthy, nonpregnant women aged 18–40 years Diabetic women Patients with long-term indwelling catheters Older women in the community Elderly nursing home residents Renal transplant patients Patients undergoing orthopedic surgery <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p style="text-align: right;"><small>ASB and UTI 8</small></p>																
<p>Treatment of ASB May Cause Harm</p> <p>SAY:</p> <p>Treatment of asymptomatic bacteriuria is associated with adverse events related to antibiotics and development of resistant organisms causing future UTIs. In addition, a randomized controlled trial suggested that treatment of asymptomatic bacteriuria in healthy women increased the risk of a subsequent symptomatic UTI.</p>	<p>Slide 9</p> <p style="text-align: center;">Treatment of ASB May Cause Harm^{6-9, 14}</p> <ul style="list-style-type: none"> Treatment is associated with— <ul style="list-style-type: none"> Adverse events and development of resistance An increased risk of subsequent UTIs  <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p style="text-align: right;"><small>ASB and UTI 9</small></p>																

Slide Title and Commentary	Slide Number and Slide
<p>Mental Status Changes, ASB, and UTI</p> <p>SAY:</p> <p>Bacteriuria and delirium are both common in the elderly; thus, it can be difficult to understand if there is a causal relationship between these two conditions. While a UTI diagnosed based on the traditional symptoms reviewed earlier may also be associated with delirium, there is no evidence that delirium, falls, or confusion are symptoms of a UTI in the absence of development of symptoms related to the urinary tract, such as dysuria or systemic signs of infection.</p> <p>In a study in which 72 elderly residents without traditional UTI symptoms were questioned about symptoms of well-being when they did and did not have asymptomatic bacteriuria detected in urine specimens over a year, no differences in insomnia, malaise, fatigue, weakness, or anorexia were noted in the presence or absence of asymptomatic bacteriuria. These findings suggest that asymptomatic bacteriuria is not associated with a reduction in neurologic function.</p> <p>As of April 2019, guidelines recommend that in the absence of local genitourinary symptoms or systemic signs of infection, older patients with bacteriuria experiencing delirium or falls should be managed with assessment for other causes, such as dehydration, and careful observation rather than antibiotic therapy. It is important to remember that if a patient has symptoms suggestive of a systemic infection, such as hypotension, antibiotic initiation should be considered, regardless of the presence of symptoms related to the urinary tract.</p>	<p>Slide 10</p> <p>Mental Status Changes, ASB, and UTI¹⁵⁻¹⁷</p> <ul style="list-style-type: none"> • Bacteriuria and delirium are both independently common in the elderly. • Although patients with a symptomatic UTI may present with delirium, no evidence suggests that delirium, falls, or confusion are symptoms of a UTI in the absence of urinary symptoms. • Asymptomatic bacteriuria is not associated with a decreased feeling of well-being. <ul style="list-style-type: none"> – 72 elderly residents without traditional UTI symptoms with and without ASB detected in their urine specimens over a 1-year period – No differences in insomnia, malaise, fatigue, weakness, or anorexia in the presence or absence of ASB • If a patient has signs of systemic infection and delirium, empiric antibiotic therapy may be warranted. <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p><small>ASB and UTI 20</small></p>


Slide Title and Commentary	Slide Number and Slide
<p>When Is Screening/Treating For ASB Indicated?</p> <p>SAY:</p> <p>As of April 2019, guidelines recommend screening for and treating asymptomatic bacteriuria in two specific situations: pregnant women in early pregnancy and individuals about to undergo a urologic procedure in which mucosal bleeding is expected.</p> <p>Asymptomatic bacteriuria in early pregnancy confers a 20- to 30-fold increased risk for the development of pyelonephritis during the pregnancy compared with women without bacteriuria. It is also associated with preterm labor and low birth weight. As of April 2019, the optimal duration of antibiotic therapy has not been yet determined, although guidelines suggest 3–7 days.</p> <p>Asymptomatic bacteriuria has been associated with urosepsis in patients undergoing urologic procedures involving mucosal bleeding. Of note, the term “urologic procedure” does not include placement or removal of a urinary catheter.</p>	<p>Slide 11</p> <p>When Is Screening/Treating for ASB Indicated?</p> <ul style="list-style-type: none"> Guidelines recommend screening and treating for ASB in two situations¹ <ol style="list-style-type: none"> Pregnant women at 12–16 weeks gestation <ul style="list-style-type: none"> Prevents pyelonephritis, preterm labor, and infant low birth weight Impending urologic procedure in which mucosal bleeding is expected <ul style="list-style-type: none"> May prevent urosepsis This does not include placement of a urinary catheter  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASB and UTI 11</p>


Slide Title and Commentary	Slide Number and Slide
<p>Can I Follow the Same Rules for Candiduria?</p> <p>SAY:</p> <p>Ten percent of urine cultures in hospitalized patients grow <i>Candida</i>. In a multicenter, placebo-controlled trial of fluconazole in patients with candiduria who were asymptomatic or minimally symptomatic, fluconazole eradicated candiduria in two-thirds of patients. However, one-third of patients cleared the candiduria without therapy, and two-thirds of patients in both groups had recurrence of candiduria 2 weeks after fluconazole was stopped. Note that half of the patients had indwelling catheters, and to be in the study, urine cultures had to grow <i>Candida</i> after the catheter had been removed.</p> <p>Importantly, no patient developed pyelonephritis or candidemia in either group.</p> <p>Thus, treatment of asymptomatic or mildly symptomatic candida in urine cultures appears to have no clinical benefit.</p>	<p>Slide 12</p> <p>Can I Follow the Same Rules for Candiduria?</p> <ul style="list-style-type: none"> • ~10% of urine cultures in hospitalized patients grow <i>Candida</i> species. • Multicenter placebo-controlled trial of fluconazole in patients with <i>Candida</i> in two consecutive urine cultures who were asymptomatic (95%) or minimally symptomatic (5%).¹⁸ <ul style="list-style-type: none"> – Fluconazole eradicated candiduria in 2/3. – 1/3 had eradication with no therapy. – Two weeks after completion of fluconazole, <i>Candida</i> grew in 2/3 of urine cultures in both the fluconazole and placebo groups. – 56% of patients had catheters—urine cultures had to grow <i>Candida</i> after the catheter had been removed. – No patients developed pyelonephritis or candidemia. <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASB and UTI 12</p>
<p>The Four Moments of Antibiotic Decision Making</p> <p>SAY:</p> <p>In this discussion of asymptomatic bacteriuria, we've focused on Moment 1 and reviewed the critical distinction between asymptomatic bacteriuria, which is not an infection as it is not associated with signs and symptoms of infection, and urinary tract infections, which are associated with signs and symptoms that vary based on the location of the infection in the urinary tract.</p> <p>The rest of this presentation will focus on moments 2, 3, and 4.</p>	<p>Slide 13</p> <p>The Four Moments of Antibiotic Decision Making</p>  <ol style="list-style-type: none"> 1. Does my patient have an infection that requires antibiotics? 2. Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate? 3. A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy? 4. What duration of antibiotic therapy is needed for my patient's diagnosis? <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASB and UTI 13</p>


Slide Title and Commentary	Slide Number and Slide
<p>Moment 2: Urinalysis and Cultures</p> <p>SAY:</p> <p>The diagnostic evaluation for hospitalized patients suspected to have UTI should include a urinalysis and urine culture.</p> <p>Remember, urine cultures should be sent when a patient has signs and symptoms of UTI. The following situations are not indications for sending a urine culture: foul-smelling or cloudy urine, routinely on admission or preoperatively, routinely before or after a catheter change, as part of the evaluation into a fever if there are no signs or symptoms localizing to the urinary tract, or as a test of cure for a UTI.</p> <p>It is important to optimize the collection of urine cultures to increase their clinical utility. They should be collected using the clean catch approach or straight catheterization if clean catch is not possible. Standard guidance should be followed in patients with urinary catheters, and urinary catheters should optimally be changed before cultures are sent in patients with chronic indwelling catheters.</p>	<p>Slide 14</p> <p>Moment 2: Urinalysis and Cultures</p> <ul style="list-style-type: none"> • Send urinalysis (UA) and urine cultures when patients have symptoms of UTI • Do not send urine cultures for— <ul style="list-style-type: none"> – Foul-smelling or cloudy urine – Routinely on admission or preoperatively – Routinely before or after a catheter change – As part of a fever workup if there are no signs or symptoms localizing to the urinary tract – As a test of cure • Ensure that urine cultures are collected correctly  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASIS and UTI 14</p>


Slide Title and Commentary	Slide Number and Slide
<p>Moment 2: Urinalysis and Cultures, Continued</p> <p>SAY:</p> <p>The number of urinary white blood cells or WBC that is considered abnormal is based on the specific laboratory testing approach and, therefore, may vary from site to site. However, a general cutoff for a positive urinalysis or UA is greater than or equal to 10 WBC per high-power field. Thus, in a patient with fewer than 10 WBC per high-power field, there is minimal or no inflammation, making the diagnosis of UTI unlikely.</p> <p>Leukocyte esterase is also often reported and indicates the presence of WBCs. But leukocyte esterase can still be detected even when the WBC count is low and may not be clinically significant. Nitrites indicate the presence of bacteria in the urine—this result should not be used alone to determine whether there is a UTI given that a positive test may represent asymptomatic bacteriuria.</p> <p>The colony count representing a positive urine culture generally ranges from greater than or equal to 10,000 colony forming units or cfu per milliliter or mL to greater than or equal to 100,000 cfu per mL of a urinary pathogen; this may vary by microbiology laboratory. Lower cutoffs may be considered if the patient has received antibiotics before the culture was sent, if there is strong clinical suspicion of a UTI, or if the culture is from a suprapubic catheter. For urine cultures obtained from catheterized patients, the colony count representing a positive urine culture can be as low as 1,000 cfu per mL of a urinary pathogen.</p> <p>Most patients with a UTI do not need blood cultures, although they should be obtained in patients with pyelonephritis admitted to the hospital or if urosepsis is suspected.</p>	<p>Slide 15</p> <p>Moment 2: Urinalysis and Cultures, Continued 1, 19-20</p> <ul style="list-style-type: none"> • Positive UA <ul style="list-style-type: none"> – ≥ 10 WBC per high-power field (hpf) – Leukocyte esterase indicates presence of WBCs – Nitrites indicate bacteria in urine • Positive urine culture <ul style="list-style-type: none"> – No catheter: $\geq 10,000$–$100,000$ cfu/mL of a urinary pathogen – Catheter: $\geq 1,000$ cfu/mL of a urinary pathogen • Obtain blood cultures when you suspect pyelonephritis or urosepsis  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASB and UTI 15</p>


Slide Title and Commentary	Slide Number and Slide
<p>Uncomplicated Cystitis</p> <p>SAY:</p> <p>Uncomplicated cystitis is cystitis in a woman in the absence of urinary tract abnormalities. Oral therapy is preferred for empiric therapy, and you should avoid giving intravenous, or IV, therapy just because the patient is in the hospital.</p> <p>Fluoroquinolones are not considered first-line therapy for uncomplicated cystitis because of both increasing <i>E. coli</i> resistance and their associated side effects that include tendinitis, aortic dissection, and <i>Clostridioides difficile</i> infection. They can also cause mental status changes in the elderly.</p> <p>First-line treatment recommendations include nitrofurantoin, ideally in a twice-daily formulation, and trimethoprim/sulfamethoxazole or trim/sulfa. It is important to know local resistance patterns for both of these agents before using them, given increasing resistance particularly with trim/sulfa.</p> <p>For patients unable to take these agents, oral cephalosporins can also be used. When making empiric treatment decisions, remember to look at prior urine culture information as previous susceptibility patterns may help guide antibiotic choices.</p>	<p>Slide 16</p> <p style="text-align: center;">Uncomplicated Cystitis</p> <ul style="list-style-type: none"> • Moment 2: Empiric therapy²¹ <ul style="list-style-type: none"> – Oral therapy is preferred <ul style="list-style-type: none"> ○ Avoid giving ceftriaxone or other IV options just because the patient is hospitalized – Avoid fluoroquinolones <ul style="list-style-type: none"> ○ No longer first-line therapy in guidelines due to resistance and side effects – Options to consider <ul style="list-style-type: none"> ○ First-line recommendations <ul style="list-style-type: none"> ▪ Nitrofurantoin ▪ Trimethoprim/sulfamethoxazole (TMP/SMX) (check local resistance data) ○ Second-line options <ul style="list-style-type: none"> ▪ Oral cephalosporins – For any UTI, look at prior urine culture information to guide empiric therapy. <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p style="text-align: right;"><small>ASIS and UTI 26</small></p>

Slide Title and Commentary	Slide Number and Slide														
<p>Uncomplicated Cystitis, Continued</p> <p>SAY:</p> <p>The de-escalation and intravenous to oral conversion components of Moment 3 are uncommon in the management of uncomplicated cystitis, as most patients should be treated with relatively narrow spectrum oral agents for a short duration.</p> <p>However, it is important to re-examine the diagnosis of cystitis daily and if an alternative diagnosis is found, antibiotics should be stopped.</p> <p>Moment 4, optimal duration, should also be straightforward for uncomplicated cystitis. The table shows both first-line agents (in bold) and second-line agents and the recommended durations of therapy based on clinical trials. Note that most of the cephalosporins were studied for 5-day courses except cefpodoxime, which was studied for a 3-day course, and cephalexin, which was studied for a 7-day course.</p>	<p>Slide 17</p> <p>Uncomplicated Cystitis, Continued</p> <ul style="list-style-type: none"> • Moment 3: De-escalation and IV to PO conversion²¹ <ul style="list-style-type: none"> – Patients will be treated for 3–5 days with relatively narrow-spectrum agents, so there is not often an opportunity to de-escalate. – If you started therapy for cystitis and subsequently determined an alternative diagnosis, stop antibiotics. • Moment 4: Duration <table border="1" data-bbox="932 527 1260 688"> <thead> <tr> <th>Drug</th> <th>Duration Studied</th> </tr> </thead> <tbody> <tr> <td>Nitrofurantoin</td> <td>5 days</td> </tr> <tr> <td>TMP/SMX</td> <td>3 days</td> </tr> <tr> <td>Cefaclor</td> <td>5 days</td> </tr> <tr> <td>Cefpodoxime</td> <td>3 days</td> </tr> <tr> <td>Cephalexin</td> <td>7 days</td> </tr> <tr> <td>Cefdinir</td> <td>5 days</td> </tr> </tbody> </table>  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASB and UTI 17</p>	Drug	Duration Studied	Nitrofurantoin	5 days	TMP/SMX	3 days	Cefaclor	5 days	Cefpodoxime	3 days	Cephalexin	7 days	Cefdinir	5 days
Drug	Duration Studied														
Nitrofurantoin	5 days														
TMP/SMX	3 days														
Cefaclor	5 days														
Cefpodoxime	3 days														
Cephalexin	7 days														
Cefdinir	5 days														


Slide Title and Commentary	Slide Number and Slide
<p>Pyelonephritis</p> <p>SAY:</p> <p>The next few slides primarily refer to uncomplicated pyelonephritis in women admitted to the hospital. Men with UTIs often have additional contributing pathology that should be investigated and may require longer durations of antibiotic therapy.</p> <p>Empiric therapy for pyelonephritis in women has become more challenging because of emerging <i>E. coli</i> resistance to commonly used antibiotics.</p> <p>Fluoroquinolones or trim/sulfa are preferred given excellent penetration into kidney. In addition, they can be given orally and have excellent bioavailability. However, local <i>E. coli</i> resistance data must be considered as these agents cannot be recommended for empiric therapy if resistance is seen in a large proportion of isolates—some have proposed a cutoff of greater than 20 percent of isolates. Remember that <i>E. coli</i> susceptibilities on a hospital antibiogram may not reflect the <i>E. coli</i> susceptibilities of patients being admitted to the hospital from the community with pyelonephritis, which may show a greater proportion of susceptible isolates. If possible, it is useful to develop urine antibiograms and even more specifically, emergency department urine antibiograms, which are likely more reflective of resistance patterns in the community.</p> <p>Options when there is concern about declining susceptibility to fluoroquinolones and trim/sulfa include third generation cephalosporins such as ceftriaxone. For patients with severe penicillin allergies, aztreonam or gentamicin can be used.</p> <p>In patients with a history of colonization or infection with an extended-spectrum beta-lactamase-producing, or ESBL-producing, organism, ertapenem can be considered.</p>	<p>Slide 18</p> <p style="text-align: center;">Pyelonephritis²²⁻²⁵</p> <ul style="list-style-type: none"> • Moment 2: Empiric therapy <ul style="list-style-type: none"> – Fluoroquinolones or TMP/SMX are preferred given excellent penetration into kidney. <ul style="list-style-type: none"> • Can be given orally, given excellent bioavailability. • Must consider local <i>E. coli</i> resistance data as not recommended for empiric therapy if resistance is seen in greater than 20% of isolates. – Second-line therapy <ul style="list-style-type: none"> • Ceftriaxone • Severe PCN allergy: <ul style="list-style-type: none"> – Gentamicin, aztreonam  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p style="text-align: right;">ASB and UTI 28</p>


Slide Title and Commentary	Slide Number and Slide
<p>Pyelonephritis Continued</p> <p>SAY:</p> <p>For Moment 3 of pyelonephritis management, if the isolated organism is susceptible to fluoroquinolones or trim/sulfa, continuation of or conversion to these agents is reasonable. If neither can be used because of resistance, then consider converting to an oral cephalosporin once the patient has improved.</p> <p>Duration of therapy depends on the agent used. In women, 7 days of a fluoroquinolone has been shown to be equivalent to longer courses, and 5 days has been shown to be effective for levofloxacin.</p> <p>Most patients can also receive 10 days of trim/sulfa, although a 14-day course can be considered in patient who was slow to respond. There is less clinical data with oral cephalosporins in treatment of pyelonephritis, but if they need to be used because of resistance, a longer course of 10–14 days total should be considered based on clinical response and duration of the preceding IV therapy.</p> <p>Remember to count days of appropriate inpatient IV therapy towards the total count of days of therapy. For example, a patient who received 2 days of ceftriaxone needs only 5 days of oral ciprofloxacin to complete a total 7-day course.</p>	<p>Slide 19</p> <p>Pyelonephritis, Continued</p> <ul style="list-style-type: none"> • Moment 3: De-escalation and IV to PO conversion <ul style="list-style-type: none"> – If susceptible to fluoroquinolones or TMP/SMX, continue or convert to these agents and give orally. – If resistant to these agents, consider an oral cephalosporin. • Moment 4: Duration <ul style="list-style-type: none"> – Fluoroquinolones: 5–7 days total therapy – TMP/SMX: 10–14 days total therapy – Oral cephalosporin: 10–14 days total therapy  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASB and UTI 19</p>


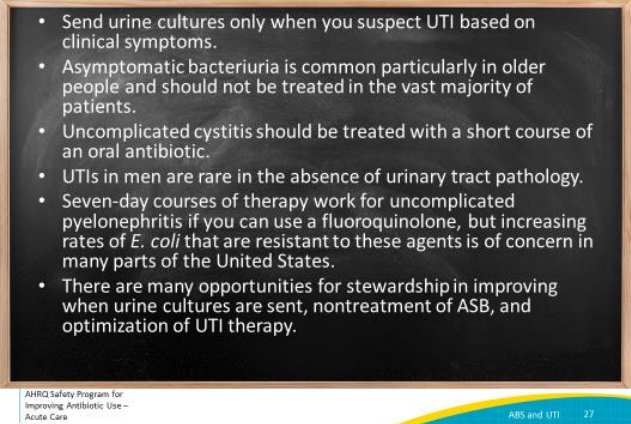
Slide Title and Commentary	Slide Number and Slide
<p>Catheter-Associated UTI</p> <p>SAY:</p> <p>For patients with catheter-associated UTI, or CAUTI, you can take the same general approach when interpreting urine results as with non-CAUTI with a few caveats.</p> <p>First, for patients with chronic catheters, the catheter should be removed, and replaced if necessary, before urine cultures are obtained. If this is not done, results are likely to show polymicrobial growth because of colonizing bacteria in the biofilm around the catheter. Thus, determining the causative organisms will be potentially challenging.</p> <p>Second, patients with catheters often have pyuria in the absence of CAUTI because of local inflammation of the bladder from the catheter.</p> <p>Third, a positive urine culture is considered $\geq 1,000$ CFU per mL of a urinary pathogen.</p> <p>All patients with CAUTI should have their catheters removed whenever possible. Empiric therapy for CAUTI depends on how ill the patient appears and is the extent of the infection—limited to the bladder vs. involving the upper tract.</p> <p>Narrower spectrum agents that do not have pseudomonal activity can be considered for lower tract infection, such as trim/sulfa or ceftriaxone. Most would recommend an agent with anti-pseudomonal activity (for example, cefepime) for an ill patient or one in whom pyelonephritis is suspected.</p>	<p>Slide 20</p> <p>Catheter-Associated UTI²⁰</p> <ul style="list-style-type: none"> • Moment 2: Urinalysis and culture <ul style="list-style-type: none"> – Same general approach as with non-CAUTI <ul style="list-style-type: none"> • For patients with chronic catheters, catheter should be removed before cultures are obtained. • Patients often have pyuria in the absence of CAUTI. • Positive urine culture: ≥ 1000 CFU/mL of a urinary pathogen. • Moment 2: Empiric therapy <ul style="list-style-type: none"> – Remove the catheter whenever possible. – Empiric therapy based on severity of illness, location of infection (upper vs. lower tract), and information from prior urine cultures if available. <div style="text-align: right; margin-top: 20px;">  </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div data-bbox="922 703 1026 745" style="font-size: small;"> AHRQ Safety Program for Improving Antibiotic Use – Acute Care </div> <div data-bbox="1291 703 1526 745" style="font-size: small; text-align: right;"> AHS and UTI 20 </div> </div>

Slide Title and Commentary	Slide Number and Slide
<p>Catheter-Associated UTI Continued</p> <p>SAY:</p> <p>If the isolated organism is susceptible to trim/sulfa, continuation of or conversion to it is reasonable. Ciprofloxacin or levofloxacin can be considered for more severe infections but should be avoided for uncomplicated lower tract infections given emerging issues with side effects. If trim/sulfa or fluoroquinolones cannot be used because of resistance, then consider converting to an oral cephalosporin once the patient has improved.</p> <p>Duration of therapy depends on the clinical scenario. If the catheter is removed in a female patient, ≤ 65 years, and no upper tract disease is present, 3 days of therapy has been shown to be effective.</p> <p>For other patients, if there is prompt resolution of symptoms 7 days of therapy will likely suffice. If there is delayed response or continued need for a catheter, a 10- to 14-day course may be required. The duration of therapy chosen is not dependent on catheter removal (except for a 3-day regimen), although catheter retention may prolong clearance of infection.</p>	<p>Slide 21</p> <p>Catheter-Associated UTI, Continued²⁰</p> <ul style="list-style-type: none"> • Moment 3: De-escalation and IV to PO conversion <ul style="list-style-type: none"> – If susceptible to TMP/SMX can continue or convert to it and give orally – If treating severe infection, can consider oral ciprofloxacin or levofloxacin <ul style="list-style-type: none"> • Avoid for uncomplicated infections given side effects – If resistant to these agents, consider an oral cephalosporin • Moment 4: Duration <ul style="list-style-type: none"> – If catheter removed in a female patient ≤ 65 years and no upper tract disease: 3 days²⁶ – Prompt resolution of symptoms: 7 days – Delayed response or obstruction: 10–14 days  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ABS and UTI 21</p>
<p>UTI in Males</p> <p>SAY:</p> <p>UTIs in males are considered complicated because they are usually associated with obstructive pathology such as renal stones, strictures, or enlarged prostates. In the absence of these risk factors, UTI is a rare diagnosis in males, and this diagnosis should be evaluated critically, particularly if it is being driven by a positive urine culture and nonspecific symptoms.</p> <p>Other causes of urinary symptoms in males to consider include prostatitis, epididymitis, and sexually transmitted infections.</p>	<p>Slide 22</p> <p>UTI in Males</p> <ul style="list-style-type: none"> • UTIs in the absence of a urinary catheter in men are considered complicated because they are usually associated with obstructive pathology such as— <ul style="list-style-type: none"> – Renal stones – Strictures – Enlarged prostate • In the absence of these risk factors, UTI is a rare diagnosis in males. • Other causes of urinary symptoms in males: prostatitis, epididymitis, sexually transmitted infections. <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ABS and UTI 22</p>

Slide Title and Commentary	Slide Number and Slide
<p>Other Complicated UTIs</p> <p>SAY:</p> <p>Besides CAUTI, other complicated UTIs include those occurring in the presence of a urological abnormality or UTI associated with pregnancy.</p> <p>In addition to antibiotics, management of the underlying associated process must also occur whenever possible (e.g., relief of obstruction via nephrostomy tubes, stents, transurethral resection of the prostate, etc.).</p> <p>As with CAUTI, antibiotic selection and duration depend on the extent of infection and the severity of illness of the patient. Narrower spectrum agents that do not have anti-pseudomonal activity can be considered for empiric treatment of lower tract infections, while most would recommend an agent with anti-pseudomonal activity for a patient in whom urosepsis or pyelonephritis is suspected. Therapy should be narrowed based on culture results.</p> <p>Duration of therapy should be determined based on clinical response of the patient and the timing of relief of the inciting process. If there is prompt resolution of symptoms and resolution of the underlying abnormality, 7 days of therapy will likely suffice. If there is delayed response or persistent obstruction, a longer course (such as 10–14 days) may be required.</p>	<p>Slide 23</p> <p>Other Complicated UTIs</p> <ul style="list-style-type: none"> • Includes UTIs occurring in the presence of urologic abnormalities such as those described on the previous slide and UTIs in pregnancy. • Management of the underlying associated process must also occur whenever possible (e.g., relief of obstruction via nephrostomy tubes, stents, transurethral resection of the prostate). • As with CAUTI, antibiotic selection depends on the extent of infection and the severity of illness of the patient. • Duration of therapy is based on the clinical response of the patient and the timing of relief of the inciting process. <ul style="list-style-type: none"> – Prompt resolution of symptoms and resolution of the underlying abnormality: 7 days of therapy – Delayed response or persistent obstruction: a longer course (e.g., 10–14 days) <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p><small>ASU and UTI 23</small></p>

Slide Title and Commentary	Slide Number and Slide
<p>Improving Prescribing for ASB and UTI at Your Hospital</p> <p>SAY:</p> <p>Prevention of testing for and treatment of asymptomatic bacteriuria is of critical importance as the collective goal is to treat patients who have UTIs while avoiding antibiotics in those who do not. The concept of asymptomatic bacteriuria is often new to clinicians who have been trained to respond to positive urine cultures without asking the important questions about signs and symptoms. The data discussed in this presentation should provide some reassurance that not treating asymptomatic bacteriuria, with rare exceptions, will not hurt and likely help our patients.</p>	<p>Slide 24</p> <p>Improving Prescribing for ASB and UTI at Your Hospital</p> <ul style="list-style-type: none"> Interventions can occur both at the time a urine culture is ordered and after urine culture results are available  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ASB and UTI 24</p>

Slide Title and Commentary	Slide Number and Slide
<p>Urine Culture Ordering Stewardship</p> <p>SAY:</p> <p>Let’s consider some strategies to reinforce optimal management of asymptomatic bacteriuria and UTI. Frontline providers should avoid ordering urine cultures in the absence of signs and symptoms of UTI, including in patients with urinary catheters and those in patients undergoing preoperative evaluation unless mucosal bleeding is expected.</p> <p>Frontline providers and stewardship teams should work together to find approaches to reduce the sending of urine cultures. It can be helpful to identify prescribers or services that send many urine cultures and then determine why they are being sent. For example, if many urine cultures are sent as part of preoperative testing that is not guideline-based, a meeting can be convened to discuss revisiting this approach and determining strategies for dissemination of new recommendations not to send preoperative cultures.</p> <p>Other approaches include working with the clinical lab to set up reflex testing protocols where urine cultures are only performed if certain parameters on the UA are met such as increased WBCs. It is important to note that this will not completely solve the problem of treatment of asymptomatic bacteriuria because patients can have pyuria and bacteria in the urine and not have a UTI, but it may reduce the collection of some unnecessary urine cultures.</p> <p>Frontline providers and stewardship teams may also consider working with information technology to develop prompts in the electronic health record that require documentation of an indication for urine cultures.</p>	<p>Slide 25</p> <p>Urine Culture Ordering Stewardship</p> <ul style="list-style-type: none"> Do not order in the absence of signs and symptoms of UTI, including patients with urinary catheters and those undergoing preoperative evaluation (unless urinary mucosal bleeding anticipated). Work with lab to determine from where and why urine cultures are being sent to identify targets for improvement. Consider reflex testing protocols with the lab. Develop tools in the EHR to prompt providers to document indication for sending a urine culture.  <p>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</p> <p>ABS and UTI 25</p>

Slide Title and Commentary	Slide Number and Slide
<p>Positive Urine Culture Stewardship</p> <p>SAY:</p> <p>Both frontline providers and stewardship teams should consider strategies to optimize management of positive urine cultures.</p> <p>Frontline providers should make a habit of asking patients if they have urinary symptoms before initiating antibiotic therapy for positive urine cultures. Also, it is important to work with colleagues to improve communication about why a urine culture was sent through documentation in the medical record or during handoffs. If a patient merits treatment, follow local guidelines developed by frontline providers and stewardship teams that include avoiding IV therapy when oral therapy is possible and minimization of use of fluoroquinolones for lower tract infection.</p>	<p>Slide 26</p> <p>Positive Urine Culture Stewardship</p> <ul style="list-style-type: none"> • Ask the patient if he or she is having urinary symptoms before initiating antibiotics. • Ask colleagues why the urine culture was sent (was there a suspicion for UTI at some point?). • Develop and follow guidelines for treatment and de-escalation. 
<p>Take-Home Messages</p> <p>SAY:</p> <p>Here are the take-home messages to remember:</p> <ul style="list-style-type: none"> • Send urine cultures only when you suspect UTI based on clinical symptoms • Asymptomatic bacteriuria is common particularly in older people and should not be treated in the vast majority of patients • Uncomplicated cystitis should be treated with a short course of an oral antibiotic • UTIs in men are rare in the absence of urinary tract pathology • Seven day courses of therapy work for uncomplicated pyelonephritis if you can use a fluoroquinolone, but increasing rates of <i>E. coli</i> that are resistant to these agents is of concern in many parts of the United States • There are <u>many</u> opportunities to improve when urine cultures are sent, nontreatment of asymptomatic bacteriuria, and optimization of UTI therapy 	<p>Slide 27</p> <p>Take-Home Messages</p> <ul style="list-style-type: none"> • Send urine cultures only when you suspect UTI based on clinical symptoms. • Asymptomatic bacteriuria is common particularly in older people and should not be treated in the vast majority of patients. • Uncomplicated cystitis should be treated with a short course of an oral antibiotic. • UTIs in men are rare in the absence of urinary tract pathology. • Seven-day courses of therapy work for uncomplicated pyelonephritis if you can use a fluoroquinolone, but increasing rates of <i>E. coli</i> that are resistant to these agents is of concern in many parts of the United States. • There are many opportunities for stewardship in improving when urine cultures are sent, nontreatment of ASB, and optimization of UTI therapy. 

Slide Title and Commentary	Slide Number and Slide
<p>Disclaimer</p> <p>SAY</p> <ul style="list-style-type: none"> The findings and recommendations in this presentation are those of the authors, who are responsible for its content, and do not necessarily represent the views of AHRQ. No statement in this presentation should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services. Any practice described in this presentation must be applied by health care practitioners in accordance with professional judgment and standards of care in regard to the unique circumstances that may apply in each situation they encounter. These practices are offered as helpful options for consideration by health care practitioners, not as guidelines. 	<p>Slide 28</p> <p style="text-align: center;">Disclaimer</p> <ul style="list-style-type: none"> The findings and recommendations in this presentation are those of the authors, who are responsible for its content, and do not necessarily represent the views of AHRQ. No statement in this presentation should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services. Any practice described in this presentation must be applied by health care practitioners in accordance with professional judgment and standards of care in regard to the unique circumstances that may apply in each situation they encounter. These practices are offered as helpful options for consideration by health care practitioners, not as guidelines. <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p style="text-align: right;"><small>ABS and UTI</small></p>
<p>References</p>	<p>Slide 29</p> <p style="text-align: center;">References</p> <ol style="list-style-type: none"> Nicolle LE, Gupta K, Bradley SF, et al. Clinical practice guideline for the management of asymptomatic bacteriuria: 2019 update by the Infectious Diseases Society of America. Clin Infect Dis. 2019 Mar 21. [Epub ahead of print]. PMID: 30895288. Taweel I, Beatty N, Duarte A, et al. Significance of bacteriuria in patients with end-stage renal disease on hemodialysis. Avicenna J Med. 2018 Apr-Jun;8(2):51-4. PMID: 29682478. Warren JW, Tenney JH, Hoopes JM, et al. A prospective microbiologic study of bacteriuria in patients with chronic indwelling urethral catheters. J Infect Dis. 1982 Dec;146(6):719-23. PMID: 6815281. Zhanell GG, Harding GK, Nicolle LE. Asymptomatic bacteriuria in patients with diabetes mellitus. Rev Infect Dis. 1991 Jan-Feb;13(1):150-4. Nicolle LE, Bradley S, Colgan R, et al. Infectious Diseases Society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. Clin Infect Dis. 2005 Mar 1;40(5):643-54. PMID: 15714408. Cai T, Mazzoli S, Mondaini N, et al. The role of asymptomatic bacteriuria in young women with recurrent urinary tract infections: to treat or not to treat? Clin Infect Dis. 2012 Sep;55(6):771-7. PMID: 22677710. <p><small>AHRQ Safety Program for Improving Antibiotic Use – Acute Care</small></p> <p style="text-align: right;"><small>ABS and UTI 29</small></p>

Slide Title and Commentary	Slide Number and Slide
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Slide Title and Commentary	Slide Number and Slide
References	<p data-bbox="899 218 1019 254">Slide 33</p> <div data-bbox="899 260 1528 317" style="background-color: #00A0C0; color: white; text-align: center; padding: 5px;">References</div> <p data-bbox="938 331 1490 638"> 23. Sandberg T, Skoog G, Hermansson AB, et al. Ciprofloxacin for 7 days versus 14 days in women with acute pyelonephritis: a randomised, open-label and double-blind, placebo-controlled, non-inferiority trial. <i>Lancet</i>. 2012 Aug 4;380(9840):484-90. PMID: 22726802. 24. Talan DA, Klimberg IW, Nicolle LE, et al. Once daily, extended release ciprofloxacin for complicated urinary tract infections and acute uncomplicated pyelonephritis. <i>J Urol</i>. 2004 Feb;171(2 Pt 1):734-9. PMID: 14713799. 25. Peterson J, Kaul S, Khashab M, et al. A double-blind, randomized comparison of levofloxacin 750 mg once-daily for five days with ciprofloxacin 400/500 mg twice-daily for 10 days for the treatment of complicated urinary tract infections and acute pyelonephritis. <i>Urology</i>. 2008 Jan;71(1):17-22. PMID: 18242357. 26. Harding GK, Nicolle LE, Ronald AR, et al. How long should catheter-acquired urinary tract infection in women be treated? A randomized controlled study. <i>Ann Intern Med</i>. 1991 May 1;114(9):713-9. PMID: 2012351. </p> <div data-bbox="922 705 1026 743" style="font-size: small;"> AHRQ Safety Program for Improving Antibiotic Use – Acute Care </div> <div data-bbox="1289 709 1528 743" style="text-align: right; font-size: small;"> ASB and UTI 33 </div>