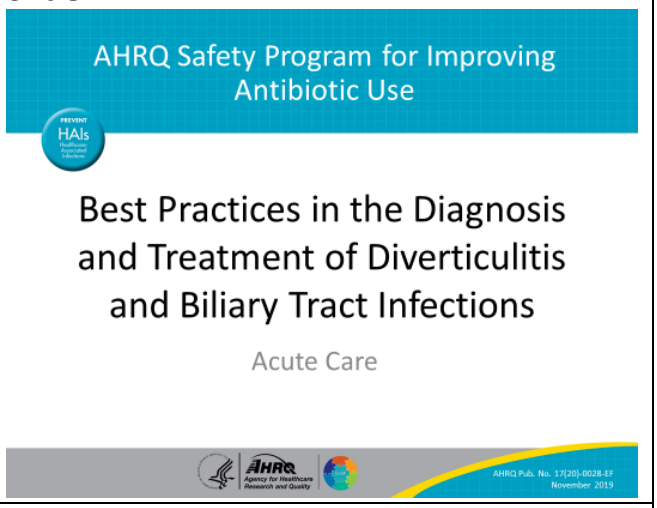
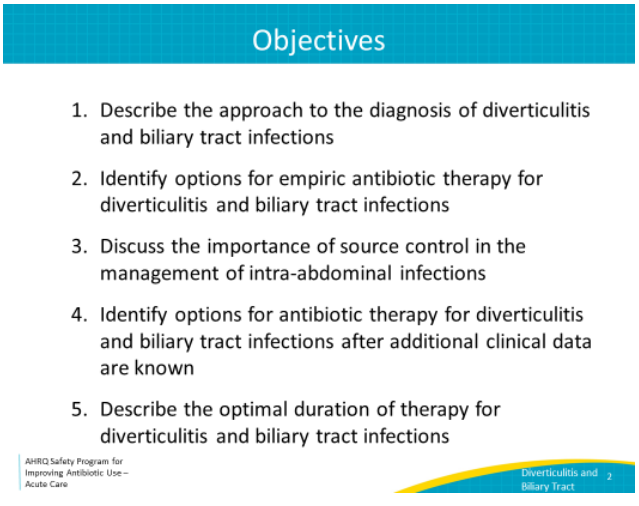
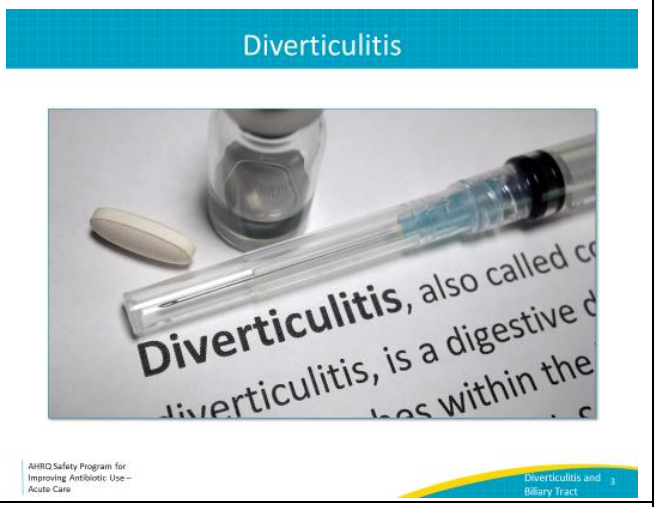
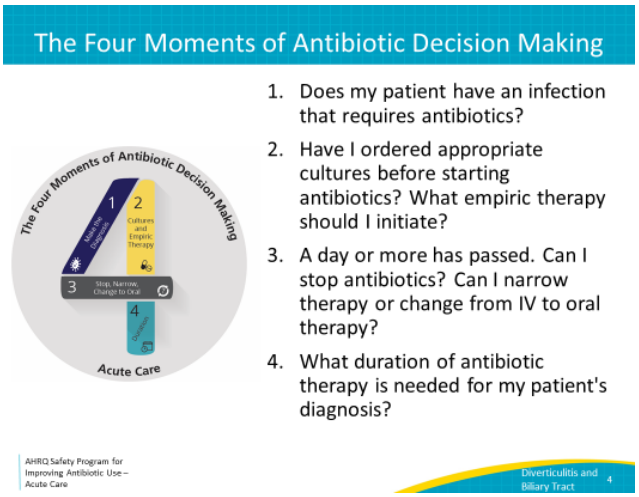
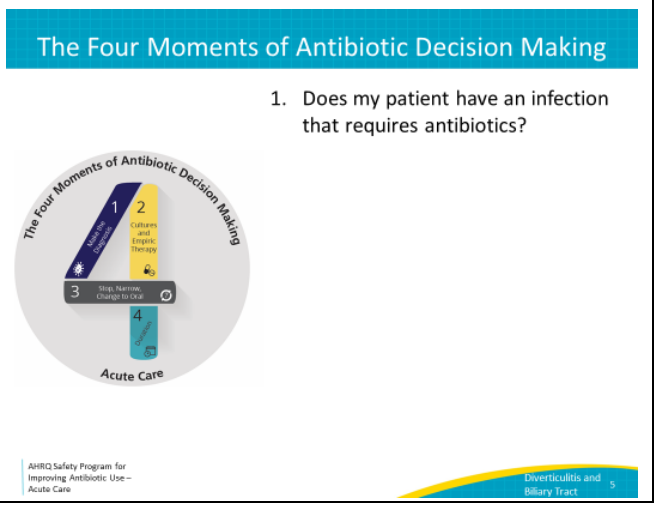
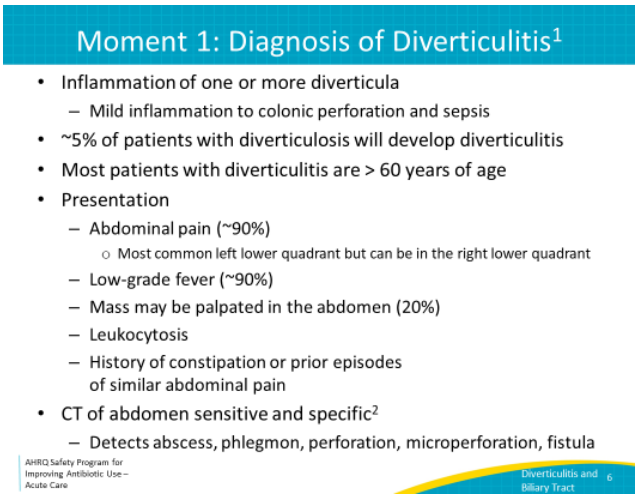
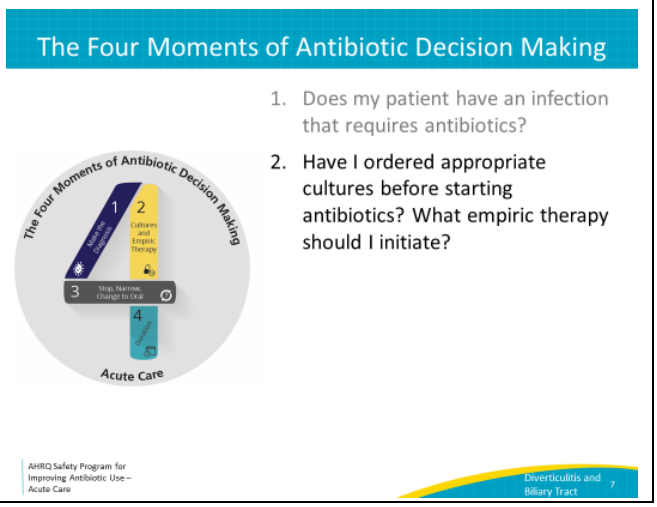
Best Practices in the Diagnosis and Treatment of Diverticulitis and Biliary Tract Infections

Slide Title and Commentary	Slide Number and Slide
Best Practices in the Diagnosis and Treatment of Diverticulitis and Biliary Tract Infections **Acute Care** SAY: This presentation will address two common intra-abdominal infections: diverticulitis and biliary tract infections.	**Slide 1** 
Objectives SAY: The objectives for this presentation are to: • Describe the approach to the diagnosis of diverticulitis and biliary tract infections • Identify options for empiric antibiotic therapy for diverticulitis and biliary tract infections • Discuss the importance of source control in the management of intra-abdominal infections • Identify options for antibiotic therapy for diverticulitis and biliary tract infections after additional clinical data are known • Describe the optimal duration of therapy for diverticulitis and biliary tract infections	**Slide 2** 

Slide Title and Commentary	Slide Number and Slide
Diverticulitis SAY: We will start by discussing diverticulitis.	**Slide 3** 
The Four Moments of Antibiotic Decision Making SAY: We will review diverticulitis using the Four Moments of Antibiotic Decision Making. 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 intravenous to oral therapy? 4. What duration of antibiotic therapy is needed for my patient's diagnosis?	**Slide 4** 

Slide Title and Commentary	Slide Number and Slide
The Four Moments of Antibiotic Decision Making SAY: Moment 1 is: Does my patient have an infection that requires antibiotics?	**Slide 5** 

Slide Title and Commentary	Slide Number and Slide
Moment 1: Diagnosis of Diverticulitis SAY: Diverticulitis is defined as inflammation of one or more diverticula. Disease presentation ranges from mild inflammation to colonic perforation and sepsis. Only about 5 percent of patients with diverticulosis will develop diverticulitis; remember that the presence of just diverticulosis on abdominal imaging does not mean that infection or inflammation is present. Most people with diverticulitis are older than 60, although recent trends suggest that younger people are also developing the disease. The vast majority of patients presenting with diverticulitis will have abdominal pain, usually in the left lower quadrant as the sigmoid colon is the most common site of both diverticulosis and diverticulitis. Most patients will also report at least low-grade fever. In addition to abdominal pain on palpation, patients may have a palpable mass indicating inflammation or abscess; the latter occurs in about 15–20 percent of cases. Most patients will have associated leukocytosis. Many patients will have a history of constipation or prior episodes of similar pain. The imaging method of choice for diverticulitis is CT, which can also help with categorizing the extent of disease by detecting associated abscess, phlegmon, perforation and microperforation, and fistula.	**Slide 6** 

Slide Title and Commentary	Slide Number and Slide
The Four Moments of Antibiotic Decision Making SAY: Moment 2 is: Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?	**Slide 7** 

Moment 2: Microbiologic Diagnosis and Empiric Therapy

SAY:

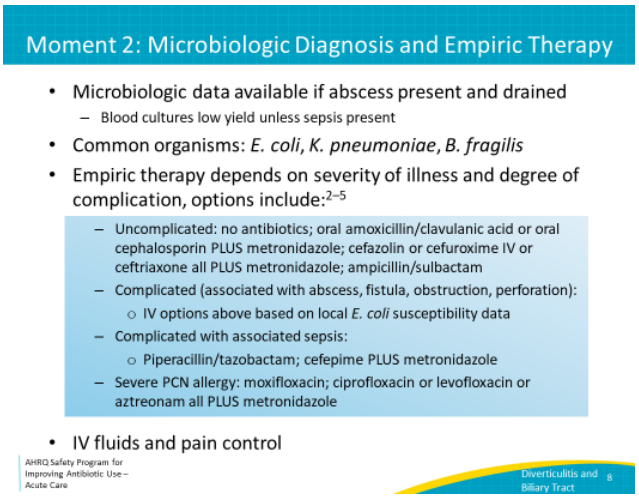
Making a microbiological diagnosis in diverticulitis is challenging unless the patient has an abscess that is drained and sent for culture. Blood cultures are of low yield and generally should not be obtained unless the patient has concomitant signs and symptoms of sepsis.

The most common organisms that cause diverticulitis are *E. coli*, *K. pneumoniae*, and *B. fragilis*; thus, empiric therapy should at a minimum cover these organisms. Empiric therapy should also be guided by the severity of illness of the patient and the extent of disease. For patients with acute uncomplicated diverticulitis, as of April 2019, the American Gastroenterological Association suggests that antibiotics should be used selectively, rather than routinely; this recommendation will be reviewed further on the next slide.

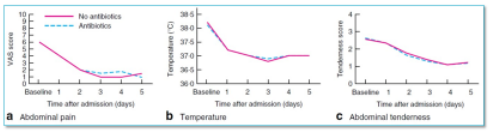
If antibiotics are given for uncomplicated diverticulitis, consider amoxicillin/clavulanic acid or an oral cephalosporin plus metronidazole if the patient can take oral therapy. If intravenous therapy is needed cefazolin, cefuroxime, or ceftriaxone, all plus metronidazole or ampicillin/sulbactam alone can be used. For patients with complicated diverticulitis, that is diverticulitis associated with an abscess, fistula, obstruction or perforation, IV therapy with cefazolin, cefuroxime, or ceftriaxone, all plus metronidazole or ampicillin/sulbactam alone can be used. Local data on *E. coli* susceptibilities to these agents should be evaluated when making treatment recommendations. This is a particular concern when using ampicillin/sulbactam for which significant decreases in *E. coli* susceptibility have been noted in many parts of the country. Finally, some institutions may recommend ertapenem, although as of April 2019 it is more expensive.

For patients with complicated diverticulitis associated with sepsis, consider broader coverage for *Enterobacteriaceae* and *Pseudomonas*with piperacillin/tazobactam or cefepime plusmetronidazole. In general, *S. aureus* is an uncommon cause of diverticulitis and empiric coverage directed at MRSA

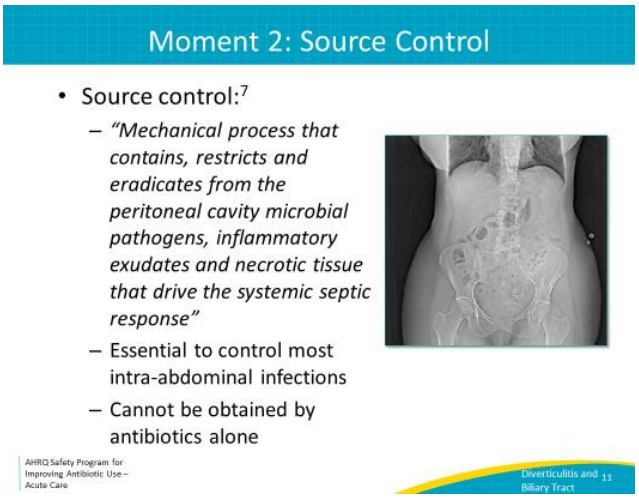
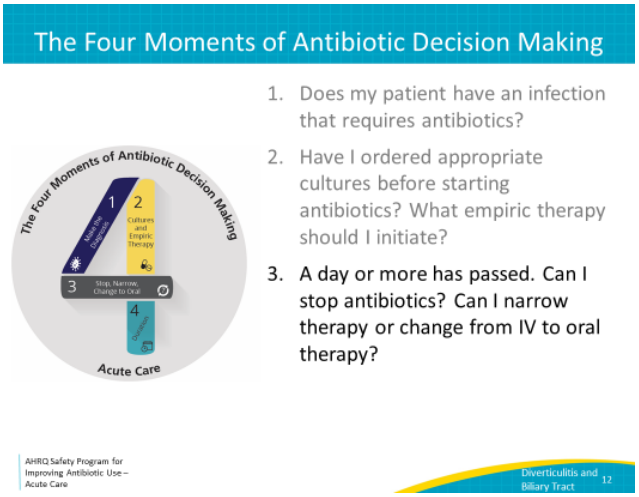
Slide 8

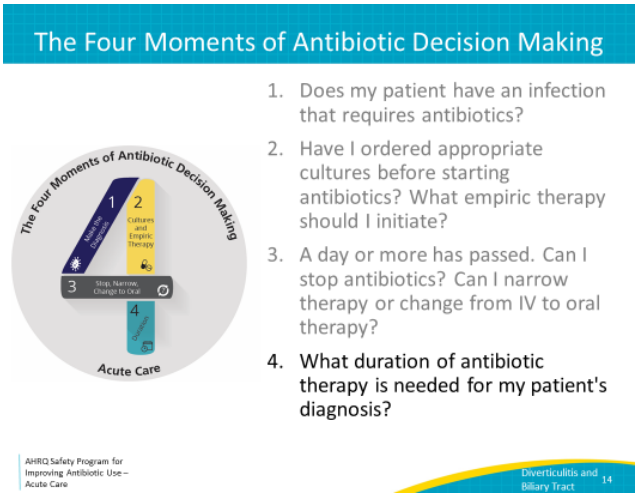


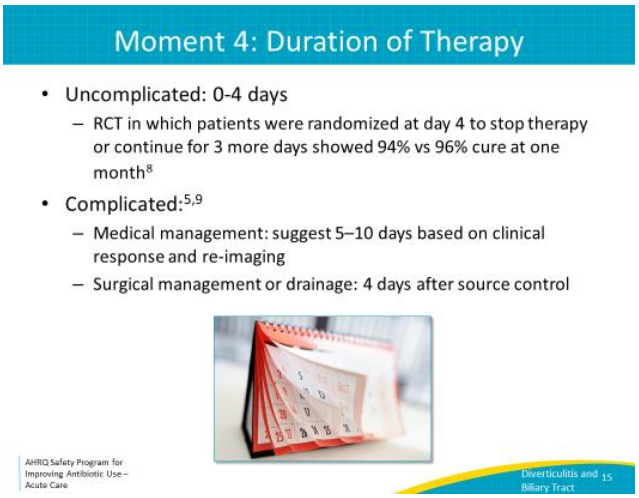
Slide Title and Commentary	Slide Number and Slide
with vancomycin is not needed in the majority of cases. Although recommended in the 2010 Infectious Diseases Society of America clinical guidelines on intra-abdominal infections, the subject matter experts who created this resource believe that empiric coverage for *Enterococcus* species is not needed in all cases as it is an organism of low virulence, and lack of empiric coverage has not been shown to impact patient outcomes. If there are current or prior cultures growing *Enterococcus* spp. or a strong clinical concern that a patient has a high risk of severe infection from *Enterococcus* spp., then an agent directed against them should be considered, for example piperacillin/tazobactam. Further, empiric coverage for *Candida* species is not needed in most cases. If there are current or prior biliary cultures growing *Candida* spp. or a strong clinical concern that a patient has a high risk of severe infection from *Candida* spp., then an agent directed against them should be considered. For patients with severe penicillin allergies, consider fluoroquinolone or aztreonam-based regimens, making sure to include anaerobic coverage unless moxifloxacin is used. Moxifloxacin has anaerobic activity; thus, addition of metronidazole is not needed when using this agent. Vancomycin should be added to ciprofloxacin and aztreonam in patients presenting with sepsis as these agents do not have Gram-positive activity to cover streptococci or enterococci. Patients who are hospitalized should also be managed with IV fluids and pain control.	

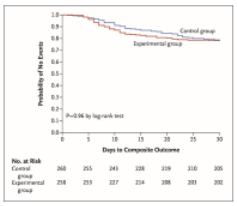
Slide Title and Commentary	Slide Number and Slide
Moment 2: Are Antibiotics Needed for Uncomplicated Diverticulitis? SAY: Several randomized controlled trials and cohort studies have suggested that antibiotics may not be needed for treatment of patients with uncomplicated diverticulitis. The first of these, published in 2012, randomized 623 patients to receive either no antibiotic therapy or standard of care antibiotic therapy; these patients received at least 7 days of therapy with the regimens chosen by the care team. These included a cephalosporin plus metronidazole, a carbapenem or piperacillin/tazobactam followed by oral therapy with ciprofloxacin. Patients had CT-confirmed diverticulitis without complicating features and were admitted to the hospital. Baseline characteristics were similar between the groups. 97 percent of patients had abdominal pain, 90 percent had fever, and the mean WBC was 12.5. The three curves show the time course of decrease in abdominal pain by patient report, temperature, and abdominal tenderness from baseline through day 5 of hospital admission. Note that patients who did not receive antibiotics (in pink) had almost identical clinical courses as patients who did receive antibiotics (in blue). Patients were followed for 12 months. Complications were rare in the two groups with 2 percent of patients in the group that did not receive antibiotics and 1 percent of patient in the group that received antibiotics developing subsequent perforation or abscess. In practice, when considering not prescribing antibiotics, it is important to select patients who are stable without evidence of sepsis who clearly have uncomplicated disease by CT. Some have argued that most patients who meet these criteria may not be admitted to the hospital in the first place, although as long as the patient has a followup plan, it would be reasonable to also use this strategy in patients seen in clinic or the emergency department.	**Slide 9** Moment 2: Are Antibiotics Needed for Uncomplicated Diverticulitis? • Multicenter RCT of antibiotics vs. no antibiotics for CT-verified acute left-sided uncomplicated diverticulitis (n = 623)[6] • Antibiotics given for at least 7 days and included: – Cephalosporin/metronidazole, carbapenem, piperacillin/tazobactam – Ciprofloxacin step down • Baseline characteristics balanced between both arms • On presentation, 97% with abdominal pain, 90% with fever, mean WBC 12.5 cells/mL  • Complications (perforation, abscess formation) in 2% who did not and 1% who did receive antibiotics AHRQ Safety Program for Improving Antibiotic Use – Acute Care Diverticulitis and Biliary Tract 9

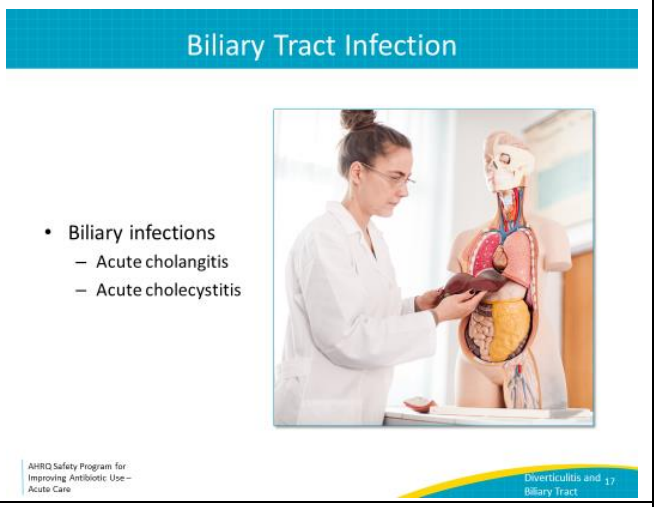
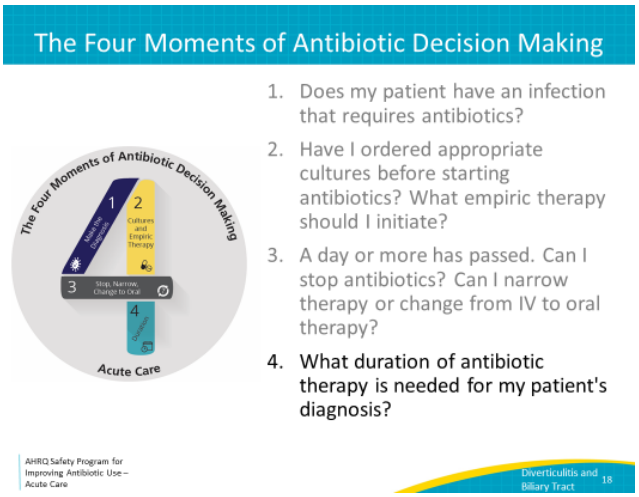
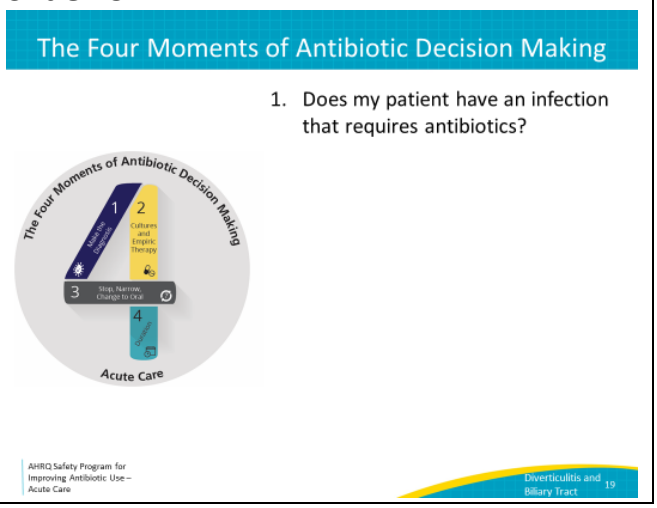
Slide Title and Commentary	Slide Number and Slide
Moment 2: When To Call the Surgeon SAY: Diverticulitis is an illness managed by many medicine and surgery providers. For patients admitted to medicine services, it is important to recognize when surgical consultation during the admission is indicated. Specific examples include the presence of perforation, peritonitis, obstruction, and/or failure of medical therapy. For patients with abscesses, management depends on the size of the abscess. Attempts should be made to percutaneously drain abscesses, particularly those ≥ 5 cm. Smaller abscesses (those that are 3–4 cm) may be harder to reach. If they cannot be drained, some small abscesses may respond to medical therapy alone. If the abscess is large and cannot be drained, surgical intervention is generally required. For patients with fistula or stricture, if they can be stabilized, elective or semi-elective surgery is generally required. For patients with multiple episodes of diverticulitis, there is some controversy about the role of elective surgery as part of management, although outpatient surgical follow up is indicated.	**Slide 10** 

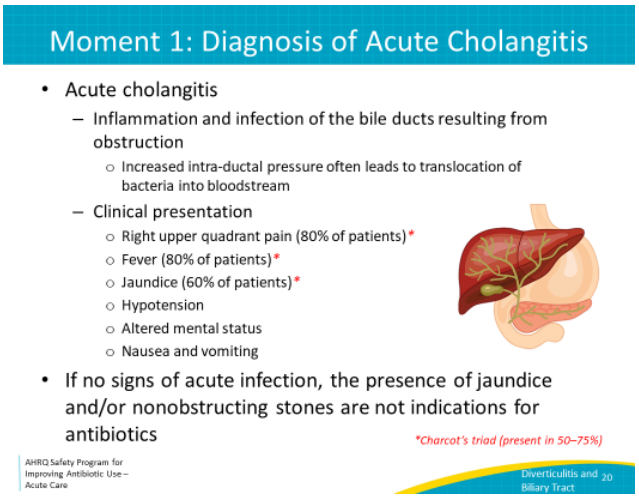
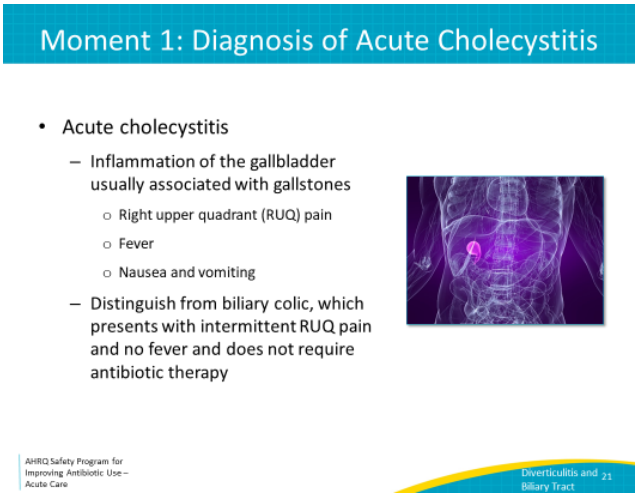
Slide Title and Commentary	Slide Number and Slide
Moment 2: Source Control SAY: Controlling the source of infection via percutaneous drain or a surgical procedure is an important component of management of many infectious diseases processes- including intra-abdominal infections. Source control has been defined as a "mechanical process that contains, restricts and eradicates from the peritoneal cavity microbial pathogens, inflammatory exudates and necrotic tissue that drive the systemic septic response." Antibiotics alone will be unable to contain infection when there is a significant abscess or leakage of intraluminal contents into the peritoneal space—they will not reach the site adequately to fully sterilize it and they have no ability to affect the inflammatory process of WBC and tissue necrosis that drives systemic symptoms. The concept of source control is commonly used when discussing intra-abdominal infections, but applies to all infectious diseases—if enough pus is present, or if that pus is in a location that is not draining, a procedure to debride the pus is almost always required. In addition, for many infections involving hardware (such as orthopedic rods), removal of hardware is often needed for cure.	**Slide 11** 
The Four Moments of Antibiotic Decision Making SAY: Moment 3 occurs after a day or more has passed. Ask yourself: Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?	**Slide 12** 

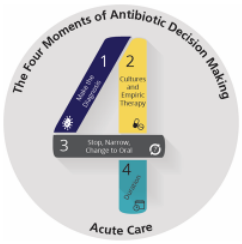
Slide Title and Commentary	Slide Number and Slide
Moment 3: Narrowing and Converting to Oral Therapy SAY: If culture data are available, therapy should be narrowed based on these results. For infections involving the colon, step-down regimens generally include anaerobic coverage given the high burden of anaerobes in the colon. Overall, it is reasonable to switch to oral therapy when the patient has clinical improvement. Patients undergoing medical management should show improvement by 48 hours. Oral regimens to consider include oral cephalosporins plus metronidazole, trimethoprim/sulfamethoxazole plus metronidazole, or either ciprofloxacin or levofloxacin plus metronidazole, or amoxicillin/clavulanate or moxifloxacin as single agents. Although moxifloxacin has anaerobic activity, ciprofloxacin and levofloxacin do not.	**Slide 13** 
The Four Moments of Antibiotic Decision Making SAY: The last moment to consider is, what duration of antibiotic therapy is needed for your patient's diagnosis?	**Slide 14** 

Slide Title and Commentary	Slide Number and Slide
Moment 4: Duration of Therapy SAY: Uncomplicated diverticulitis, if treated with antibiotics, does not require a long course of therapy. In a randomized controlled trial in which patients were randomized at day 4 to stop therapy or continue for 3 more days, cure rates were high and similar in the two groups—94 percent versus 96 percent cure at one month. Thus, most patients can receive 4 days of therapy, if they have a good clinical response. Treatment duration in complicated diverticulitis depends on the status of source control. For patients undergoing medical management of a small abscess, durations ranging from 5 to 10 days may be considered based on clinical response and results of repeat imaging to assess for improvement in the size of the abscess and associated inflammation. In general, a prolonged course of antibiotics beyond 14 days should be avoided; if patients have not improved, surgical management may be indicated. For patients who achieve source control via percutaneous drainage or surgical intervention, a randomized study has demonstrated that 4 days of therapy after source control is appropriate. These data are reviewed on the next slide.	**Slide 15** 

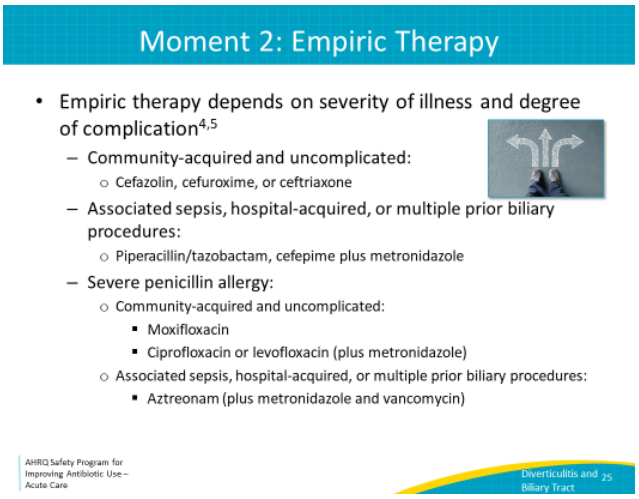
Slide Title and Commentary	Slide Number and Slide
Moment 4: Duration of Therapy SAY: In a randomized trial known as the STOP-IT trial (Study to Optimize Peritoneal Infection Therapy), 518 patients with intra-abdominal infection were randomized to receive either 4 days of antibiotics or up to 10 days of antibiotics after source control was achieved. Infections arising from several abdominal sites were enrolled including the colon or rectum in 35 percent, the appendix in 14 percent, the small bowel in 14 percent, and the biliary tree including the gallbladder in 10 percent. One-third of patients had percutaneous drainage as the method of source control. The primary outcome was a composite of development of a surgical site infection, recurrence of intra-abdominal process, and/or death. There was no difference in the two groups in the primary outcome, which occurred in 22 percent of patients in both arms. While receipt of longer courses of antibiotics did not prevent subsequent infection, it was associated with a delay in the diagnosis of surgical site infections by 6 days and a delay in the diagnosis of a recurrent intra-abdominal infection by four days. In other words, antibiotics did not prevent these infections, but delayed their diagnosis. Such delays prolong the period of convalescence for patients following surgical procedures and should be avoided. The STOP-IT trial provides compelling evidence that 4 days of antibiotic therapy after source control should be the preferred approach for treatment of intra-abdominal infections.	**Slide 16** Moment 4: Duration of Therapy • STOP-IT trial: 518 patients with intra-abdominal infection randomized to receive either 4 days or up to 10 days (median was 8) of antibiotic therapy after source control[10] • Primary outcome: surgical site infection (SSI), recurrent intra-abdominal process and/or death – 22% vs. 22% • Time to diagnosis of SSI: – 9 vs. 15 days • Time to diagnosis of recurrent intra-abdominal process: – 11 vs. 15 days  AHRQ Safety Program for Improving Antibiotic Use – Acute Care Diverticulitis and Biliary Tract 16

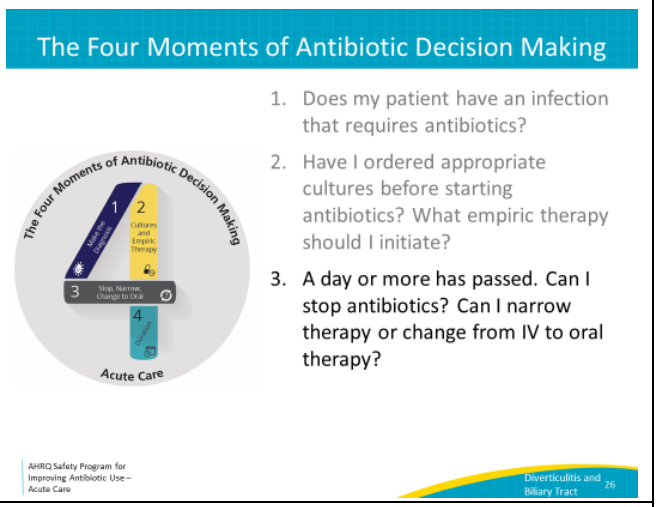
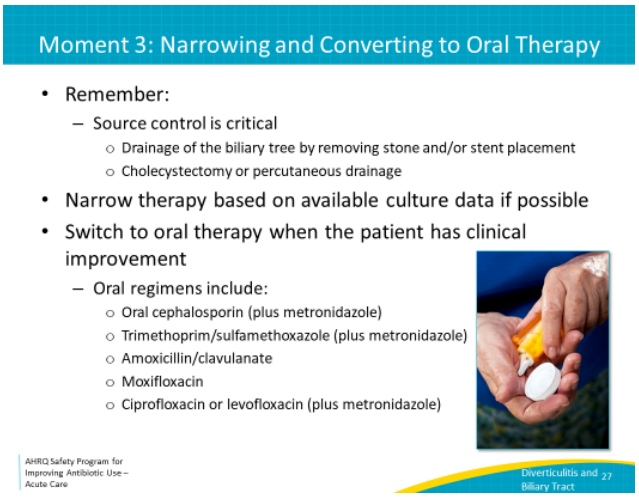
Slide Title and Commentary	Slide Number and Slide
Biliary Tract Infection SAY: We will move on to discussing two common biliary tract infections: acute cholangitis and acute cholecystitis.	**Slide 17** 
The Four Moments of Antibiotic Decision Making SAY: We will review these infections using the Four Moments of Antibiotic Decision Making.	**Slide 18** 
The Four Moments of Antibiotic Decision-Making SAY: Moment 1 is: Does my patient have an infection that requires antibiotics?	**Slide 19** 

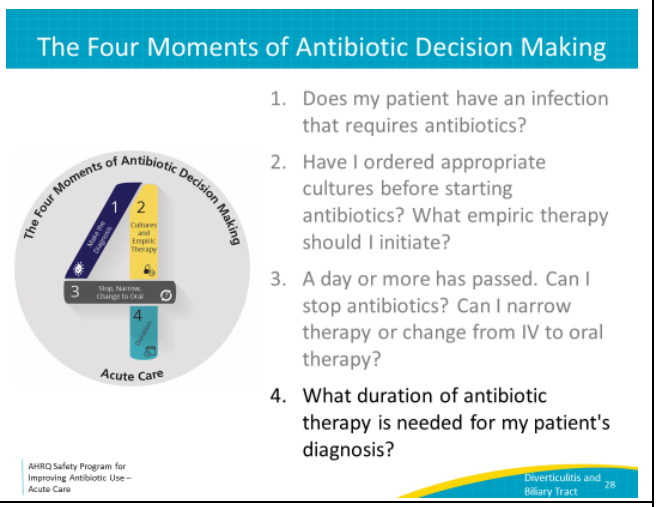
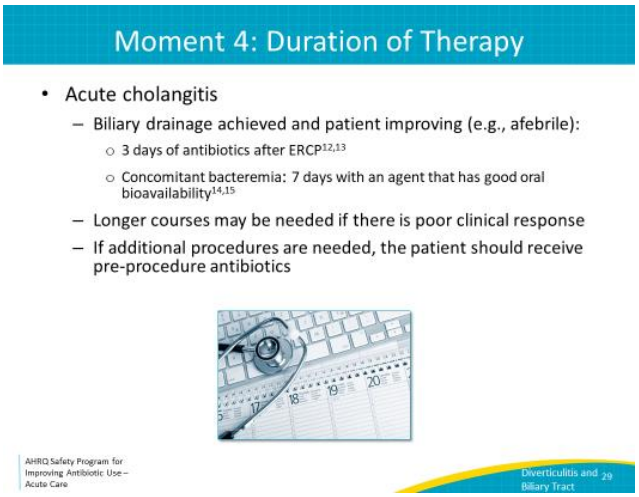
Slide Title and Commentary	Slide Number and Slide
Moment 1: Diagnosis of Acute Cholangitis SAY: Acute cholangitis is inflammation and infection of the bile ducts resulting from obstruction; the increased intra-ductal pressure that results often leads to translocation of bacteria into the bloodstream. The majority of patients present with right upper quadrant pain and fever and many will have associated jaundice; this triad of symptoms is known as Charcot's triad. Some patients with cholangitis are quite ill and have hypotension and changes in mental status; the addition of these two symptoms is known as Reynold's pentad and is associated with a high mortality. In the absence of signs and symptoms of acute infection, patients with jaundice, and/or non-obstructing stones do not require initiation of antibiotics.	**Slide 20** 
Moment 1: Diagnosis of Acute Cholecystitis SAY: Acute cholecystitis is inflammation of the gallbladder and is usually associated with gallstones. Primary symptoms of acute cholecystitis are constant right upper quadrant pain, fever, nausea, and vomiting. It is important to distinguish acute cholecystitis from episodes of biliary colic, which occurs when the cystic duct is temporarily blocked by a gallstone. The pain of biliary colic usually lasts around 1–3 hours, is not associated with fever, and resolves on its own. It does not require antibiotic therapy. Acalculous cholecystitis is a type of acute cholecystitis that by definition is not associated with gallstones. It usually occurs in critically ill patients. It is associated with high mortality rates and needs to be managed aggressively, typically with percutaneous drainage and appropriate antibiotics.	**Slide 21** 

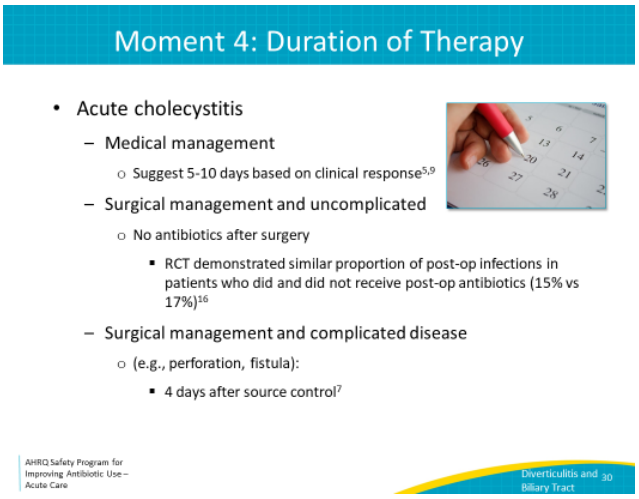
Slide Title and Commentary	Slide Number and Slide
Moment 1: Diagnosis of Biliary Tract Infection In general, the imaging modality of first choice for both acute cholangitis and cholecystitis is ultrasound. Patients with acute cholangitis may also undergo magnetic resonance cholangiopancreatography (MRCP) to visualize the biliary ducts and are likely to go on to have endoscopic retrograde cholangiopancreatography (ERCP) or percutaneous transhepatic cholangiography (PTC) for source control. Some patients with suspected cholecystitis who do not have evidence by ultrasound may undergo a hepatobiliary iminodiacetic acid (HIDA) scan, which can demonstrate impaired gallbladder function, an indicator of cholecystitis.	**Slide 22** Moment 1: Diagnosis of Biliary Tract Infection • Imaging – Acute cholangitis: ultrasound, magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP), endoscopic ultrasound – Acute cholecystitis: ultrasound, hepatobiliary iminodiacetic acid (HIDA) scan  AHRQ Safety Program for Improving Antibiotic Use – Acute Care Diverticulitis and Biliary Tract 22
The Four Moments of Antibiotic Decision Making SAY: Moment 2 is: Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?	**Slide 23** The Four Moments of Antibiotic Decision Making  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? AHRQ Safety Program for Improving Antibiotic Use – Acute Care Diverticulitis and Biliary Tract 23

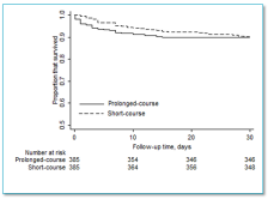
Slide Title and Commentary	Slide Number and Slide
Moment 2: Microbiologic Diagnosis SAY: In many cases of acute cholangitis, a microbiologic diagnosis can be made. Blood cultures grow in about 50 percent of cases and should be obtained. Cultures of bile during ERCP should also be obtained. Results of prior cultures related to cholangitis should also be used to guide empiric therapy. In contrast to acute cholangitis, patients with acute cholecystitis are less likely to have positive blood cultures, although they should be obtained if the patient has concomitant signs and symptoms of sepsis. The most common organisms associated with biliary tract infections are *E. coli, K. pneumoniae*, and *Enterococcus* spp. Although empiric regimens must cover *E. coli and K. pneumoniae*, *Enterococcus* spp. are less virulent organisms and do not require empiric coverage unless the patient is critically ill. Anaerobes should not be in the biliary tract in the absence of a prior history of its disruption. Other *Enterobacteriaceae*, particularly *Enterobacter* spp. and *Pseudomonas* spp. can be seen in patients with hospital-acquired infections or multiple prior biliary procedures. *S. aureus* and yeast are uncommon biliary pathogens and do not generally need to be covered empirically unless they have grown in prior cultures.	**Slide 24** Moment 2: Microbiologic Diagnosis • Acute cholangitis – Blood cultures often grow (~50%) and should be obtained – Cultures of bile during ERCP – For patients with prior procedures, use previous culture data to guide therapy • Acute cholecystitis – Lower yield for blood cultures • Common organisms[11] – *E. coli, K. pneumoniae, Enterococcus* spp. o Anaerobes should not be in the biliary tract unless there has been previous disruption o Other *Enterobacteriaceae*, particularly *Enterobacter* spp. and *Pseudomonas* spp. in patients with hospital-acquired infections or multiple prior procedures  AHRQ Safety Program for Improving Antibiotic Use – Acute Care Diverticulitis and Biliary Tract 24

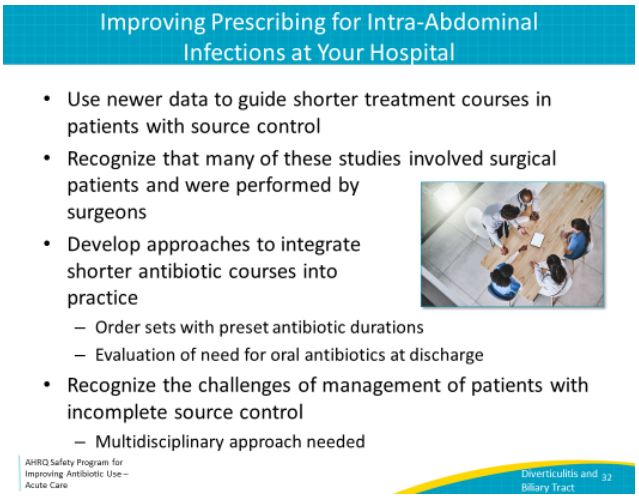
Slide Title and Commentary	Slide Number and Slide
Moment 2: Empiric Therapy SAY: Empiric therapy of biliary infections depends on the severity of illness and whether the infection is complicated or uncomplicated. For community-acquired and uncomplicated infections (e.g., those without prior biliary procedures), cefazolin, cefuroxime, or ceftriaxone are reasonable choices. Some institutions may recommend ertapenem, although it is more expensive as of April 2019. For patients with associated sepsis, hospital-acquired biliary infections, or multiple prior biliary procedures, broader spectrum therapy with piperacillin/tazobactam or the combination of cefepime plus metronidazole should be considered. As noted previously for diverticulitis, the subject matter experts who created this resource believe not all patient need empiric coverage for *Enterococcus* species and *Candida* species, but this should be considered in patients with prior biliary cultures growing these organisms or if there is a strong clinical concern that a patient has a high risk of infection with these organisms. Regimens for patients with severe penicillin allergy and community-acquired infection include moxifloxacin or either ciprofloxacin or levofloxacin with the addition of metronidazole. For patients with associated sepsis, hospital-acquired infection, or multiple prior biliary procedures, many of whom have had significant prior exposure to fluoroquinolones, aztreonam plus metronidazole should be considered. Vancomycin should be added to ciprofloxacin and aztreonam in patients presenting with sepsis as these agents do not have Gram-positive activity to cover streptococci or enterococci.	**Slide 25** 

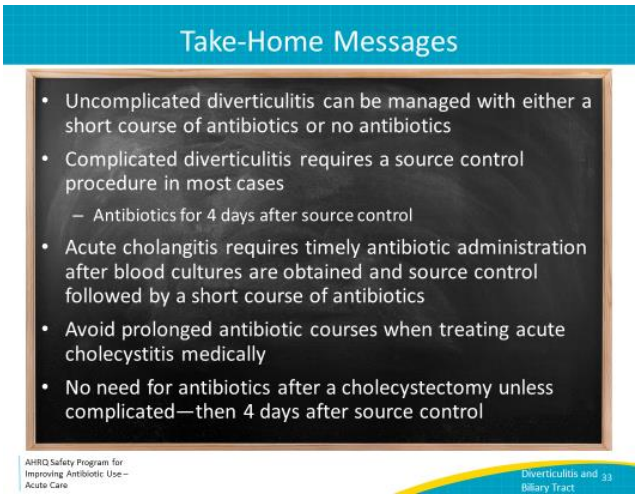
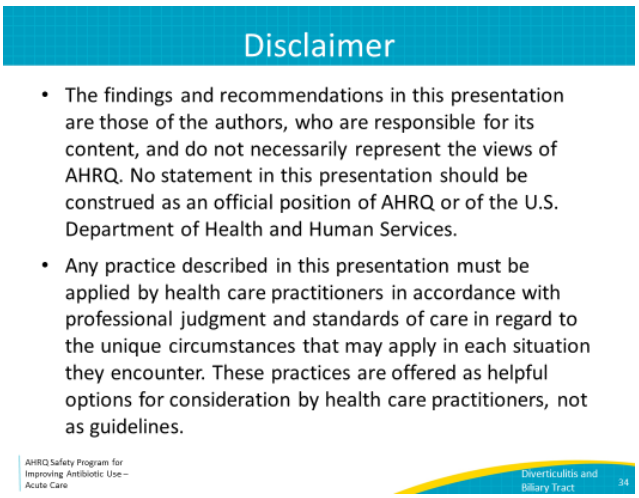
Slide Title and Commentary	Slide Number and Slide
The Four Moments of Antibiotic Decision Making SAY: Moment 3 occurs after a day or more has passed. Ask yourself: Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?	**Slide 26** 
Moment 3: Narrowing and Converting to Oral Therapy SAY: Remember that source control is critical in most intra-abdominal infections. In acute cholangitis, drainage of the biliary tree by removing the stone and/or stent placement is required. Although some cases of acute cholecystitis may respond to medical therapy, most patients will require cholecystectomy or percutaneous drainage of the gallbladder. Remember to narrow therapy based on culture data, if available. When the patient stabilizes, oral regimens to consider include the following: (1) oral cephalosporins plus metronidazole, (2) trimethoprim/sulfamethoxazole with metronidazole added for anaerobic coverage if the patient has severe or complicated disease, (3) amoxicillin/clavulanic acid (4) moxifloxacin, or (5) either ciprofloxacin or levofloxacin with metronidazole added if the patient has severe or complicated disease. Of note, trimethoprim/sulfamethoxazole, metronidazole, and all fluoroquinolones have excellent oral bioavailability and can be used as oral agents to treat associated bacteremia.	**Slide 27** 

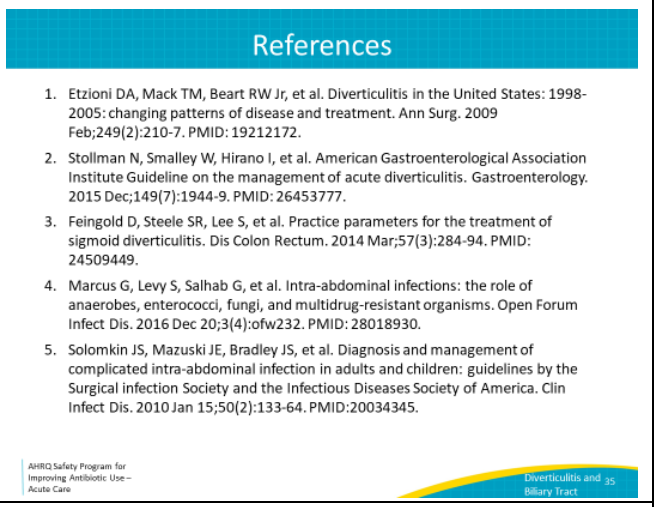
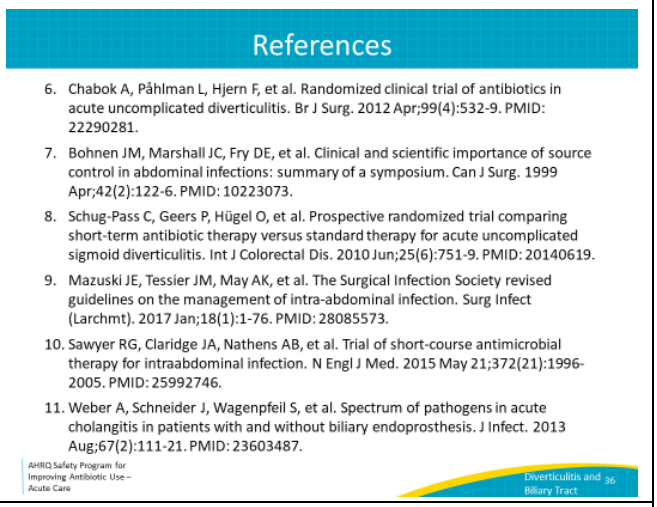
Slide Title and Commentary	Slide Number and Slide
The Four Moments of Antibiotic Decision Making SAY: The last moment to consider is: What duration of antibiotic therapy is needed for your patient's diagnosis?	**Slide 28** 
Moment 4: Duration of Therapy SAY: For patients with acute cholangitis who have undergone successful biliary drainage and are clinically improving (e.g., they have defervesced), 3 days of antibiotics after ERCP is adequate. Antibiotics do not have to be continued just because a stent remains in place. For patients with concomitant bacteremia and adequate drainage, consider extending therapy for 7 days with an agent that has good oral bioavailability. Longer courses may be needed if there is poor clinical response, although this generally indicates inadequate drainage, which should be addressed. If additional procedures are needed, the patient should receive pre-procedure antibiotics if not already receiving them.	**Slide 29** 

Slide Title and Commentary	Slide Number and Slide
Moment 4: Duration of Therapy SAY: Patients with acute cholecystitis who are not critically ill and are being observed without emergent surgery can generally be treated with 5-10 days of antibiotics based on clinical response. Prolonged durations of antibiotics while patients are awaiting surgical procedures are not advised. For patients undergoing surgical management of uncomplicated acute cholecystitis, no antibiotics are needed after surgery. A randomized controlled trial demonstrated similar proportions of post-operative infections in patients who did and did not receive post-op antibiotics (15% vs. 17%). In patients undergoing surgical management of complicated disease (e.g., perforation, fistula), based on the STOP-IT trial, 4 days of antibiotics after source control are sufficient.	**Slide 30** 

Slide Title and Commentary	Slide Number and Slide
Moment 4: Short Course Therapy for GN Bacteremia SAY: As of April 2019, evidence indicates that shorter courses of therapy are effective for patients with *Enterobacteriaceae* bacteremia who have adequate source control. In a multicenter retrospective study, outcomes of patients who received longer courses of therapy (median of 15 days) were compared to those who received shorter courses (median of 8 days). Propensity score matching resulted in 385 well-balanced matched pairs. About 20 percent of included patients had an intra-abdominal source of infection. As seen in figure on the right side of the slide, no difference in mortality between the treatment groups was seen at 30 days. The odds of recurrent bloodstream infections and CDI were also similar. There was a trend towards a protective effect of short-course antibiotic therapy on the emergence of multidrug resistant Gram-negative bacteria (OR 0.59; 95% CI 0.32-1.09 *P*=0.09). Similar results were seen in a multicenter randomized trial comparing 7 days to 14 days of therapy in which 11 percent of patients had an intra-abdominal source. This study is discussed in the "Bacteremia" presentation.	**Slide 31** Moment 4: Short-Course Therapy for GN Bacteremia • Three-center retrospective cohort study of patients with monomicrobial *Enterobacteriaceae* bacteremia[14] – Prolonged course 11–16 days ○ Median 15 days – Short course 6–10 days ○ Median 8 days • Propensity score matching resulted in 385 well-balanced matched pairs • No difference in mortality • Trend towards less emergence of MDR Gram-negative bacteria in the short course group (OR 0.59, p = 0.09)  AHRQ Safety Program for Improving Antibiotic Use – Acute Care Diverticulitis and Biliary Tract 31

Slide Title and Commentary	Slide Number and Slide
Improving Prescribing for Intra-Abdominal Infections at Your Hospital Improving antibiotic prescribing for diverticulitis and biliary tract infections can be challenging. Often clinicians are not aware of the data that demonstrates that shorter courses of therapy in the presence of source control are associated with the same outcomes as longer courses. Further, some might not feel that percutaneous drainage can be considered source control, although the STOP-IT trial included such patients. It can be useful to recognize that the STOP-IT trial was performed by surgeons, as this can help other surgeons to see that their peers embraced this approach. Post-procedure order sets for acute cholangitis and post-operation order sets for diverticulitis and cholecystitis with specific antibiotic durations can be considered. Finally, many surgical and gastroenterology patients likely do not need to be discharged home on oral antibiotics given that most have source control, although this is a common practice. Discharge can be another point in time for clinicians to assess the need for continued antibiotics. A more challenging circumstance is managing antibiotic therapy in patients with incomplete source control. The shorter durations discussed in this presentation may not be appropriate in these cases, although prolonged antibiotic therapy with no plan for source control should be discouraged. A multidisciplinary approach involving relevant clinicians such as surgeons, gastroenterologists, interventional radiologists, and infectious diseases should be used to optimize surgical and medical therapy.	**Slide 32** 

Slide Title and Commentary	Slide Number and Slide
Take-Home Messages SAY: In summary, patients with uncomplicated diverticulitis can receive either a short course of antibiotics or no antibiotics. Complicated diverticulitis requires a source control procedure in most cases, then antibiotics for four days after source control. Patients with acute cholangitis require timely antibiotic administration after blood cultures are obtained and source control followed by a short course of antibiotics—usually 3 days or 7 days if there is concomitant bacteremia. Patients with acute cholecystitis who are treated medically should not receive prolonged antibiotic courses. If they are not responding to antibiotic therapy, cholecystectomy or percutaneous drainage should be pursued. There is no need for antibiotics after a cholecystectomy unless complicated—then 4 days after source control.	**Slide 33** 
Disclaimer SAY: 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.	**Slide 34** 

Slide Title and Commentary	Slide Number and Slide
References	**Slide 35** 
References	**Slide 36** 
References	**Slide 37**