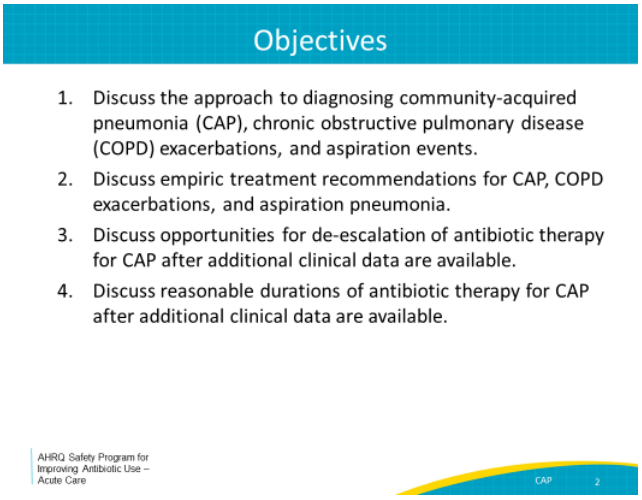
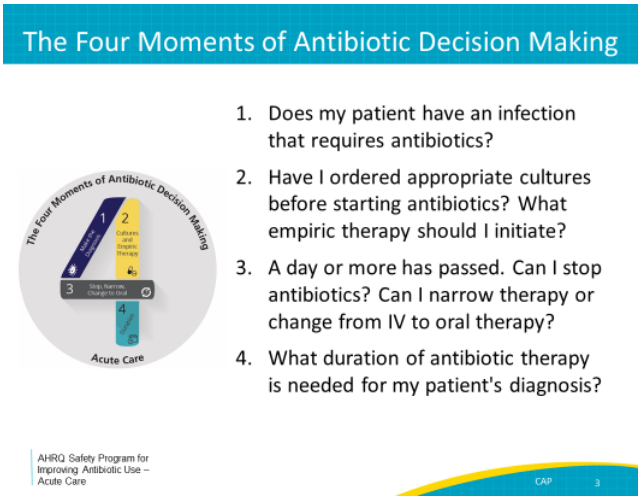
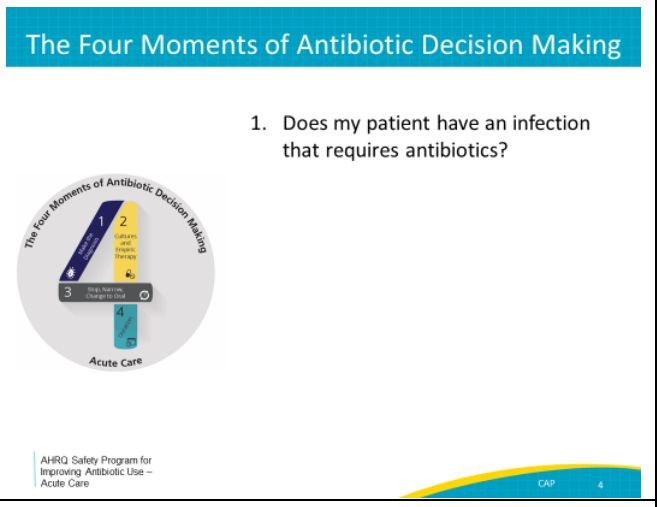
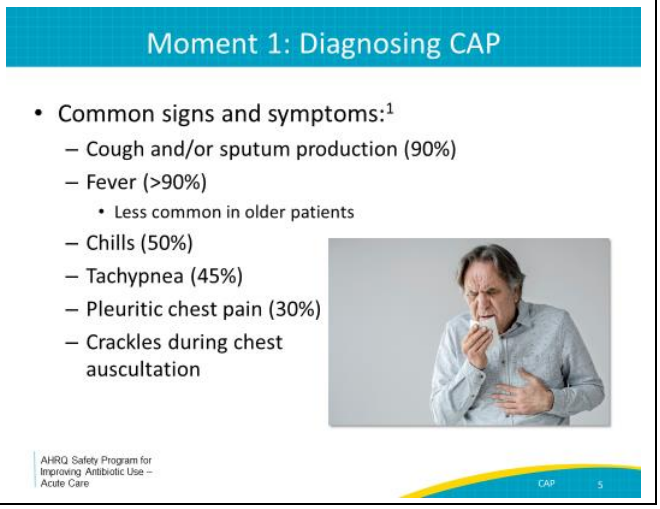
Best Practices in the Diagnosis and Treatment of Community-Associated Lower Respiratory Tract Conditions

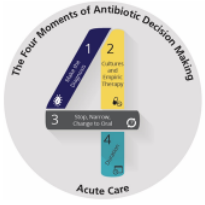
Acute Care

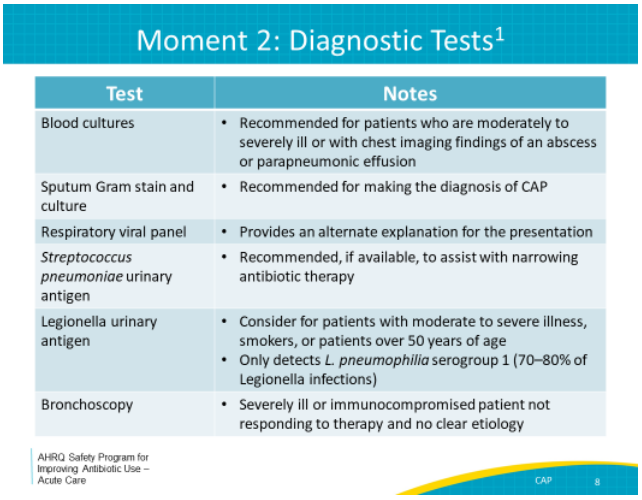
Slide Title and Commentary	Slide Number and Slide
Best Practices in the Diagnosis and Treatment of Community-Associated Lower Respiratory Tract Conditions Acute Care SAY: This presentation is titled “Best Practices in the Diagnosis and Treatment of Community-Associated Lower Respiratory Tract Conditions.”	**Slide 1** 

AHRQ Pub. No. 17(20)-0028-EF
November 2019

Slide Title and Commentary	Slide Number and Slide
Objectives SAY: This presentation will address— • The approach to diagnosing community-acquired pneumonia or CAP, chronic obstructive pulmonary disease or COPD exacerbation, and aspiration events • The empiric treatment recommendations for CAP, COPD exacerbation, and aspiration pneumonia • The opportunities for de-escalation of antibiotic therapy for CAP after additional clinical data are available • The reasonable durations of antibiotic therapy for CAP after additional clinical data are available	**Slide 2** 
The Four Moments of Antibiotic Decision Making SAY: As we discuss the diagnosis and treatment of CAP, we will continue to use the Four Moments of Antibiotic Decision Making framework. As a reminder, Moment 1 asks: Does my patient have an infection that requires antibiotics? Moment 2 consists of two questions and asks: Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate? Moment 3 consists of three questions and asks: A day or more has passed since initiating antibiotics. As I have more clinical and microbiologic data available can I stop antibiotics, can I narrow antibiotics, or can I change from intravenous to oral antibiotics? And finally, Moment 4 asks: What duration of therapy is needed for my patient's diagnosis?	**Slide 3** 

Slide Title and Commentary	Slide Number and Slide
The Four Moments of Antibiotic Decision-Making SAY: The first moment of the Four Moments of Antibiotic Decision Making asks the question, "Does my patient have an infection that requires antibiotics?"	**Slide 4** 
Moment 1: Diagnosing CAP SAY: A number of signs and symptoms commonly are observed with CAP. Cough and/or productive sputum are observed in over 90 percent of patients. Additionally, most patients have fevers, although this may be less common in the elderly. About half of patients have chills or tachypnea and a third will complain of chest pain. Crackles are generally heard upon chest auscultation.	**Slide 5** 

Slide Title and Commentary	Slide Number and Slide
Moment 1: Diagnosing CAP SAY: Whenever a combination of these signs and symptoms are present, a chest x ray should be obtained. The absence of an infiltrate on chest x ray generally excludes the diagnosis of CAP. Similarly, the presence of an infiltrate on an x ray obtained for an unrelated reason without the signs and symptoms of CAP is unlikely to be CAP. If a patient has respiratory symptoms but does not have signs, symptoms, and imaging findings consistent with CAP, it is important to consider other causes of respiratory illness such as pulmonary embolism, asthma exacerbation, aspiration pneumonitis, or COPD exacerbations. These last two processes will be discussed later in this presentation.	**Slide 6** Moment 1: Diagnosing CAP • If common signs and symptoms are present, obtain chest x ray – No infiltrates – indicates pneumonia not present – Presence of infiltrate without respiratory symptoms is unlikely to be CAP AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 6
The Four Moments of Antibiotic Decision Making SAY: During Moment 2, ask, “Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?”	**Slide 7** 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 CAP 7

Slide Title and Commentary	Slide Number and Slide
Moment 2: Diagnostic Tests SAY: Several diagnostic tests are available to assist with identifying the organism causing CAP. Blood cultures are recommended for patients who are moderately to severely ill or with chest imaging findings of a lung abscess or parapneumonic effusion. A sputum Gram stain and culture is recommended whenever a patient is able to produce sputum. A respiratory viral panel is helpful as it could provide an alternative explanation for the patient's clinical symptoms—particularly during respiratory virus season. If a *Streptococcus pneumoniae* urinary antigen test is available at your institution, it can be helpful as a positive test can assist with the narrowing of therapy—depending on the agent initially started. A *Legionella* urinary antigen should be considered, if available, for patients with moderate to severe symptoms, smokers, immunocompromised patients, or patients over 50 years of age. Of note, the Legionella urinary antigen only detects *L. pneumophila* serogroup 1 which is responsible for 70 to 80 percent of Legionella infections. In severely ill or immunocompromised patients not responding to therapy and when the etiology of pneumonia is unknown, a bronchoscopy should be considered to assess for rare bacterial pathogens. These include *Legionella* and *Nocardia* and fungal pathogens such as *Pneumocystis jiroveci*, *Aspergillus*, and endemic fungi, and *Mycobacterium tuberculosis* and atypical *Mycobacteri*a.	**Slide 8** 

Moment 2: Empiric Therapy

SAY:

The Infectious Diseases Society of America and the American Thoracic Society Community Acquired-Pneumonia Guidelines for adults from 2007 recommend antibiotic regimens that cover both usual bacterial pathogens like *S. pneumoniae* and *H. influenzae* and atypical bacterial pathogens like *Legionella*.

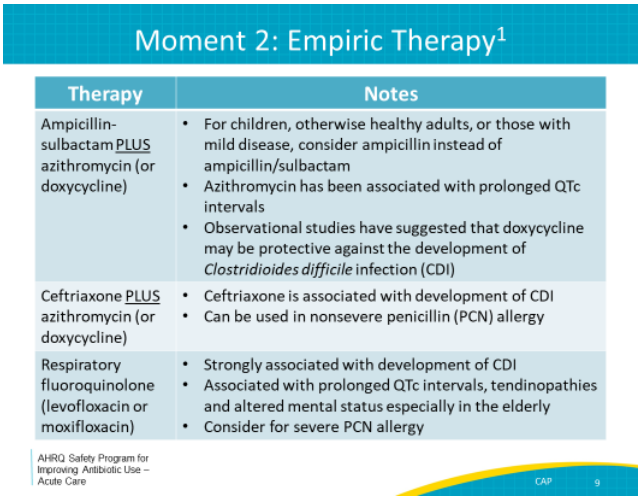
There are several options for empiric therapy for CAP, but for most patients, current guidelines as of April 2019 suggest ampicillin-sulbactam and azithromycin or ceftriaxone and azithromycin as reasonable choices. Both ampicillin-sulbactam and ceftriaxone provide similar coverage for common bacterial causes of CAP. Azithromycin provides atypical coverage.

Ceftriaxone has more of an association with the development of *Clostridioides difficile* infection compared to ampicillin-sulbactam. But ceftriaxone is easier to administer as it is dosed less frequently and can be used in patients with non-severe penicillin allergies. Additionally, ceftriaxone provides broader coverage for *Enterobacteriaceae* such as *E. coli* and *Klebsiella* species, thus, some prefer it over ampicillin-sulbactam for patients admitted to the ICU.

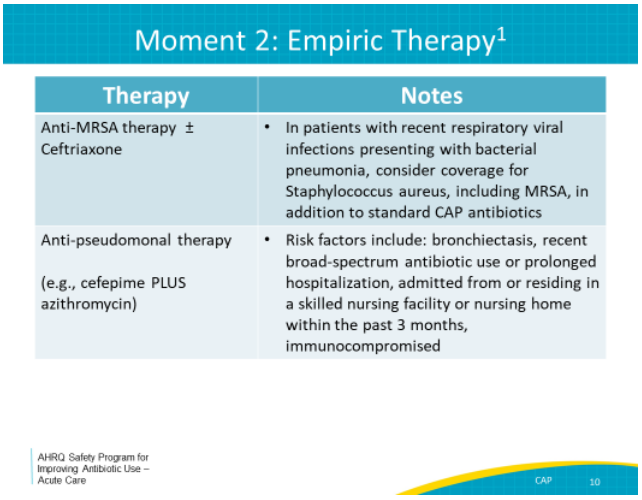
For children with CAP in non-ICU settings, ampicillin or amoxicillin monotherapy are considered reasonable choices, if the child has not recently received amoxicillin. For adults with mild disease who are otherwise healthy, it is reasonable to consider ampicillin instead of ampicillin-sulbactam.

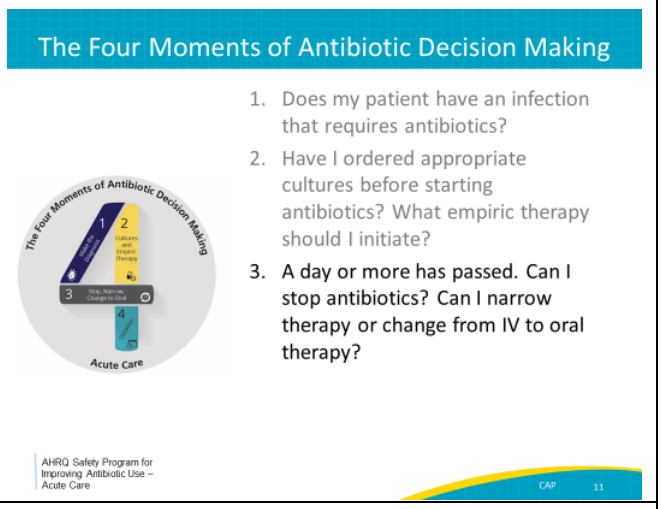
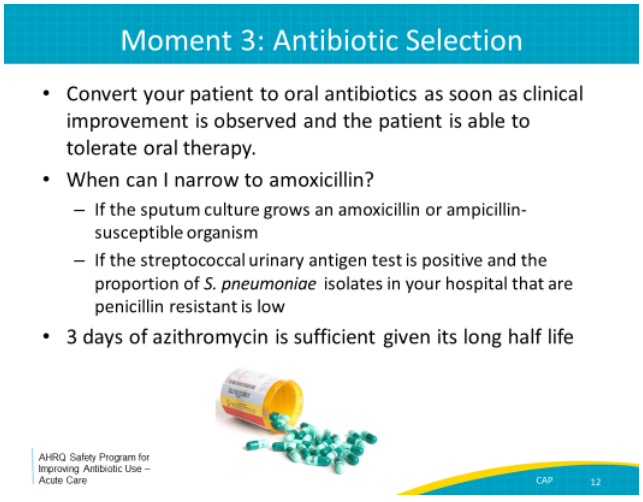
The addition of azithromycin to beta-lactam antibiotics has been shown to improve outcomes for adults with severe CAP. Although it can be considered for adult patients admitted to the general wards, data suggest that it may not improve outcomes for milder cases of CAP in non-ICU patients. The addition of doxycycline also provides coverage against atypical pathogens. Although no head-to-head trials compare outcomes of patients who received azithromycin or doxycycline as combination therapy for CAP, observational studies have suggested that macrolide-containing regimens are

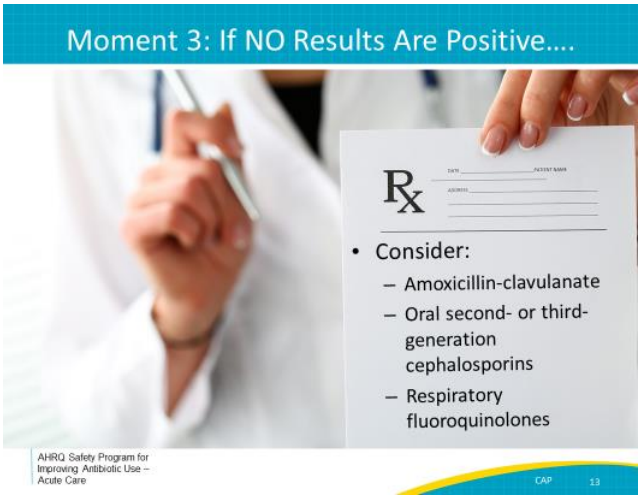
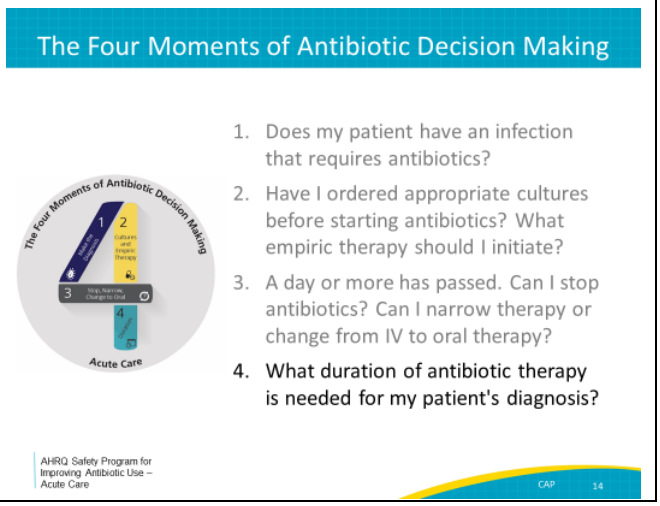
Slide 9

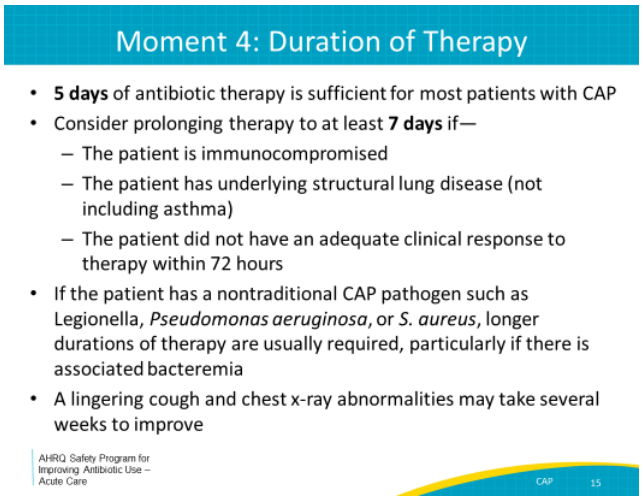
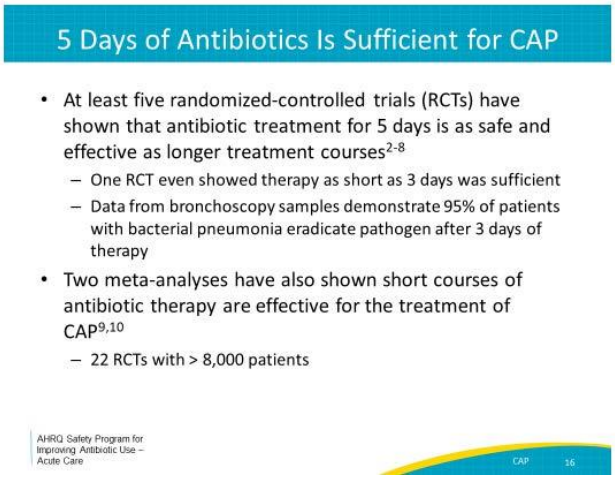


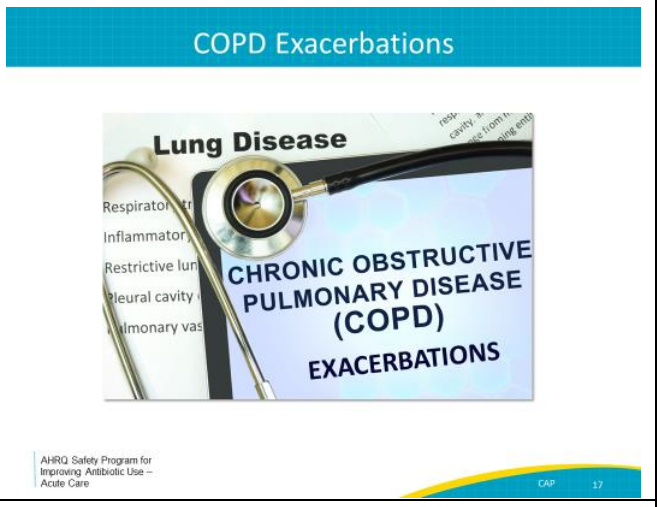
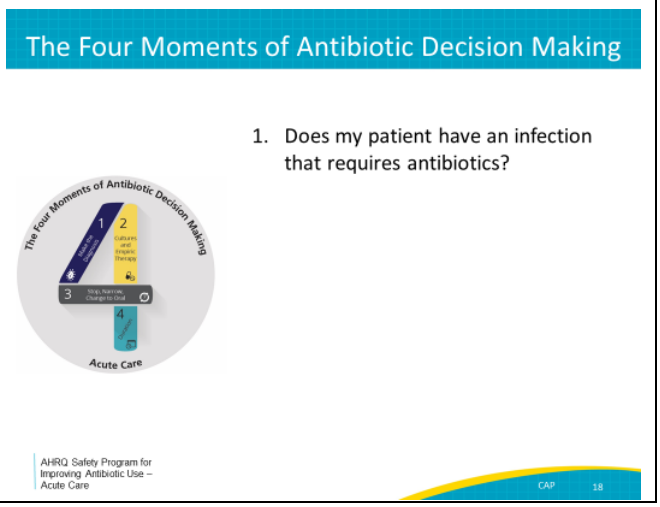
Slide Title and Commentary	Slide Number and Slide
associated with better clinical outcomes for patients with severe CAP compared to other agents, possibly due to their immunomodulatory effects. Respiratory quinolones such as levofloxacin and moxifloxacin are also options for CAP—particularly in patients with severe penicillin allergies. However, it is important to remember that quinolones are associated with some notable adverse events such as *C. difficile* infections, prolonged QTc intervals, tendinopathies, and altered mental status changes, especially in the elderly.	

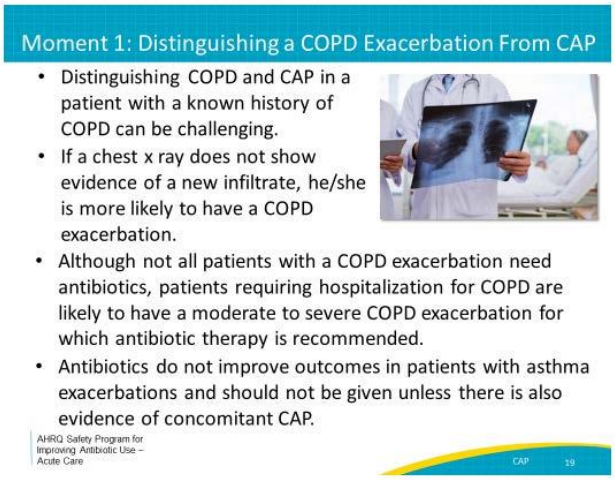
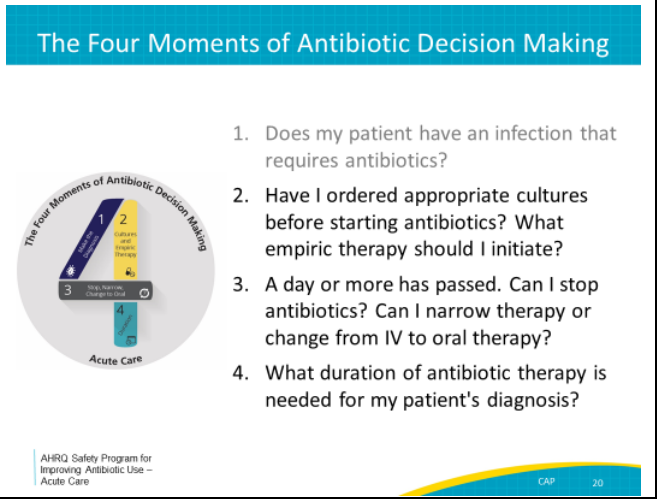
Slide Title and Commentary	Slide Number and Slide
Moment 2: Empiric Therapy In patients with recent respiratory viral infections presenting with bacterial pneumonia, consider coverage for *Staphylococcus aureus* including methicillin-resistant *S. aureus* or MRSA, in addition to standard antibiotics such as ceftriaxone. Coverage for MRSA such as vancomycin, linezolid, or trimethoprim-sulfamethoxazole should be considered in patients with cavitary lesions or if sputum Gram stain results reveal Gram-positive cocci in clusters. Patients with bronchiectasis, those who received recent broad-spectrum antibiotic therapy, patients with a prolonged hospitalization, those admitted from a skilled nursing facility or nursing home in the past 3 months, or those who are immunocompromised may benefit from anti-pseudomonal coverage. Anti-pseudomonal agents such as cefepime or piperacillin-tazobactam should be considered for patients with these risk factors presenting with CAP, in addition to azithromycin. During respiratory virus season, bacterial superinfections can be a concern. These are generally caused by *S. pneumoniae*, *S. agalactiae* (or Group A strep), and *S. aureus*. Generally patients have symptoms strongly suggestive of influenza followed by an improvement in signs and symptoms, with then a recurrence of fevers and respiratory findings. Chest x rays should be obtained to evaluate for a new infiltrate. For patients admitted to the ICU with a concern for a bacterial superinfection, it is reasonable to start antibiotics with coverage against both *S. aureus* and *Streptococcus* species.	**Slide 10**  Moment 2: Empiric Therapy[1] Therapy / Notes Anti-MRSA therapy ± Ceftriaxone — In patients with recent respiratory viral infections presenting with bacterial pneumonia, consider coverage for Staphylococcus aureus, including MRSA, in addition to standard CAP antibiotics Anti-pseudomonal therapy (e.g., cefepime PLUS azithromycin) — Risk factors include: bronchiectasis, recent broad-spectrum antibiotic use or prolonged hospitalization, admitted from or residing in a skilled nursing facility or nursing home within the past 3 months, immunocompromised AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 10

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: Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?	**Slide 11** 
Moment 3: Antibiotic Selection SAY: You can switch a patient to oral therapy as soon as clinical improvement is observed and the patient is able to tolerate oral medications. There are several instances when you can narrow to amoxicillin, when broader therapy has been started initially. If the sputum culture grows an amoxicillin or ampicillin-susceptible organism, if the streptococcal urinary antigen test is positive, or the proportion of *S. pneumoniae* isolates in your hospital that are penicillin resistant is low. Azithromycin has a long half-life, so if it was initiated, 3 days of azithromycin is sufficient (unless you are treating *Legionella*).	**Slide 12** 

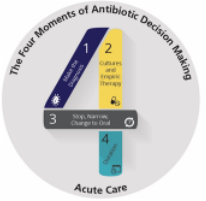
Slide Title and Commentary	Slide Number and Slide
Moment 3: If NO Results Are Positive…. SAY: If no cultures are positive, consider completing therapy with amoxicillin-clavulanate, oral second- or third-generation cephalosporins, or respiratory fluoroquinolones. If a patient initially received ampicillin-sulbactam or IV cephalosporins, it is reasonable to convert to amoxicillin-clavulanate or an oral cephalosporin rather than switching to a respiratory fluoroquinolone which exposes the patient to additional risks from this class of antibiotics unnecessarily.	**Slide 13** 
The Four Moments of Antibiotic Decision Making SAY: The fourth moment of antibiotic decision making is asking the question, “What duration of antibiotic therapy is needed for my patient’s diagnosis?”	**Slide 14** 

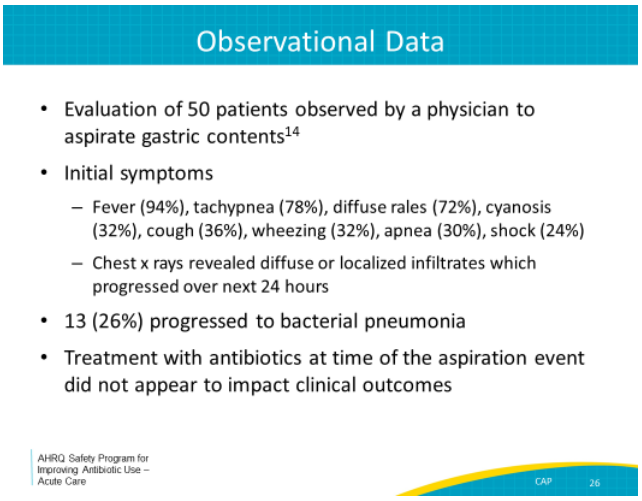
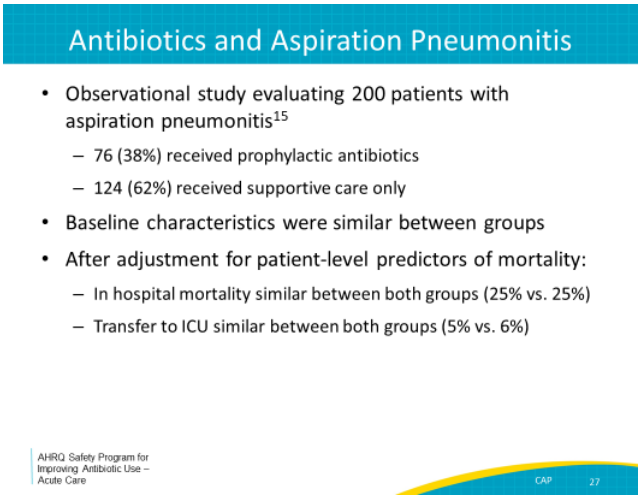
Slide Title and Commentary	Slide Number and Slide
Moment 4: Duration of Therapy SAY: Numerous studies indicate that 5 days of antibiotic therapy is sufficient for most patients with CAP. Consider prolonging therapy to at least 7 days if: The patient is immunocompromised, the patient has underlying structural lung disease (not including asthma), or the patient did not have an adequate clinical response to therapy within 72 hours. If the patient has a nontraditional CAP pathogen such as *Legionella*, *Pseudomonas aeruginosa*, or *S. aureus*, longer durations of therapy are usually required, particularly if there is associated bacteremia. A lingering cough and chest x-ray abnormalities may take several weeks to improve. There is no need to prolong antibiotic therapy or repeat imaging if the patient is otherwise showing improvement.	**Slide 15** 
5 Days of Antibiotics Are Sufficient for CAP SAY: A number of RCTs have shown that antibiotic treatment for 5 days is as safe and effective as longer treatment courses. One RCT even demonstrated that therapy as short as 3 days is sufficient. Data from bronchoscopy samples demonstrate 95 percent of patients with bacterial pneumonia eradicate pathogens after 3 days of therapy. Additionally, two meta-analyses have shown short courses of antibiotic therapy are effective for the treatment of CAP.	**Slide 16** 

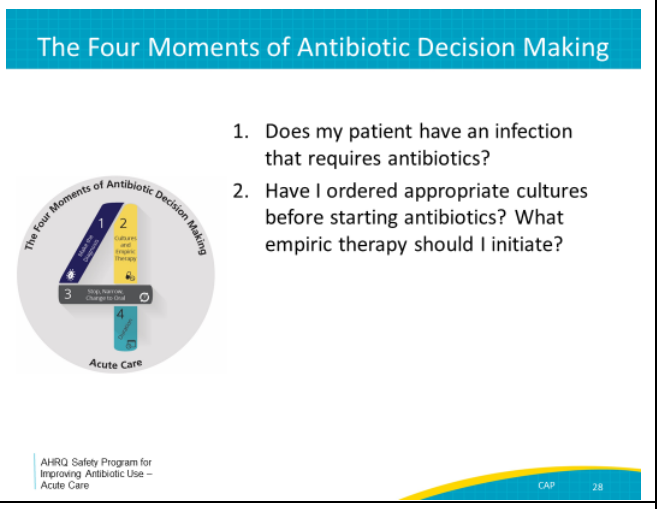
Slide Title and Commentary	Slide Number and Slide
COPD Exacerbations SAY: Let's move on to discuss exacerbations of chronic obstructive pulmonary disease or COPD.	**Slide 17** 
The Four Moments of Antibiotic Decision Making SAY: Remember, the first step is to ask yourself if your patient has an infection that requires antibiotics.	**Slide 18** 

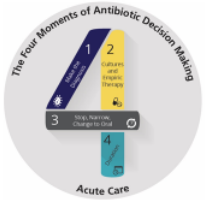
Slide Title and Commentary	Slide Number and Slide
Moment 1: Distinguishing a COPD Exacerbation From CAP SAY: Distinguishing COPD from CAP in a patient with a known history of COPD can be challenging. If a chest x ray does not show evidence of a new infiltrate, he or she is more likely to have a COPD exacerbation. Although not all patients with a COPD exacerbation need antibiotics, patients requiring hospitalization for COPD are likely to have a moderate to severe COPD exacerbation for which antibiotic therapy is recommended. Remember, antibiotics generally do not improve outcomes in patients with asthma exacerbations and should not be given unless there is also evidence of concomitant CAP.	**Slide 19** 
The Four Moments of Antibiotic Decision Making SAY: Let's move on to moments 2 through 4 which, for simplicity, we will combine for COPD management.	**Slide 20** 

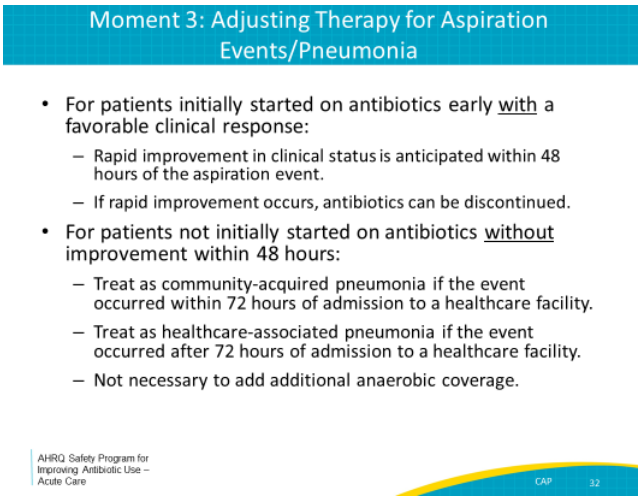
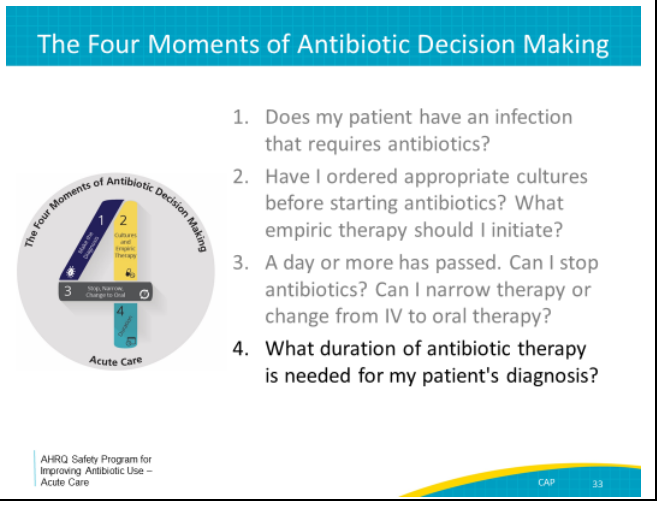
Slide Title and Commentary	Slide Number and Slide
Moment 2–4: Management of COPD Exacerbations SAY: The goal of antibiotic therapy for COPD exacerbations is to reduce the bacterial burden and not to necessarily eradicate bacteria. Common bacteria associated with COPD exacerbations include *H. influenzae* and *S. pneumoniae*. Sputum Gram stain and culture is not needed in many cases of COPD exacerbations, but can be considered for patients with extensive prior antibiotic exposure or a severe COPD exacerbation to understand what organisms the patient is colonized with. Most patients can be treated empirically with a 3-day course of azithromycin. If a patient is already taking azithromycin, consider doxycycline, amoxicillin/clavulanate, or cefuroxime for a 5-day course. Avoid the use of fluoroquinolones unless prior or current cultures indicate infection with organisms resistant to standard therapy.	**Slide 21** Moments 2–4: Management of COPD Exacerbations • Common bacteria associated with COPD exacerbations include *H. influenzae* and *S. pneumoniae* • Sputum Gram stain and culture are not needed in many cases of COPD exacerbation, but can be considered for patients with extensive prior antibiotic exposure or a severe COPD exacerbation • Most patients can be treated with 3 days of azithromycin[11,12] • If a patient is already taking azithromycin, consider doxycycline, amoxicillin/clavulanate, or cefuroxime for a 5-day course[11,12] • Avoid use of fluoroquinolones unless prior or current microbiology indicates infection with organisms resistant to standard therapy AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 21
Aspiration Events and Aspiration Pneumonia SAY: Finally, let's discuss aspiration events and aspiration pneumonia.	**Slide 22** Aspiration Events and Aspiration Pneumonia  AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 22

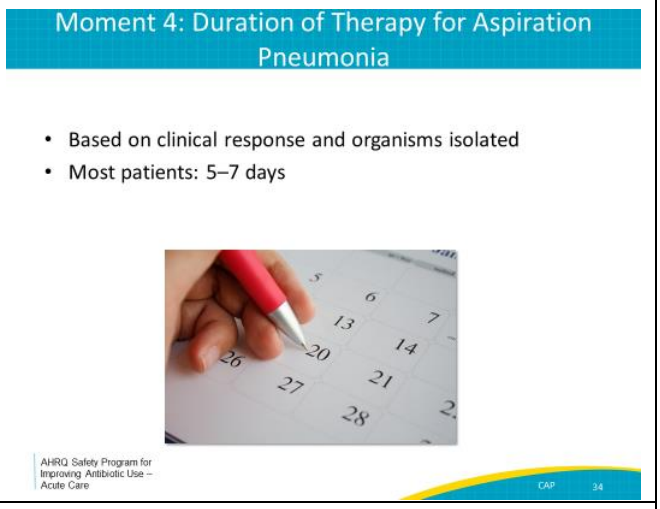
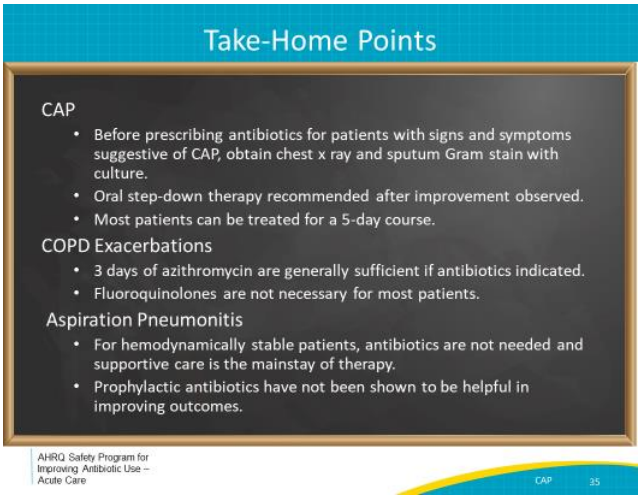
Slide Title and Commentary	Slide Number and Slide
The Four Moments of Antibiotic Decision Making SAY: We will start with moment 1 again. Does my patient have an infection that requires antibiotics?	**Slide 23** The Four Moments of Antibiotic Decision Making 1. Does my patient have an infection that requires antibiotics?  AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 23
Moment 1: Aspiration Event SAY: Pneumonitis is an abrupt chemical injury caused by inhalation of sterile gastric contents. It progresses quickly to respiratory failure followed by rapid improvement within 48 hours of the event. Chest x rays can look very concerning, and supportive care is the mainstay of therapy. Prophylactic antibiotics have NOT been shown to be helpful in preventing pneumonia.	**Slide 24** Moment 1: Aspiration Event • Pneumonitis is an abrupt chemical injury caused by inhalation of sterile gastric contents[13-15] – Progresses quickly to respiratory failure followed by rapid improvement ≤48 hours of the event – Chest x rays can look very concerning – Supportive care is the mainstay of therapy – Prophylactic antibiotics have NOT been shown to be helpful in preventing pneumonia AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 24
Moment 1: Distinguishing Aspiration Events From Aspiration Pneumonia SAY: If an aspiration event progresses to aspiration pneumonia, this generally occurs around 48 hours after the aspiration event. A portion of patients with aspiration events (about 20–25%), develop bacterial pneumonia in the ensuing 2 to 7 days. Aspiration pneumonia becomes apparent with new fevers and a worsening respiratory status after initial clinical improvement.	**Slide 25** Moment 1: Distinguishing Aspiration Event From Aspiration Pneumonia • Aspiration pneumonia – Generally occurs 48 hours after the aspiration event – A portion of patients with aspiration events (20–25%) develop bacterial pneumonia the ensuing 2 to 7 days • Becomes apparent because of new fevers and a worsening respiratory status after initial clinical improvement AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 25

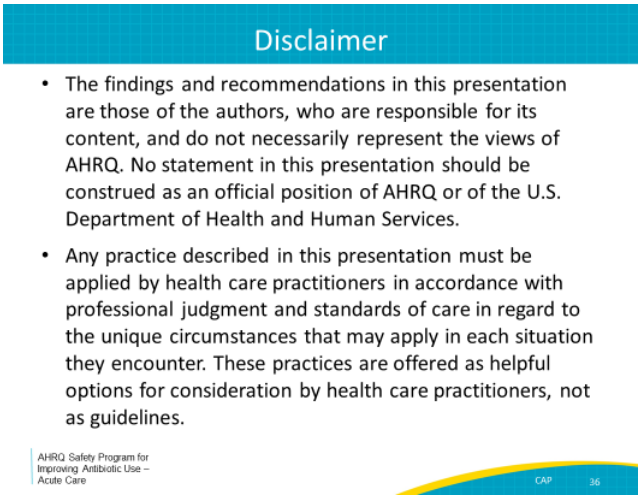
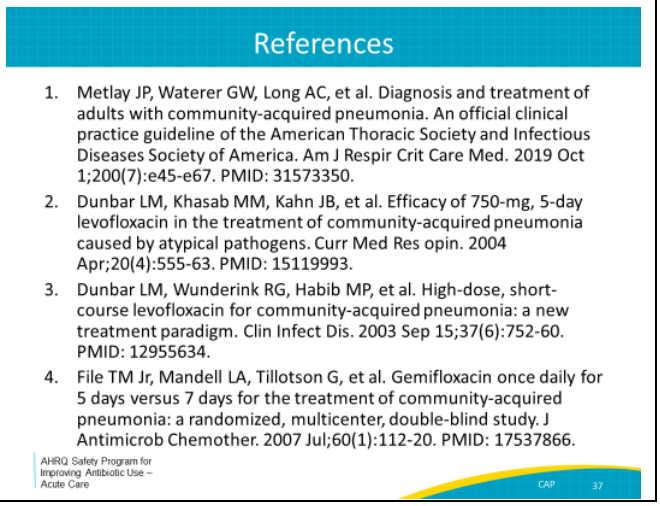
Slide Title and Commentary	Slide Number and Slide
Observational Data SAY: Is it safe not to treat aspiration events? In one study evaluating 50 patients who were observed by physicians to have an aspiration event, initial symptoms included fever, tachypnea, diffuse rales, cyanosis, cough, wheezing, apnea, and shock. Chest x rays generally revealed diffuse or localized infiltrates which progressed over the next 24 hours. In this cohort, 26 percent of patients progressed to bacterial pneumonia. Treatment with antibiotics at the time of the aspiration event did not appear to impact clinical outcomes.	**Slide 26** 
Antibiotics and Aspiration Pneumonitis Say: In an observational study of 200 patients with aspiration pneumonitis, 38 percent received prophylactic antibiotics soon after the aspiration event and 62 percent received supportive care only without antibiotic therapy. The baseline characteristics were similar between the two groups. After adjustment for patient-level predictors of mortality, the in hospital mortality was similar between the groups at 25 percent and the need to transfer patients to the ICU was similar between the two groups at 5 percent and 6 percent.	**Slide 27** 

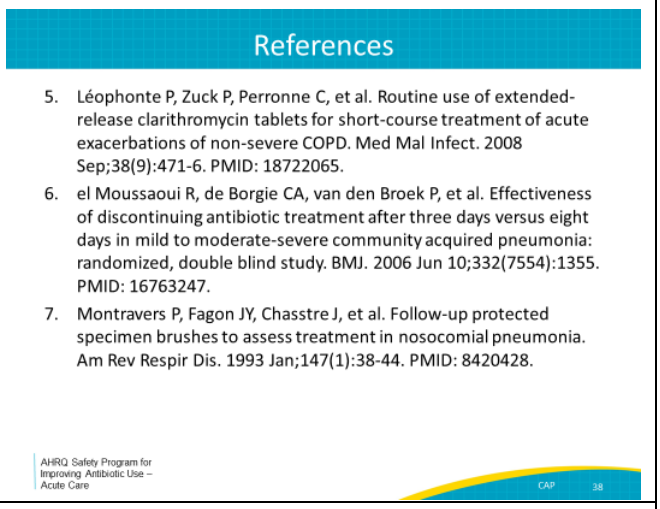
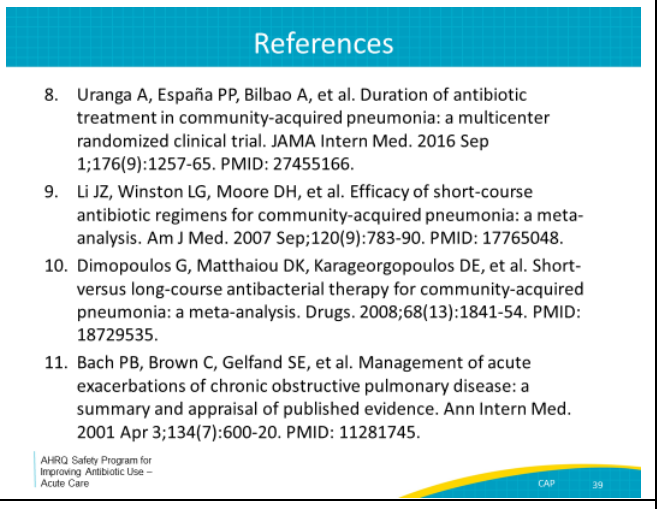
Slide Title and Commentary	Slide Number and Slide
The Four Moments of Antibiotic Decision-Making SAY: During Moment 2, ask, “Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?”	**Slide 28** 
Moment 2: To Culture or not To Culture? SAY: Patients with aspiration events will be unlikely to produce significant sputum, making the utility of sputum cultures low. Sputum Gram stain and cultures should be considered when the diagnosis is unclear or if purulent sputum is being produced.	**Slide 29** 

Slide Title and Commentary	Slide Number and Slide
Moment 2: Empiric Therapy for Aspiration Events SAY: Antibiotics are not indicated for most aspiration events. It is reasonable to treat hemodynamically unstable patients with antibiotics but frequent reassessment for the continued need for antibiotics is needed. Treat as community-acquired pneumonia if the event occurred within 72 hours of admission to a healthcare facility. Treat as healthcare-associated pneumonia with agents like cefepime or piperacillin/tazobactam if the event occurred after 72 hours of admission to a healthcare facility or if the patient has risk factors for resistant organisms such as coming from a nursing home. It is not necessary to add additional anaerobic coverage with agents such as metronidazole or clindamycin as ampicillin, ampicillin-sulbactam, ceftriaxone, or agents used for healthcare-associated pneumonia such as cefepime or piperacillin-tazobactam all provide coverage for oral anaerobes.	**Slide 30** Moment 2: Empiric Therapy for Aspiration Events • Antibiotics are not indicated for most aspiration events. • It is reasonable to consider antibiotics for hemodynamically unstable patients, but frequent reevaluation of the continued need for antibiotics is necessary. – Treat as community-acquired pneumonia if the event occurred within 72 hours of admission to a healthcare facility. – Treat as healthcare-associated pneumonia if the event occurred after 72 hours of admission to a healthcare facility. – Not necessary to add additional anaerobic coverage. AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 30
The Four Moments of Antibiotic Decision Making SAY: Moment 3 occurs after a day or more has passed. Ask: Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?	**Slide 31** 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 IV to oral therapy? AHRQ Safety Program for Improving Antibiotic Use – Acute Care CAP 31

Slide Title and Commentary	Slide Number and Slide
Moment 3: Adjusting Therapy for Aspiration Events/Pneumonia SAY: For patients initially started on antibiotics after an aspiration event with a favorable clinical response: Rapid improvement in clinical status is anticipated within 48 hours of the aspiration event. If rapid improvement occurs, antibiotics can be discontinued. For patients not initially started on antibiotics without improvement within 48 hours: Treat as community-acquired pneumonia if the event occurred within 72 hours of admission to a health care facility. Treat as healthcare-associated pneumonia if the event occurred 72 hours or more after admission to a healthcare facility or if the patient has risk factors for resistant organisms such as coming from a nursing home. Again, it is not necessary to add additional anaerobic coverage.	**Slide 32** 
The Four Moments of Antibiotic Decision-Making SAY: The fourth moment of antibiotic decision making is asking the question, “What duration of antibiotic therapy is needed for my patient’s diagnosis?”	**Slide 33** 

Slide Title and Commentary	Slide Number and Slide
Moment 4: Duration of Therapy for Aspiration Pneumonia SAY: Duration should be determined based on clinical response and any relevant microbiology data. Most patients can receive 5 to 7 days of therapy.	**Slide 34** 
Take-Home Points SAY: To summarize some of the main take-home points from this presentation. First, regarding CAP, before prescribing antibiotics for a patient with signs and symptoms suggestive of CAP, obtain a chest x ray and sputum Gram stain and culture. Oral antibiotic step-down therapy is recommended after clinical improvement is observed and most patients can be treated for a 5-day course of antibiotics. Regarding COPD exacerbations, 3 days of azithromycin are generally sufficient. Fluoroquinolone use should be generally avoided, unless prior or current culture data for a specific patient suggests risk for or actual infection with organisms resistant to standard therapy. And finally, regarding aspiration pneumonitis, for hemodynamically stable patients, antibiotics generally are not needed and supportive care is the mainstay of therapy. Prophylactic antibiotics have not been shown to be helpful in improving outcomes.	**Slide 35** 

Slide Title and Commentary	Slide Number and Slide
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 36** 
References SAY: Here are the references.	**Slide 37** 

Slide Title and Commentary	Slide Number and Slide
References	**Slide 38** 
References	**Slide 39** 
References	**Slide 40**