Ear, Nose, and Throat Infections

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Advanced Practice Provider Conference
Interactive Learning

• Go to https://kahoot.it
• Enter Game PIN:
• Receive User Name
• We will use this platform to answer questions throughout the presentation
Learning Objectives

• Describe the pathophysiology of acute otitis media, bacterial pharyngitis, and sinusitis

• Interpret clinical signs and symptoms and pertinent diagnostic studies utilized for diagnosing acute otitis media, bacterial pharyngitis, and sinusitis

• Identify appropriate pharmacological treatment options for acute otitis media, bacterial pharyngitis, and sinusitis
ACUTE OTITIS MEDIA (AOM)

In infants and children 6 months through 12 years of age with uncomplicated AOM
Epidemiology

• Second most common reason for a child to visit primary care practice
• Most common reason for prescribing an antibiotic agent
• Rate of ear infections has declined since introduction of pneumococcal conjugate vaccines
Pathogenesis

- Angle of the opening of the Eustachian tube is decreased allowing bacteria to ascend to the middle ear cavity and prevents adequate drainage of the middle ear fluid

Clinical Presentation

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otalgia (tugging/rubbing of the ear)</td>
<td>Tympanic membrane (TM) appears:</td>
</tr>
<tr>
<td>Fever</td>
<td>• Bulging or fullness</td>
</tr>
<tr>
<td>Irritable</td>
<td>• Impaired or absent mobility</td>
</tr>
<tr>
<td>Excessive crying</td>
<td>• Cloudy</td>
</tr>
<tr>
<td>Decreased activity and/or appetite</td>
<td>• Erythematous</td>
</tr>
<tr>
<td>Poor sleeping</td>
<td>• White or pale yellow</td>
</tr>
<tr>
<td></td>
<td>• Otorrhea</td>
</tr>
</tbody>
</table>
Interactive Learning

Which of the following is a risk factor for developing acute otitis media?

A. Attending daycare
B. Breastfeeding
C. Female gender
D. Young maternal age
Risk Factors

- Family history of acute otitis media
- Child care attendance
- Lack of breastfeeding
- Experiencing acute otitis media at a young age
Interactive Learning

Which of the following is the most common pathogen implicated in acute otitis media?

A. Haemophilus influenzae
B. Moraxella catarrhalis
C. Mycoplasma pneumoniae
D. Streptococcus pneumoniae
Common Pathogens

- Respiratory viruses (70%)
- *Streptococcus pneumoniae* (25-50%)
- Non-typeable *Haemophilus influenzae* (15-30%)
- *Moraxella catarrhalis* (3-20%)
- *Streptococcus pyogenes* (< 5%)
Which of the following would be considered a diagnosis of acute otitis media? None of the patients are experiencing ear pain or fever.

A.  

B.  

C.  

D. None of the above
Diagnosis

Clinicians should diagnose AOM in children who present with:

• Mild bulging of the TM and recent (< 48 hours) onset of ear pain or intense erythema of the TM

• Moderate to severe bulging of the TM or new onset of otorrhea not due to acute otitis externa
Challenges with Diagnosis

• Lack of cooperation from the child or lack of assistance from parent
• AOM and upper respiratory tract infections (URTIs) share common symptoms
  • 50-70% of new AOM cases are associated with URTI or cold-like illness
  • 29-61% of new URTI cases develop into AOM
• Otitis media with effusions (OME) may precede the development of AOM, but does not represent an acute infectious process
• General practitioners are only certain of their diagnosis in 58% of infants
• 22% of AOM diagnosed by general practitioners were misdiagnosed

**OME vs. AOM**

<table>
<thead>
<tr>
<th>Signs and Symptoms</th>
<th>OME</th>
<th>AOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired hearing</td>
<td>Mild to moderate</td>
<td>Mild to moderate</td>
</tr>
<tr>
<td>Pain (otalgia)</td>
<td>None</td>
<td>Can be severe</td>
</tr>
<tr>
<td>Purulent drainage (otorrhea)</td>
<td>No</td>
<td>Only after perforation of tympanic membrane</td>
</tr>
<tr>
<td>Bacterial infection</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Systemic symptoms</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Managed with antibiotics?</td>
<td>No</td>
<td>In certain circumstances</td>
</tr>
</tbody>
</table>

Interactive Learning

What percentage of outpatient antibiotic prescriptions are deemed unnecessary by the CDC?

A. 5%
B. 15%
C. 30%
D. 60%
70% Necessary Prescriptions
(Still need to improve drug selection, dose and duration)

At least 30% Unnecessary Prescriptions

In U.S. Doctor's Offices and Emergency Departments

# Initial Management

## Recommendations for Initial Management for Uncomplicated AOM

<table>
<thead>
<tr>
<th>Age</th>
<th>Otorrhea With AOM&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Unilateral or Bilateral AOM&lt;sup&gt;a&lt;/sup&gt; With Severe Symptoms&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Bilateral AOM&lt;sup&gt;a&lt;/sup&gt; Without Otorrhea</th>
<th>Unilateral AOM&lt;sup&gt;a&lt;/sup&gt; Without Otorrhea</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mo to 2 y</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy OR additional observation</td>
</tr>
<tr>
<td>≥ 2 y</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy OR additional observation</td>
<td>Antibiotic therapy OR additional observation&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Applies only to children with well-documented AOM with high certainty of diagnosis

<sup>b</sup> A toxic-appearing child, persistent otalgia more than 48 h, temperature ≥39°C (102.2°F) in the past 48 h, or if there is uncertain access to follow-up after the visit.

<sup>c</sup> This plan of initial management provides an opportunity for shared decision-making with the child's family for those categories appropriate for additional observation. If observation is offered, a mechanism must be in place to ensure follow-up and begin antibiotics if the child worsens or fails to improve within 48 to 72 h of AOM onset.
<table>
<thead>
<tr>
<th><strong>Population</strong></th>
<th>Children 6 months to 12 years with AOM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intervention</strong></td>
<td>Patients with non-severe AOM were randomized to immediate amoxicillin or watchful waiting (WW)</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>Parent satisfaction with AOM care, resolution of symptoms, AOM failure/recurrence, and nasopharyngeal carriage of <em>Streptococcus pneumoniae</em> strains resistant to antibiotics</td>
</tr>
</tbody>
</table>
| **Results** | • 66% of children in WW group completed the study without needing antibiotics  
• Parent satisfaction with AOM care was not different between the 2 treatment groups at either day 12 or 30  
• Office and emergency department visits, phone calls, and days of work/school missed were not different between groups  
• Symptoms resolved faster in subjects treated with immediate antibiotics, but were associated with increased antibiotic-related adverse effects  
• *S pneumoniae* strains cultured from children in the antibiotics group at day 12 were more likely to be multidrug-resistant than in the WW group |

Initial Observation

- Joint decision between clinician and parent
- Education for parents should include:
  - The self-limited nature of AOM
  - Pain management strategies
  - Adverse effects of antibiotics
What Is Watchful Waiting?

WAIT. DO NOT FILL YOUR PRESCRIPTION JUST YET.

Your healthcare professional believes your illness may go away on its own. You should watch and wait for ____ days/hours before deciding whether to take an antibiotic.

In the meantime, follow your healthcare professional’s recommendations to help you feel better and continue to monitor your own symptoms over the next few days.

- Rest.
- Drink extra water and fluids.
- Use a cool mist vaporizer or saline nasal spray to relieve congestion.
- For sore throats in adults and older children, try ice chips, sore throat spray, or lozenges.
- Use honey to relieve cough. Do not give honey to an infant younger than 1.

If you feel better, no further action is necessary. You don’t need antibiotics.
If you do not feel better, experience new symptoms, or have other concerns, call your healthcare professional. Discuss whether you need a recheck or antibiotics.

It may not be convenient to visit your healthcare professional multiple times, but it is critical to take antibiotics only when needed. When antibiotics aren’t needed, they won’t help you and the side effects could still hurt you. Common side effects of antibiotics can include rash, dizziness, nausea, diarrhea, and yeast infections.

Antibiotics save lives, and when a patient needs antibiotics, the benefits outweigh the risks of side effects. You can protect yourself and others by learning when antibiotics are and are not needed.

To learn more about antibiotic prescribing and use, visit www.cdc.gov/antibiotic-use.
You have diagnosed your patient with AOM with concurrent purulent conjunctivitis. Which of the following is the most appropriate antibiotic regimen?

A. Amoxicillin 50 mg/kg/day divided every 8 hours
B. Amoxicillin 90 mg/kg/day divided every 12 hours
C. Amoxicillin/clavulanate 90/12.8 mg/kg/day divided every 12 hours
D. Amoxicillin/clavulanate 90/6.4 mg/kg/day divided every 12 hours
### Antimicrobials

#### Recommended Antibiotics for (Initial or Delayed) Treatment and for Patients who have Failed Initial Antibiotic Treatment

<table>
<thead>
<tr>
<th>Initial Immediate or Delayed Antibiotic Treatment</th>
<th>Antibiotic Treatment After 48-72 hours of Failure of Initial Antibiotic Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommended First-line Treatment</strong></td>
<td><strong>Recommended First-line Treatment</strong></td>
</tr>
<tr>
<td>Amoxicillin 90 mg/kg/day divided q12 hours –OR–</td>
<td>Amoxicillin/clavulanate&lt;sup&gt;a&lt;/sup&gt; 90 mg/kg/day of amoxicillin with 6.4 mg/kg/day of clavulanate [amoxicillin to clavulanate ratio, 14:1] divided q12 hours –OR–</td>
</tr>
<tr>
<td>Amoxicillin/clavulanate&lt;sup&gt;a&lt;/sup&gt; 90 mg/kg/day of amoxicillin with 6.4 mg/kg/day of clavulanate [amoxicillin to clavulanate ratio, 14:1] divided q12 hours</td>
<td></td>
</tr>
<tr>
<td>Cefdinir 14 mg/kg/day divided q12 hours –OR–</td>
<td>Ceftriaxone 50 mg/kg/day IM or IV for 3 days</td>
</tr>
<tr>
<td>Cefuroxime 30 mg/kg/day divided q12 hours –OR–</td>
<td>Clindamycin (30–40 mg/kg per day in 3 divided doses) with or without third-generation cephalosporin Tympanocentesis&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cefpodoxime 10 mg/kg/day divided q12 hours –OR–</td>
<td></td>
</tr>
<tr>
<td>Ceftriaxone 50 mg/kg/day IM or IV for 1-3 days</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> May be considered in patients who have received amoxicillin in the previous 30 d or who have the otitis-conjunctivitis syndrome.

<sup>b</sup> Perform tympanocentesis/drainage if skilled in the procedure, or seek a consultation from an otolaryngologist for tympanocentesis/drainage. If the tympanocentesis reveals multidrug-resistant bacteria, seek an infectious disease specialist consultation.

<sup>c</sup> Cefdinir, cefuroxime, cefpodoxime, and ceftriaxone are highly unlikely to be associated with cross-reactivity with penicillin allergy on the basis of their distinct chemical structures.
Duration of Therapy

- < 2 yo or have severe AOM: 10 days
- 2 – 5 yo and mild or moderate AOM: 7 days
- ≥ 6 yo and mild to moderate AOM: 5–7 days

Exceptions:
- Ceftriaxone: 1-3 days
## Analgesia

### Treatment for Otalgia in AOM

<table>
<thead>
<tr>
<th>Treatment Modality</th>
<th>AAP Comments</th>
</tr>
</thead>
</table>
| Acetaminophen, ibuprofen | - Effective analgesia for mild to moderate pain  
- Readily available  
- Mainstay of pain management for AOM |
| Topical agents  
- Benzocaine, procaine, lidocaine | Additional, but brief, benefit over acetaminophen in patients older than 5 years |
| Topical agents  
- Naturopathic agents | Comparable to amethocaine/phenazone drops in patients older than 6 years |
| Narcotic analgesia with codeine or analogs | - Effective for moderate or severe pain  
- Requires prescription; risk of respiratory depression, altered mental status, gastrointestinal tract upset, and constipation |
| Home remedies (no controlled studies that directly address effectiveness)  
- Distraction  
- External application of heat or cold  
- Oil drops in external auditory canal | May have limited effectiveness |
| Homeopathic agents | No controlled studies that directly address pain |
| Tympanostomy/myringotomy | Requires skill and entails potential risk |

Interactive Learning

Which of the following preventative strategies is NOT recommended by the AAP?

A. Annual influenza vaccination
B. Avoidance of tobacco exposure
C. Prophylactic antibiotics
D. Exclusive breastfeeding
Prevention

• Prophylactic antibiotics are NOT recommended
• Pneumococcal vaccination series
• Annual influenza vaccination
• Encourage exclusive breastfeeding for at least 6 months
• Avoidance of tobacco exposure
BACTERIAL PHARYNGITIS
Bacterial

- Swollen uvula
- Whitish spots
- Red swollen tonsils
- Throat redness
- Gray furry tongue

Viral

- Red swollen tonsils
- Throat redness

https://www.digitalworldhub.com/others/lifestyle/what-is-pharyngitis/
Interactive Learning

Which of the following is the most common bacterial pathogen responsible for acute bacterial pharyngitis?

A. *Mycoplasma pneumoniae*
B. Group C and G streptococci
C. Group A *streptococcus*
D. *Staphylococcus aureus*
Causes of Acute Pharyngitis

- **Viruses**
  - Adenovirus
  - Influenza virus
  - Parainfluenza virus
  - Rhinovirus
  - Respiratory syncytial virus
  - Coxsackievirus
  - Echoviruses
  - Herpes Simplex virus
  - Epstein-Barr virus

- **Bacterial**
  - Group A *streptococcus*
  - Group C and G streptococci
  - *Neisseria gonorrhoeae*
  - *Fusobacterium necrophorum*
  - *A. haemolyticum*
  - Diptheria
  - Tularemia
  - *Mycoplasma pneumoniae*

Epidemiology of Bacterial Pharyngitis

- Group A *Streptococcus* (GAS) pharyngitis
  - *Streptococcus pyogenes*
  - Most common cause of bacterial pharyngitis
  - Peaks during winter and early spring
  - 15-30 % of all cases of pharyngitis in children between the ages of 5 and 15 years
    - Most common in school aged children, but can occur in younger children who have contact with school aged children

Clinical Signs and Symptoms

Group A Streptococcus Pharyngitis

- Sudden onset of sore throat
- Age 5–15 years
- Fever
- Headache
- Nausea, vomiting, abdominal pain
- Tonsillopharyngeal inflammation
- Patchy tonsillopharyngeal exudates
- Palatal petechiae
- Anterior cervical adenitis (tender nodes)
- Winter and early spring presentation
- History of exposure to strep pharyngitis
- Scarlatiniform rash

Viral Pharyngitis

- Conjunctivitis
- Coryza
- Cough
- Diarrhea
- Hoarseness
- Discrete ulcerative stomatitis
- Viral exanthema

Diagnosis of GAS Pharyngitis

- **Rapid antigen detection test (RADT)**
  - Point of care testing
  - Specificity of > 95%
  - Sensitivity of 70-90%
- **Throat Culture**
  - Reference standard for diagnosis
  - Sensitivity of 90-95%

Who to test for GAS Pharyngitis

- Evidence of acute tonsilopharyngitis (erythema, edema, and/or exudates) or scarlatiniform rash and the absence of signs and symptoms of viral infection (cough, rhinorrhea, hoarseness, and oral ulcers)

- Testing is not recommended in children < 3 years of age
  - Incidence of GAS pharyngitis and rheumatic fever is rare in this age range
  - Only test if patient has other risk factors → older siblings with GAS infections

Carriage of GAS

- Asymptomatic GAS carriers do not require treatment
  - As defined as a positive RADT or throat culture without signs and symptoms
- 10-15% of the school age population are carriers of GAS
- Overuse of antibiotics vs eradication
- Difficult to differentiate viral vs. GAS pharyngitis in symptomatic carriers

Interactive Learning

• Which of the following are possible complication from GAS pharyngitis?
  A. Otitis media
  B. Meningitis
  C. Acute rheumatic fever
  D. All of the above
Goals of Treatment

• Reduce symptom severity and duration

• Prevention of acute complications:
  • Otitis media or sinusitis
  • Peritonsillar cellulitis or abscess
  • Meningitis
  • Bacteremia
  • Acute rheumatic fever

• Prevention of spread to others

Adjuvant Therapy

- Acetaminophen or NSAID can be used for symptoms and fever
- Use of corticosteroids is not recommended
- Topical agents:
  - Rinses, sprays, and lozenges may provide temporary symptomatic relief

Penicillin or amoxicillin is the treatment of choice

Antibiotic Resistance
- No reported clinical isolate resistant to penicillin
- Increase in azithromycin and clarithromycin resistance

Penicillin allergic patient
- Cephalexin, clindamycin, azithromycin or clarithromycin
What is the duration of penicillin / amoxicillin therapy for treatment of GAS pharyngitis?

A. 10 days
B. 7 days
C. 14 days
D. 5 days
## Treatment Recommendations

### Table 2. Antibiotic Regimens Recommended for Group A Streptococcal Pharyngitis

<table>
<thead>
<tr>
<th>Drug, Route</th>
<th>Dose or Dosage</th>
<th>Duration or Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>For individuals without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>penicillin allergy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penicillin V, oral</td>
<td>Children: 250 mg twice daily or 3 times daily; adolescents and adults: 250 mg 4 times daily or 500 mg twice daily</td>
<td>10 d</td>
</tr>
<tr>
<td>Amoxicillin, oral</td>
<td>50 mg/kg once daily (max = 1000 mg); alternate: 25 mg/kg (max = 500 mg) twice daily</td>
<td>10 d</td>
</tr>
<tr>
<td>Benzathine penicillin G,</td>
<td>&lt;27 kg: 600 000 U; ≥27 kg: 1 200 000 U</td>
<td>1 dose</td>
</tr>
<tr>
<td>intramuscular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For individuals with</td>
<td></td>
<td></td>
</tr>
<tr>
<td>penicillin allergy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalexin, oral</td>
<td>20 mg/kg/dose twice daily (max = 500 mg/dose)</td>
<td>10 d</td>
</tr>
<tr>
<td>Cefadroxil, oral</td>
<td>30 mg/kg once daily (max = 1 g)</td>
<td>10 d</td>
</tr>
<tr>
<td>Clindamycin, oral</td>
<td>7 mg/kg/dose 3 times daily (max = 300 mg/dose)</td>
<td>10 d</td>
</tr>
<tr>
<td>Azithromycin, oral</td>
<td>12 mg/kg once daily (max = 500 mg)</td>
<td>5 d</td>
</tr>
<tr>
<td>Clarithromycin, oral</td>
<td>7.5 mg/kg/dose twice daily (max = 250 mg/dose)</td>
<td>10 d</td>
</tr>
</tbody>
</table>
ACUTE BACTERIAL RHINOSINUSITIS
Epidemiology

- One of the most common causes for visiting a primary care physician
- 6-9% of upper respiratory tract viral infections are complicated with acute bacterial rhinosinusitis
- Most commonly occurs in children 4-7 years of age, but can occur at any age

Pathogenesis

Clinical Signs and Symptoms

- Cough
- Nasal symptoms
- Fever
- Headache
- Facial pain and swelling
- Sore throat

Diagnosis

- Acute respiratory infection with one of the following:
  - Persistent illness
    - *Nasal discharge of any quantity, or daytime cough, or both lasting more than 10 days without improvement*
  - Worsening course
    - *Worsening or new onset of nasal discharge, daytime cough or fever after initial improvement*
  - Severe onset
    - *Concurrent fever and purulent nasal discharge for at least 3 consecutive days*
Imaging

- Imaging studies such as plain x-rays, computed tomography, magnetic resonance imaging or ultrasounds should not be obtained.
- Majority of parasinus images in pediatric patients with uncomplicated upper respiratory tract infections are abnormal.
- Normal images $\rightarrow$ no sinusitis
- Abnormal images $\rightarrow$ cannot confirm diagnosis

Complications of Sinusitis

- Orbital
  - Sympathetic effusion
  - Subperiosteal abscess
  - Orbital abscess
  - Orbital cellulitis
  - Cavernous sinus thrombosis

- CNS
  - Subdural empyema
  - Epidural empyema
  - Venous thrombosis
  - Brain abscess
  - Meningitis

Interactive Learning

• Which of the following is the most common bacterial pathogen responsible for acute bacterial rhinosinusitis?
  A. *Streptococcus pneumonia*
  B. *Haemophilus influenzae*
  C. *Staphylococcus aureus*
  D. *Moraxella catarrhalis*
Microbiology

- **Haemophilus influenzae**
  - 50-60%

- **Streptococcus pneumoniae**
  - 15-25%

- **Moraxella catarrhalis**
  - 12-15%
<table>
<thead>
<tr>
<th>Clinical Presentation</th>
<th>Severe Acute Bacterial Sinusitis(^a)</th>
<th>Worsening Acute Bacterial Sinusitis(^b)</th>
<th>Persistent Acute Bacterial Sinusitis(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncomplicated acute bacterial sinusitis without coexisting illness</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy or additional observation for 3 days(^d)</td>
</tr>
<tr>
<td>Acute bacterial sinusitis with orbital or intracranial complications</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
</tr>
<tr>
<td>Acute bacterial sinusitis with coexisting acute otitis media, pneumonia, adenitis, or streptococcal pharyngitis</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
<td>Antibiotic therapy</td>
</tr>
</tbody>
</table>
What is the appropriate treatment for a patient who presents with acute bacterial rhinosinusitis in an area with a high prevalence of resistant *S. pneumoniae*?

A. Amoxicillin 45 mg/kg/day divided BID
B. Amoxicillin 75 mg/kg/day divided BID
C. Amoxicillin 25 mg/kg/day divided BID
D. Amoxicillin 90 mg/kg/day divided BID
Antibiotic Treatment

- Amoxicillin 45 mg/kg/day divided BID
- Amoxicillin 90 mg/kg/day divided BID
  - High prevalence of penicillin-resistant *Streptococcus pneumoniae*
- Amoxicillin – clavulanate 45 – 90 mg/kg/day divided BID
  - *H. influenza* β-lactamase positive strains
- Ceftriaxone 50 mg/kg IV or IM
- Penicillin Allergy:
  - Cephalosporins: cefdinir, cefuroxime, cefpodoxime
  - Clindamycin plus cefixime
  - Levofloxacin

Duration

- No optimal duration of therapy based on randomized controlled trials
- Duration of therapy anywhere from 10-28 days
- Most common duration of therapy approximately 10 days

Adjuvant Therapy

- Antihistamines
- Intranasal steroids
- Intranasal saline
- Decongestants

Conclusion

• Acute otitis media, bacterial pharyngitis and acute bacterial rhinosinusitis are common ENT infections in pediatric patients

• Clinical signs and symptoms are important to rule out viral vs bacterial causes

• Amoxicillin and amoxicillin – clavulanate are appropriate treatment recommendations
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