



HOSPITALS • RESEARCH • FOUNDATION

# Acute Otitis Media, Acute Bacterial Sinusitis, and Acute Bacterial Rhinosinusitis

This guideline, developed by Larry Simmons, MD, in collaboration with the ANGELS team, on October 3, 2013, is a significantly revised version of the Recurrent Otitis Media guideline by Bryan Burke, MD, and includes the most recent information for acute otitis media, acute bacterial sinusitis, and acute bacterial rhinosinusitis. Last reviewed by Larry Simmons, MD on July 5, 2016.

## Preface

As the risk factors for the development of acute otitis media (AOM) and acute bacterial sinusitis (ABS)/ acute bacterial rhinosinusitis (ABRS) are similar, the bacterial pathogens are essentially the same for both AOM and ABS/ABRS, and since the antimicrobial treatments are similar, the following guideline is based, unless otherwise referenced, on recently published evidenced-based guidelines by the American Academy of Pediatrics (AAP) for AOM,<sup>1,2</sup> and by the Infectious Diseases Society of America (IDSA) for ABRS.<sup>3</sup>

This guideline applies to children 6 months to 12 years of age and otherwise healthy children without pressure equalizer (PE) tubes, immune deficiencies, cochlear implants, or anatomic abnormalities including cleft palate, craniofacial anomalies, and Down syndrome. However, the IDSA ABRS guideline includes recommendations for children and adult patients.

## Key Points

- Acute otitis media (AOM) is characterized by a bulging tympanic membrane (TM) + middle-ear effusion.
- Antibiotic treatment is indicated in children  $\geq 6$  months of age with severe AOM, children 6-23 months of age with mild signs/symptoms of bilateral AOM. In children 6-23 months of age with non-severe unilateral AOM, and in children  $\geq 24$  months of age with bilateral or unilateral

AOM who have mild pain and low fever  $<39^{\circ}\text{C}/102.2^{\circ}\text{F}$ , either antibiotic treatment or observation is appropriate.

- Acute bacterial sinusitis (ABS)/Acute bacterial rhinosinusitis (ABRS) is a bacterial infection of the paranasal sinuses.
- Antibiotic treatment for 10-14 days is usually recommended in pediatric patients. Macrolides (azithromycin, clarithromycin) are not recommended because of high rates of resistance in *Streptococcus pneumoniae* and *H influenzae*.
- Trimethoprim-Sulfamethoxazole (TMP-SMX) is not recommended because of high rates of resistance in *Streptococcus pneumoniae* and nontypeable *H influenzae*.
- Therapy with second and third generation oral cephalosporins is not recommended as a single treatment option by the IDSA ABRS guideline. The AAP ABS guideline recommends oral second/third generation oral cephalosporins only if patients have true penicillin allergy.

## Definitions, Assessment, and Diagnosis of Acute Otitis Media

### Definition

- Acute otitis media (AOM) is defined by a bulging tympanic membrane (TM) and acute onset of symptoms, the identification of middle-ear effusion (MEE), and the presence of signs and symptoms of middle-ear inflammation, or a purulent discharge not related to otitis externa<sup>1</sup>
- Otitis media with effusion (OME) is defined by the presence of fluid in the middle ear without signs or symptoms of acute ear infection, and isolated OME is not an indication for antibiotic treatment.<sup>4</sup>
- Acute otitis media is the most common reason for prescribing antibiotics in children.

### Assessment and diagnosis of AOM in children 6 months to 12 years of age

- Bacterial microbiologic data for assessment and diagnosis of AOM and ABRS are primarily derived from middle ear fluid isolates.
- Most common bacterial pathogens are
  - *Streptococcus pneumoniae*
  - Nontypeable *Haemophilus influenzae*
  - *Moraxella catarrhalis*
- Most frequent viral infections associated with secondary bacterial AOM<sup>5</sup>
  - Adenovirus
  - Coronavirus
  - Respiratory syncytial virus (RSV)
  - Influenza
  - Rhinovirus
- Other predisposing factors for developing AOM
  - Allergens
  - Environmental tobacco smoke
  - Airborne irritants
- Requirements for diagnosis of AOM
  - Moderate-to-severe bulging tympanic membrane
  - Mild bulging tympanic membrane and  $<48$  hours of pain, fussiness
  - Intense erythema and  $<48$  hours of pain, fussiness
  - Otorrhea from spontaneous perforation, not due to otitis externa
  - Indication of effusion must be present for diagnosis by

Severely bulging tympanic membrane

Visualization of air-fluid level

Pneumatic otoscopy is the standard of care in diagnosing acute otitis media

- Factors that do not indicate AOM<sup>o</sup>
  - Restlessness
  - Ear rubbing/pulling
  - Fever

## Management of Acute Otitis Media

### Antibiotic treatment

- Children  $\geq 6$  months of age with severe AOM
  - Severe bulging tympanic membrane, or purulent otorrhea from perforation of the TM
  - Moderate to severe pain for  $\geq 48$  hours
  - Fever  $\geq 39^{\circ}\text{C}/102.2^{\circ}\text{F}$
- Children 6-23 months of age with mild signs/symptoms of bilateral AOM
  - Mild bulging tympanic membrane plus effusion
  - Acute onset mild pain and mild fever ( $<39^{\circ}\text{C}$ )
- Children 6-23 months with non-severe unilateral AOM-antibiotic treatment or observation with:
  - Treatment of mild pain, low fever  $<39^{\circ}\text{C}/102.2^{\circ}\text{F}$
  - Follow-up if symptoms worsen with 48-72 hours from symptom onset
- Children  $\geq 24$  months of age with mild pain and low fever  $<39^{\circ}\text{C}/102.2^{\circ}\text{F}$ , antibiotic treatment or
  - Observation and pain/fever treatment
  - Follow-up if symptoms worsen with 48-72 hours from symptom onset
- Symptomatic treatment of pain is indicated in all patients, whether treated with antibiotics or observation.

### Duration of antibiotic treatment for AOM

- Ten (10) days for children  $< 2$  years of age and children with severe symptoms
- Five (5) to 7 days for children  $> 2$  years of age with mild to moderate symptoms

**Table 1. Preferred Antibiotic Treatment for Acute Otitis Media**

To view a larger image on your device, please click or touch the image.

Table 1. Preferred Antibiotic Treatment for Acute Otitis Media		
Antibiotic	Dosage	Note
Amoxicillin high dose	80-90mg/kg/day in 2 divided doses x 10 days	
Amoxicillin-Clavulanate 14:1 high dose	80-90mg/kg/day + 6.4 mg/kg/day in 2 divided doses x 10 days	Use with patients who <ul style="list-style-type: none"><li>• Received amoxicillin in past 30 days</li><li>• Have concurrent conjunctivitis</li><li>• Have recurrent AOM unresponsive to amoxicillin</li></ul>

**Table 2. Alternate Antibiotic Treatment for Acute Otitis Media\***

Oral cephalosporin susceptibility to *S. pneumoniae* 60-75% vs. >90% for high dose amoxicillin

To view a larger image on your device, please click or touch the image.

**Table 2. Alternate Antibiotic Treatment for Acute Otitis Media\***

Oral cephalosporin susceptibility to *S. pneumoniae* 60-75% vs. >90% for high dose amoxicillin

Antibiotic	Dosage
Cefdinir	14mg/kg/day in 1 or 2 doses x 10 days
Cefuroxime	30mg/kg/day in 2 divided doses x 10 days
Cefpodoxime	10mg/kg/day in 2 divided doses x 10 days
Ceftriaxone	50 mg/kg IM or IV x 3 days

\* Use only in patients with recent or true severe penicillin allergy; patients with a history of

- Anaphylaxis
- Urticaria
- Urticaria multiforme
- Stevens- Johnson Syndrome

Patients with true penicillin allergy often tolerate 2nd and 3rd generation cephalosporins according to AAP AOM guideline.<sup>2</sup>

**Table 3. Alternate Antibiotic Treatment for Acute Otitis Media if Initial Treatment Fails\***

To view a larger image on your device, please click or touch the image.

**Table 3. Alternate Antibiotic Treatment for Acute Otitis Media if Initial Treatment Fails\***

Initial Antibiotic	Substitute Antibiotic and Dosage	Comment
Amoxicillin	Amoxicillin-Clavulanate 14:1 high dose: <ul style="list-style-type: none"> <li>• 80-90mg/kg/day + 6.4 mg/kg/day in 2 divided doses</li> </ul>	
Amoxicillin-Clavulanate	Ceftriaxone <ul style="list-style-type: none"> <li>• 50 mg/kg IM or IV x 3 days</li> </ul>	
Ceftriaxone	Clindamycin <ul style="list-style-type: none"> <li>• 30-40mg/kg/day in 3 divided doses</li> </ul>	Clindamycin has limited activity against <i>H influenzae</i>  Tympanocentesis for culture and sensitivity

\*Use if initial treatment fails 42-72 hours after presentation

**Follow-up, Cautions, and Comments**

- No scientific evidence exists for follow-up in patients who respond to antibiotic treatment within 72 hours.
- Prophylactic antibiotics should not be used in patients with recurrent AOM.

- Adenoidectomy does not reduce recurrent AOM.
- Pressure equalizer (PE) tubes
  - A clinical practice guideline<sup>6</sup> by the American Academy of Otolaryngology recommends:
    - Age-appropriate hearing tests for children with persistent middle ear effusion > 3 months.
    - Consideration of PE tubes in children with bilateral persistent middle ear effusion > 3 months with documented hearing difficulties.
    - PE tubes are not recommended in children with recurrent AOM who do not have middle ear effusions.
  - Have small effect in reducing recurrent AOM
  - Thirty-two percent (32%) of patients have tympanosclerosis and possible decreased hearing ability related to previous PE tube insertion(s).<sup>7</sup>

## **Definition, Risk Factors, Assessment, and Diagnosis of Acute Bacterial Sinusitis (ABS)/Acute Bacterial Rhinosinusitis (ABRS)**

### **Definition**

- Acute bacterial rhinosinusitis/acute bacterial sinusitis (ABS/ABRS) is a bacterial infection of the paranasal sinuses.
- ABS/ABRS affects 1% of children in the U.S. annually.<sup>8</sup>

### **Risk factors**

- Inflammatory
  - Viral upper respiratory infections
    - ABS/ABRS results from upper respiratory infections in 5% of children.<sup>3</sup>
    - Children in day care are twice as likely to have ABS/ABRS following an upper respiratory infection.
  - Allergic rhinitis
  - Irritants
- Congenital
  - Cystic fibrosis
  - Cilia dysfunction
  - Immune disorders
- Anatomic
  - Choanal atresia
  - Trauma
  - Foreign body
  - Tumor
  - Deviated septum

### **Complications of ABRS**

- Extracranial
  - Periorbital inflammatory edema
  - Sub-periosteal abscess
  - Orbital cellulitis
  - Orbital abscess

- Intracranial
  - Subdural empyema
  - Brain abscess
  - Epidural abscess
  - Venous sinus thrombosis
  - Meningitis

## Assessment and diagnosis of acute bacterial rhinosinusitis

- Common symptoms in children with ABRS
  - Persistent nasal discharge – 76%
  - Cough – 80%
  - Fever – 63%
- Clinical presentations of ABRS
  - Persistent respiratory symptoms or signs  $\geq 10$ -30 days<sup>2</sup>
    - Nasal discharge-any quality and
    - Cough-day and night
    - Low grade fever
    - Child may appear mildly ill
  - Severe symptoms
    - Usually appear in school-age children, adolescents, and adults.
    - Fever  $\geq 39^{\circ}\text{C}$  at least 3 to 4 days
    - Purulent nasal discharge  $>3$ -4 days from the onset of symptoms
    - Headache/facial pain may occur
  - Worsening of signs or symptoms after initial improvement-double sickening<sup>8</sup>
    - Fever recurs
    - Headache appears/worsens
    - Increase in nasal discharge
  - Bacterial microbiologic data for assessment and diagnosis are primarily derived from middle ear fluid isolates
  - Most common bacterial pathogens are
    - Streptococcus pneumoniae
    - Nontypeable Haemophilus influenzae
    - Moraxella catarrhalis

## Management of Acute Bacterial Rhinosinusitis

- Antibiotic treatment 10-14 days in children, although 5-7 days may be adequate in adults
- Macrolides (azithromycin, clarithromycin) are not recommended because of high rates of resistance in Streptococcus pneumoniae and H influenzae.
- Trimethoprim-Sulfamethoxazole (TMP-SMX) is not recommended because of high rates of resistance in Streptococcus pneumoniae and NT H influenzae.
- Second and third generation oral cephalosporins are not recommended as monotherapy, due to high rates of resistance according to the IDSA ABRS guideline, and in only patients with true penicillin allergy according to the AAP ABS guideline.

### Table 4. Preferred Antibiotic Treatment for Acute Bacterial Rhinosinusitis

To view a larger image on your device, please click or touch the image.

Antibiotic	Dosage	Note
Amoxicillin	45 mg/kg/day in 2 divided doses	Use as first line treatment in areas which have low antibiotic resistance rates in patients >2 years of age with uncomplicated ABS/ABRS who do not attend daycare, and who have not been treated with antibiotics within the last 4 weeks. <sup>2</sup>
Amoxicillin high dose	80-90mg/kg/day in 2 divided doses x 10 days. Max dose 2 grams/day	Use in patients >2 years of age with uncomplicated mild to moderate ABS/ABRS who do not attend day care and who live in areas with high rates of resistance.
High-dose amoxicillin/clavulanate	90 mg/kg/day; max 2grams/day (divide into 2X/day doses) Max dose 2 grams/day	<p>Use with patients who</p> <ul style="list-style-type: none"> <li>• Have severe infection with fever <math>\geq 39^{\circ}\text{C}</math></li> <li>• Are in day care</li> <li>• Are &lt;2 years old</li> <li>• Have had antibiotic within past month</li> <li>• Have had recent hospitalization</li> <li>• Are immunocompromised</li> </ul> <p>Areas where invasive non-meningitis S pneumonia resistance is <math>\geq 10\%</math>-which includes most of Southeast US, including central Arkansas</p>

**Table 5. Alternate Antibiotic Treatment for Acute Bacterial Sinusitis/Acute Bacterial Rhinosinusitis**

To view a larger image on your device, please click or touch the image.

---

**AAP Recommendations**

- *Oral cephalosporins should only be used in patients with true PCN allergy.*
- There is a low risk of serious allergic reaction in patients with Type I or Type II PNC reactions according to the AAP AOM and ABS guidelines.
  - Cefnidir (Omnicef®): 14mg/kg/day in 1 or 2 doses X 10 days
  - Cefuroxime (Ceftin®): 30mg/kg/day in 2 bid doses X 10 days
  - Cefpodoxime (Vantin®): 10mg/kg/day in 2 divided doses X 10 d
  - Children <2 years-of-age: clindamycin + cefixime (Suprax®)

---

**IDSA Recommendations**

Antibiotic	Dosage	Note
Levofloxacin	10-20 mg/kg/day in 2 divided doses	Use with patients who have type I penicillin allergy  Also use in areas with high clindamycin resistance
Clindamycin plus Cefixime, or Cefpodoxime	30-40 mg/kg/day in 3 divided doses 8mg/kg/day in 2 divided doses 10mg/kg/day in 2 divided doses	Use with patients who have non-type I penicillin allergy
Doxycycline	100mg po q 12 hours	Use in children >12 years of age with type 1 penicillin allergy  Doxycycline is an acceptable alternative to amoxicillin/clavulanate  Highly active against all respiratory pathogens

- If patients fail recommended treatment in 3-5 days or worsen on recommended antibiotic therapy, refer to ENT to obtain cultures and for antimicrobial sensitivities.
  - Direct sinus aspiration, preferred
  - Endoscopically-guided culture
  - Nasopharyngeal cultures – not recommended
- Role of adjunctive therapies
  - Analgesics, antipyretics, and appropriate oral hydration is recommended for all patients
  - Saline irrigation – evidence of effectiveness in children is weak
  - Intranasal topical steroids – may be helpful in patients with allergic rhinitis, but evidence of effectiveness in children is weak
  - Topical or oral decongestants or antihistamines – not recommended
- Role of imaging
  - Not recommended and not advised in patients with uncomplicated ABRS, which is a clinical diagnosis
  - Patients with severe ABRS and orbital or intracranial complications
    - Contrast-enhanced CT is recommended due to availability in almost all area at all times of the day
    - MRI is not recommended due to limited availability, especially off hours, in many areas

*This guideline was developed to improve health care access in Arkansas and to aid health care providers in making decisions about appropriate patient care. The needs of the individual patient, resources available, and limitations unique to the institution or type of practice may warrant variations.*

## References

## References

1. Lieberthal AS, Carroll AE, Chonmaitree T, Ganiats TG, et al. The diagnosis and management of acute otitis media. *Pediatrics* 2013; 131(3):e964-99.
2. Wald ER, Applegate DE, Bordley C, Darrow DH, et al. Clinical practice guideline for the diagnosis and management of acute bacterial sinusitis in children aged 1 to 18 years. *Pediatrics* 2013; 132(1):e262-80.
3. Chow AW, Benninger MS, Brook I, Brozek JL, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clin Infect Dis* 2012;54(8):e72-112.
4. U.S. National Library of Medicine and National Institutes of Health. Otitis media with effusion. Available from: <http://www.nlm.nih.gov/medlineplus/ency/article/007010.htm> Accessed October 03, 2013.
5. Chonmaitree T, Revai K, Grady JJ, Clos A, et al. Viral upper respiratory tract infection and otitis media complication in young children. *Clin Infect Dis* 2008;46(6):815-23.
6. Rosenfeld RM, Schwartz SR, Pynnonen MA, Tunkel DE, et al. A clinical practice guideline: tympanostomy tubes in children – executive summary. *Otolaryngol Head Neck Surg* 2013;149(1):8-16.
7. Kay DJ, Nelson M, Rosenfeld RM. Meta-analysis of tympanostomy tube sequelae. *Otolaryngol Head Neck Surg* 2001; 124(4):374-80.
8. DeMuri GP, Wald ER, Clinical practice. Acute bacterial sinusitis in children. *N Engl J Med* 2012;367(12):1128-34.