Otitis Media: Clinical Practice Guidelines and Management

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“Pulling it all together for the Kids”
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Disclosures

- None
Learning Objectives

Identify the common pathogens, clinical presentation, indications for referral, clinical practice guidelines, best treatment options for:

- Acute Otitis Media
- Acute Otitis Externa
- Otitis media with effusion
- Tympanic membrane perforation
Classification of Otitis Media

- Acute: < 6 weeks
- Chronic: > 6 weeks
- Recurrent otitis media: 3 episodes in 6 months or 4+ episodes in 1 year
Acute Otitis Media
Definition

▪ Moderate to severe bulging of the tympanic membrane (TM) or new onset of otorrhea not due to acute otitis externa
  ▪ typically accompanied by acute signs of illness

▪ Bulging of the TM is considered the quintessential sign that distinguishes AOM from otitis media with effusion and a normal TM.
Pathogenesis

- Most frequently a consequence of viral URI leading to the movement of secretions from the nasopharynx into the middle ear cleft

- May result in:
  - Eustachian tube inflammation/dysfunction
  - Negative middle ear pressure
Health Care Burden

- Most children have experienced at least **1 AOM episode by 3 years** of age and nearly 40% of children have had **3 or more AOM by age 6 years**.

- There are nearly **670,000 tympanostomy tube placements annually**. Average cost of tympanostomy tube placement is $2700 (totaling $1.8 billion).

- Clinician visits for OM have decreased significantly over the past 20 years, but **providers continue to prescribe antibiotics at similar rates** despite 2004 AAP guideline outlining when watchful waiting is appropriate.
Common Bacterial Pathogens

- *Streptococcus pneumoniae*
- *Haemophilus influenzae*
- *Moraxella catarrhalis*
- *Streptococcus pyogenes* (<5%)

- Vast majority of AOM cases will involve pathogenic bacteria alone or in conjunction with viral pathogens.

Clinical Presentation

- Otalgia
- Fever
- Decreased hearing
- URI symptoms
- Fussiness/irritability
- Otorrhea
- Anorexia
Risk Factors

- Age
- Family history
- Day care
- Lack of breastfeeding
- Tobacco smoke and air pollution
- Pacifier use
- Race and ethnicity
- Social and economic conditions
- Seasons
- Altered host defenses and underlying disease
Diagnosis

- No gold standard
- Moderate to severe TM bulging or new onset of otorrhea
- Mild TM bulging and recent onset of ear pain or intense TM erythema
- Evidence of middle ear effusion
Progression of Tympanic Membrane Bulging
So... when am I supposed to treat with antibiotics?
Treatment

- **Antibiotics**
  - severe symptoms (moderate-severe otalgia > 48 hours, or temperature of 39 degrees C)
  - < 2 years old and bilateral AOM

- **Observation & Analgesics**
  - no severe symptoms
# Antibiotic Choice

<table>
<thead>
<tr>
<th>TABLE 5 Recommended Antibiotics for (Initial or Delayed) Treatment and for Patients Who Have Failed Initial Antibiotic Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Immediate or Delayed Antibiotic Treatment</strong></td>
</tr>
<tr>
<td><strong>Recommended First-line Treatment</strong></td>
</tr>
<tr>
<td>Amoxicillin (80–90 mg/kg per day in 2 divided doses)</td>
</tr>
<tr>
<td>Amoxicillin-clavulanate (90 mg/kg per day of amoxicillin, with 6.4 mg/kg per day of clavulanate [amoxicillin to clavulanate ratio, 14:1] in 2 divided doses)</td>
</tr>
<tr>
<td><strong>Alternative Treatment (If Penicillin Allergy)</strong></td>
</tr>
<tr>
<td>Cefdinir (14 mg/kg per day in 1 or 2 doses)</td>
</tr>
<tr>
<td>Cefuroxime (500 mg/kg per day in 2 divided doses)</td>
</tr>
<tr>
<td>Cefpodoxime (10 mg/kg per day in 2 divided doses)</td>
</tr>
<tr>
<td><strong>Antibiotic Treatment After 48–72 h of Failure of Initial Antibiotic Treatment</strong></td>
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</tr>
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<tr>
<td>Ceftriaxone, 3 d Clindamycin (30–40 mg/kg per day in 3 divided doses) plus third-generation cephalosporin</td>
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</tr>
<tr>
<td>Consult specialist $^a$</td>
</tr>
</tbody>
</table>

*IM, intramuscular; IV, intravenous.

$^a$ May be considered in patients who have received amoxicillin in the previous 30 d or who have the otitis-conjunctivitis syndrome.

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

$^c$ 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. See text for more information.
Duration of Antibiotic Therapy

- **10 days**: < 2 years old or if severe symptoms present
- **7 days**: 2 to 5 years old without severe symptoms
- **5 to 7 days**: 6 years and older
AOM Follow Up

- Limited scientific evidence for a routine 10 to 14 day reevaluation visit for all children with AOM.

- Provider may choose to reassess on case to case basis, such as young children with severe symptoms, recurrent AOM, history of craniofacial abnormalities, or by parent request.
Intratemporal Complications

- Hearing loss
- Balance/motor problems
- TM perforation (shown in picture)
- Cholesteatoma
- Middle ear atelectasis
- Ossicular fixation or discontinuity
- Mastoiditis, Petrositis, or Labyrinthitis
- Facial paralysis

Intracranial Complications

- Meningitis
- Epidural or brain abscess
- Lateral sinus, cavernous sinus, or carotid artery thrombosis
- Subdural empyema
Referral

- 3+ AOM episodes in 6 months or 4+ episodes in 12 months (with 1 episode in previous 6 months) with effusion present at time of exam*

*Lower threshold* for referral for children with recurrent AOM or chronic OME who are at increased risk for speech, language, or learning problems because of baseline sensory, physical, cognitive, or behavioral factors.
Otitis Media with Effusion
Definition

▪ Otitis Media with effusion (OME)
  ▪ The presence of fluid in the middle ear without signs or symptoms of acute ear infection.

▪ Chronic OME
  ▪ The presence of fluid in middle ear persisting for > 3 months from the date of onset (if known) or from the date of diagnosis.
Diagnosis

- Pneumatic otoscopy should be used to assess for OME in child with otalgia, hearing loss, or both

- Tympanometry should be obtained in children with suspected OME for whom the diagnosis is uncertain after performing (or attempting) pneumatic otoscopy
## Etiology

### Eustachian tube dysfunction

<table>
<thead>
<tr>
<th>Obstruction</th>
<th>Infection</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenoid hyperplasia</td>
<td>Chronic adenoiditis</td>
<td>Cigarette smoke</td>
</tr>
<tr>
<td>Palatal defects</td>
<td>Chronic rhinosinusitis</td>
<td>GERD</td>
</tr>
<tr>
<td>Tumors (nasopharyngeal carcinoma)</td>
<td>Chronic tonsillitis</td>
<td>Milk</td>
</tr>
</tbody>
</table>
Prevalence

▪ In the first year of life 50% of children will experience OME, increasing to 60% by age 2 years.

▪ When children aged 5 to 6 years in primary school are screened for OME, about 1 in 8 are found to have fluid in one or both ears.

▪ The prevalence of OME in children with Down syndrome or cleft palate, however, is much higher, ranging from 60% to 85%.
Management

- Watchful waiting for 3 months from the date of effusion onset (if known) or 3 months from the date of diagnosis (if onset is unknown)
  - Not recommended in children who are at increased risk for speech, language, or learning problems from MEE because of baseline sensory, physical, cognitive, or behavioral factors

- Obtain an age-appropriate hearing test if OME persists for 3 months or longer OR for OME of any duration in an at-risk child

- Infants with OME who fail a newborn screening need repeat ABR when OME resolves and to exclude an underlying sensorineural hearing loss
### Frequently Asked Questions: Ear Fluid and Newborn Hearing Screening (NBHS)

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many babies who fail their newborn hearing screen will really have hearing loss?</td>
<td>Only a very small number of babies who fail will have permanent hearing loss; overall, only about 2 or 3 of every 1000 children in the US are born deaf or hard of hearing.</td>
</tr>
<tr>
<td>How common is middle ear fluid in children who fail a hearing screen?</td>
<td>Middle ear fluid is a very common cause of a failed NBHS (around 6 of every 10 children who fail). The fluid will often go away on its own in the first few months of life.</td>
</tr>
<tr>
<td>Can I assume that middle ear fluid is the reason for the failed test?</td>
<td>No. The newborn hearing screen cannot determine the cause of hearing loss. About 90% of the time, hearing loss goes away when the fluid does, but 10% of children may still have hearing loss that needs further medical attention. For this reason, it is very important to retest your child’s hearing after fluid is gone.</td>
</tr>
</tbody>
</table>
Treatment

- Tympanostomy tubes
  - Chronic OME that does not resolve in 3 months if causing hearing difficulties
  - At risk children

- Adenoidectomy
  - History of nasal obstruction, chronic adenoiditis

- Should NOT:
  - Use intranasal or systemic steroids for treating OME
  - Use systemic antibiotics for treating OME
  - Use antihistamines, decongestants, or both for treating OME.
Health Care Burden

- Approximately 2.2 million diagnosed episodes of OME occur annually in the United States at a cost of $4.0 billion.

- At any given time, approximately 20% of school-aged children have MEE, with nearly all children having at least 1 episode during their childhood.

- The indirect costs are likely much higher since OME is largely asymptomatic and many episodes are therefore undetected, including those in children with hearing difficulties.
Referral & Surgery Indications

- **Referral**
  - **OME for 3+ months** with documented hearing difficulties or symptoms likely attributable to chronic OME

- **Tympanostomy Tubes**

- **Adenoidectomy**
  - Children < 4 years with chronic OME and nasal obstruction, chronic adenoiditis
  - Children > 4 years old with chronic OME
Tympanic membrane perforation
Perforation

- Location
  - Marginal
  - Central
  - Posterior/Anterior
  - Superior/Inferior

- Description
  - Dry/Wet
  - Size (%)
Management

- Ofloxacin 5 gtts BID x 10 days
- Ciprodex 5 gtts BID x 10 days
  - Ideal for bloody otorrhea
- Re-evaluate TM in 4-6 weeks
- Does NOT need urgent ENT referral
  - ENT referral if no resolution in drainage, residual perforation at follow up, and/or continued hearing concerns
Tympanostomy Tubes
Purpose

- Enables drainage of the middle ear

- Allows air to flow into the middle ear which can help negative pressure

- May be plastic or metal
Types of Tympanostomy Tubes
Risks

- Bleeding
- Infection/Otorrhea
- Hearing loss
- Premature tube extrusion
- Repeat procedure to remove or replace tubes
- Cholesteatoma
- TM perforation
- Possible need for myringoplasty and/or tympanoplasty
Procedure
After care

- May get clean water in ears (bath, pool)
- Ear plugs when swimming in lakes or oceans
- ENT evaluation 2-3 months after placement
- Audiogram
- Yearly ENT follow up while tubes are in place
Otorrhea with Tympanostomy Tubes

- Bloody
- Purulent
- Serous

- Antibiotic gtts if patient has any episodes of otorrhea, signaling an acute infection
  - Ofloxacin
  - Ciprofloxacin (may consider 1st choice if bloody otorrhea)
  - Duration: BID up to 10 days or 3 days after last episode of drainage
  - Follow up with ENT if drainage has not subsided after 10 days of treatment

- Vinegar/water irrigations 1:1 solution
  - Safe for middle ear
## Expectations vs Reality

<table>
<thead>
<tr>
<th>Expectation</th>
<th>Reality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear infections will stop</td>
<td>Tubes will not prevent infections but may reduce amount due to open system</td>
</tr>
<tr>
<td>Speech will improve</td>
<td>If speech delay is directly related to MEE, some children will have an improvement in speech after tube placement. Although, there are other factors that contribute to speech delay outside of MEE</td>
</tr>
<tr>
<td>Hearing will improve</td>
<td>Approximately 70% of children, hearing loss caused by fluid will go away right after the tubes are in place. However, 30% of children, it could take up to several months before hearing improves</td>
</tr>
</tbody>
</table>
Acute Otitis Externa
Anatomy
Pathogenesis

▪ Breakdown of the skin-cerumen barrier is the first step in the pathogenesis of external otitis.

▪ Inflammation and edema of the skin then leads to pruritis and obstruction.

▪ Increased pH of the ear canal resulting in dark, warm, alkaline, moist ear canal which becomes an ideal breeding ground for numerous organisms.
Pathogens

- Most common:
  - *Pseudomonas aeruginosa*
  - *Staphylococcus epidermidis*
  - *Staphylococcus aureus*

- Other pathogens principally gram-negative
- Fungal (*Aspergillus* and *Candida*)

Clinical Presentation

- Otalgia
- Fever
- Otorrhea
- Pruritis
- Difficulty hearing

- Predisposing factors: humidity, prolonged water exposure, dermatologic conditions, anatomic abnormalities, trauma or external devices, and otorrhea
Diagnosis

- **Rapid onset** (~48 hours), AND...
- **Signs of ear canal inflammation** (otalgia, itching, or fullness +/- hearing loss or jaw pain), AND...
- **Symptoms of ear canal inflammation** (tragus/pinna tenderness or ear canal edema/erythema +/- otorrhea, regional lymphadenitis, TM erythema, or pinna/adjacent skin cellulitis).
Health Care Burden

- In 2007, there were approximately 2.4 million ambulatory care and emergency department visits for acute otitis externa, affecting 1 in 123 persons in the United States. Slightly less than 50% of visits were for children 5 to 14 years of age.

- Estimated direct costs are estimated at approximately half a billion dollars annually, and ambulatory care providers spent approximately 600,000 hours treating AOE.
Treatment

- **Topical antimicrobials** (NOT systemic) twice daily x 7-10 days
- Non-antibiotic topical treatments
- Analgesics
- Patient Counseling
### Treatment

**Table 6.** Common topical otic preparations approved by the Food and Drug Administration for treating diffuse acute otitis externa.

<table>
<thead>
<tr>
<th>Active Drug(s)</th>
<th>Name</th>
<th>Bottle Size, mL</th>
<th>Trade</th>
<th>Cost, US$$\textsuperscript{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid 2.0% solution</td>
<td>Acetic acid otic (generic)</td>
<td>15.0</td>
<td>—</td>
<td>33</td>
</tr>
<tr>
<td>Acetic acid 2.0%, hydrocortisone 1.0%</td>
<td>Acetasol HC (generic)</td>
<td>10.0</td>
<td>—</td>
<td>23</td>
</tr>
<tr>
<td>Ciprofloxacin 0.2%, hydrocortisone 1.0%</td>
<td>Cipro HC (trade)</td>
<td>10.0</td>
<td>170</td>
<td>—</td>
</tr>
<tr>
<td>Ciprofloxacin 0.3%, dexamethasone 0.1%</td>
<td>Ciprodex (trade)</td>
<td>7.5</td>
<td>144</td>
<td>—</td>
</tr>
<tr>
<td>Neomycin, polymyxin B, hydrocortisone</td>
<td>Cortisporin Otic (trade)</td>
<td>10.0</td>
<td>85</td>
<td>30</td>
</tr>
<tr>
<td>Ofloxacin 0.3%</td>
<td>Floxin Otic (trade)</td>
<td>5.0</td>
<td>76</td>
<td>18</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Approximate price in New York metropolitan region (http://www.goodrx.com).
Proper administration

Table 9. Instructions for patients.

- If possible, get someone to put the drops in the ear canal for you.
- Lie down with the affected ear up. Put enough drops in the ear canal to fill it up.
- Once the drops are in place, stay in this position for 3 to 5 minutes. Use a timer to help measure the time. It is important to allow adequate time for the drops to penetrate into the ear canal.
- A gentle to-and-fro movement of the ear will sometimes help in getting the drops to their intended destination. An alternate method is to press with an in/out movement on the small piece of cartilage (tragus) in front of the ear.
- You may then get up and resume your normal activities. Wipe off any excess drops.
- Keeping the ear dry is generally a good idea while using ear drops.
- Try not to clean the ear yourself as the ear is very tender and you could possibly damage the ear canal or even the eardrum.
- If the drops do not easily run into the ear canal, you may need to have the ear canal cleaned by your clinician or have a wick placed in the ear canal to help in getting the drops into the ear canal.
- If you do have a wick placed, it may fall out on its own. This is a good sign as it means the inflammation is clearing and the infection subsiding.
- Do not remove the wick yourself unless instructed to do so.
Complications

- Periauricular cellulitis
- Malignant external otitis
Referral Indications

▪ Need for specialist referral is uncommon (< 3%) when AOE is treated appropriately

▪ Alternative causes of ear pain and associated otorrhea should be considered if the patient fails to respond to treatment
References


References


Contact Information

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