**Introduction**

Otitis media (OM) is a highly prevalent disease in children, with over 80% experiencing at least one episode by age 5. As one of the most common reasons for antibiotic prescription in pediatrics, OM warrants special attention from pharmacists. Recent advances in pneumococcal vaccination have reduced the burden of OM caused by S. pneumoniae, but challenges remain with antibiotic overuse and resistance. This subtopic will provide an in-depth review of OM pathophysiology, diagnosis, and management per recent guidelines. Key aspects include distinguishing acute OM from otitis media with effusion, judicious antibiotic use, and tailoring therapy based on disease severity and age. Staying updated on the latest evidence and guidelines is crucial for pharmacists to optimize outcomes in this vulnerable population.

**Clinical Presentation**

* Typical symptoms of acute OM include:
* Otalgia (ear pain or tugging/rubbing of the ear in young children)
* Fever
* Hearing loss
* Otorrhea (drainage from the ear)

* Risk factors:
* Recent upper respiratory infection
* Age 6-24 months
* Not being breastfed
* Exposure to secondhand smoke
* Daycare attendance
* Craniofacial abnormalities
* Immunodeficiency
* Frequent pacifier use

Importantly, AOM should be distinguished from otitis externa, which is a swimmer's ear infection of the outer ear canal, and otitis media with effusion, which is fluid in the middle ear without acute infection. Identifying these key features of the clinical presentation will assist pharmacists in making an accurate AOM diagnosis.

**Pathophysiology**

The pathophysiology of AOM begins with a preceding viral upper respiratory infection that causes Eustachian tube dysfunction and inflammation of the middle ear. The altered host defenses allow bacterial pathogens, most commonly S. pneumoniae, H. influenzae, and M. catarrhalis, to proliferate and cause infection. The accumulation of inflammatory mediators, immune cells, and pathogens in the confined space of the middle ear leads to disruption of normal middle ear pressure regulation and an influx of fluid into the middle ear space. This drives intense inflammation of the tympanic membrane.

The end result is occlusion of the middle ear space, impaired mobility of the tympanic membrane, and conduction hearing loss. If unresolved, the fluid and inflammation can persist as otitis media with effusion even after the acute infection resolves. Recurrent AOM episodes also sustain chronic inflammation and increase the risk of permanent hearing loss. Relating this pathophysiology back to the clinical findings of fever, ear pain, hearing changes, and drainage can help pharmacists better recognize and manage AOM.

**Diagnostic Approach**

The key diagnostic criteria for acute OM include recent onset (<48hrs) of signs and symptoms, the presence of middle ear effusion as diagnosed by pneumatic otoscopy and/or tympanometry, and signs of middle ear inflammation like bulging, intense erythema, or opacity of the tympanic membrane.

On physical exam, pneumatic otoscopy allows assessment of tympanic membrane mobility, visualization of anatomical landmarks, and presence of middle ear fluid. Tympanometry provides an objective measure of middle ear function and effusion.

Other supportive but non-essential tests include tympanocentesis to obtain middle ear fluid for Gram stain and culture, nasopharyngeal culture, and audiometry to evaluate hearing status. Severity is classified based on symptoms as mild with low-grade fever and mild otalgia or severe with high fever (≥102.2°F) and moderate-severe otalgia for at least 48 hours. Identifying these key diagnostic features allows reliable differentiation of acute OM from otitis media with effusion.

**Management - Overview**

The initial management of acute OM is typically observational with analgesic treatment only. Antibiotic therapy is reserved for patients under 6 months old, those with severe symptoms, or those with medical comorbidities putting them at high risk of complications. The first-line antibiotics used are amoxicillin or amoxicillin-clavulanate. The duration of antibiotics is 5-10 days based on the patient's age and disease severity. Analgesics, antipyretics, and otic drops help manage symptoms. Referral to an ENT specialist is needed for complications of OM or multiple treatment failures. Following these principles allows pharmacists to thoughtfully limit antibiotic overuse and ensure appropriate therapy when indicated for acute OM.

**Pharmacotherapy**

First-line:

* Amoxicillin:
* Dose: 80-90 mg/kg/day divided BID
* Duration: 5-7 days (10 days if <2yrs or severe)
* MOA: Penicillin; inhibits bacterial cell wall synthesis
* AEs: Diarrhea, rash, abdominal pain
* Pearls: Preferred first-line for patients without recent amoxicillin exposure, conjunctivitis, penicillin allergy

* Amoxicillin-clavulanate
* Dose: Amoxicillin 90 mg/kg/day + clavulanate 6.4 mg/kg/day divided BID
* Duration: 10 days
* MOA: Adds beta-lactamase inhibitor for H. influenzae/M. catarrhalis
* AEs: Diarrhea, nausea, rash
* Pearls: First-line after initial treatment failure; better empiric activity

Alternatives for penicillin allergy:

* Cefdinir
* Dose: 14 mg/kg/day either BID or daily
* Duration: 10 days
* MOA: 3rd generation cephalosporin; inhibits cell wall synthesis
* AEs: Diarrhea, rash, nausea
* Pearls: Lower efficacy than amoxicillin but option for penicillin allergy

* Azithromycin
* Dose: 10 mg/kg x 1 day then 5 mg/kg x 4 days
* Duration: 5 days
* MOA: Macrolide; inhibits bacterial protein synthesis
* AEs: Diarrhea, nausea, vomiting
* Pearls: Higher failure rates than amoxicillin

Analgesics/antipyretics:

* Acetaminophen, ibuprofen for pain/fever management
* Narcotics generally not indicated

Otic drops:

* Analgesic drops (antipyrine/benzocaine) for pain relief
* Avoid antibiotics without tympanostomy tubes

Monitoring:

* Follow up in 48-72 hours to confirm resolution of infection
* Ensure resolution of middle ear effusion after treatment
* Refer to ENT for complications or multiple recurrences

**Key Guidelines and Evidence**

Guidelines

* AAP 2013 Guidelines - "The Diagnosis and Management of Acute Otitis Media"
* NICE 2008 Guidelines - “Respiratory tract infections – antibiotic prescribing"

Guideline Recommendations for Acute OM Treatment

* AAP 2013 guidelines:
* 6-24 months: Antibiotics recommended for unilateral/bilateral AOM
* 24 months: Observation, with antibiotics only if no improvement in 48-72 hrs
* All ages: Antibiotics recommended if otorrhea or severe symptoms present

* NICE 2008 guidelines:
* <2 years: Observation or backup antibiotics, refer if no improvement in 3 days
* 2 years: Observation, no antibiotics
* All ages: Antibiotics recommended if otorrhea or severe symptoms

* Recent guidelines support more judicious antibiotic use and preferentially recommend observation over immediate antibiotics for mild-moderate AOM

* High-dose amoxicillin provides better coverage of penicillin-resistant S. pneumoniae (AAP 2013)

* 5-7 days of antibiotics is appropriate for most children >2 years (Hoberman 2016)

* Analgesics and antipyretics are first-line for symptom relief

**Clinical Scenarios**

Clinical Scenario 1:

A 2-year-old girl presents with left ear pain, tugging at her left ear, and fever of 101°F for the past 18 hours. On exam, her left TM is erythematous and bulging. You diagnose acute OM and prescribe high-dose amoxicillin for 10 days. Her mother calls back after 7 days as her daughter's symptoms have resolved. You advise her to continue the amoxicillin for the full 10 day course to prevent recurrence.

Clinical Scenario 2:

A 7-year-old boy presents with several days of rhinorrhea, cough, and now complains of acute onset right ear pain. He is febrile at home per parents. On exam, his right TM is erythematous but not bulging. You diagnose acute OM and prescribe 5 days of amoxicillin. His mother calls back after 3 days worried his symptoms are worsening. You advise they return to the office for re-evaluation.

Clinical Scenario 1 Answer Key:

The full antibiotic course should be completed to ensure eradication of the bacterial pathogens involved. While the patient may feel better in a few days, persisting subclinical infection can lead to recurrence if antibiotics are stopped prematurely.

Clinical Scenario 2 Answer Key:

Rationale: Worsening symptoms despite antibiotic therapy warrants close follow-up and consideration of a change in management approach, as it suggests treatment failure from antibiotic resistance or more severe disease. The shorter 5 day course may have been inadequate to treat his infection fully.

**Tips for Board Exam Questions**

* Know the diagnostic criteria for acute OM -
* must have acute onset, middle ear effusion, and signs of middle ear inflammation
* Recognize high-risk groups that warrant more aggressive antibiotic therapy
* Understand correct antibiotic selection, doses, and duration based on severity, age, and risk factors
* Analgesics and antipyretics are first-line for pain/fever control, not antibiotics
* Ensure follow up in 48-72 hours to confirm resolution and need for additional interventions

**Summary**

Key points about pediatric acute OM include properly distinguishing it from otitis media with effusion based on diagnostic criteria, using analgesics as initial treatment for pain/fever relief, reserving antibiotics only for patients at high risk of complications or with severe symptoms, selecting antibiotics that cover the common bacterial pathogens, ensuring appropriate dose and duration based on severity and age, and following up closely to confirm resolution or need for additional treatment. Staying up-to-date on pediatric OM guidelines is crucial for pharmacists to reduce inappropriate antibiotic use and improve outcomes.

**References**

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