Acute Otitis Media

Emergency Department, Urgent Care & Outpatient

Nationwide Children's — When your child needs a hospital, everything matters.

Center for Clinical Excellence

Diagnosis

Concern for Acute Otitis Media → Analgesic / Anti-pyretic as indicated*

Inclusion criteria:
Patients age 60 days to 21 years with suspicion for acute otitis media (AOM)

Exclusion criteria:
- Unable to visualize TM (despite cerumen removal attempts)
- Cochlear Implants (or history): call ENT stat from ED/UC to discuss

Diagnostic Criteria
(must have all)
1: Bulging TM
2: Acute inflammation (TM erythema and/or otalgia)
3: Middle ear effusion (gold standard is evaluation with pneumatic otoscopy)
OR
Otorrhea without signs of AOE

No → Consider alternate diagnosis

Yes →

Otorrhea (not from AOE)? — Yes → PE Tubes? — Yes → AOM with Intact PE Tubes

Otorrhea (not from AOE)? — No → AOM

PE Tubes? — No → AOM with Perforation

Abbreviations:
AOE: Acute Otitis Externa
AOM: Acute Otitis Media
MEE: Middle Ear Effusion
OME: Otitis Media with Effusion
PE: Pressure equalizer
TM: Tympanic Membrane

Pain Management

Treatments Not Recommended

Deterioration and Escalation of Care

AOM Complications

Treatment

Age ≥ 2 yrs? — Yes → Immediate Oral Antibiotic Therapy for 5 days. Treat for 10 days if otorrhea is present [Consider watchful waiting with SNAP]

Age ≥ 2 yrs? — No → Signs of Severe AOM:
- Severe pain
- Fever ≥ 102.2
- Perforation
- Bilateral
- Pain for > 48 hrs

Signs of Severe AOM: — Yes → Immediate Antibiotic Therapy for 10 Days

Signs of Severe AOM: — No → Shared decision making with caregivers:
- Observation/watchful waiting for 48-72 hours with Safety Net Antibiotic Prescription (SNAP) (preferred)
  Vs
- Immediate Antibiotic Therapy for 10 Days (Consider confidence in diagnosis: if uncertain, recommend watchful waiting more strongly)

Topical Antibiotic Therapy

Indications	Antibiotic
First Line	Ofloxacin 5 drops twice daily x 10 days
Treatment Failure, Granulation, Tissue, or Bloody Otorrhea	Ciprofloxacin-Dexamethasone 4 drops twice daily x 7 days

Follow-up

Symptomatic Improvement in 48-72 hours? — No → Proceed to next indicated antibiotic

Symptomatic Improvement in 48-72 hours? — Yes → No routine follow up needed

Immediate ENT Consult for:
- Complications of AOM –Immediate ENT consult
- Cochlear implants (or history of)

Place ENT Referral in Epic **for:**
- Multiple courses to clear AOM (2nd or 3rd line failure)
- Persistent MEE > 3 months
- Recurrent AOM
  - ≥ 3 episodes in 6 months
  - ≥ 4 episodes in 12 months (with at least 1 in last 6 months)

Exclusion Criteria

- Unable to visualize TM (despite cerumen removal attempts)
- Cochlear Implants (or history): call ENT stat from ED/UC to discuss
- Concern for mastoiditis
- Recent ENT surgery
- Immune deficiency
- Cranio-facial abnormalities

Return to AOM Algorithm

Differential Diagnosis

Findings suggestive of another diagnosis include:

- Middle Ear Effusion
  - Non-purulent fluid behind a non-bulging TM
- Otitis Externa (Swimmer's Ear)
  - Canal erythema or swelling
  - Exudate within ear canal (without perforated TM)
  - Pain with manipulation of helix, pinna, or tragus of ear
- Eustachian Tube Dysfunction
  - Concave (negative pressure or retracted/sucked in) appearance of the TM
  - Congestion or popping sensation in ears
- Cholesteatoma
  - Often white or pearly mass seen behind the TM
  - Collection of squamous epithelial cells which may be locally invasive or destructive
- Foreign Body/Obscured Canal
  - Foreign object identified within the ear canal (emergent removal indicated if button battery)
  - Cerumen impaction
- Mastoiditis
  - Pain and erythema or swelling just posterior to the ear over the mastoid process
  - May be complication of AOM
  - Consider CT temporal bones to evaluate (w/IV contrast if concerned for mastoiditis or intracranial infection)
  - Prompt diagnosis is important to prevent complications such as bony erosion and/or intracranial extension of infection
- Trauma
  - Laceration or irritation from fingernails, cotton swabs, or foreign bodies
  - Bruising of the ear itself without sufficient explanation should raise high suspicion for Non-Accidental Trauma
- Otalgia
  - Normal otoscopic exam
  - May be referred pain from teething or jaw pain or reflux

Return to AOM Algorithm

Testing

- Otoscopic exam should be used to evaluate the ear canal and TM for complaints of ear pain, congestion, popping, or foreign body sensation.
- Pneumatic otoscopy is more sensitive for detection of MEE for diagnosis of AOM but is highly operator dependent and requires prior training to perform correctly. Pneumatic otoscopy with a skilled clinician is encouraged as the preferred method.
- Tympanocentesis is required for etiologic diagnosis of AOM but this is an invasive procedure and is not recommended for routine diagnosis of AOM as empiric therapy is typically sufficient. It may be helpful in cases of severe or recurrent AOM that is resistant to multiple antibiotics but should only be performed by a specialist.

Return to AOM Algorithm

Severity Assessment

- Evaluate for signs of severe AOM:
  - Severe pain
  - Persistent otalgia >48 hours
  - Fever ≥ 102.2F
  - TM perforation

Return to AOM Algorithm

Admission Criteria

- Uncomplicated AOM with or without perforation does not require admission
- Consider admission if other severe symptoms are present such as severe dehydration or inconsolability
  - Consider other or additional diagnoses if the above are present
- Mastoiditis and other complications of AOM require immediate ENT consult

Return to AOM Algorithm

Assessment & Monitoring

- Evaluate for and manage as needed any concomitant URI, bronchiolitis, pneumonia, croup, dehydration, or other illness.
- Consider underlying immunodeficiency disorders in children with frequent recurrent AOM, sinusitis, and pneumonia.

Return to AOM Algorithm

Recommended Treatments

After review of the current literature, we agree with the AAP guidelines that the treatment of AOM should take into consideration a child's age, severity of infection, and whether or not there are TM perforations or intact PE tubes in place.

AOM with intact PE tubes (tube otorrhea):

- First line: Ofloxacin 5 drops twice daily x 10 days
  - Use ophthalmic formulation for otic use due to cost difference
- Second line (treatment failure, granulation tissue or bloody otorrhea): Ciprofloxacin-dexamethasone 4 drops twice daily x 7 days
- If otorrhea is not improved by day 7, call ENT clinic

AOM without PE tubes:

- Age <2 = Immediate oral antibiotic therapy for 10 days
  - Can consider watchful waiting (WW) if unilateral, non-severe
- Age ≥2 = Assess for otorrhea
  - Otorrhea= Immediate oral antibiotic therapy for 10 days
  - No otorrhea=Shared decision making with caregivers for:
    - Watchful waiting for 48-72 hours with Safety Net Prescription (preferred) vs
    - Immediate antibiotic therapy for 5 days

	AOM with Severe Symptoms(otorrhea, fever ≥102.2, severe or persistent otalgia)	Bilateral AOM, Non-Severe	Unilateral AOM, Non-Severe
<2 years	Antibiotics x 10 days	Antibiotics x 10 days	Watchful Waiting or Antibiotics x 10 days

	AOM with Otorrhea	AOM without Otorrhea
≥2 years	Antibiotics x 10 days	Watchful Waiting (preferred if non-severe symptoms) or Antibiotics x 5d

Watchful Waiting: If observation is offered for appropriate patients, shared decision making with caregivers is recommended with certain access to follow up within 48-72 hours or Safety Net Prescription

Return to AOM Algorithm

Recommended Treatments

Oral/IM Antibiotic Therapy		
Indications	**Antibiotic**	**Dose**
First line for most	Amoxicillin	45mg/kg/dose twice daily MAX 2000mg/dose
First line if: Amoxicillin within 30 days Concurrent purulent conjunctivitis or Amoxicillin failure	Amoxicillin-clavulanate ES or XR Formulations	45mg/kg/dose of Amoxicillin twice daily MAX 2000mg/dose
Penicillin Allergy	Cefdinir	14mg/kg/dose once daily MAX 600mg/dose
Penicillin AND Cephalosporin Allergy	Clindamycin	10mg/kg/dose three times daily MAX 600mg/dose
Amoxicillin-clavulanate or oral Cephalosporin failure	Ceftriaxone OR	50mg/kg IM once daily for 3 days MAX 1g/dose
	Levofloxacin(consider with barriers to follow up for IM ceftriaxone)	6 months to <5 years: 10 mg/kg/dose twice daily ≥5 years: 10 mg/kg/dose once daily MAX 750mg/dose

AOM Pain Management

- Ibuprofen 10 mg/kg Q6 PRN (Max 800 mg/dose, 3.2g/day)
  - Children ≥ 6 months
- Acetaminophen 10-15 mg/kg Q4 PRN (Max 75mg/kg/day or 4 g/day)
  - Children ≥ 2 months old

Return to AOM Algorithm

Safety Net Antibiotic Prescription (SNAP)

SNAP (Safety Net Antibiotic Prescription)

- Initiative to reduce antibiotic resistance and decrease adverse effects of antibiotic use
- AOM symptoms will resolve within 2 days in > 70% of cases without antibiotics
- Antibiotic therapy does not decrease risk of otitis media complications such as middle ear effusion.
- Patient is provided an antibiotic prescription but instructed to only fill if no improvement in the child's symptoms in 48-72 hours or worsening of symptoms (temp rising above 102.2°F, uncontrolled ear pain despite OTC pain relievers, new otorrhea)
- Encourage symptom control with ibuprofen (age ≥ 6 months) and/or acetaminophen (age ≥ 2 months)

Exclusion criteria:

- Age <6 months or 6-24 months with bilateral infection
- Severe symptoms: Temp ≥ 39°C (102.2°F), severe otalgia, otalgia ≥ 48 hours, TM perforation
- PE tubes, cochlear implants, history of resistant bacterial AOM or recent AOM in past 3 months, immune deficiency, or anatomic abnormalities

Return to AOM Algorithm

Referral to ENT

Discuss with families the following options for ENT referral:

1. Referral for ENT clinic visit during which PE tubes would be placed in the office by ENT
- Only available to patients under 16 months
- Would involve local anesthesia/lidocaine and papoosing patients to control movements

2. Referral for ENT clinic visit during which same-day PE tube OR placement would be arranged
- Available for patients of all ages
- Would involve general anesthetic

3. Referral for ENT clinic visit for general discussion about the need for PE tubes, benefits, alternative care options or any other concerns

Referral should be placed as a discharge order and in the comment section, please indicate family preference for type of ENT clinic visit.

ENT will call family and provide further scheduling and visit information.

Return to AOM Algorithm

Treatments Not Recommended

- The following treatments are NOT recommended:
  - Olive oil, essential oils, or other herbal extracts(oral or topical)
  - Antihistamines (can prolong MEE)
  - OTC cold or cough medicines do not help with treatment of AOM
  - Otic topical anesthetics (oral pain management preferred)

Return to AOM Algorithm

Deterioration & Escalation of Care

- Treatment failure: Fever and pain are not expected to improve until 48-72 hours after initiating antibiotics.
- If no symptomatic improvement after 48-72 hours, switch to 2nd or 3rd line antibiotic.
- Place ENT referral order in EPIC as it is recommended for consideration of tympanostomy tube placement:
  - ENT referral recommended if failing 2ndand 3rdline antibiotics for consideration of tympanostomy tubes
  - Recurrent AOM
    - ≥ 3 episodes in 6 months
    - ≥ 4 episodes in 12 months (with at least 1 in last 6 months)
  - Chronic MEE (≥ 3 months). Middle ear effusions may remain after AOM infection is treated. They often resolve on their own over time but when persistent further intervention is considered by ENT.
- Escalation of Care: If any signs of acute complications present consult ENT
  - Consider additional head or temporal bone imaging with ENT guidance

Return to AOM Algorithm

Education

Patient and Family Education

- ED/UC DC Instructions: Otitis Media, Otitis Externa, Foreign Body Ear, Ear Pain Without Infection, Eustachian Tube Dysfunction
- Helping Hands available for: Ear Infection -Otitis Media, Otitis Externa (Swimmer's Ear), Insertion of Ear (Myringotomy) Tubes, Ear Wax, Ear Irrigations

Clinician Education:

- **Ear Irrigation:** NCH Policy
- Do NOT irrigate if an unknown foreign body is suspected. Food items or cotton tips can swell with irrigation making removal very difficult. These patients should be referred to ENT for cleaning.
- Do NOT irrigate ears with a patient with prior tympanostomy tubes, known or suspected perforation. These patients should be referred to ENT for ear canal cleaning.
- Use caution in recommending irrigation in patients with the following conditions: Otitis externa, cleft palate, ear canal stenosis, exostoses (outgrowths of bone into the ear canal), patients who are immunosuppressed or receiving anticoagulant therapy.

Return to AOM Algorithm

Complications of AOM

AOM infections have a very small risk of developing the following complications; if any are present, these warrant immediate ENT consultation

- Labyrinthitis: Vertigo, tinnitus, nystagmus, nausea
- Facial nerve palsy: Complete paralysis (including forehead) of unilateral face
- Mastoiditis: Pain and erythema or swelling just posterior to the ear over the mastoid process
- Meningoencephalitis or brain abscess: Altered mental status, seizures, severe headache, acute focal neurologic deficit
- Prior cochlear implant (CI) and concern for AOM

Return to AOM Algorithm

Key References

1. Lieberthal AS, Carroll AE, ChonmaitreeT, et al. The diagnosis and management of acute otitis media. *Pediatrics.* 2013;131(3):e964-999.

2. Venekamp RP, Sanders SL, Glasziou PP, Del Mar CB, Rovers MM. Antibiotics for acute otitis media in children. *Cochrane Database Sys Rev*. 2015(6).

3. Hoberman A, Ruohola A, Shaikh N, Tahtinen PA, Paradise JL. Acute otitis media in children younger than 2 years. *Jama, Pediatr*.. 2013;167(12):1171-2.

4. Hoberman A, Paradise JL, Rockette HE, et al. Treatment of acute otitis media in children under 2 years of age. *N Engl J Med.* 2011;364(2):105-15.

5. Tähtinen PA, Laine MK, Huovinen P, Jalava J, Ruuskanen O, Ruohola A. A placebo-controlled trial of antimicrobial treatment for acute otitis media. *N Engl J Med*. 2011;364(2):116-126.

6. Rovers MM, Glasziou P, Appelman CL, etal. Antibiotics for acute otitis media: a meta-analysis with individual patient data. *Lancet.* 2006;368(9545):1429-1435.

7. Shaikh N, Dando EE, Dunleavy ML, et al. A Cost-Utility Analysis of 5 Strategies for the Management of Acute Otitis Media in Children. *J Pediatr.* 2017;189:54-60.e3

Return to AOM Algorithm

Quality Measures

- Use of recommended 1st-line empiric antibiotics in outpatients
- Duration of treatment for AOM
- Use of order sets

Return to AOM Algorithm

Team & Process

Pathway Development Team:

Leaders:

Emergency Medicine/Urgent Care:

Betsy Schmerler, MD

Members:

Emergency Medicine:

MaKayla Beecham, MD

ENT:

Kris Jatana, MD

Urgent Care:

Courtney Porter, RN, MS

Pharmacy:

Sonya Sebastian, PharmD

Infectious Disease:

Joshua Watson, MD

Clinical Pathways Program:

Medical Director – Emergency Medicine:

Aarti Gaglani, MD,

Medical Director – Clinical Informatics & Emergency Medicine:

Laura Rust, MD, MPH

Physician Informatics:

Kathy Nuss, MD

Business & Development Manager:

Rekha Voruganti, MBOE, LSSBB

Program Coordinators:

Tahje Brown, MBA
Tara Dinh, BS

Clinical Pathway Approved:

Medical Director – Associate Chief Quality Officer, Center for Clinical Excellence:

Ryan Bode, MD, MBOE

Origination Date: *June, 2021*

Last Revision Date: *December, 2024*

Next Revision Date: *December, 2027*

Clinical Pathway Development

This clinical pathway was developed using the process described in the NCH Clinical Pathway Development Manual Version 6, 2022. Clinical Pathways at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice, clinician judgment, and other relevant factors in diagnosing and treating patients remain central to the selection of diagnostic tests and therapy. The ordering provider assumes all risks associates with care decisions. NCH assumes no responsibility for any adverse consequences, errors, or omissions that may arise from the use or reliance on these guidelines. NCH's clinical pathways are reviewed periodically for consistency with new evidence; however, new developments may not be represented, and NCH makes no guarantees, representations, or warranties with respect to the information provided in this clinical pathway.

For more information about our pathways and program please contact:
ClinicalPathways@NationwideChildrens.org

Return to AOM Algorithm