JOURNAL REVIEW

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Clinical Practice Guideline: Acute Otitis Externa

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Introduction

- Acute otitis externa (AOE) is defined
  - diffuse inflammation of the external ear canal,
  - may also involve the pinna or tympanic membrane.
- A diagnosis of diffuse AOE requires
- rapid onset (< 48 hours) in the past 3 weeks
- symptoms and signs of ear canal inflammation
- A hallmark sign of diffuse AOE
  - tenderness of the tragus, pinna, or both
  - intense and disproportionate by visual inspection

- AOE is a cellulitis of the ear canal skin and subdermis
- Nearly all (98%) AOE in North America is bacterial.
  - Pseudomonas aeruginosa (20%-60% prevalence) and Staphylococcus aureus (10%-70% prevalence)
  - Often polymicrobial infection.
- Other pathogens
  - gram-negative organisms (2% to 3%)
  - Fungal involvement is uncommon
    - but more common in COE or after treatment of AOE with topical or less often systemic, antibiotics

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- Topical antimicrobials are beneficial for AOE, but oral antibiotics have limited utility.
  - Nonetheless, about 20% to 40% of patients with AOE receive oral antibiotics, with or without concurrent topical therapy.
- The oral antibiotics
  - usually inactive against P aeruginosa and S aureus
  - undesirable side effects
  - to select out resistant organisms.
- Topical antimicrobials with the high local concentration in the ear canal will generally eradicate all susceptible organisms plus those resistant to systemically administered antibiotics

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- The etiology of AOE is multifactorial.
  - Regular cleaning of the ear canal removes cerumen.
    - Cerumen → a slightly acidic pH → inhibits infection (especially by P aeruginosa) but can be altered by water exposure, aggressive cleaning, soapy deposits, or alkaline eardrops.
  - Debris from dermatologic conditions may also encourage infections,
  - local trauma from attempts at self-cleaning, irrigation,22 and wearing hearing aids.
  - Other factors such as sweating, allergy, and stress
- AOE is more common in regions with warmer climates, increased humidity, or increased water exposure from swimming.
- In addition, these organisms are present in the healthy external auditory canal, and thus the external auditory canal may be a source of AOE.
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Strategies to prevent AOE

- Limiting water accumulation and moisture retention in the EAC and maintaining a healthy skin barrier.
- Recommendations to prevent AOE include
  - removing obstructing cerumen
  - using acidifying ear drops shortly before swimming, after swimming, at bedtime, or all three
  - drying the ear canal with a hair dryer
  - using ear plugs while swimming
  - avoiding trauma to the external auditory canal

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Purpose

- The primary purpose of the original guideline was to promote appropriate use of oral and topical antimicrobials for AOE and to highlight the need for adequate pain relief.
- The target patient is aged 2 years or older

Methods

- this update of the evidence-based clinical practice guideline on managing AOE, the American Academy of Otolaryngology—Head and Neck Surgery Foundation (AAOHNSF)
- updated from July 2005 to October 2012 on PubMed
- none of the guidelines, 2 of the systematic reviews, and 12 RCTs

Table 3. Guideline definitions for evidence-based statements.

Statement	Definition	Implication
Strong recommendation	A strong recommendation means the benefits of the recommended approach clearly exceed the harms (or that the harms clearly exceed the benefits in the case of a strong negative recommendation) and that the quality of the supporting evidence is excellent (Grade A or B).[a] In some clearly identified circumstances, strong recommendations may be made based on lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.	Clinicians should follow a strong recommendation unless a clear and compelling rationale for an alternative approach is present.
Recommendation	A recommendation means the benefits exceed the harms (or that the harms exceed the benefits in the case of a negative recommendation) but the quality of evidence is not as strong (Grade B or C).[a] In some clearly identified circumstances, recommendations may be made based on lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits outweigh the harms.	Clinicians should also generally follow a recommendation but should remain alert to new information and sensitive to patient preferences.
Option	An option means that either the quality of evidence that exists is suspect (Grade D)[a] or that well-done studies (Grade A, B, or C)[a] show little clear advantage to one approach versus another.	Clinicians should be flexible in their decision making regarding appropriate practice, although they may set bounds on alternatives; patient preference should have a substantial influencing role.
No recommendation	No recommendation means there is both a lack of pertinent evidence (Grade D)[a] and an unclear balance between benefits and harms.	Clinicians should feel little constraint in their decision making and be alert to new published evidence that clarifies the balance of benefit versus harm; patient preference should have a substantial influencing role.

Table 4. Evidence quality for grades of evidence.[a]

Grade	Evidence Quality for Diagnosis	Evidence Quality for Treatment and Harm
A	Systematic review of cross-sectional studies with consistently applied reference standard and blinding	Well-designed randomized controlled trials performed on a population similar to the guideline's target population
B	Individual cross-sectional studies with consistently applied reference standard and blinding	Randomized controlled trials; overwhelmingly consistent evidence from observational studies
C	Nonconsecutive studies, case-control studies, or studies with poor, nonindependent, or inconsistently applied reference standards	Observational studies (case control and cohort design)
D	Mechanism-based reasoning or case reports	
X	Exceptional situations in which validating studies cannot be performed and there is a clear preponderance of benefit over harm	

[a]American Academy of Pediatrics (AAP)[48] classification scheme updated for consistency with current level of evidence definitions.[49]

STATEMENT 1. DIFFERENTIAL DIAGNOSIS

Recommendation

- A diagnosis of diffuse AOE requires rapid onset with signs and symptoms of ear canal inflammation
  - identify various predisposing factors including exposure to potentially contaminated water
- Symptoms of AOE include otalgia (70%), itching (60%), or fullness (22%), with or without hearing loss (32%) or ear canal pain on chewing
- Otoscopy will reveal diffuse ear canal edema, erythema, or both, with or without otorrhea
- AOE can mimic the appearance of AOM
  - because of erythema involving the tympanic membrane.
  - the latter may require systemic antimicrobials.
  - *Pneumatic otoscopy, tympanometry*

- Common predisposing factors for AOE are humidity or prolonged exposure to water
  - dermatologic conditions (eczema, seborrhea, psoriasis)
  - anatomic abnormalities (narrow canal, exostoses),
  - trauma or external devices (wax removal, inserting earplugs, using hearing aids)
  - otorrhea caused by middleear disease.
- AOE may also occur secondary to ear canal obstruction
  - by impacted cerumen, a foreign object, a dermoid cyst, a sebaceous cyst, or a furuncle.

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Dermatoses of the Ear Canal

- Eczema (atopic dermatitis), seborrhea (seborrheic dermatitis), and other inflammatory dermatoses; Contact dermatitis
- Patients with eczema
  - chronic pruritus
  - typically starting in childhood
  - involvement of multiple areas of the body
  - erythema, xerotic scaling, lichenification, and hyperpigmentation
- Management
  - gentle skin care, application of emollients,
  - the use of topical corticosteroids and other antipruritics

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- Seborrheic dermatitis is a common condition
  - affecting the ears, scalp, central face
  - Symptoms/signs: greasy yellowish scaling, itching
  - secondary inflammation from Malassezia yeast,
  - More pronounced in patients with Down syndrome, HIV infection, and Parkinson sisease.
- Treatment includes the use of topical antifungal medications and topical anti-inflammatory
- Other skin disorders that can mimic AOE
  - psoriasis and discoid lupus erythematosus

- Contact dermatitis
  - metals (nickel, silver), chemicals (cosmetics, soaps, detergents, shampoos, hair sprays), plastics, rubber, leather, or drugs.
  - Nickel is the most common contact allergen, affecting about 10% of women with pierced ears
- Some otic preparations (antibiotics and vehicle substances)
  - Neomycin is the most common substance, causing reactions in about 5% to 15% of patients with chronic external otitis
- Management
  - removing the sensitizing agent
  - applying a topical steroid or other anti-inflammatory
  - topical such as a calcineurin inhibitors (eg, tacrolimus 0.1% ointment or pimecrolimus 1% cream).

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Other Causes of Otalgia or Otorrhea That May Mimic AOE

- Furunculosis
  - otalgia, otorrhea, localized tenderness, focal swelling, and pustular lesions.
  - Treatment may include local heat, incision and drainage, or systemic antibiotics that cover *S aureus*
- Viral infections of the external ear, caused by varicella, measles, or herpes virus➔ rare but for DDx of AOE'
  - Management involves prompt systemic antiviral therapy and systemic steroids.
- If otalgia in the absence of swelling of the ear canal and without apparent middle ear disease should arouse suspicion of pathology outside the ear.
  - the most common cause of referred otalgia is **TMJ syndrome**.
  - Related history and PE should be completed

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- On occasion, the only symptom of patients with upper aerodigestive tract cancer is that of otalgia.
  - Older patients, history of tobacco and ethanol use, and HPV(+)
- A complete head and neck examination
  - visualization of the mucosal surfaces of the head and neck
  - any neck masses
  - palpation of the tongue base
- Other potential etiologies
  - dental pathologies (caries, impacted molars)
  - tonsillitis, peritonsillar abscesses, retropharyngeal abscesses
  - carotidynia, styloid process elongation, angina, intrathoracic aneurysms
  - glossopharyngeal neuralgia, and geniculate neuralgia.

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- **Cholesteatoma** may be mistaken for AOE or chronic external otitis but is typically painless and associated with abnormalities of the tympanic membrane
  - perforation, retraction pockets, and granulation tissue.
- **AOM with tympanostomy tubes**
- otorrhea, painless at first
  - By a primary bacterial AOM episode or by water penetration(swimming or bathing)
  - Topical antibiotic eardrops are the treatment of choice for acute tympanostomy tube otorrhea

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STATEMENT 2. MODIFYING FACTORS

Recommendation

- The key components of the clinical history that can modify management of diffuse AOE include
  - (1) diabetes (2) HIV infection, AIDS, or other immunocompromised states (cancer s/p C/T)
  - (3) history of R/T; (4) tympanostomy tubes or perforation (nonintact tympanic membrane).
- P't with DM and an immunocompromised state ➔ susceptible to **otomycosis and necrotizing otitis externa**, **similar to AOE but require different management**.
  - require systemic antibiotics (in addition to topical therapy)
  - should not have their ear canals irrigated to remove debris, since it may predispose to necrotizing otitis externa
  - P. aeruginosa is more than 90% of cases.
  - If it was untreated ➔ skull base osteomyelitis
  - Facial nerve paralysis may be an early sign, with other cranial nerve(IX, XI)
- A clinical diagnosis of necrotizing otitis externa can be confirmed with ESR + abnormal CT or MRI ; others images : gallium scan, indium-labeled leukocyte scan, technetium bone scan, and single-photon emission tomographs.
- Treatment
  - surgical debridement and systemic antibiotics to cover P. aeruginosa and MRSA
  - Biopsy for possible neoplasia if the diagnosis is uncertain or poor response to therapy

- Otomycosis(fungal infection)
  - common in tropical countries, humid locations
  - after long-term topical antibiotic therapy
  - P't with DM, HIV infection, or immunocompromised state.
- Aspergillus species (60%-90%) and Candida species (10%-40%)
- Symptoms : pruritus and thickened otorrhea(black, gray, bluish green, yellow, or white.)
- Candida→ white debris sprouting hyphae.
- Aspergillus niger →a moist white plug dotted with black debris ("wet newspaper").
- Management
  - debridement + topical antifungal therapy, rarely systemic therapy
  - Topical antibiotic therapy is contraindicated
    - ineffective and may promote further fungal overgrowth.

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- Radiotherapy can damage the EAC by acute and late skin reactions
  - Acute events include erythema, desquamation, or ulceration → pain and otorrhea.
  - Late skin changes include atrophy, necrosis or ulceration, and external canal stenosis.
  - diminish cerumen production.
- Management of AOE in patients after radiotherapy may require systemic antimicrobials.
- Patients with a tympanostomy tube or tympanic membrane perforation may develop diffuse AOE because of purulent middle-ear secretions that enter the EAC(eczematoid dermatitis)
- Management
  - systemic antimicrobials, imaging studies, or surgery.
  - non-ototoxic topical preparation when the tympanic membrane is not intact.

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STATEMENT 3. PAIN MANAGEMENT
Strong recommendation

- Pain relief is an essential component of managing AOE
- Pain caused by AOE can be intense and severe, because the highly sensitive periosteum and skin
- Mild to moderate pain usually responds to acetaminophen or NSAID given alone or in fixed combination with an opioid
- When frequent dosing is required to maintain adequate pain relief, administering analgesics at fixed intervals rather than on PRN basis may be more effective.
- Nonpharmacologic therapies
  - heat or cold, relaxation, and distraction are of unproven value

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- Analgesic cream was applied to relieve EAC pain if the tympanic membrane was intact.
- There is no specific indication for using topical anesthetic drops in treating AOE, and for using them may mask progression of underlying disease while pain is being suppressed.
  - If use, reexamined within 48 hours and in intact drums
  - Adding a topical steroid to topical antimicrobial drops has no significant to pain relief
- Symptoms of uncomplicated AOE should improve within 48 to 72 hours of initiating appropriate topical therapy

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STATEMENT 4. SYSTEMIC ANTIMICROBIALS

Strong recommendation

- Topical preparations are recommended as initial therapy for diffuse, uncomplicated AOE
  - because of safety, efficacy over placebo in randomized trials, and excellent clinical and bacteriologic outcomes in comparative studies
- Orally administered antibiotics have significant adverse effects such as allergy reaction and development of bacterial resistance
- Many of the oral antibiotics selected are inactive against *P aeruginosa and S aureus, the most common pathogens identified in cases of AOE*
- Treatment with penicillins, macrolides, or cephalosporins increases disease persistence and treatment with cephalosporins also increases recurrence
- Oral antibiotics *are unnecessary*, particularly those with no activity against *P aeruginosa or S aureus* in uncomplicated AOE

- *Benefits of Topical Therapy*
  - very high concentration of antimicrobial; often 100 to 1000 times higher than systemic
  - Not result in selective pressure for resistant organisms
- If complicated AOE by osteitis, abscess formation, middle ear disease, or recurrent episodes of infection and poor individual condition(DM, HIV).
- Topical therapy should be supplemented by systemic antibiotics
- Systemic antibiotics, if indicated, should include coverage for common AOE pathogens, including *P aeruginosa and S aureus*.

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STATEMENT 5. TOPICAL THERAPY

Recommendation

- Rosenfeld found no significant differences in clinical outcomes of AOE for
  - antiseptic versus antimicrobial
  - quinolone antibiotic versus nonquinolone antibiotic(s)
  - steroid-antimicrobial versus antimicrobial alone.
- Regardless of topical agent used, about 65% to 90% of patients had clinical resolution within ***7 to 10 days***
- Topical treatment with a quinolone-containing otic drop resulted in improved rates of bacteriologic cure in 2 metaanalyses
  - Rosenfeld found that 87% of patients cure after nonquinolone therapy, with an 8% absolute increase by quinolone
  - Mosges also found a higher bacteriologic cure rate when quinolones were used

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

		Bottle	Cost, US$[a]	
Active Drug(s)	Name	Size, mL	Trade	Generic
Acetic acid 2.0% solution	Acetic acid otic (generic)	15.0	—	33
Acetic acid 2.0%, hydrocortisone 1.0%	Acetasol HC (generic)	10.0	—	23
Ciprofloxacin 0.2%, hydrocortisone 1.0%	Cipro HC (trade)	10.0	170	—
Ciprofloxacin 0.3%, dexamethasone 0.1%	Ciprodex (trade)	7.5	144	—
Neomycin, polymyxin B, hydrocortisone	Cortisporin Otic (trade)	10.0	85	30
Ofloxacin 0.3%	Floxin Otic (trade)	5.0	76	18

[a]Approximate price in New York metropolitan region (http://www.goodrx.com).

Adverse Events, Adherence to Therapy, and Cost

- The lack of differences in efficacy among most topical antimicrobial and steroid preparations suggests that patient preference and clinician experience are important
- The most common problems
  - pruritus (about 5% to 7%) and site reaction (4% to 5%);
  - other events with an incidence less than 2% include rash, discomfort, otalgia, dizziness, vertigo, superinfection, and reduced hearing.
- Contact dermatitis is a potential sequela of topical antimicrobial or steroid therapy
  - About 30% to 60% of patients with chronic or eczematous external otitis develop a contact dermatitis, most often to aminoglycosides such as neomycin and framycetin
- Adherence to therapy and patient satisfaction
  - drops are easy to administer and less dose frequence
  - a twice-daily dosing regimen is adequate.
  - More recent trials recommend 7 to 10 days of topical therapy

Patient Counseling

- Clinicians should advise patients with AOE
  - to resist manipulating the ear to minimize trauma
  - to water restrictions during treatment with inserting earplugs or cotton prior to showering or swimming
  - The external auditory canal can be dried by hair dryer
- Abstain from water sports for 7 to 10 days during treatment.
  - Competitive swimmers sometimes return to competition after 2 to 3 days after completing treatment
  - if using well-fitting earplugs, after pain resolution.
- Hearing aids or ear phones should be limited insertion

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Complementary and Alternative Therapies

- There are no data regarding the efficacy of complementary and alternative therapies for AOE.
- Isopropyl ("rubbing") alcohol, as well as 5% acetic acid (white vinegar) mixed, no any clinical trial
- Tea tree oil has been found to be effective in vitro against 71% of organisms cultured from 52 patients with AOE
  - Pseudomonas was resistant in 75% of cases
- Ear candles should never be used in treating AOE
  - no efficacious for AOE but to produce harm
  - associated hearing loss and perforation of the tympanic membrane have been reported

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STATEMENT 6. DRUG DELIVERY

Recommendation

- Drug delivery may be impaired by poor adherence to therapy, poor application debris filling the canal, or edema closing the canal
- Self-administration of eardrops is difficult because it must be done by feel.
  - Only 40% of patients who self-medicate do so appropriately during the first 3 days
- Instruction of administration of eardrop
- *Wicks to Promote Drug Delivery*

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.

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STATEMENT 7. NONINTACT TYMPANIC MEMBRANE

Recommendation

- If eardurum was not intact, antibiotics placed into the middle ear can cross the round window membrane and reach the inner ear.
  - Ototoxic agent should be avoided
- In some cases of AOE. The ear canal and auricle may be so tender or swollen, that the tympanic membrane cannot be visualized without undue pain or discomfort
  - tympanometry can sometimes be helpful
- If the tympanic membrane is known or suspected to be non-intact
  - topical drops that contain **alcohol**, have a **low pH** or both should be avoided because of pain and potential ototoxicity
- The only topical antimicrobials approved by the FDA(December 2005) for middle ear use are quinolone drops

STATEMENT 8. OUTCOME ASSESSMENT

Recommendation

- Appropriate treatment of uncomplicated AOE should be followed by symptom improvement (otalgia, itching, fullness) within 48 to 72 hours
- After topical Tx.→ significant decreases after 1 day of treatment, and most pain resolves within 4 to 7 days.
- most patients show rapid improvement (within 72 hours) even if complete resolution may take a week or more
- Initial treatment failure of diffuse AOE may be caused by
  - an obstructed ear canal, poor adherence to therapy, misdiagnosis, microbiologic factors, host factors, or contact sensitivity to eardrops.

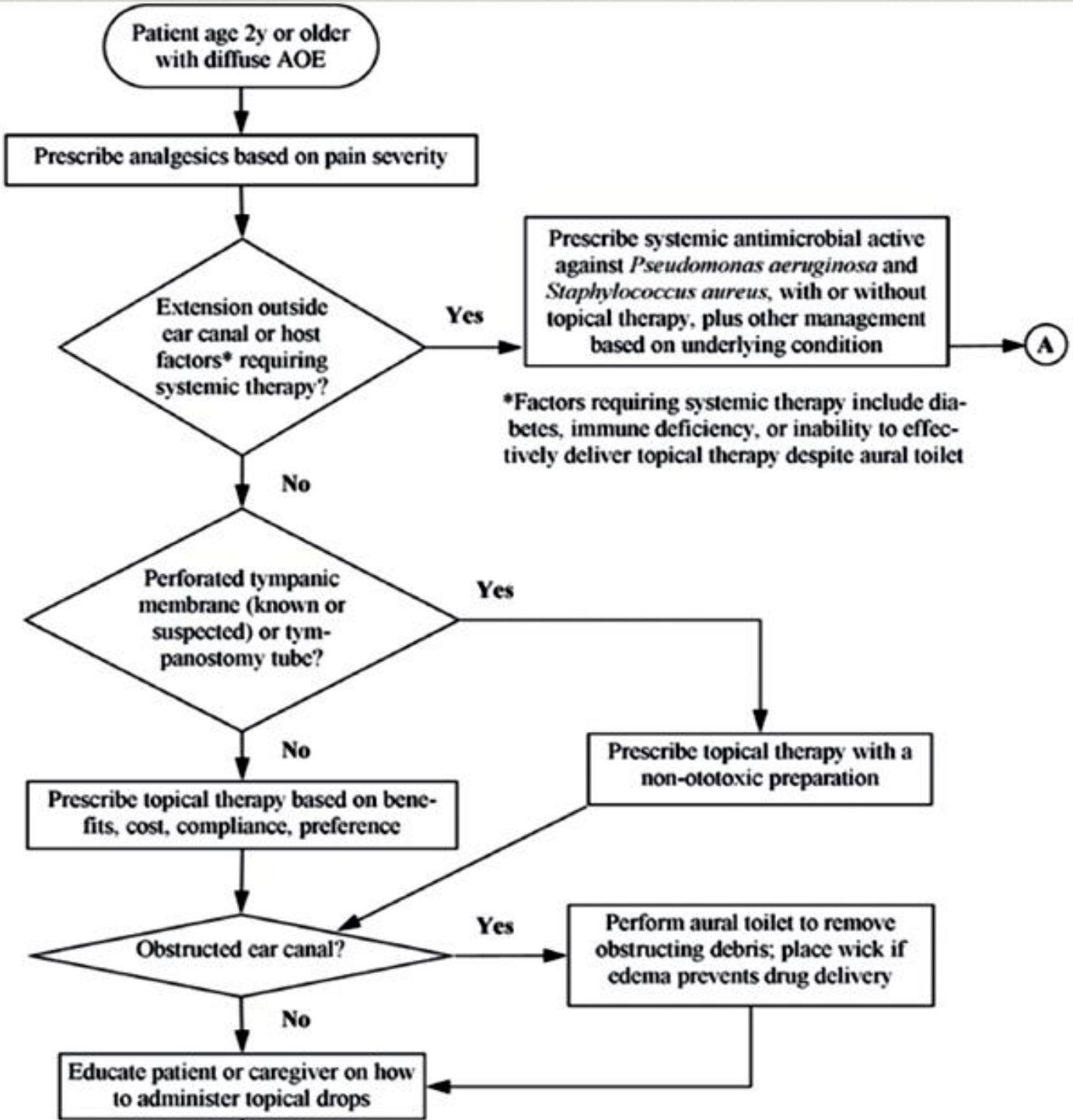

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Table 5. Summary of evidence-based statements.

Statement	Action	Strength
1. Differential diagnosis	Clinicians should distinguish diffuse acute otitis externa (AOE) from other causes of otalgia, otorrhea, and inflammation of the external ear canal.	Recommendation
2. Modifying factors	Clinicians should assess the patient with diffuse AOE for factors that modify management (nonintact tympanic membrane, tympanostomy tube, diabetes, immunocompromised state, prior radiotherapy).	Recommendation
3. Pain management	The clinician should assess patients with AOE for pain and recommend analgesic treatment based on the severity of pain.	Strong recommendation
4. Systemic antimicrobials	Clinicians should not prescribe systemic antimicrobials as initial therapy for diffuse, uncomplicated AOE unless there is extension outside the ear canal or the presence of specific host factors that would indicate a need for systemic therapy.	Strong recommendation
5. Topical therapy	Clinicians should use topical preparations for initial therapy of diffuse, uncomplicated AOE.	Recommendation
6. Drug delivery	Clinicians should inform patients how to administer topical drops and should enhance delivery of topical drops when the ear canal is obstructed by performing aural toilet, placing a wick, or both.	Recommendation
7. Nonintact tympanic membrane	When the patient has a known or suspected perforation of the tympanic membrane, including a tympanostomy tube, the clinician should recommend a non-ototoxic topical preparation.	Recommendation
8. Outcome assessment	If the patient fails to respond to the initial therapeutic option within 48 to 72 hours, the clinician should reassess the patient to confirm the diagnosis of diffuse AOE and to exclude other causes of illness.	Recommendation

THANK YOU FOR LISTENING