Update on Pediatric Otitis Media

Anatoli Karas, MD
Assistant Professor, Pediatric Otolaryngology
Dept. of Otorhinolaryngology – Head and Neck Surgery
Rush University Medical Center
Chicago, Illinois

RUSH

Disclosures

- None

Objectives

- Review evaluation and management of otitis media in pediatric population (AAP/AAFP guidelines)
- Discuss update in clinical practice guideline: Otitis Media and Tympanostomy Tube Placement (AAO-HNS)
- Recognize complications of otitis media
- Introduction to in-office ear tubes

Otitis Media

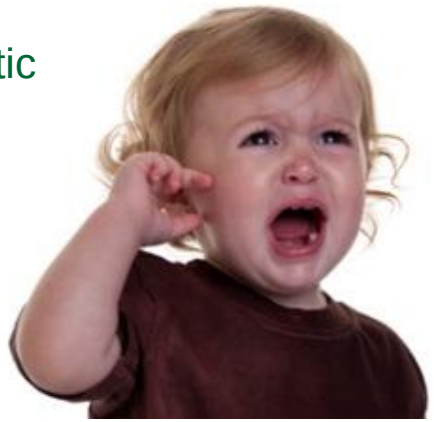
- 75-80% of children have at least one episode of AOM before school age
- Most common condition for which antibiotics are prescribed in children
- *Streptococcus pneumonia, Haemophilus influenza, Moraxella catorrhalis*
- At any given time, ~20% of young school-aged children have middle ear effusions
- Risk factors
  - Younger age
  - Allergies
  - Craniofacial abnormalities
  - Cigarette smoke exposure
  - Day care
  - Immunodeficiency/Immunocompromise

Otitis Media - Definitions

- Acute Otitis Media (AOM)
  - Rapid onset of signs and symptoms
  - Severe – moderate to severe otalgia OR fever equal to or higher 39C/102.2F
  - Nonsevere – mild otalgia and temperature below 39C/102.2F
  - Usually diagnosed by a distinctly bulging tympanic membrane and the presence of middle ear effusion

- Otitis media with effusion (OME)
  - The presence of fluid in the middle ear WITHOUT signs or symptoms of acute otitis media (AOM)
  - Often follows an episode of AOM
  - Associated with hearing loss, tinnitus, vertigo, or asymptomatic
  - Does NOT require antibiotics

- Chronic OME – OME for 3 months or longer



Otitis Media - Definitions

- Recurrent AOM
  - 3 or more AOM in last 6 months
  - At least 4 episodes of AOM in last 12 months with at least 1 in the last 6 months

- Persistent AOM
  - Persistence of S/S of AOM during antimicrobial therapy
  - Relapse of AOM within 1 month of completing antibiotic therapy

Normal TM

No effusion

RUSH

Acute otitis media
-bulging, purulent

Otitis media with
effusion

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

The Diagnosis and Management of Acute Otitis Media

Allan S. Lieberthal, Aaron E. Carroll, Tasnee Chonmaitree, Theodore G. Ganiats, Alejandro Hoberman, Mary Anne Jackson, Mark D. Joffe, Donald T. Miller, Richard M. Rosenfeld, Xavier D. Sevilla, Richard H. Schwartz, Pauline A. Thomas and David E. Tunkel

Pediatrics; originally published online February 25, 2013;
DOI: 10.1542/peds.2012-3488

- 6 Key Action Statements
  - Diagnosis – 3 recommendations
  - Assessment of pain – 1 strong recommendation
  - When to use antibiotics – 1 strong recommendation, 3 recommendations
  - Which antibiotics to use – 3 recommendations
  - Recurrent AOM – 1 recommendation, 1 option
  - Prevention of AOM – 1 strong recommendation, 3 recommendation

RUSH

Leiberthal AS, Carrol AE, Chonmaitree T, et al. The diagnosis and management of acute otitis media. *Pediatrics*. 2013;131(3):e964-e999.

Diagnosis

- **AOM when:**
  - Moderate to severe bulging of TM
  - OR
  - New onset of otorrhea not due to acute otitis externa
- **AOM when:**
  - mild bulging of TM
  - AND
  - Recent (less than 48 hrs) onset of ear pain, intense erythema of TM
- ***NO* AOM when:**
  - No middle ear effusion (based on pneumatic otoscopy or tympanogram)

Assessment of Pain

- **Management of AOM should include assessment of pain**
- If present, should be treated (regardless of use of antibiotics)

- Antibiotics may not relieve symptoms within first 24 hours, but analgesics do

- Possible treatments:
  - Ibuprofen/acetaminophen
  - Home remedies (distraction, heat/cold) – limited effect
  - Topical (benzocain, lidocaine) – brief benefit
  - Narcotics – increased side effect/risks
  - Tympanostomy/myringotomy

When to give antibiotics

- **Severe AOM** *(strong recommendation)*
  - Moderate or severe otalgia
  - Otalgia for at least 48 hours
  - Temperature 39C/102.2F or higher
  - *ANY child - Bilateral or unilateral in children 6 months or older

- **Non-severe AOM** - *Bilateral* in children 6 months – 23 months (young)

- **Non-severe AOM** - *Unilateral* AOM in children 6 months – 23 months
  - *give antibiotics OR offer observation
    - Must have mechanism in place to follow up or begin therapy if child worsens or fails to improve in 48-72 hours from onset of symptoms

- **Non-severe AOM – older children**
  - *give antibiotics OR offer observation
    - Must have mechanism in place to follow up or begin therapy if child worsens or fails to improve in 48-72 hours from onset of symptoms

Which antibiotic to give

- **Amoxicillin**
  - If not treated with Amox in last 30 days
  - No concurrent conjunctivitis
  - No PCN allergy
- **Beta-lactamase coverage**
  - Has received Amox in last 30 days
  - Has concurrent conjunctivitis
  - Hx of recurrent AOM unresponsive to Amoxicillin
- **Reassess if symptoms worsen or fail to respond within 48-72 hours**
  - Determine if change in treatment is needed

Antibiotics

- First line treatment
  - High dose amoxicillin (80-90 mg/kg/day divided BID)
  - Amoxicillin-clavulanate (90 mg/kg/day of amox divided BID)
    - Amoxicillin in past 30 days, conjunctivitis or prior amox failure

- First line if PCN allergy (no h/o type 1 hypersensitivity)
  - Cefdinir (14 mg/kg/day in 1-2 doses)
  - Cefuroxime (30mg/kg/day divided BID)
  - Cefpodoxime (10 mg/kg/day divided BID)
  - Ceftriaxone (50 mg/kg, IM/IV for 1 or 3 days)

- 1st-line failure
  - Amoxicillin → Amoxicillin-clavulanate
  - Amoxicillin-clavulanate → Ceftriaxone (3 days), Cefdinir
  - Consider Clindamycin, levofloxacin, linezolid
  - NO role for trimethoprim-sulfamethoxazole or erythromycin
  - Tympanocentesis

Recurrent AOM

- **No role for prophylactic antibiotics to reduce frequency of AOM**

- **May offer tympanostomy tubes***
  - 3 episodes in 6 months
  - 4 episodes in 1 year with 1 episode in preceding 6 months

Prevention of AOM

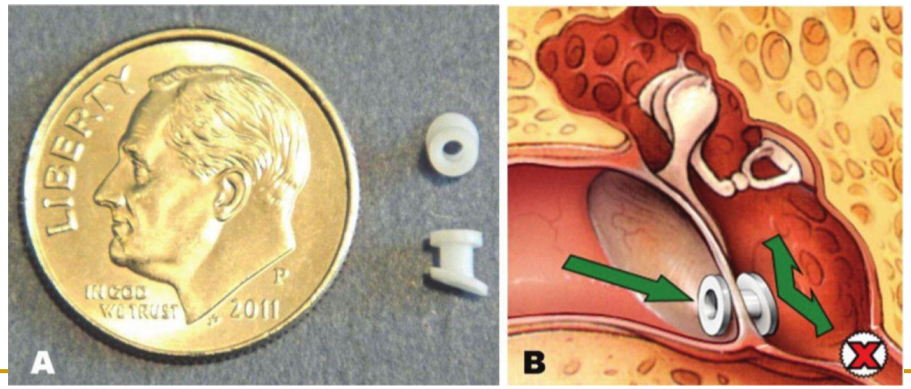
- **Recommend pneumococcal conjugate vaccine to all children**
  - ***strong recommendation***
- **Recommend annual influenza vaccine**
- **Encourage exclusive breastfeeding for at least 6 months**
- **Encourage avoidance of tobacco smoke exposure**

Referral to ENT

- Consider referral to ENT:
  - Diagnosis unclear (ie, cerumen)
  - Recurrent or persistent infection
  - Chronic otitis media
  - Hearing concerns/high risk factors

Tympanostomy/Pressure equalization tubes

- Most common ambulatory surgery performed on children in US
- Indications
  - Recurrent AOM
  - COME (persistent fluid)
  - Refractory AOM/Persistent AOM
- Outpatient
- Mask anesthesia
- Combined with other procedures (T&A, palate repair, other surgical specialties)
- Short (1-1.5 years) vs long-term (3-5+ years)



RUSH

AMERICAN ACADEMY OF OTOLARYNGOLOGY–HEAD AND NECK SURGERY FOUNDATION

Clinical Practice Guideline: Tympanostomy Tubes in Children (Update)

Richard M. Rosenfeld, MD, MPH, MBA[1], David E. Tunkel, MD[2], Seth R. Schwartz, MD, MPH[3], Samantha Anne, MD, MS[4], Charles E. Bishop, AuD, PhD, CCC-A[5], Daniel C. Chelius, MD[6], Jesse Hackell, MD[7,8], Lisa L. Hunter, PhD[9], Kristina L. Keppel, DNP, APNP, CPNP[10], Ana H. Kim, MD[11], Tae W. Kim, MD, MEHP[12], Jack M. Levine, MD[13], Matthew T. Maksimoski, MD[14], Denee J. Moore, MD[15], Diego A. Preciado, MD, PhD[16], Nikhila P. Raol, MD, MPH[17], William K. Vaughan[18], Elizabeth A. Walker, PhD, CCC-A/SLP[19], and Taskin M. Monjur[20]

- 16 Statements
  - 2 strong recommendations
  - 11 recommendations
  - 3 options

RUSH

14-month-old child presents for routine visit. Had a cold one month ago but otherwise doing well. No hearing concerns. Speech development on track.

RUSH

1) OME of short duration

- **Clinicians should NOT perform tympanostomy tube in children with single episode of OME of less than 3 months' duration (date of onset if known or date of diagnosis)**
  - OME often self-limited
  - Allow observation period of three months
  - After URI or AOM, 70% of children with have OME at 2 weeks
    - 40% at 1 month
    - 20% at 2 months
    - 10% at 3 months
- Children with risk of developmental delays are excluded

Risk factors for Developmental Difficulties

Table 2. Risk Factors for Developmental Difficulties.[a]

Permanent hearing loss independent of otitis media with effusion
Suspected or confirmed speech and language delay or disorder
Autism spectrum disorder
Syndromes (eg, Down) or craniofacial disorders that include cognitive, speech, or language delays
Blindness or uncorrectable visual impairment
Cleft palate, with or without associated syndrome
Developmental delay
Intellectual disability, learning disorder, or attention-deficit/hyperactivity disorder[b]

[a]Sensory, physical, cognitive, or behavioral factors that place children who have otitis media with effusion at increased risk for developmental difficulties (delay or disorder).[20]

[b]The conditions in this row are a new addition to the list.

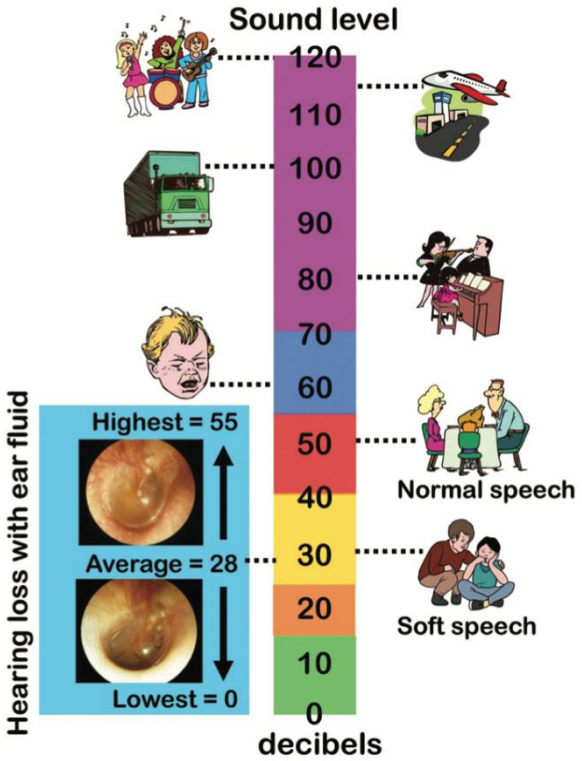
Same child returns after 2 months. Exam is the same. Still no concerns for speech.

RUSH

2) Hearing Evaluation

- **Clinicians should obtain a hearing evaluation if OME persists for 3 months OR prior to surgery**

- Usually mild to moderate hearing loss in most important frequencies for speech perception
- Screening for hearing is important in primary care setting (AAP)
  - Any parental/caregiver concern about hearing should be taken seriously, requires objective hearing screening
  - Limitations in screening if developmental abnormalities, level of functioning or behavioral problems ENT/ped audio
  - Abnormal screening should be followed up on/referred for formal audio testing



RUSH

3) COME with hearing difficulty

- **Clinicians should offer bilateral tympanostomy tubes to children with bilateral OME for 3+ months AND documented hearing loss**

  - Normal hearing 0 – 15 dB (previously up to 20)
  - OFFER – language changed from recommend to offer
  - Children even with mild hearing loss but otherwise normal speech development may not benefit from tubes
  - Offer means:
    - Discuss unfavorable natural history of COME
    - Benefits of tubes
    - Alternatives (essentially surveillance)

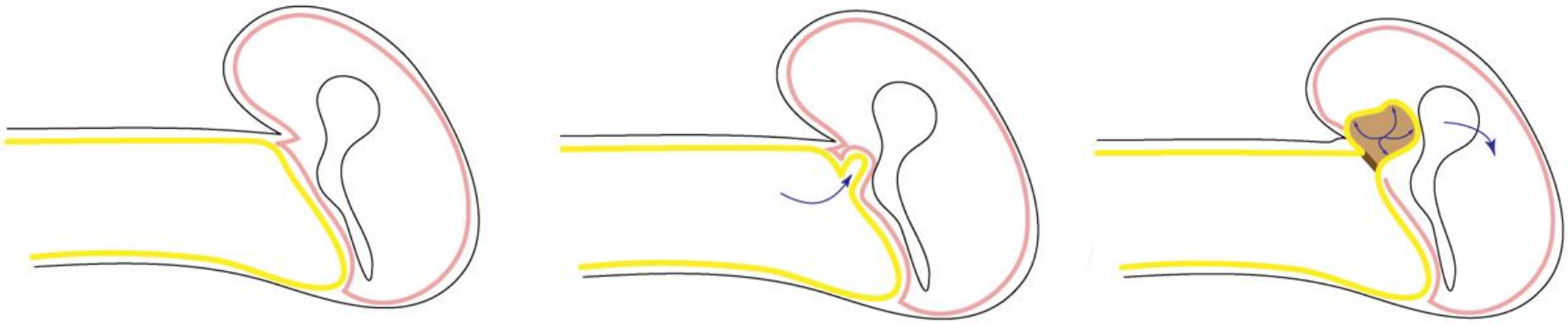
4) COME with symptoms (Option)

- **Clinicians may perform tympanostomy tube insertion in children with unilateral or bilateral OME for 3+ months AND symptoms**

  - Symptoms
    - Balance/vestibular problems
    - Poor school performance
    - Behavioral problems
    - Ear discomfort
    - Reduced QOL

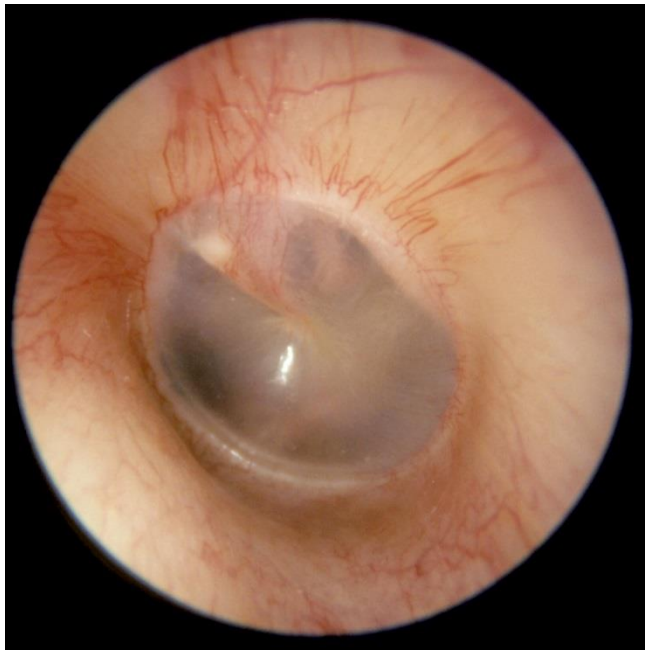
5) Surveillance of COME

- **Clinicians should reevaluate, at 3-6 month intervals, children with chronic OME who do not receive tympanostomy tubes, until effusion is no longer present, significant hearing loss detected or structural abnormalities of the ear as suspected**
  - Physical exam
    - Pneumotoscopy
  - Audiogram
  - Retraction pockets → cholesteatoma



RUSH

A 3 yo child present for evaluation for recurrent ear infections. Mom reports 6 infections in the past year, 4 within the past 6 months. Diagnosed by various ER/UC.



RUSH

6) Recurrent AOM without MEE

- **Clinicians should NOT perform tympanostomy tube insertion in children with recurrent AOM who do not have MEE in either ear at time of assessment for tube candidacy**

  - Exceptions
    - At-risk children
    - Multiple antibiotic allergies/intolerances
    - Complications of AOM
    - Immunosuppression
  - Disadvantages
    - Need for systemic antibiotics
    - QOL (not in guideline)

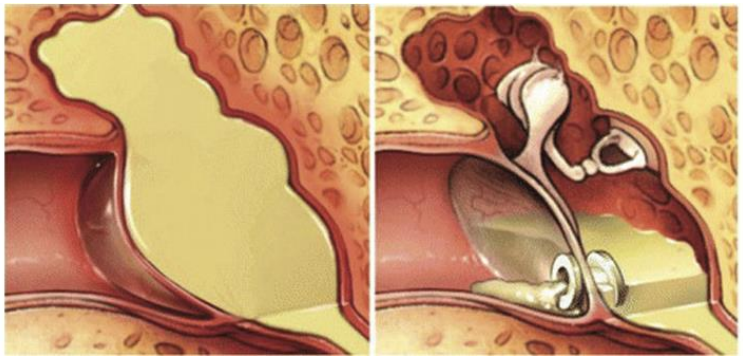
A 3 yo child present for evaluation for recurrent ear infections. Mom reports 6 infections in the past year, 4 within the past 6 months. Diagnosed by various ER/UC.

RUSH

7) Recurrent AOM with MEE

- **Clinicians should offer bilateral tympanostomy tube insertion in children with recurrent AOM who have unilateral or bilateral MEE at time of assessment for tube candidacy**

  - MEE indicator of underlying eustachian tube dysfunction
  - Bilateral tubes (even in only one ear with MEE) because eustachian tube function similar on both side
  - Reduced number of AOM per year
  - Advantages
    - Topical therapy instead of systemic
    - Decreased pain



RUSH

8) At-risk children

- **Clinicians should determine if a child with recurrent AOM or with OME of any duration is at increased risk for speech, language, or learning problems from otitis because because of baseline sensory, physical, cognitive or behavioral factors**

Table 2. Risk Factors for Developmental Difficulties.[a]

Permanent hearing loss independent of otitis media with effusion
Suspected or confirmed speech and language delay or disorder
Autism spectrum disorder
Syndromes (eg, Down) or craniofacial disorders that include cognitive, speech, or language delays
Blindness or uncorrectable visual impairment
Cleft palate, with or without associated syndrome
Developmental delay
Intellectual disability, learning disorder, or attention-deficit/hyperactivity disorder[b]

[a]Sensory, physical, cognitive, or behavioral factors that place children who have otitis media with effusion at increased risk for developmental difficulties (delay or disorder).[20]

[b]The conditions in this row are a new addition to the list.

RUSH

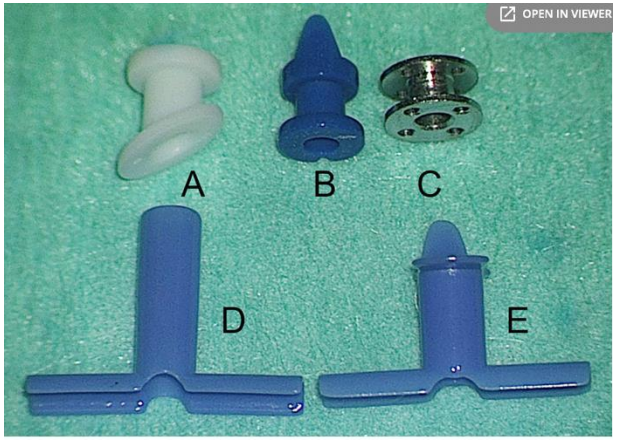
9) Tympanostomy tubes and At-risk children (Option)

- **Clinicians may perform tympanostomy tube insertion in at-risk children with unilateral or bilateral OME that is likely to persist as reflected by type B (flat) tympanogram or a documented effusion for 3 months or longer.**
  - Trying to optimize sensory input
  - Even unilateral OME can degrade auditory input and reduced binaural processing and speech perception

10) Long-term tubes (NEW)

- **Clinicians should NOT place long-term tubes as initial surgery for children who meet criteria for tube insertion unless specific reason based on anticipated need for prolonged middle ear ventilation beyond short-term tube.**

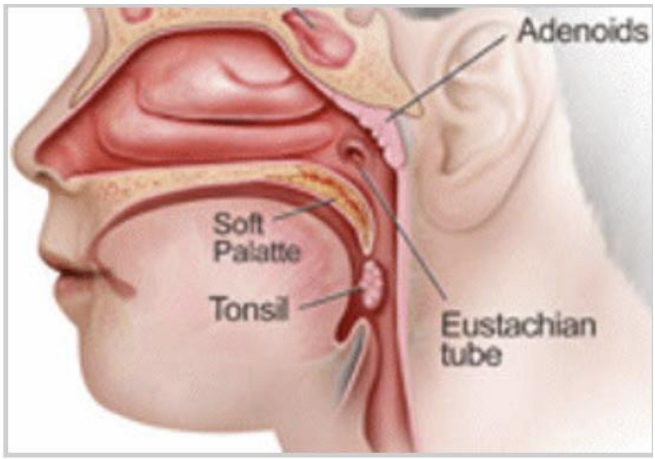
  - Short term: 8-18 months
    - Armstrong, Sheehy, Reuter Bobbin
    - Approx 25% will need 2nd set of tubes
  - Long term: 2+ years
    - Goode or Modified Richards T-tube, Butterfly
    - Increased risk for TM perforation, granulation
    - Craniofacial, Down syndrome
    - Multiple sets of tubes



Isaacson G. Tympanostomy tubes - a visual guide for the young otolaryngologist. *Ear Nose Throat J*. 2020;99(1):8S-14S.

11) Adjuvant adenoidectomy (NEW, Option)

- **Clinicians may perform adenoidectomy as an adjunct to tympanostomy tube insertion for children with symptoms directly relate to adenoids (infection/obstruction) OR in children aged 4+ to potentially reduce future incidence of ROM or need for repeat tube insertion**
  - Doubles length of benefit of tubes
  - Not necessarily related to size of adenoids
  - Reduces bacterial load in nasopharynx



https://newenglandent.com/tonsillitis-adenoiditis/

12) Perioperative education

- **Expected duration of tube**
- **Recommended follow up schedule**
  - Within 3 months of placement (witih audiogram)
  - Periodically (every 6 months)
  - Referral to ENT by PCP
    - Tubes not visualized or occluded
    - Concerns about change in hearing
    - Granuloma, refractory otorrhea, perforation at tube site, cholesteatoma, retained tube for 3+ years
- **Detection of complications**
  - Acute infection/drainage
  - Water exposure (precautions during acute otorrhea)

13) Perioperative ear drops (NEW)

- **Clinicians should NOT routinely prescribe postoperative antibiotics ear drops after tympanostomy tube placement**
  - No difference between antibiotic drops and saline solution
  - Increased cost (?)
  - Has not shown to reduce occlusion by blood, crust, mucus
  - Possible harm – fungal infection, local skin reaction

A 2 yo child has previously undergone tympanostomy tube placement and presents with 3 days of ear drainage, low-grade fevers, otherwise feeling well.

https://www.researchgate.net/figure/Left-acute-tube-otorrhea-right-tube-otorrhea-with-granulation_fig8_342291832/

14) Acute tympanostomy tube otorrhea

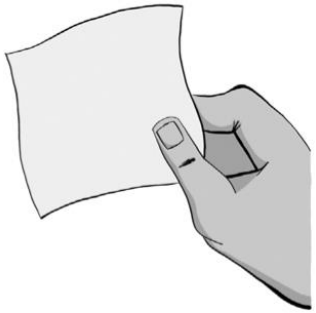
strong recommendation

- **Clinicians should prescribe topical antibiotic ear drops only, WITHOUT oral antibiotics, for children with uncomplicated acute tympanostomy tube otorrhea**

  - Acute – less than 4 weeks
  - Uncomplicated
    - No fever over 38.5C/101.3F
    - No concurrent illness (strep, sinusitis)
    - No cellulitis extending behind external ear canal
  - Avoids GI and other reactions, avoid antibiotic resistance
  - Systemic indicated when
    - Toxic appearing
    - Intolerance of drops
    - immune-compromise

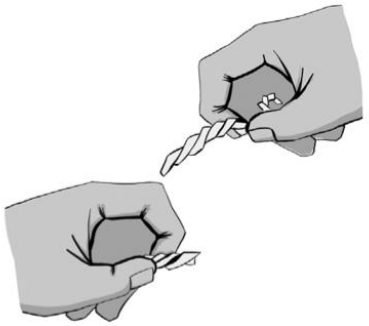
RUSH

Tissue Spears

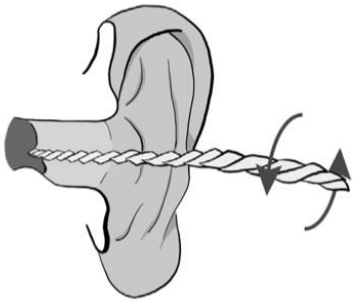


1. Tissue spears can be made with toilet paper or facial tissue.

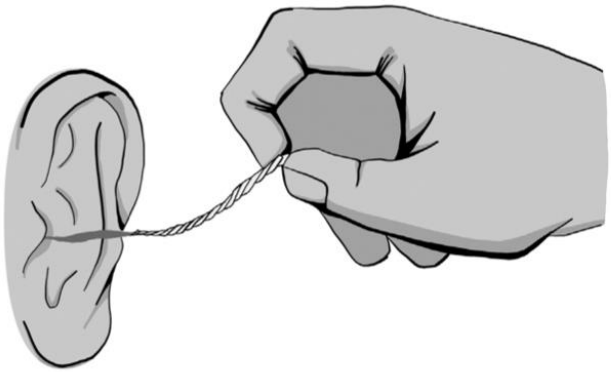
2. Twist - do not roll - the corner of the tissue. Use thumbs and first fingers of both hands to twist spear tight.



3. Break off about 1″ of the top of the spear (too floppy to use).



4. Push tissue spear into ear with a slight twist; stop pushing when it stops going in (about 1″ or if child cries or coughs).



5. If possible, leave in a minute to absorb pus; remove slowly and discard; repeat until spear comes out dry.

Figure 10. Tissue spears. Adapted from Centre for Remote Health.[286]

15) Water precautions

- **Clinicians should NOT encourage routine, prophylactic water precautions (earplugs, headbands, avoidance of swimming) for children with tympanostomy tubes**
  - Prior to 2013 guidelines, water precautions were recommended
  - RCT showed no significant difference in tube otorrhea in those wearing plugs vs not
  - Consider if:
    - Immunocompromised
    - Highly contaminated water
    - Ear discomfort during swimming
    - Recurrent/persistent otorrhea

16) Follow up (NEW)

strong recommendation

- **Surgeon or designee should examine ears within 3 months of tympanostomy tube insertion AND educate families on the need for routine, periodic follow up until tubes extrude**
  - Recognize early extrusion
  - Tube obstruction
  - Perforation
  - Generally, 6 months
  - Consider close communication with PCP if patient not able to get to specialist every 6 months

RUSH

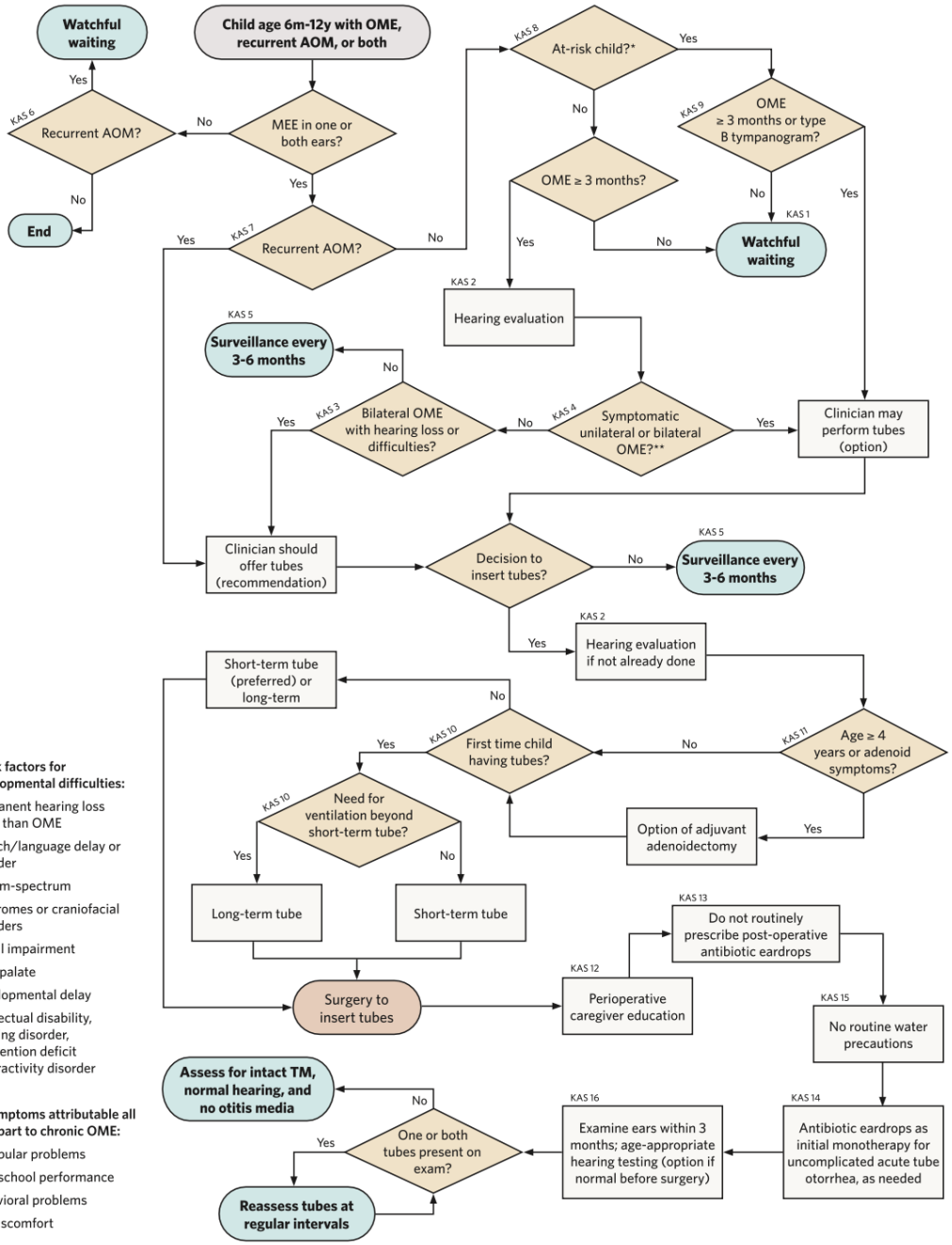
https://www.researchgate.net/figure/Left-acute-tube-otorrhea-right-tube-otorrhea-with-granulation_fig8_342291832/

CPG: Tympanostomy Tubes: Update (2013/2022)

3. Chronic bilateral OME with hearing difficulty	Clinicians should offer bilateral tympanostomy tube insertion to children with bilateral OME for 3 months or longer AND documented hearing difficulties.	Recommendation
4. Chronic OME with symptoms	Clinicians may perform tympanostomy tube insertion in children with unilateral or bilateral OME for 3 months or longer (chronic OME) AND symptoms that are likely attributable, all or in part, to OME that include, but are not limited to, balance (vestibular) problems, poor school performance, behavioral problems, ear discomfort, or reduced quality of life.	Option
6. Recurrent AOM without MEE	Clinicians should *not* perform tympanostomy tube insertion in children with recurrent AOM who do not have MEE in either ear at the time of assessment for tube candidacy.	Recommendation (against)
7. Recurrent AOM with MEE	Clinicians should offer bilateral tympanostomy tube insertion in children with recurrent AOM who have unilateral or bilateral MEE at the time of assessment for tube candidacy.	Recommendation
14. Acute tympanostomy tube otorrhea	Clinicians should prescribe topical antibiotic ear drops only, without oral antibiotics, for children with uncomplicated acute tympanostomy tube otorrhea.	Strong recommendation
15. Water precautions	Clinicians should *not* encourage routine, prophylactic water precautions (use of earplugs or headbands, avoidance of swimming or water sports) for children with tympanostomy tubes.	Recommendation (against)

RUSH

Rosenfeld RM, Tunkel DE, Schwartz SR, et al. Clinical practice guideline: tympanostomy tubes in children (update). *Otolaryngol Head Neck Surg* 2022;166(1S) S1-S55.



*** Risk factors for developmental difficulties:**

- Permanent hearing loss other than OME
- Speech/language delay or disorder
- Autism-spectrum
- Syndromes or craniofacial disorders
- Visual impairment
- Cleft palate
- Developmental delay
- Intellectual disability, learning disorder, or attention deficit hyperactivity disorder

**** Symptoms attributable all or in part to chronic OME:**

- Vestibular problems
- Poor school performance
- Behavioral problems
- Ear discomfort

AOM, acute otitis media; KAS, key action statement; MEE, middle-ear effusion; OME, otitis media with effusion; TM, tympanic membrane

In-office ear tubes

- Indications
  - 6 months and older
  - Ear canal size/anatomy
  - Cooperation of child
  - Anxiety/situational awareness of parents

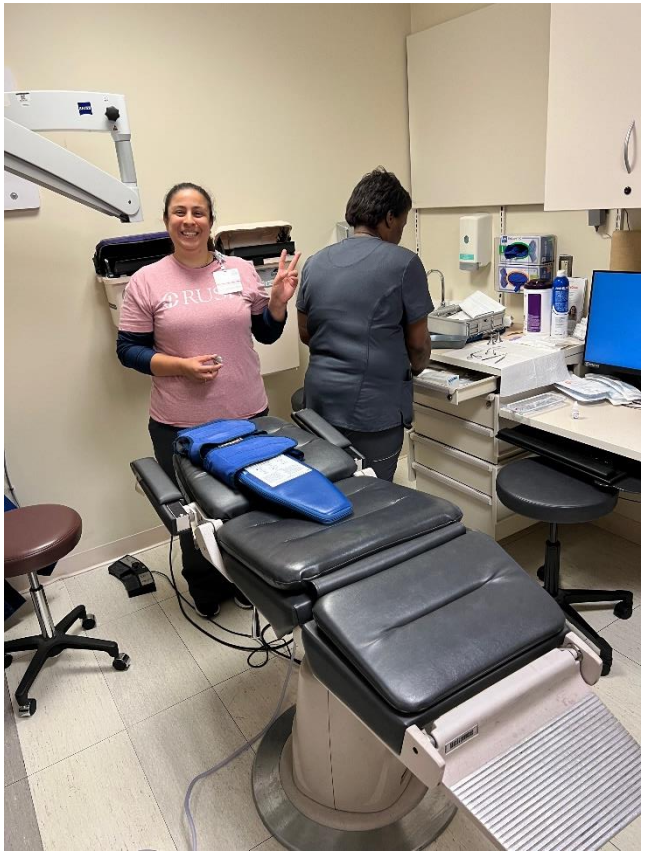
- Initial clinic visit
  - Discuss indication for ear tubes
  - If candidate, discuss traditional OR vs in-office
  - Set up another appt for procedure
    - (consider same day pending schedule)

In-office ear tubes

- Day of
  - Room 1 – consent, discuss how things will run
  - Room 2 – procedure room, minimal down time
  - Room 1 – give some space, review instructions/debrief

- In room
  - Parent(s)
  - MA/RN - hold head, help immobilize body if needed, instruments
  - Child life specialist

In-office ear tubes



RUSH

In-office ear tubes

Thank you!

RUSH

Rush University Medical Center
1611 W. Harrison St, Suite 550
Chicago, IL
312-942-6100

Rush Copley Medical Center
2040, Suite 301
Aurora, IL
630-978-6895

RUSH Oak Park
610 S. Maple Ave
Oak Park, IL

RUSH South Loop
1411 S. Michigan Ave
Chicago, IL

RUSH Aerodigestive Clinic
RUMC, 7 Kellogg
1st and 3rd Thursday AM

RUSH Craniofacial Clinic
RUMC, POB 425
3rd Tuesday AM

RUSH