

Children's Mercy Kansas City

## SHARE @ Children's Mercy

---

Clinical Critically Appraised Topics

Critically Appraised Topics

---

7-2022

### Acute Otitis Media: Tympanostomy Antibiotics

Children's Mercy Kansas City

Let us know how access to this publication benefits you

Follow this and additional works at: <https://scholarlyexchange.childrensmercy.org/clinical-critically-appraised-topics>



Part of the [Pediatrics Commons](#)

---

### Specific Care Question

In pediatric patients with acute otitis media (AOM) AND tympanostomy tubes, are antibiotic ear drops (topical, drops, otic) versus oral antibiotics better for the outcomes of resolution and adverse events?

### Recommendations from the AOM CPM Committee

A **conditional** recommendation is made **for** the use of ear drops over oral antibiotics for patients with tympanostomy tubes, based on the GRADE Evidence to Decision instrument<sup>a</sup> and the Summary of Findings Table<sup>a</sup>. Even though the certainty of the evidence is low to very low<sup>a</sup>, antibiotic ear drops were favorable compared to oral antibiotics for the resolution of ear discharge. Also, adverse events were found to be no difference between the two interventions. Standard work should be developed, implemented, and monitored when there is a lack of scientific evidence.

### Literature Summary

**Background** Acute otitis media is the most common infection in early childhood (Venekamp et al., 2015) and ear discharge (otorrhea) is common in children with tympanostomy tubes. The most common treatment for AOM strategies includes oral antibiotics, antibiotic ear drops, or ear drops containing a combination of antibiotics and corticosteroids (Venekamp et al., 2016). This review will summarize identified literature to answer the specific care question.

**Study characteristics.** The search for suitable studies was completed on April 25, 2022. T. Williams RN, APRN, CPN, CPNP, and H. Austin MD, FAAP reviewed the 54 titles and/or abstracts found in the search and identified<sup>b</sup> eight single studies believed to answer the question. After an in-depth review of the single studies<sup>d</sup>, two answered the question (Steele et al., 2017; Venekamp et al., 2016). Venekamp et al. (2016) is a systematic review/meta-analysis which includes the comparison of ear drops antibiotics versus systemic antibiotics in patients with tympanostomy tubes and ear discharge. Steele et al. (2017) is a network meta-analysis that indirectly compares ear drop antibiotics versus systemic antibiotics in pediatric patients with tympanostomy tubes and ear discharge.

### Summary by Outcome

#### Data Summary by Outcome (rationale for evidence certainty rating<sup>a</sup> provided for each outcome)

##### Resolution of ear discharge at one week

The systematic review by Venekamp et al. (2016) found one RCT (Heslop et al., 2010) that measured resolution of ear discharge at one week, ( $N = 42$ ). For the outcome of resolution, the results indicated the intervention of antibiotic ear drops (with or without corticosteroids) was favorable to the comparator of oral antibiotics,  $OR = 2.58$ , 95% CI [1.27, 5.22],  $p$ -value = 0.01.

**Certainty Of The Evidence For Resolution of ear discharge at one week.** The certainty of the body of evidence was very low. The body of evidence was assessed to not have serious inconsistency nor indirectness, however was assessed to have serious risk of bias and serious imprecision. Risk of bias was serious due to lack of blinding in the study which could have affected outcome assessment. Imprecision was serious due the low number of events ( $n = 23$ ) and subjects ( $N = 42$ ). As only one study, Heslop et al. (2010), was identified to answer this question, consistency could not be assessed.

##### Resolution of ear discharge at two to four weeks

The systematic review by Venekamp et al. (2016) found two RCTs (Dohar et al., 2006; Van Dongen et al., 2014) that measured resolution of ear discharge at two to four weeks ( $N = 232$ ). For the outcome of resolution, the results indicated the intervention of antibiotic ear drops (with corticosteroids) was favorable to the comparator of oral antibiotics,  $OR = 1.59$ , 95% CI [1.35, 1.88],  $p$ -value < .0001.

**Certainty Of The Evidence For Resolution of ear discharge at one week.** The certainty of the body of evidence was low. The body of evidence was assessed to not have serious inconsistency nor indirectness, however, was assessed to have serious risk of bias and serious imprecision. Risk of bias was serious due to lack of blinding in the study which could have affected outcome assessment. Imprecision was serious due to the low number of subjects ( $N = 232$ ).

### **Adverse events**

The systematic review by Venekamp et al. (2016) found three RCTs (Dohar et al., 2006; Goldblatt et al., 1998; Van Dongen et al., 2014) that measured adverse events, ( $n = 232$ ). For the outcome of adverse events, the results indicated the intervention of antibiotic ear drops (with and without corticosteroids) was not different to the comparator of oral antibiotics,  $OR = 0.37$ , 95% CI [0.12, 1.09],  $p$ -value = .07.

**Certainty Of The Evidence For Resolution of ear discharge at one week.** The certainty of the body of evidence was low. The body of evidence was assessed to not have serious imprecision nor indirectness, however, was assessed to have serious risk of bias and serious inconsistency. Risk of bias was serious due to the lack of blinding in the study which could have affected the outcome assessment. Imprecision was serious as evidenced by the substantial heterogeneity  $I^2=88\%$ .

### **Relative effectiveness**

The network meta-analysis by Steele et al. (2017) measured relative effectiveness of different treatments for otorrhea in patients with tympanostomy tubes, ( $N = 7$  Studies). For the outcome of relative effectiveness, the results indicated the intervention of antibiotic ear drops (with or without corticosteroids) was favorable to the comparator of oral antibiotics,  $OR = 5.30$ , 95% CI [1.20, 27].

**Certainty Of The Evidence For Resolution of ear discharge at one week.** The certainty of the body of evidence was very low. The body of evidence was assessed to not have serious inconsistency, however, was assessed to have serious risk of bias, serious indirectness, and serious imprecision. The risk of bias was serious due to the lack of blinding in the study which could have affected the outcome assessment. Indirectness was serious due to the study being a network meta-analysis and imprecision was serious due to the wide confidence interval.

### **Identification of Studies**

#### **Search Strategy and Results** (see Figure 1)

(**2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py**) AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [school]/lim) AND ('**article**'/it OR '**review**'/it) '**cure**'/exp OR '**cure**' OR '**treatment outcome**' OR '**outcome**'/exp OR '**outcome**' OR '**patient assessment**'/exp OR '**patient assessment**' OR '**treatment failure**'/exp OR '**treatment failure**' '**tympanostomy tube\***' OR '**tympanostomy tube otorrhea**'/exp OR '**tympanostomy tube otorrhea**' OR '**tympanostomy tube**'/exp OR '**tympanostomy**'/exp OR '**tympanostomy**' OR '**eardrum perforation**'/exp OR '**eardrum perforation**' OR '**tympanic membrane perforation**' '**acute otitis media**'/exp OR '**acute otitis media**' OR '**otorrhea**'/exp OR '**otorrhea**' '**amoxicillin**'/exp OR '**amoxicillin**' OR '**amoxicillin plus clavulanic acid**'/exp OR '**amoxicillin plus clavulanic acid**' OR '**cephalosporin**'/exp OR '**cephalosporin**' OR '**cefdinir**'/exp OR '**cefdinir**' OR '**cefepodoxime**'/exp OR '**cefepodoxime**' OR '**cefazolin**'/exp OR '**cefazolin**' OR '**cefixime**'/exp OR '**cefixime**' OR '**ceftriaxone**' OR '**ciprofloxacin plus dexamethasone**'/exp OR '**ciprofloxacin**' OR '**ofloxacin**' OR '**prednisolone sodium phosphate plus sulfacetamide**'/exp OR '**vasocidin**' OR '**boric acid**' '**#1 ear drops**'/exp OR '**ear drops**' OR ((''**antibiotic agent**'/exp OR '**antibiotic agent**' OR '**antibiotic therapy**'/exp OR '**antibiotic therapy**' OR '**antiinfective agent**'/exp) AND (**oral** OR '**enteric**' OR '**topical**' OR '**otic**' OR '**drop\***'))

Records identified through database searching  $n = 54$

Additional records identified through other sources  $n = 0$

Studies Included in this Review

Citation	Study Type
Steele et al. (2017)	Systematic Review/Meta-Analysis
Venekamp et al. (2016)	Systematic Review/Meta-Analysis

Studies Not Included in this Review with Exclusion Rationale

Citation	Reason for exclusion
Gupta et al. (2014)	Chronic otitis media and study includes adults
Hullegie et al. (2021)	Study protocol
Spektor et al. (2017)	Study of ear drops only
Syed et al. (2013)	Study on postoperative care
Van Dongen et al. (2014)	Included in Venekamp et al. (2016) SR
Van Dongen et al. (2015)	Cost study

**Methods Used for Appraisal and Synthesis**

<sup>a</sup>The GRADEpro Guideline Development Tool (GDT) Using the GDT, the author of this CAT rates the certainty of the evidence based on four factors: *within-study risk of bias, consistency among studies, directness of evidence, and precision of effect estimates*. Each factor is subjectively judged against the author's confidence of the estimated treatment effect. Confidence is assessed as not serious, serious, or very serious. If the attribute of serious or very serious is assessed, the author will provide an explanation.

<sup>b</sup>Rayyan is a web-based software used for the initial screening of titles and / or abstracts for this analysis (Ouzzani, Hammady, Fedorowicz & Elmagarmid, 2017).

<sup>c</sup>Review Manager (Higgins & Green, 2011) is a Cochrane Collaborative computer program used to assess the study characteristics as well as the risk of bias and create the forest plots found in this analysis.

<sup>d</sup>The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram depicts the process in which literature is searched, screened, and eligibility criteria is applied (Moher, Liberati, Tetzlaff, & Altman, 2009).

**References to Appraisal and Synthesis Methods**

<sup>a</sup>GRADEpro GDT: GRADEpro Guideline Development Tool (2015). McMaster University, (developed by Evidence Prime, Inc.). [Software]. Available from [grade.pro.org](http://grade.pro.org).

<sup>b</sup>Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan-a web and mobile app for systematic reviews. *Systematic Reviews*, 5(1), 210. doi:10.1186/s13643-016-0384-4

<sup>c</sup>Higgins, J. P. T., & Green, S. e. (2011). *Cochrane Handbook for Systematic Reviews of Interventions [updated March 2011]* (Version 5.1.0 ed.): The Cochrane Collaboration, 2011.

<sup>d</sup>Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097 **For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).**

**Question Originator**

T. Williams, RN, APRN, CPN, CPNP

**Medical Librarian Responsible for the Search Strategy**

K. Swaggart, MLIS, AHIP

**EBP Team or EBP Scholar's Responsible for Analyzing the Literature**

A. Randall, MHA, RRT, RRT-ACCS, RRT-NPS, C-NPT, CPPS

M. Gripka, MT(ASCP)SM

**EBP Medical Director Responsible for Reviewing the Literature**

K. Berg, MD, FAAP

**EBP Team Member Responsible for Reviewing, Synthesizing, and Developing this Document**

J. Dusin, MS, RD, LD, CPHQ

*Acronyms Used in this Document*

Acronym	Explanation
AGREE II	Appraisal of Guidelines Research and Evaluation II
CAT	Critically Appraised Topic
EBP	Evidence Based Practice
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

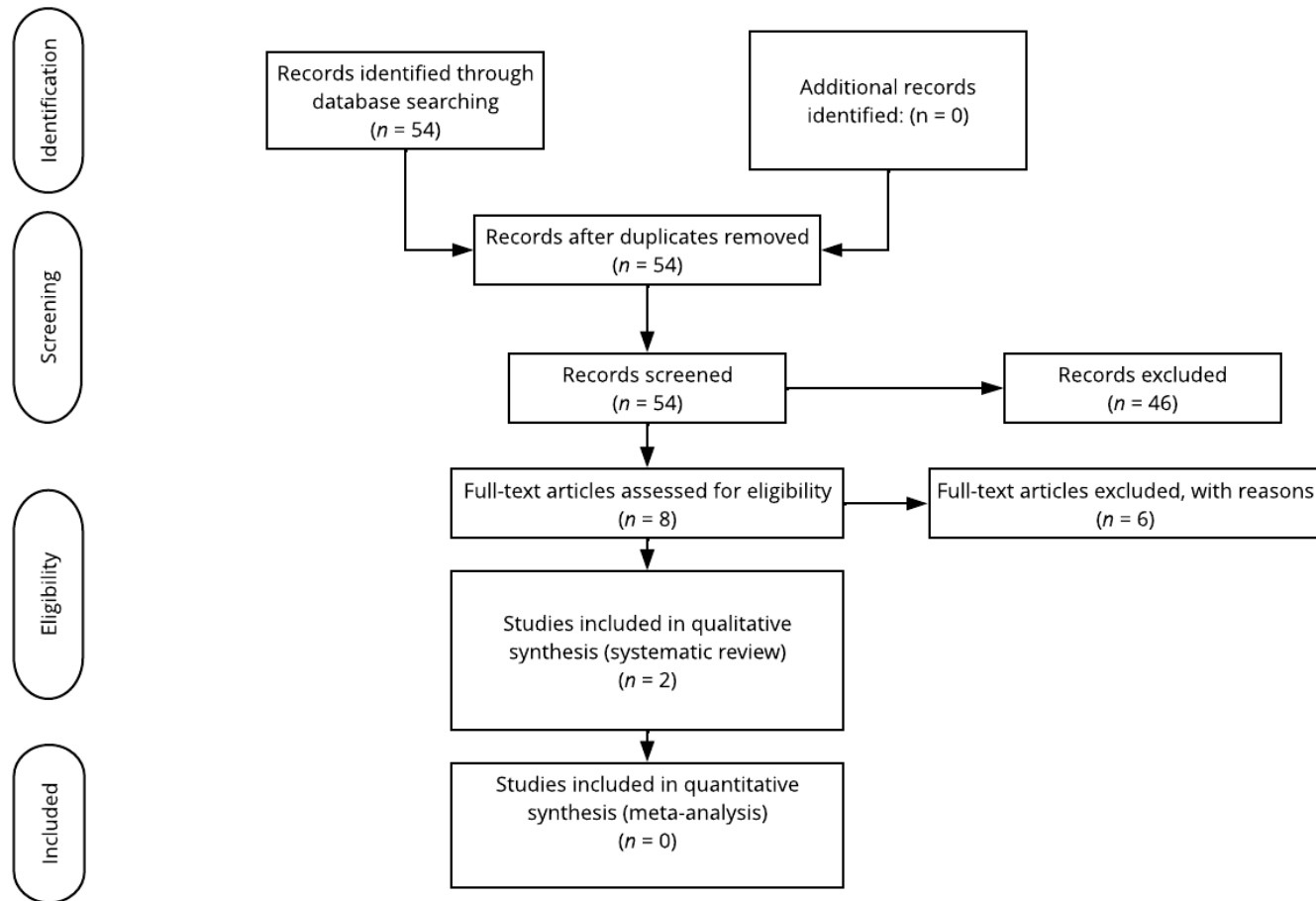
*Statistical Acronyms Used in this Document*

Statistical Acronym	Explanation
CI	Confidence Interval
$M$ or $\bar{X}$	Mean
$n$	Number of cases in a subsample
$N$	Total number in sample
OR	Odds Ratio
$P$ or $p$	Probability of success in a binary trial
RCT	Randomized controlled trial
SD	Standard deviation
SR	Systematic Review



**Figure 1**

*Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)<sup>d</sup>*





Characteristics of Intervention Studies

Steele et al., 2017

<b>Design</b>	<b>Quantitative Synthesis (meta-analysis)</b>
<b>Objective</b>	Reviewed evidence for water precautions (ear plugs or swimming avoidance) and effectiveness of topical versus oral antibiotic treatment of otorrhea in children with tympanostomy tube.
<b>Methods</b>	<p><b>Criteria for considering studies for this review</b></p> <ul style="list-style-type: none"> <li>• <b>Types of studies:</b> Randomized controlled trials (RCTs) and nonrandomized comparative studies</li> <li>• <b>Participants:</b> Children, not specified</li> <li>• <b>Target Condition(s):</b> Otorrhea in patients with tympanostomy tubes</li> </ul> <p><b>Search methods for identification of studies</b></p> <ul style="list-style-type: none"> <li>• <b>Electronic databases searched:</b> Medline, the Cochrane Central Trials Registry and Cochrane Database of Systematic Reviews, Excerpta Medica Database, and the Cumulative Index to Nursing and Allied Health Literature all dates through May 19, 2016.</li> <li>• <b>Search strategy employed:</b> Not reported</li> </ul> <p><b>Data collection and analysis</b></p> <ul style="list-style-type: none"> <li>• <b>Inclusion criteria:</b> Comparison of benefits and/or harms of at least two of the following: <ul style="list-style-type: none"> <li>◦ Symptomatic or asymptomatic children with acute tympanostomy tube otorrhea beyond the immediate postoperative period (30 days after surgery)</li> </ul> </li> <li>• <b>Exclusion criteria:</b> <ul style="list-style-type: none"> <li>◦ Trials enrolling children with early postoperative otorrhea or chronic suppurative otitis media</li> </ul> </li> <li>• <b>Population:</b> Children, ages not specified</li> <li>• <b>Setting:</b> Not specified</li> <li>• <b>Study Design:</b> Systemic review and network meta-analysis</li> <li>• <b>Data collection process:</b> Not specified</li> <li>• <b>Assessment of Bias:</b> <ul style="list-style-type: none"> <li>◦ Cochrane Risk of Bias Tool (RCTs)</li> <li>◦ Newcastle Ottawa Scale (Nonrandomized studies)</li> </ul> </li> <li>• <b>Data Synthesis:</b> <ul style="list-style-type: none"> <li>◦ <b>Overall Effect Size</b> <ul style="list-style-type: none"> <li>▪ Odds ratios (ORs) and confidence interval (CI)</li> <li>▪ Number needed to treat (NNT)</li> </ul> </li> </ul> </li> </ul>
<b>Results</b>	<p><b>Study Selection (actual results/data)</b></p> <p><b>Number of articles identified:</b> <math>N = 13334</math></p> <p><b>Full-text articles assessed for eligibility:</b> <math>n = 172</math></p> <ul style="list-style-type: none"> <li>◦ <b>Studies included in qualitative synthesis:</b> <math>n = 7</math></li> </ul> <p><b>Synthesis of quality of evidence:</b> Moderate</p>



***Critically Appraised Topic (CAT):  
Acute Otitis Media (AOM) Tympanostomy Antibiotics***

	<p><b>Synthesis of quantitative evidence</b></p> <ul style="list-style-type: none"><li>○ <b>Overall Effect Size:</b> RCT that studied antibiotic ear drops with corticosteroids versus oral antibiotics on relative effectiveness<ul style="list-style-type: none"><li>▪ Ear drops with corticosteroids versus oral antibiotics:</li><li>▪ <b>OR:</b> 5.3</li><li>▪ <b>CI:</b> 95% CI 1.20 to 27.00</li><li>▪ <b>NNT:</b> 3.2</li><li>▪ <b>Heterogeneity:</b> Not reported</li></ul></li><li>○ <b>Overall Effect Size:</b> RCT that studied antibiotic ear drops without corticosteroids versus oral antibiotics on relative effectiveness<ul style="list-style-type: none"><li>▪ Ear drops without corticosteroids versus oral antibiotics:</li><li>▪ <b>OR:</b> 3.3</li><li>▪ <b>CI:</b> 95% CI 0.74 to 16</li><li>▪ <b>Heterogeneity:</b> Not reported</li></ul></li></ul>
<b>Discussion</b>	<p><b>Summary of evidence</b></p> <ul style="list-style-type: none"><li>• Network meta-analyses suggest that, relative to oral antibiotics, topical antibiotic–glucocorticoid drops were more effective.</li><li>• Network meta-analyses suggest that, relative to oral antibiotics, topical antibiotics were not more effective</li></ul> <p><b>Limitations</b></p> <ul style="list-style-type: none"><li>• The author used indirect evidence from the network meta-analysis to augment the direct evidence relating to the comparisons of interest for the treatment of otorrhea. The study assumes there is consistency with the effect modifiers across the direct and indirect evidence.</li></ul>





Venekamp et al., 2016

<b>Design</b>	<b>Quantitative Synthesis (meta-analysis)</b>
<b>Objective</b>	Conduct a systemic review and meta-analysis of the interventional and observational studies reporting data on the benefits and harms of current treatment strategies for children with ear discharge occurring at least two weeks following grommet (ventilation tube) insertion.
<b>Methods</b>	<p><b>Criteria for considering studies for this review</b></p> <ul style="list-style-type: none"> <li>• <b>Types of studies:</b> Randomized controlled trials (RCTs)</li> <li>• <b>Participants:</b> Patients, less than 18 years, with grommets</li> <li>• <b>Target Condition(s):</b> Acute ear discharge outside the immediate postoperative period, following grommet insertion</li> </ul> <p><b>Search methods for identification of studies</b></p> <ul style="list-style-type: none"> <li>• <b>Electronic databases searched:</b> ENT Trials Register, Cochrane Central Register of Controlled Trials, PubMed/MEDLINE, EMBASE, CAB, EBSCO CINAHL, LILACS, KoreaMed, IndMed, PakMediNet, Web of Knowledge, CNKI, ClinicalTrials.gov, ICTRP, ISRCTN, Google Scholar, Google for all dates through June 23, 2016</li> <li>• <b>Search strategy employed:</b> Mesh terms: (middle ear ventilation or grommet) OR (cerebrospinal fluid otorrhea)</li> <li>• <b>Searching other resources:</b> Ovid MEDLINE, TRIPdatabase, The Cochrane Library and Google</li> </ul> <p><b>Data collection and analysis</b></p> <ul style="list-style-type: none"> <li>• <b>Inclusion criteria:</b> Comparison of benefits and/or harms of at least two of the following: <ul style="list-style-type: none"> <li>○ Oral corticosteroids</li> <li>○ Antibiotic ear drops</li> <li>○ Antibiotic(s)-corticosteroid ear drops</li> <li>○ Corticosteroid ear drops</li> <li>○ Cleaning the ear canal using micro suction</li> <li>○ Saline rinsing of the ear canal</li> <li>○ Placebo (in the form of ear drops, oral suspension, or tablets, depending on the 'active' intervention that is studied) or no treatment</li> </ul> </li> <li>• <b>Exclusion criteria:</b> <ul style="list-style-type: none"> <li>○ Review article</li> <li>○ Not a randomized trial</li> </ul> </li> <li>• <b>Population:</b> Children, ages 0 to 12 years</li> <li>• <b>Setting:</b> Secondary or tertiary care setting</li> <li>• <b>Study Design:</b> Systemic review and meta-analysis</li> <li>• <b>Data collection process:</b> Two investigators independently review</li> <li>• <b>Assessment of the certainty of the evidence:</b> GRADE</li> <li>• <b>Data Synthesis:</b> <ul style="list-style-type: none"> <li>○ <b>Overall Effect Size</b></li> </ul> </li> </ul>



***Critically Appraised Topic (CAT):  
Acute Otitis Media (AOM) Tympanostomy Antibiotics***

	<ul style="list-style-type: none"> <li>▪ Mantel-Haenszel (MH) risk ratio (RR) for dichotomous outcomes with 95% confidence interval (CI)</li> <li>▪ DerSimonian and Laird model for random effects</li> <li>○ <b>Heterogeneity</b> <ul style="list-style-type: none"> <li>▪ Chi<sup>2</sup> test</li> <li>▪ I<sup>2</sup> statistic</li> </ul> </li> </ul>
<b>Results</b>	<p><b>Study Selection</b>  <b>Number of articles identified:</b> <i>N</i> = 1548  <b>Full-text articles assessed for eligibility:</b> <i>n</i> = 21</p> <ul style="list-style-type: none"> <li>○ <b>Studies included in qualitative synthesis:</b> <i>n</i> = 9</li> </ul> <p><b>Synthesis of quality of evidence:</b> Moderate</p> <p><b>Synthesis of quantitative evidence</b></p> <ul style="list-style-type: none"> <li>○ <b>Overall Effect Size:</b> RCT that studied antibiotic ear drops with corticosteroids vs oral antibiotics on resolution of ear discharge at two to four weeks <ul style="list-style-type: none"> <li>▪ Oral vs ear drop antibiotics: <i>N</i> = 213</li> <li>▪ <b>Risk Ratio (RR):</b> 1.59</li> <li>▪ <b>CI:</b> 95% CI 1.35 to 1.88, <i>p</i> &lt; .0001</li> <li>▪ <b>Heterogeneity:</b> Not reported</li> </ul> </li> <li>○ <b>Overall Effect Size:</b> RCT that studied antibiotic ear drops (with and without corticosteroids) vs oral antibiotics on resolution of ear discharge at one week <ul style="list-style-type: none"> <li>▪ Oral vs ear drop antibiotics: <i>N</i> = 42</li> <li>▪ <b>Risk Ratio (RR):</b> 2.58</li> <li>▪ <b>CI:</b> 95% CI 1.27 to 5.22, <i>p</i> = .01</li> <li>▪ <b>Heterogeneity:</b> Not reported</li> </ul> </li> <li>○ <b>Overall Effect Size:</b> RCT studies adverse events likely related to study medications <ul style="list-style-type: none"> <li>▪ Adverse events likely related to study medications: <i>n</i> = 705</li> <li>▪ <b>Risk Ratio (RR):</b> 0.37</li> <li>▪ <b>CI:</b> 95% CI 0.12 to 1.09, <i>p</i> = .07</li> <li>▪ <b>Heterogeneity</b> <ul style="list-style-type: none"> <li>• Tau<sup>2</sup> = 0.8</li> <li>• Chi<sup>2</sup> = 16.9</li> <li>• df = 2 (<i>p</i> = .3)</li> <li>• I<sup>2</sup> = 5.31%</li> </ul> </li> </ul> </li> </ul>
<b>Discussion</b>	<p><b>Summary of evidence</b></p> <ul style="list-style-type: none"> <li>▪ Authors note all studies favor antibiotic ear drops over other interventions.</li> <li>▪ The difference between treatments was large, in favor of ear drops.</li> <li>▪ Inconclusive evidence that antibiotic ear drops are more effective than saline rinsing.</li> </ul>



***Critically Appraised Topic (CAT):***  
***Acute Otitis Media (AOM) Tympanostomy Antibiotics***

	<b>Limitations</b> <ul style="list-style-type: none"><li>▪ Quality of evidence</li></ul>
<b>Funding</b>	<b>Funding</b> <ul style="list-style-type: none"><li>▪ Five studies received financial support or were directly funded by pharmaceutical companies.</li><li>▪ Pharmaceutical companies provided the study medication in two studies.</li><li>▪ One study received governmental funding.</li><li>▪ One study was performed without funding.</li></ul>

### References

- Dohar, J., Giles, W., Roland, P., Bikhazi, N., Carroll, S., Moe, R., Reese, B., Dupre, S., Wall, M., & Stroman, D. (2006). Topical ciprofloxacin/dexamethasone superior to oral amoxicillin/clavulanic acid in acute otitis media with otorrhea through tympanostomy tubes. *Pediatrics*, 118(3), e561-e569.
- Goldblatt, E. L., Dohar, J., Nozza, R. J., Nielsen, R. W., Goldberg, T., Sidman, J. D., & Seidlin, M. (1998). Topical ofloxacin versus systemic amoxicillin/clavulanate in purulent otorrhea in children with tympanostomy tubes. *International Journal of Pediatric Otorhinolaryngology*, 46(1-2), 91-101.
- Gupta, M., Singh, S., Singh, H., & Chauhan, B. (2014). To study the role of antibiotic+steroid irrigation of the middle ear in active chronic otitis media with small perforation and pulsatile discharge [Article]. *B-ENT*, 10(1), 35-40.  
<https://www.embase.com/search/results?subaction=viewrecord&id=L373340912&from=export>
- Heslop, A., Lildholdt, T., Gammelgaard, N., & Ovesen, T. (2010). Topical ciprofloxacin is superior to topical saline and systemic antibiotics in the treatment of tympanostomy tube otorrhea in children: the results of a randomized clinical trial. *The Laryngoscope*, 120(12), 2516-2520.
- Hullegie, S., Venekamp, R. P., Van Dongen, T. M. A., Mulder, S., Van Schaik, W., De Wit, G. A., Hay, A. D., Little, P., Moore, M. V., Sanders, E. A. M., Bonten, M. J. M., Bogaert, D., Schilder, A. G. M., & Damoiseaux, R. A. M. J. (2021). Topical or oral antibiotics for children with acute otitis media presenting with ear discharge: Study protocol of a randomised controlled non-inferiority trial [Article]. *BMJ Open*, 11(12). <https://doi.org/10.1136/bmjopen-2021-052128>
- Spektor, Z., Pumarola, F., Ismail, K., Lanier, B., Hussain, I., Ansley, J., Butehorn, H. F., Esterhuizen, K., Byers, J., Douglass, F., Lansford, B., & Hernández, F. J. (2017). Efficacy and safety of ciprofloxacin plus fluocinolone in otitis media with tympanostomy tubes in pediatric patients: A randomized clinical trial [Article]. *JAMA Otolaryngology - Head and Neck Surgery*, 143(4), 341-349. <https://doi.org/10.1001/jamaoto.2016.3537>
- Steele, D. W., Adam, G. P., Di, M., Halladay, C. W., Balk, E. M., & Trikalinos, T. A. (2017). Prevention and treatment of tympanostomy tube otorrhea: A meta-analysis [Article]. *Pediatrics*, 139(6). <https://doi.org/10.1542/peds.2017-0667>
- Syed, M. I., Suller, S., Browning, G. G., & Akeroyd, M. A. (2013). Interventions for the prevention of postoperative ear discharge after insertion of ventilation tubes (grommets) in children [Review]. *Cochrane Database of Systematic Reviews*, 2013(4). <https://doi.org/10.1002/14651858.CD008512.pub2>
- Van Dongen, T. M. A., Schilder, A. G. M., Venekamp, R. P., De Wit, G. A., & Van Der Heijden, G. J. M. G. (2015). Cost-effectiveness of treatment of acute otorrhea in children with tympanostomy tubes [Article]. *Pediatrics*, 135(5), e1182-e1189. <https://doi.org/10.1542/peds.2014-3141>
- Van Dongen, T. M. A., Van Der Heijden, G. J. M. G., Venekamp, R. P., Rovers, M. M., & Schilder, A. G. M. (2014). A trial of treatment for acute otorrhea in children with tympanostomy tubes [Article]. *New England Journal of Medicine*, 370(8), 723-733. <https://doi.org/10.1056/NEJMoa1301630>
- Venekamp, R. P., Javed, F., van Dongen, T. M., Waddell, A., & Schilder, A. G. (2016). Interventions for children with ear discharge occurring at least two weeks following grommet (ventilation tube) insertion [Article]. *The Cochrane database of systematic reviews*, 11, CD011684.  
<https://www.embase.com/search/results?subaction=viewrecord&id=L615180902&from=export>

**Appendix**

Evidence to Decision Assessment for XXXX

<b>Problem</b> Is the problem a priority?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>
<ul style="list-style-type: none"> <li>○ No</li> <li>○ Probably no</li> <li>○ Probably yes</li> <li>● Yes</li> <li>○ Varies</li> <li>○ Don't know</li> </ul>	<p>Roughly 80% of all children will experience otitis media during their lifetime, and between 80-90% of all children will have otitis media with an effusion before school age. There is an increased risk of tympanic membrane perforation with AOM, particularly in children with a history of infections (Pelton &amp; Tahtinen, 2022). Additionally, the most common cause of children with tympanostomy tube otorrhea is AOM (Schmelzle et al., 2008). <b>Fifty-one percent of children with tympanostomies experience ≥1 episode of otorrhea (Steele et al., 2017).</b></p>	
<b>Desirable Effects</b> How substantial are the desirable anticipated effects?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>
<ul style="list-style-type: none"> <li>○ Trivial</li> <li>○ Small</li> <li>● Moderate</li> <li>○ Large</li> <li>○ Varies</li> <li>○ Don't know</li> </ul>	<p><b>Resolution of ear discharge at one week</b> The systematic review by Venekamp et al. (2016) found one RCT (Heslop et al., 2010) that measured resolution of ear discharge at one week, (<math>N = 42</math>). For the outcome of resolution, the results indicated the intervention of antibiotic ear drops (with or without corticosteroids) was favorable to the comparator of oral antibiotics, <math>OR = 2.58</math>, 95% CI [1.27, 5.22], <math>p</math>-value = 0.01.</p> <p><b>Resolution of ear discharge at two to four weeks</b> The systematic review by Venekamp et al. (2016) found two RCTs (Dohar et al., 2006; Van Dongen et al., 2014) that measured resolution of ear discharge at two to four weeks (<math>N = 232</math>). For the outcome of resolution, the results indicated the intervention of antibiotic ear drops (with corticosteroids) was favorable to the comparator of oral antibiotics, <math>OR = 1.59</math>, 95% CI [1.35, 1.88], <math>p</math>-value &lt; .0001.</p> <p><b>Relative effectiveness</b> The network meta-analysis by Steele et al. (2017) measured relative effectiveness of different treatments for otorrhea in patients with tympanostomy tubes, (<math>N = 7</math> Studies). For the outcome of relative effectiveness, the results indicated the intervention of antibiotic ear</p>	

***Critically Appraised Topic (CAT):  
Acute Otitis Media (AOM) Tympanostomy Antibiotics***

	drops (with or without corticosteroids) was favorable to the comparator of oral antibiotics, <i>OR</i> = 5.30, 95% CI [1.20, 27].	
<b>Undesirable Effects</b> How substantial are the undesirable anticipated effects?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>
<ul style="list-style-type: none"> <li>○ Large</li> <li>○ Moderate</li> <li>○ Small</li> <li>● Trivial</li> <li>○ Varies</li> <li>○ Don't know</li> </ul>	<b><i>Adverse events</i></b> The systematic review by Venekamp et al. (2016) found three RCTs (Dohar et al., 2006; Goldblatt et al., 1998; Van Dongen et al., 2014) that measured adverse events, ( <i>n</i> = 232). For the outcome of adverse events, the results indicated the intervention of antibiotic ear drops (with and without corticosteroids) was not different to the comparator of oral antibiotics, <i>OR</i> = 0.37, 95% CI [0.12, 1.09], <i>p</i> -value = .07.	Treatment failure and recurrence
<b>Certainty of evidence</b> What is the overall certainty of the evidence of effects?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>



<ul style="list-style-type: none"> <li>• Very low</li> <li>○ Low</li> <li>○ Moderate</li> <li>○ High</li> <li>○ No included studies</li> </ul>	<p><b>Certainty Of The Evidence For Resolution of ear discharge at one week.</b> The certainty of the body of evidence was very low. The body of evidence was assessed to not have serious inconsistency nor indirectness, however was assessed to have serious risk of bias and serious imprecision. Risk of bias was serious due to lack of blinding in the study which could have affected outcome assessment. Imprecision was serious due the low number of events (<math>n = 23</math>) and subjects (<math>N = 42</math>). As only one study, Heslop et al. (2010), was identified to answer this question, consistency could not be assessed.</p> <p><b>Certainty Of The Evidence For Resolution of ear discharge at one week.</b> The certainty of the body of evidence was low. The body of evidence was assessed to not have serious inconsistency nor indirectness, however, was assessed to have serious risk of bias and serious imprecision. Risk of bias was serious due to lack of blinding in the study which could have affected outcome assessment. Imprecision was serious due to the low number of subjects (<math>N = 232</math>).</p> <p><b>Certainty Of The Evidence For Resolution of ear discharge at one week.</b> The certainty of the body of evidence was low. The body of evidence was assessed to not have serious imprecision nor indirectness, however, was assessed to have serious risk of bias and serious inconsistency. Risk of bias was serious due to the lack of blinding in the study which could have affected the outcome assessment. Imprecision was serious as evidenced by the substantial heterogeneity <math>I^2=88\%</math>.</p> <p><b>Certainty Of The Evidence For Resolution of ear discharge at one week.</b> The certainty of the body of evidence was very low. The body of evidence was assessed to not have serious inconsistency, however, was assessed to have serious risk of bias, serious indirectness, and serious imprecision. The risk of bias was serious due to the lack of blinding in the study which could have affected the outcome assessment. Indirectness was serious due to the study being a network meta-analysis and imprecision was serious due to the wide confidence interval.</p>	
<p><b>Values</b> Is there important uncertainty about or variability in how much people value the main outcomes?</p>		
<p><b>JUDGEMENT</b></p>	<p><b>RESEARCH EVIDENCE</b></p>	<p><b>ADDITIONAL CONSIDERATIONS</b></p>
<ul style="list-style-type: none"> <li>○ Important uncertainty or variability</li> <li>• Possibly important uncertainty or variability</li> </ul>		<p>Some providers (e.g. Antimicrobial Stewardship) may weigh more heavily the risk of adverse drug events, side effects, and antimicrobial resistance. Some</p>

***Critically Appraised Topic (CAT):  
Acute Otitis Media (AOM) Tympanostomy Antibiotics***

<ul style="list-style-type: none"> <li>○ Probably no important uncertainty or variability</li> <li>○ No important uncertainty or variability</li> </ul>		parents/families of patients may weigh more heavily the risk of treatment failure. Risk aversion
---	--	--

**Balance of effects**

Does the balance between desirable and undesirable effects favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li>○ Favors the comparison</li> <li>○ Probably favors the comparison</li> <li>○ Does not favor either the intervention or the comparison</li> <li>○ Probably favors the intervention</li> <li>● Favors the intervention</li> <li>○ Varies</li> <li>○ Don't know</li> </ul>	Evidence is limited but favors the intervention of ear drops	

**Resources required**

How large are the resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li>○ Large costs</li> <li>○ Moderate costs</li> <li>○ Negligible costs and savings</li> <li>● Moderate savings</li> <li>○ Large savings</li> <li>○ Varies</li> <li>○ Don't know</li> </ul>	At two weeks, the mean total cost per patient is \$42.43 for antibiotic-glucocorticoid eardrops, \$70.60 for oral antibiotics, and \$82.03 for initial observation. At six months, the mean total cost per patient was \$368.20, \$420.73, and \$640.44, respectively. (Dongen et al., 2015)	

**Certainty of evidence of required resources**

What is the certainty of the evidence of resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<ul style="list-style-type: none"> <li>○ Very low</li> <li>○ Low</li> <li>○ Moderate</li> <li>○ High</li> <li>● No included studies</li> </ul>		Recent price drop of ear drops



***Critically Appraised Topic (CAT):  
Acute Otitis Media (AOM) Tympanostomy Antibiotics***

<b>Cost effectiveness</b> Does the cost-effectiveness of the intervention favor the intervention or the comparison?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>
<ul style="list-style-type: none"> <li>○ Favors the comparison</li> <li>○ Probably favors the comparison</li> <li>○ Does not favor either the intervention or the comparison</li> <li>○ Probably favors the intervention</li> <li>● Favors the intervention</li> <li>○ Varies</li> <li>○ No included studies</li> </ul>	At two weeks, the mean total cost per patient is \$42.43 for antibiotic-glucocorticoid eardrops, \$70.60 for oral antibiotics, and \$82.03 for initial observation. At six months, the mean total cost per patient was \$368.20, \$420.73, and \$640.44, respectively. (Dongen et al., 2015)	
<b>Equity</b> What would be the impact on health equity?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>
<ul style="list-style-type: none"> <li>○ Reduced</li> <li>○ Probably reduced</li> <li>○ Probably no impact</li> <li>○ Probably increased</li> <li>○ Increased</li> <li>○ Varies</li> <li>● Don't know</li> </ul>		Issues with patients taking antibiotics Cost issues may affect access for some families
<b>Acceptability</b> Is the intervention acceptable to key stakeholders?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>
<ul style="list-style-type: none"> <li>○ No</li> <li>○ Probably no</li> <li>● Probably yes</li> <li>○ Yes</li> <li>○ Varies</li> <li>○ Don't know</li> </ul>		
<b>Feasibility</b> Is the intervention feasible to implement?		
<b>JUDGEMENT</b>	<b>RESEARCH EVIDENCE</b>	<b>ADDITIONAL CONSIDERATIONS</b>

***Critically Appraised Topic (CAT):  
Acute Otitis Media (AOM) Tympanostomy Antibiotics***

<ul style="list-style-type: none"> <li><input type="radio"/> No</li> <li><input type="radio"/> Probably no</li> <li><input type="radio"/> Probably yes</li> <li><input type="radio"/> Yes</li> <li><input checked="" type="radio"/> Varies</li> <li><input type="radio"/> Don't know</li> </ul>		Availability issue cost prohibitive when not covered by insurance
---	--	---

CONCLUSIONS

**Recommendation**

A **conditional** recommendation is made **for** the use of ear drops over oral antibiotics for patients with tympanostomy tubes, based on the GRADE Evidence to Decision instrument.