Primary care management of otitis media among Australian children

Hasantha Gunasekera, Tony E O’Connor, Shyan Vijayasekaran and Christopher B Del Mar

Otitis media has been prevalent among children throughout history. Australian Aboriginal children experience otitis media from a younger age,1 more frequently, for longer periods and with more complications than other children around the world.2 Otitis media is also a major cause of morbidity among non-Indigenous children: it affects nearly every child at least once,3 and is one of the most common causes of health care presentations,4 antibiotic prescriptions,5 and hearing impairment in children.6

Acute otitis media (AOM) is one of the most common reasons for severe pain in infants and children. Nearly everyone is affected in childhood, usually by 1 year of age. AOM is an inflammatory process in the middle ear, often following a day or two after an acute respiratory infection. Pain is thought to be due to obstruction of the eustachian tube and consequent changes in pressure that stimulate stretch receptors in the tympanic membrane. Infants poorly localise the pain, so it is standard clinical practice to examine the tympanic membranes of all febrile and distressed infants in primary care. However, it can be hard to visualise the membranes in unhappy infants, and diagnosis is often difficult.

Another consequence of AOM is persistent middle ear effusion causing conductive hearing impairment.8 This hearing loss is often not appreciated by parents, carers and clinicians, and may result in speech, language, and learning delays and behaviour problems.

Management of acute otitis media

Box 1 provides a summary of treatment options for AOM among Indigenous and non-Indigenous patients.

Antibiotic therapy

The microbiological pathophysiology of AOM suggests that antibiotic therapy should be effective by treating any bacteria underlying the inflammation. However, middle ear inflammation is not always accompanied by bacterial infection. Often, only viruses, and no potential pathogens, are found.9 Randomised trials comparing antibiotic therapy with controls yield very disappointing results. In most cases, antibiotic therapy makes no difference to the resolution of the pain within 24 hours, and over the following few days, most (15 out of 16 patients) gain no reduction of pain.11 Antibiotic therapy makes no difference to persistent conductive hearing loss caused by middle ear effusion. Its marginal benefits are offset by the common (although usually mild) adverse effects of antibiotics, such as diarrhoea, rashes and abdominal pain (in one in 24).11

A search for subgroups of children who might benefit from antibiotics using meta-analysis of individual patients (rather than of the different trials) found that antibiotic therapy was more likely to be successful among children under 2 years of age with bilateral otitis media and those with discharging ears.11 However, 85% of cases of AOM resolve within a week with no treatment (Box 2). Indigenous Australian children are an exception: the Office for Aboriginal and Torres Strait Islander Health national guidelines recommend treatment of all Indigenous children with AOM with antibiotics at the initial visit.7

The unimpressive benefits of antibiotic therapy, combined with increasing anxiety about antibiotic resistance in the community, have led to decreasing antibiotic prescribing among many general practitioners.12 But there is now a void in the options for the management of AOM.

Non-steroidal anti-inflammatory drugs

Addressing the pain with analgesic anti-inflammatory drugs makes sense clinically. However, there is limited evidence for their use for AOM specifically. Effectiveness is likely to be generalisable from evidence for treatment of the less acutely painful condition of non-specific common cold.14 There is surprisingly little evidence to support the use of paracetamol to reduce fever or pain in AOM, but some evidence that it has an analgesic effect in other conditions.15

Corticosteroids

Steroids are used in many medical settings to reduce inflammation, although there is concern about their use in life-threatening...
infections due to their immunosuppressive effects. Although there is some evidence suggesting that corticosteroids are effective for treating several acute respiratory infections,\textsuperscript{16,17} there is limited evidence to support their use for otitis media.\textsuperscript{18}

**Topical analgesics**

A traditional home remedy for the pain of AOM is warmed olive oil introduced into the external ear canal to soothe the painful ear drum. Several proprietary preparations are used for this (more commonly in the United States than Australia), but the evidence for this treatment is too scant to be sure that it is effective.\textsuperscript{19}

**Xylitol**

Xylitol is a low-kilojoule sugar alternative with antibacterial activity used in some chewing gums to reduce dental caries.\textsuperscript{20} It has been trialled as a preventive for AOM (with the thinking that the chewing action and xylitol would both help) and shown to be effective.\textsuperscript{21} However, evidence from more studies will be required before this can become standard practice, and chewing gum is not possible for young infants.

**Tympanostomy tubes**

Tympanostomy tubes (also known as ventilation tubes or “grommets”) are recommended for the treatment of recurrent AOM.\textsuperscript{22} Tympanostomy tube placement for AOM reduces recurrence rates in comparison to a course of antibiotic therapy. However, consensus has not been achieved regarding the number of episodes that constitutes clinically significant recurrent AOM. The current recommendation for tympanostomy tube placement is three or more separate episodes of AOM in 6 months, or four or more episodes in 12 months.\textsuperscript{23}

**Management of otitis media with effusion (glue ear)**

Most new middle ear effusions clear spontaneously within 3 months, and there is no evidence to support the immediate use of antibiotic therapy following a new diagnosis of otitis media with effusion (OME).\textsuperscript{24} For these reasons, the Australian Therapeutic guidelines: antibiotic\textsuperscript{8} and American Academy of Pediatrics guidelines\textsuperscript{25} recommend observation for children with OME who do not have other risk factors, such as speech and language delays (Box 3). There is no evidence of sustained benefit from oral or topical steroids.\textsuperscript{26} Similarly, decongestants and antihistamines are of no benefit, can cause gastrointestinal or central nervous system side effects, and are not recommended. It is therefore not surprising that screening for OME has not been shown to provide any tangible benefits in the developed world.\textsuperscript{27}

For children with effusions persisting for 3 months, the rate of spontaneous resolution is only about 20% over the next 3 months. In this situation, long-term oral antibiotics (2–4 weeks) may have a modest benefit.\textsuperscript{28,29} An alternative therapy with low cost, low risk of harm and with potential benefit is auto-inflation. This is essentially any action that reproduces a Valsalva manoeuvre, such as forced exhalation with closed mouth and nose, or blowing up a balloon.
The critical period for tympanostomy tubes is when children are young, before school entry and when language skills are being developed. Recurrent and prolonged otitis media may result in poorer receptive and expressive language skills, and surgical intervention may improve these children’s quality of life. The long-term effects of tympanostomy tubes may be considered in children with mild hearing impairments (≤ 30 dB) on speech, language, cognition and school performance are disappointing. However, these data were obtained from the developed world, where populations have lower otitis media burdens than do disadvantaged populations, such as Australian Aboriginal children; this makes generalisation to the Indigenous Australian setting problematic.

The critical period for tympanostomy tubes is when children are young, before school entry and when language skills are being developed. Recurrent and prolonged otitis media may result in poorer receptive and expressive language skills, and surgical intervention may improve these children’s quality of life. The benefits need to be balanced against the risks, which include the risks associated with anaesthesia, tympanosclerosis, and persistent perforation with or without otorrhoea. Chronic perforations occur in 2% of children after short-term tympanostomy tubes and in up to 17% of children with long-term tubes. Tympanostomy tubes are a common cause of chronic ear discharge.

In addition to tympanostomy tubes and the other management options described above, the parents, carers and teachers of children with OME must be made aware of the likely hearing impairment and the potential impact on behaviour. This can be ameliorated by preferential seating, non-verbal cues, and reduced background noise. Amplification devices are an option for children with severe and prolonged hearing impairment. These devices can be obtained from Australian Hearing following review by an otolaryngologist.

Management of chronic suppurative otitis media

Chronic suppurative otitis media should be treated with ear cleaning (‘ear toilet’) and topical antibiotics. Ear cleaning can be achieved using tissue spears (dry mopping) or with povidone–iodine (Betadine) washouts. Ciprofloxacin drops are listed on the Pharmaceutical Benefits Scheme for Aboriginal and Torres Strait Islander children with chronic suppurative otitis media, but are not currently listed for non-Indigenous children. Ciprofloxacin drops have an advantage over dexamethasone–fracycecin–gramicidin (Sofradex) drops as they are not ototoxic. If it is not clear whether the discharge is acute or chronic, the best option is to treat as for AOM with perforation — ear cleaning, topical antibiotic therapy and 14 days of oral amoxycillin. If the discharge has been present for over 2 weeks, the evidence for oral antibiotic therapy is weak. Trimethoprim–sulfamethoxazole has been shown to increase resolution rates in the short term, but by 6 weeks there was no difference between those treated with topical therapy plus oral antibiotics compared with topical therapy alone.

Vaccination

Streptococcus pneumoniae and Haemophilus influenzae are two of the commonest bacterial pathogens involved in otitis media. Pneumococcal vaccination has been shown to reduce the rates of otitis media and tympanostomy tube insertion. However, these results were not as dramatic as expected, possibly due to infection by non-vaccine serotypes of pneumococci (‘serotype replacement’) or non-typeable H. influenzae (not covered by the H. influenzae

3 Flowchart of management options for children with otitis media

![Flowchart image](image-url)
### 4 Guidelines for referral to an ear, nose and throat specialist for otitis media

**Acute otitis media**
- **Elective referral**
  - Recurrent acute otitis media with three or more episodes in 6 months or four or more episodes in 12 months
- **Emergency referral**
  - Failure to respond to two courses of oral antibiotic therapy with persisting symptoms (eg, high fever or intractable pain)
  - Complications of otitis media (eg, mastoiditis, facial nerve paralysis, meningitis, intracranial abscess or lateral sinus thrombosis)

**Otitis media with effusion**
- **Elective referral**
  - Middle ear effusion for 3 months or more with associated symptoms of hearing loss or speech and language delay
  - Hearing loss > 30 dB with symptoms of speech delay, educational impairment or behavioural symptoms
  - Significant retraction pocket in tympanic membrane

**Chronic suppurative otitis media**
- **Elective referral**
  - Persistent perforation of tympanic membrane, recurrent ear discharge, or retraction of tympanic membrane
  - Suspected cholesteatoma

**Emergency referral**
- Development of complications of chronic suppurative otitis media or cholesteatoma (as for complications of acute otitis media)

**Children with conditions predisposing to otitis media**
- **Elective referral**
  - Down syndrome, cleft palate or craniofacial syndromes (eg, Apert syndrome and Crouzon syndrome). Patients with these conditions have high rates of otitis media and hearing loss, which may be missed to due to the complex nature of their problems

### Indications for specialist referral in otitis media

The sequelae of otitis media include language and learning delay and, less commonly, mastoiditis, facial nerve paralysis, meningitis, intracranial abscess, and lateral sinus thrombosis. Any illness not progressing towards resolution as expected, even when the child is taking a course of antibiotics, should be a trigger for considering specialist referral (Box 4).

### Competing interests
None identified.

### Author details
Hasantha Gunasekera, DCH, FRACP, MiPH(Hons), General Paediatrician, and Clinical Lecturer

Tony E O’Connor, AFRCSI, FRCS(ORL-HNS), Fellow in Paediatric Otolaryngology
Shyan Vijayasekaran, MBBS, FRACS, Otolaryngologist, and Clinical Associate Professor

Christopher B Del Mar, MD, FRACGP, Dean
1. General Medicine, Children’s Hospital at Westmead, Sydney, NSW.
2. School of Public Health, University of Sydney, Sydney, NSW.
3. Princess Margaret Hospital for Children, Perth, WA.
4. School of Surgery, University of Western Australia, Perth, WA.
5. Faculty of Health Sciences and Medicine, Bond University, Gold Coast, QLD.

Correspondence: hasanthg@chw.edu.au

### References