Ear Problems in Children

Chronic otitis media has life-long impacts

Appropriate diagnosis and treatment of ear infections can reduce permanent hearing disability and serious complications

Case Definitions

Otitis Media (OM)

All forms of inflammation and infection of the middle ear. Active inflammation or infection is nearly always associated with a middle ear effusion.

Acute Otitis Media without Perforation (AOMwoP)

Presence of fluid behind the eardrum plus at least one of: bulging eardrum, red eardrum, ear pain or irritability.

Acute Otitis Media with Perforation (AOMwiP)

Discharge of pus through a perforation in the eardrum for less than 2 weeks.

Otitis Media with Effusion (OME, "glue ear")

Presence of fluid behind the eardrum without any acute symptoms. It may be *episodic* (<3 months) or *persistent* (>3 months). Signs include reduced mobility of the eardrum on pneumatic ostoscopy or a type B tympanogram.

Recurrent Acute Otitis Media (rAOM)

3 or more episodes of AOM in a 6 month period, or 4 or more episodes in 12 months.

Chronic Suppurative Otitis Media (CSOM)

Persistent ear discharge through an easily visible perforation in the ear drum for over 2 weeks.

Dry Perforation

Perforation in the ear drum without any discharge or fluid behind the eardrum.

Tympanostomy Tube Otorrhoea (TTO)

Middle ear discharge through tympanostomy tubes (grommets). It may be early post-operative (within 4 weeks of TT insertion), delayed (after 4 weeks of TT insertion), chronic (persisting 3 months or longer) or recurrent (3 or more discrete episodes).

Cholesteatoma

An abnormal growth of skin into the middle ear, which continues to grow eventually causing erosion of surrounding structures resulting in hearing loss, facial paralysis or intracranial complications (it can sometimes cause death).

Otitis Externa

Infection of the ear canal associated with pain, swelling and discharge. In bacterial infection, the ear canal is inflamed, red and swollen. In fungal infection, there is typically fungal debris in the ear canal (white fungus is usually *Candida albicans* and black fungus *Aspergillus niger*).

Mastoiditis

A serious complication of otitis media where there is infection of the mastoid air cells (behind the ear). Symptoms can include pain/tenderness/swelling behind the ear and headache. Seizures can occur if associated with a brain abscess.

Compacted Wax

An accumulation of earwax that causes symptoms, prevents assessment of the ear, or both.

Preventing Ear Infections

Advice for caregivers:

- Breastfeeding: encourage exclusive breastfeeding for 6 months
- Hygiene: keep sick children away from babies; regular face and handwashing
- Vaccination: as per schedule including pneumococcal and influenza
- Smoking: promote smoking cessation; no smoking around children including at home or inside enclosed spaces
- Education: attend clinic as soon as child develops ear pain or discharge; untreated ear infections can cause chronic infections, problems in development and permanent hearing loss

Surveillance

Check ears of all children at every clinic visit

- Otoscopy should be performed on every child at every visit. Consider arranging tympanometry and audiometry to help diagnose ear problems
- This is particularly important for children **under 5 years** old as these are critical years of development
- Check past clinical records for previous history of ear problems to make accurate diagnoses and identify chronic problems
- Refer for diagnostic audiology if there are parental or teacher concerns about hearing, behavior or learning or as otherwise indicated

Principles of Management

- Make an accurate diagnosis by assessing the eardrum with an otoscope: use syringing and/or dry mopping if required to obtain a clear view of the eardrum (see Appendix 1)
- If perforation present, document size & location of perforation, as well as duration of discharge
- Vigilant follow up is required in chronic ear infections
- If unsure of the diagnosis or condition is not improving despite appropriate treatment, discuss with senior doctor +/- Ear Nose & Throat specialist (ENT)

Therapeutic Protocols

AOM without Perforation (AOMwoP)

- Analgesia: paracetamol 15mg/kg 4-6 hourly for pain (max 4 doses per 24 hours)
- Antibiotics: **should be used** (as Aboriginal children are at high risk of CSOM)

Amoxicillin 25mg/kg twice daily for 7 days

(max dose 1g/dose) or single dose azithromycin 30mg/kg (max 1g) if adherence difficult or no fridge

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Follow up:

- Review at 4-7 days: if persisting bulging ear drum increase amoxicillin to 45mg/kg twice daily for 7 days, or give 2nd dose azithromycin
- Follow up at least weekly & then 3 months after resolution

AOM with Perforation (AOMwiP)(<2 weeks discharge)

- Remove pus from canal by dry mopping with tissue and/or syringing with dilute betadine (see Appendix 1)
- Analgesia: paracetamol 15mg/kg 4-6 hourly for pain (max 4 doses per 24 hours)
- Antibiotics: should be used in all children

Amoxicillin 25mg/kg twice daily for 14 days
(max dose 1g/dose) or single dose azithromycin 30mg/kg (max 1g) if adherence difficult or no fridge

Follow up:

- Review at 7 days or earlier if no better
- If discharge or bulging ear drum persists: increase amoxicillin to 45mg/kg twice daily for 7 days (or second single dose azithromycin), review adherence, and add ciprofloxacin (Ciloxan 0.3%) ear drops 5 drops twice daily after dry mopping or syringing (see Appendix 2)
- Follow up weekly (add to recall system)
- If discharge persists > 2 weeks through a persistent and easily visible perforation despite appropriate treatment for AOM, then begin treatment for CSOM
- If discharge and bulging ear drum resolves, review weekly for 4 weeks, and then at 3 months for persistent OME

Episodic OME (<3 months)

- If concerns about significant language, learning, behavioural or developmental problems: refer for diagnostic audiology, ENT assessment, paediatric assessment & speech pathology
- If none of above concerns: no investigation or treatment required, document diagnosis, recall for review at 3 months to ensure resolution & provide education to carers

Persistent OME (>3 months)

- If concerns about significant language, learning, behavioural or developmental problems: refer to ENT (including diagnostic audiology), paediatricians & speech pathology
- If none of above concerns: consider **a single course** of Amoxicillin 25mg/kg twice daily for 2-4 weeks and review. If resolved after antibiotics then review regularly
- If not resolved: refer to ENT if bilateral OME > 3 months, or unilateral OME > 6 months. Provide education on communication strategies to caregivers (see HEARING HEALTH protocol)

Recurrent AOM (rAOM)

- Educate caregivers about importance of treatment of each episode, likely hearing loss & need to attend clinic if concerns about language development
- Refer to ENT for consideration of grommets/adenoidectomy if ≥4 episodes in 12 months
- Long-term prophylactic antibiotics may be considered **on discussion with regional paediatricians** for children <2 years at risk of AOMwiP or CSOM (usually amoxicillin 25-50mg/kg/day 1-2 times per day for 3-6 months). Refer to ENT if failure to improve on long-term antibiotics
- If clinician or caregiver concerns regarding long term antibiotic course or adherence, refer the child to ENT

Chronic Suppurative Otitis Media (CSOM)

Educate caregivers –
Antibiotic drops and ear cleaning may be required for prolonged periods, sometimes for week to months to treat the condition and reduce permanent hearing loss

- Cleaning: clean the ear canal by dry mopping or syringing with dilute betadine (see Appendix 1). Syringing should be used initially if pus is thick or TM cannot be seen
- Topical antibiotics: ciprofloxacin (Ciloxan 0.3%) ear drops (5 drops, twice a day, with tragal pumping) after dry mopping until ear has been dry for at least 3 days (see Appendix 2)
- Refer for diagnostic audiology at diagnosis
- Review: weekly until signs of CSOM resolved, and then at 4 weeks to ensure ear still dry. Consider taking a charcoal swab for MC&S if not resolved at first review
- Refer to ENT if ear discharge continues for >2 months despite appropriate management
- Attic perforation: anyone with an attic perforation or persistent crusting or granulation in the attic area of the eardrum should be referred urgently to ENT to investigate for cholesteatoma

Follow up:

- The primary health clinic is responsible for active management and follow up of CSOM, even when child is referred to ENT
- Refer to speech pathology if language, learning or behavioural problems at diagnosis

Dry Perforation

- Advise caregiver to attend clinic if any discharge or ear pain
- Refer for diagnostic audiology at diagnosis
- Refer to ENT if persists >3 months, if there is significant hearing loss (>20dB), if there is recurrent infections, or if there is significant language delay

Tympanostomy Tube Otorrhoea (TTO)

- Cleaning: by dry mopping or syringing (see Appendix 1)
- Keep ear dry during acute episode (advise no swimming and use of ear plugs in shower)
- Topical antibiotics: ciprofloxacin (Ciloxan 0.3%) ear drops 5 drops twice daily for 7 days (see Appendix 2)
- Review: weekly for 4 weeks; take a charcoal swab for MC&S if persistent discharge despite treatment
- If continuous discharge for 4 weeks: amoxicillin with clavulanate 45mg/kg (amoxicillin component) twice daily for 7 days; refer to ENT and diagnostic audiology
- If intermittent or recurrent for more than 3 months:

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continue ciprofloxacin (Ciloxan 0.3%) drops as indicated and refer to ENT (see Appendix 2)
- If bleeding: suggests polyp & inflammation. Discuss with ENT to consider ciprofloxacin hydrocortisone (Ciproxin HC) ear drops

Cholesteatoma

Cholesteatoma should be suspected if: persistent ear discharge that does not settle with appropriate antibiotic treatment (especially if unilateral), perforation in the attic area of the eardrum, or symptoms of deeper invasion such as vertigo, facial weakness or intracranial infection.

If cholesteatoma is suspected: patient requires urgent ENT review (discuss with on-call ENT).

Mastoiditis

Suspect mastoiditis if there is pain, swelling or redness behind the ear in an unwell child.
If suspected: discuss with on-call ENT and the on-call regional paediatrician as management involves admission for intravenous antibiotics +/- surgery with ENT.

Compacted Wax

Consider treatment if causing symptoms or if eardrum needs to be evaluated. Use wax softening drops such as Cerumol for at least 1-2 days, followed by gentle syringing (see Appendix 1). Syringing to remove compacted wax should not be performed if there is history of a non-intact eardrum or in those with previous ear surgery. Obstructive wax may be cautiously removed with syringing to obtain a better view of the eardrum in all children, unless there is a history of ear surgery (see Appendix 1).

Otitis Externa

- Analgesia: with paracetamol 15mg/kg prn 4-6 hourly (max 4 doses per 24 hours)
- Swab: take charcoal swab for MC&S
- Cleaning: by dry mopping with tissue spears (see Appendix 1)
- Topical anti-infective: choice is dependent on whether fungal infection is suspected and whether eardrum is intact – see Appendix 3 to aid decision
- Wick: a wick is recommended if the ear canal is narrow (see Appendix 4). Change wick every 48 hours
- In fungal OE with eardrum perforation: regular dry mopping with tissue spears and topical Clotrimazole 1% solution (Canestan) or Half Strength (5%) Betadine ear drops, 3 drops twice daily is recommended for 1-2 weeks
- Keep ear dry until 2 weeks after completion of treatment

Follow up:

- Review after 48-72 hours: if no improvement, reconsider diagnosis, consider fungal cause, consider wick (if not already inserted) or further aural toilet, assess adherence
- Consider malignant otitis externa, especially in diabetics, even at first presentation (malignant otitis externa occurs when infection invades the external auditory canal and skull base and can occur in immunocompromised patients – warrants urgent discussion with ENT by doctor)

Swimming

- In CSOM: do not discourage swimming
- In otitis externa: keep ear dry for 2 weeks after completion of treatment (use ear plugs designed to keep water out of ears when swimming)
- With grommets: use ear plugs for showering & swimming (disposable foam ear plugs can be used in the shower, but swimming ear plugs and a headband should be used for swimming)
- When swimming with an ear condition: swim with appropriate ear protection (as above) in a pool; swimming in creeks or rivers is not recommended

Refer / Discuss

- If unsure: discuss with experienced Aboriginal Health Practitioner, senior nurse or doctor
- Refer for diagnostic audiology, to ENT, paediatrician or speech pathologist according to clinical diagnosis
- Consider referral to environmental health services to manage some factors that increase the risk of otitis media (Environmental Health Referral Form or via MMEx)

Appendices

Appendix 1: Dry Mopping (tissue spearing) and Syringing
Tissue spearing: twist a tissue to create a spear (avoid using toilet paper). Ensure spear is not too thin and floppy or not too thick and unable to fit in the ear canal. Insert the spear gently into the ear canal. Leave for about 20 seconds and rotate whilst slowly removing. Repeat until clear. **Syringing:** fill a 20mL syringe with diluted betadine (1:20) or sterile water and attach 1-2cm of soft tubing (e.g. cut off an intravenous butterfly giving set). Point the tubing to the top of the ear canal and apply gentle pressure to the syringe plunger. The tubing should not pass the outer one-third of the ear canal. Use a container (e.g. specimen cup, kidney dish) placed under the ear to catch the water. Ensure the water temperature is not too warm or too cold by testing on your forearm prior to testing (ideal temperature is at body temperature). Stop if the patient experiences pain, vertigo, or bleeding and refer to doctor. **OtoClear® SprayWash Kit:** if your clinic has approved OtoClear for use, consider using this system with appropriate training for irrigation.

Appendix 2: Instilling ear drops
Fill ear canal with ear drops and apply pressure to the tragus of the ear to pump the drops through the perforation into the middle ear. Check expiry date and shelf-life before use.

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Appendix 3: Available Ear drops		
Ear Drop	**Indication**	**Dose**
Ciprofloxacin *(Ciloxan 0.3%)*	Bacterial infection (CSOM, otitis externa, AOMwiP). Can be used in eardrum perforation	5 drops, twice daily
Dexamethasone, framycetin, gramicidin *(Otodex, Sofradex)*	Bacterial otitis externa. Do not use in eardrum perforation	3 drops, three times a day
Flumethasone + clioquinol *(Locacorten-Vioform)*	Bacterial or fungal otitis externa. Do not use in eardrum perforation	3 drops, twice daily
Gramicidin, neomycin, nystatin, triamcinolone *(Otocomb otic, Kenacomb otic)*	Fungal otitis externa with eardrum intact. Do not use in ear drum perforation	3 drops, three times a day. Also available as ointment to coat wick
Ciprofloxacin, hydrocortisone *(Ciproxin HC)*	Polyps, Bacterial otitis externa. Can be used in eardrum perforation (but can be painful)	3 drops, twice daily (NB: not on PBS, will incur private cost to patient or clinic)
Clotrimazole 1% solution (*Canestan*)	Fungal otitis externa with TM perforation	3 drops, twice daily
Povidone-Iodine 5% solution (*Betadine 5%*)	Fungal otitis externa with TM perforation	3 drops, twice daily

Appendix 4: Inserting a wick
Pope (Merocel) ear wicks are recommended – they are made of compressed cellulose, which is thin enough to slip into the occluded ear canal and expands when wet. After a wick is inserted, water must be kept out of the ear and the patient must be instructed to use soft wax ear plugs when showering. The wick should be changed every 48 hours.

Appendix 5: Antibiotic dosing by weight		
Weight (kg)	**Amoxicillin 25mg/kg**	**Azithromycin 30mg/kg**
5	125mg (2.5mL) twice daily	150mg (3.75mL)
7	175mg (3.5mL) twice daily	210mg (5.25mL)
9	225mg (4.5mL) twice daily	270mg (6.75mL)
10	250mg (5mL) twice daily	300mg (7.5mL)
12	300mg (6mL) twice daily	360mg (9mL)
15	375mg (7.5mL) twice daily	450mg (11.25mL)
17	425mg (8.5mL) twice daily	510mg (12.75mL)
20	500mg (10mL) twice daily	600mg (15mL)
22	550mg (11mL) twice daily	660mg (16.5mL)
25	625mg (12.5mL) twice daily	750mg (18.75mL)
27	675mg (13.5mL) twice daily	810mg (20.25mL)
30	750mg (15mL) twice daily	900mg (22.5mL)

Resources

Menzies Otitis Media Guidelines 2017:
http://www.otitismediaguidelines.com/
The Otitis Media Guidelines App (free from App Store)

WACHS Ear Health Coordinators
West Kimberley: Joe Ghandour
(Joseph.Ghandour@health.wa.gov.au)
East Kimberley: Margie O'Neill
(Margie.O'Neill2@health.wa.gov.au)

KAMS Hearing Health Regional Facilitator
hearinghealthrf@kamsc.org.au

Diagnostic Audiology
In the Kimberley, diagnostic audiology is performed by:

- Audiologists accompanying ENT specialists on regional visits during ENT appointments
- Hearing Australia audiologists
  via Hearing Assessment Program – Early Ears (HAP-EE)
  HAP-EE Community Engagement Officer:
  (Azizah.Roe@hearing.com.au)
- Some local health services have other arrangements for visiting audiologists – check with your clinic manager

KAHPF Hearing Health Protocol
For the early identification and management of hearing loss