Aim

To promote the wellbeing and development of children by timely surveillance, screening and identification of childhood hearing impairment and/or ear disease.

To understand the importance of appropriate hearing function and the impact that hearing impairment has on the development and health of a child.

Risk

Unrecognised ear disease and/or unmanaged hearing impairment can have a significant effect on a child’s social, psychological development, educational progress and long term social and vocational outcomes.\(^1\text{-}^4\)

Background

Normal hearing is vital to the development and wellbeing of children, while a failure to recognise hearing impairment is known to increase vulnerability to learning difficulties and delays in achieving many early developmental milestones.\(^1\text{-}^4\) Responding to parental concerns and use of appropriate tools for hearing surveillance screening, enables early identification of deviations in ear health and/or hearing impairment to facilitate timely intervention.\(^4\text{-}^5\)

Data collected by the Australia Bureau of Statistics, (2012-2013) revealed that nationally, 3.6 per cent of non-Aboriginal children and young people aged 0 to 14 years have an ear disease and/or hearing problems, compared with 7.1 per cent of Aboriginal children.\(^6\)

This pattern of incidence was also shown in the 2015 Health of Aboriginal Children and Young People in Western Australia policy brief which identified that “Aboriginal children and young people are more than twice as likely to suffer ear diseases and hearing problems as non-Aboriginal children and young people”.\(^7\)

Children diagnosed with hearing loss within the first six months of life and provided with appropriate intervention and support are likely to acquire good communication skills and be well equipped to engage with the world. Children whose hearing loss is not identified at birth, or who acquire hearing loss later in life, may face a more uncertain outcome. Much will depend on when they are diagnosed, the choices their parents make, and the support they receive from school and from healthcare professionals.\(^8\)

Key Points

- Hearing surveillance screening should only be performed by community health staff who have undertaken appropriate training and been deemed competent in the procedures.
• New staff who have not had their clinical skills assessed should be supervised by a preceptor who provides guidance and advice to ensure they learn and adhere to the procedure. New staff attend orientation where they receive training and will have their clinical skills assessed (by this team) within 3 months.

• Audiometry and otoscopy are conducted by community health staff working in schools as part of the School Entry Health Assessment (SEHA).

• Aboriginal families who are identified as having additional needs are offered access to the Enhanced Aboriginal Child Health Schedule (EACHS) which includes a more comprehensive series of child health screening and surveillance assessments.

• Audiometry, otoscopy, tympanometry are conducted by community health staff at EACHS contacts.

• Ear health procedures are performed where ear health concerns are identified.

• Hearing risk factors are identified at each universal contact.

• Children with identified concerns are offered referral, liaison, and advocacy as required.

• Staff will conduct all screening in accordance with the appropriate procedure in the Community Health Manual accessed via the HealthPoint link or the Internet link.

Development of hearing

Auditory development in the foetus and infant has its own defined sequence. Structural parts of the ears develop in the first 20 weeks of gestation, and the neurosensory part of the auditory system develops primarily after 20 weeks' gestational age. The auditory system becomes functional at around 25 weeks' gestation, when the foetus is able to detect and interpret sounds heard in the womb. At birth, infants show a preference for their mother's voice. The neural connections required to receive, recognise and react to a range of sounds, such as language and music, are functioning between 28-30 weeks' gestational age. This process begins during the final 10-12 weeks of gestation and continues for several years after birth. Infants who have not been adequately exposed to a range of frequencies in utero will experience two months of language delay due to insufficient tuning of hair cells.

A child gradually learns how to integrate hearing into their developing language. From a very young age, children must be exposed to speech at close proximity for normal hearing acquisition to develop. Through this exposure, infants learn about a wide range of different sounds adding greatly to their understanding of their environment and capacity to interact with it in a meaningful way. The sounds an infant makes are also affected by what they hear.

Listening is the learned use of hearing. Listening skills include the ability to discriminate between the frequency, duration and rhythm of different sounds, hearing in the presence of background noise, accurate interpretation of the meaning of the sound and the ability to concentrate or pay attention. Table 1 describes the expected auditory responses in young children from birth to school entry.
Table 1: Expected auditory responses in young children\textsuperscript{11}

<table>
<thead>
<tr>
<th>Age</th>
<th>Expected hearing responses / development</th>
</tr>
</thead>
</table>
| Birth – 1 month | Startles or blinks at loud sound  
|              | May “corner” eyes reflexively to side of noise  
|              | Show preference to mother’s voice  |
| 1- 4 months  | Turns head or eyes to sound at ear level  
|              | May move head side to side if searching for sound source  
|              | Quieten or smile at sound of familiar voice before being touched  
|              | Babbles  
|              | Vocalises in synchrony to language of caregiver  |
| 6 – 9 months | Turns immediately to a familiar voice across the room  
|              | Listens to voice even if adult not in view  
|              | Locates sound made above and below ear level  |
| 12 months    | Knows and turns to own name  
|              | Locates sound in any direction  
|              | Begins sing-along familiar songs babbles loudly in conversational jargon  |
| 2 years      | Direct localisation of sounds to side, above and below  
|              | Says 50 or more recognisable words and puts 2 or more together to make a simple sentence  |
| School Entry | Have completely intelligible speech  |

**Hearing loss and disorders of the ear in early childhood**

Hearing loss is described as congenital or acquired, and then further categorised in to conductive, sensorineural or mixed, depending on which part of the auditory system is affected.

**Conductive hearing loss**

Disorders of the external or middle ear, result in the inability for sound to be conducted to the inner ear correctly, even though function of the auditory nerve is normal.\textsuperscript{12} Conductive hearing loss is usually acquired. The most common causes being; foreign object in ear canal, wax obstructions, foreign bodies, otitis media with effusion, and chronic suppurative otitis media. Most of these conditions can be treated and corrected by medical or surgical intervention.

Congenital anomalies of the pinna, tympanic membrane, external ear canal or ossicles may also lead to conductive hearing loss.\textsuperscript{12}
The degree of hearing loss is often in the slight to moderate range, however sometimes the structure of the outer ear or middle ear may have been permanently damaged, necessitating use of a hearing aid.12,13

**Sensorineural hearing loss**

Sensorineural hearing losses are caused by damage to the hair cells of the inner ear, auditory nerve or brain. Hearing loss is considered to be permanent; it can range from slight to profound impairment.

Congenital causes may include exposure to rubella, cytomegalovirus, toxoplasmosis, syphilis and/or herpes during pregnancy, genetics or low birth weight. Acquired causes include excessive exposure to loud noises, head trauma, infection and some antibiotics used to treat infections e.g. gentamycin.14

Often the treatment for children with sensorineural loss is to use a hearing aid(s)/ or cochlea implant(s). Often people with sensorineural hearing loss will experience tinnitus, or ringing in the ear.

**Mixed hearing loss**

This is a combination of conductive and sensorineural hearing loss (SNHL). Children with mixed hearing loss require management of the cause of the conductive loss, and will probably use a hearing aid as well.15

**Risk Factors**16,17

In children, hearing impairment or loss (congenital or acquired) may be attributed to:

- Family history of congenital, sensorineural hearing loss
- History of rubella, cytomegalovirus, toxoplasmosis, syphilis or herpes during pregnancy
- Dysmorphic deviations: e.g., low set ears, skin tags, accessory tragi, malformed auricles, auricular sinus, peri auricular sinus
- Hyperbilirubinemia requiring exchange transfusion
- Birthweight less than 1500gms
- Genetic syndromes known to include sensory hearing loss, e.g., Down’s Syndrome
- Recurrent or persistent otitis media with effusion (OME)
- Head trauma with fractured temporal bone
- Infectious diseases associated with SNHL, e.g., measles, mumps and rubella
- Child exposure to smoke, poor living conditions
- Ototoxic medication, e.g., gentamycin
- Neurodegenerative disease, e.g., Friedrich’s ataxia.

The following are considered **red flag signs** of possible hearing problems.11

- Lack of awareness of their usual environmental sounds
- Less or no vocalising after early babbling or poor or monotonous vocalisations, talking too loudly
- Inattentiveness
- Recurrent ear infections/and or ear discharge
• Not responding when called
• Listening to TV/electronic devices at a loud volume.

Table 2 provides a summary of childhood hearing and ear health assessments. Refer to the appropriate procedure for further instruction.

**Table 2: Hearing and ear health assessments**

<table>
<thead>
<tr>
<th>Name of test</th>
<th>Aim</th>
<th>Target Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn Hearing Screen</td>
<td>To screen for congenital hearing loss</td>
<td>All babies from 12 hours of age</td>
</tr>
<tr>
<td>Performed by hospital or trained community health staff at public, private, metropolitan and regional maternity services across WA.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audiometry(^{18})</td>
<td>To measure how well a child hears the range of speech frequencies</td>
<td>From the age of 3 years</td>
</tr>
<tr>
<td>Frequencies are measured in hertz (Hz) and intensity (loudness) is measured in decibels (decibels Hearing Level or dB HL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tympanometry(^{18})</td>
<td>To assess the function of the middle ear and used in conjunction with otoscopy and audiometry</td>
<td>May be performed in conjunction with otoscopy on any child from 7 months where there is an ear health or hearing concern suggested by parent or professional.</td>
</tr>
<tr>
<td>Measures the mobility of the tympanic membrane (TM)(^1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screens for conditions of the ear that may be missed by otoscopy alone(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Otoscopy(^{18})</td>
<td>To examine the pinna and ear canal to check for skin conditions, wax occlusion, the presence of foreign bodies, pus, fungus, swelling, granulations, polyps and other growths</td>
<td>School Entry Health Assessment</td>
</tr>
<tr>
<td>Tympanic membrane can be checked for its position, translucency, colour, and the presence of any perforation</td>
<td></td>
<td>If ear health or hearing concern are suggested by parent or professional</td>
</tr>
</tbody>
</table>
Video-otoscopy

As above, with the inclusion of a camera in the otoscope which allows images to be recorded, stored and shared.

As per otoscopy, when available/indicated

Follow up and referral pathway

Staff will comply with the specific follow-up and referral processes identified in the individual hearing and ear health procedures.

See Appendix B for general ear health referral pathway.

References


### Related internal policies, procedures and guidelines

The following documents can be accessed in the Community Health Manual via the HealthPoint link or the Internet link

- Ages and Stages Questionnaires™
- Audiometry
- Child Health Services Policy
- Child Health Universal Services Rationale
- EACHS Guidelines
- Ear drops instillation
- Ear irrigation
- Ear tissue spearing
- Otoscopy
- Physical assessment 0-4 years Guideline
- Tympanometry

### Related internal resources and forms

The following resources and forms can be accessed from the HealthPoint CACH Intranet link

- Hearing Surveillance Screening for Universal Contacts
### External resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book: From Birth To Five Years Practical Developmental Examination. 2014. Ajay Sharma and Helen Cockerill</td>
<td></td>
</tr>
<tr>
<td>Book: Mary Sheridan’s From Birth To Five Years Children’s Developmental Progress. 2014. Ajay Sharma and Helen Cockerill</td>
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Appendix A: Common childhood ear disorders

<table>
<thead>
<tr>
<th>Disorder 9,18</th>
<th>Main causes</th>
<th>Symptoms 15</th>
<th>Related procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outer ear disorders</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deformities of the pinna or canal</td>
<td>Congenital anomalies</td>
<td>Diminished sound conduction</td>
<td>Otoscopy procedure</td>
</tr>
</tbody>
</table>
| External infection of the pinna | Infection as a result of trauma e.g ear piercing, insect bite, eczema | • Itching  
• Pain  
• Redness, swelling | Physical assessment 0-4 years guideline |
| Otitis externa | • Infection of hair follicle  
• Poking with cotton wool or other objects  
• Humidity  
• Contaminated water  
• Contact allergy  
• Pre-existing skin disease | • Itching  
• Scaling skin or scanty discharge  
• Severe pain and redness  
• Oedema  
• Conductive hearing impairment | Otoscopy procedure  
Ear irrigation procedure  
Ear tissue spearing |
| **Middle ear disorders** | | | |
| Cholesteatoma  
*Abnormal benign skin behind the ear drum* | Poor Eustachian tube function coupled with middle ear infection | • Gradual increasing conductive or mixed hearing impairment  
• Foul smelling discharge, or no discharge | Otoscopy  
Tympanometry |
| Dry perforation  
*Inactive CSOM* | • Trauma  
• Previous infection | Perforation of tympanic membrane | Otoscopy |
| Ear wax | Excessive wax causing a plug | Occluded ear canal | Otoscopy  
Ear irrigation  
Ear drops instillation |
| Foreign bodies | Vegetable e.g. seeds/beans  
Non-vegetable e.g. cotton wool bud, stones | Occluded ear canal | Otoscopy  
Ear irrigation  
Ear drops instillation |
### Hearing

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>Symptoms</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Otosclerosis</strong></td>
<td>A form of bone overgrowth in the middle ear (very rare in children).</td>
<td>Unknown</td>
<td>Gradual hearing loss, Tinnitus, Dizziness</td>
</tr>
<tr>
<td><strong>Otitis Media (OM)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acute otitis media (AOM)</td>
<td>Acute infection of the middle ear</td>
<td>Upper respiratory tract infection, Infection caused by pre-existent perforation via contaminated water, Measles and scarlet fever</td>
<td>Earache, Fever, Irritability, Redness/bulging of eardrum, Discharge of pus if ruptured</td>
</tr>
<tr>
<td>otitis media with effusion (OME)</td>
<td>Often referred to as 'glue ear' An accumulation of fluid or mucous in the middle ear</td>
<td>Blockage of Eustachian tube</td>
<td>Conductive hearing loss, Feeling of pressure, Blocked ear, Tinnitus, Retracted ear drum, Air bubbles, Visible fluid</td>
</tr>
<tr>
<td>suppurative otitis media (SOM) &amp; Chronic SOM (CSOM)</td>
<td>Infection of the middle ear, with perforation of the ear drum Chronic if more than 2 weeks</td>
<td>OM which has healed, with eardrum perforation, Inflammation from measles or scarlet fever or tuberculosis, Traumatic perforation with secondary infection</td>
<td>Discharge of mucous and pus, sometimes foul smell, Eardrum perforation, Conductive or mixed hearing impairment, Absence of earache</td>
</tr>
<tr>
<td><strong>Inner ear disorders</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viral infection</td>
<td>AOM or CSOM that spreads to middle ear</td>
<td>Facial palsy, Dizziness, vertigo, Deafness</td>
<td>Otoscopy, Audiometry</td>
</tr>
<tr>
<td>Acoustic shock</td>
<td>Noisy machinery, loud music, explosions etc</td>
<td>Mild to profound hearing impairment</td>
<td>Otoscopy, Audiometry</td>
</tr>
<tr>
<td>Trauma</td>
<td>Head injury or injury to the ear</td>
<td>Mild to profound hearing impairment</td>
<td>Otoscopy, Audiometry</td>
</tr>
</tbody>
</table>
Appendix B: Ear Health Referral Pathway

1. Risk factors requiring targeted assessment
   - Presenting condition
   - Ear health issue identified
   - Referral required
   - Consent to refer
     - Yes: Refer to audiology services
       - Follow up referral outcome and provide support as required
       - Issue resolved
         - Yes: Continue with Universal contact schedule
     - No: Refer to GP

   - Repeat hearing assessment at Universal or Universal Plus contact
     - No: Issue resolved