



PROCEDURE	
Tympanometry	
Scope (Staff):	Community health staff
Scope (Area):	CAHS-CH, WACHS
<p>Child Safe Organisation Statement of Commitment</p> <p>The Child and Adolescent Health Service (CAHS) commits to being a child safe organisation by meeting the National Child Safe Principles and National Child Safe Standards. This is a commitment to a strong culture supported by robust policy documents to ensure the safety and wellbeing of children at CAHS.</p>	

This document should be read in conjunction with this [DISCLAIMER](#)

Aim

To measure mobility of the tympanic membrane in order to assess the ear canal volume, middle ear pressure and compliance function of the middle ear.

Risk

Non-compliance with the procedure may result in conditions of the middle ear not being identified early and treated effectively, and which can result in long term hearing loss.

Background

Tympanometry is part of comprehensive ear health and hearing screening for children. Screening includes otoscopy and may also include video otoscopy and/or audiometry. The ear health and hearing screening schedule for Western Australian children can be viewed in the *Hearing and Ear Health* guideline.

Tympanometry can be used to describe normal or abnormal middle ear function in response to sound and air pressure.^{1,2} Tympanometry is used in conjunction with otoscopy to identify deviations from normal such as the presence of middle ear fluid, tympanic membrane perforation and Eustachian tube dysfunction which may impact on hearing.^{1,2}

A tympanometry and tympanogram (chart) provide information about:

- Middle ear pressure – the air pressure of the air contained within the middle ear, displayed as the ‘peak’ of the tympanometric trace along the pressure axis. Normal middle ear pressure values for children are +50 daPa to -200 daPa.
- Compliance – refers to how well the middle ear system responds to sound, displayed by the height of the ‘peak’. Normal middle ear compliance values range from 0.3 to 1.5 cc.
- Equivalent ear canal volume – this value is reported by the tympanometer (not shown on the tympanogram). In children a volume range of 0.5 to 1.5 cc is considered normal.¹

Key Points

- Otoscopy is to be performed prior to tympanometry. If any of the following are identified, tympanometry will not be undertaken:
 - Ear pain.
 - Tympanic membrane is inflamed, bulging or perforated.
 - Within six (6) weeks of ear surgery, or in accordance with medical professional direction.
 - Evidence of discharge or foreign objects in the auditory canal.
- Tympanometry is to be discontinued immediately if there is any evidence of pain.
- If there is evidence that the child is under the care of a relevant health professional, clinical judgement about the need for assessment is required.
- Tympanometry is only to be performed by staff who have completed CAHS-CH or WACHS training.
- When a child is not willing to have the procedure and staff or parent have concerns, discuss referral to a medical practitioner with parent.
- Regular and opportunistic ear health screening for Aboriginal children aged 0 – 5 years is critical to preventing ear disease and optimising health and development.³
- Ear health screening for WA children is outlined in the *Hearing and ear health* guideline.
- Key health education messages for families, children and school staff are to be provided as appropriate for the audience.
- Community health staff must follow the organisation's overarching Infection Control Policies and perform hand hygiene in accordance with WA Health Guidelines at all appropriate stages of the procedure.

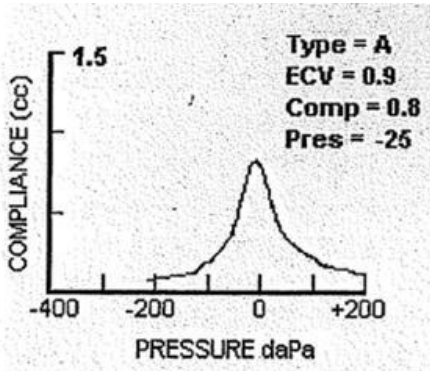
Equipment

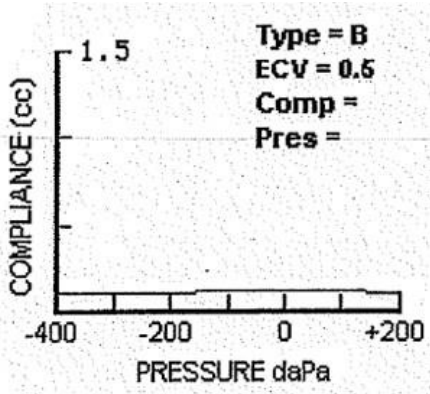
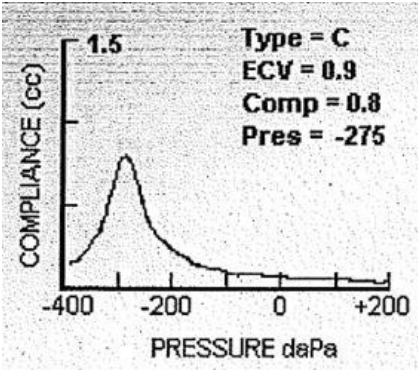
- Tympanometer with spare batteries;
 - 1000 Hz probe tone for **infants under 6 months**
 - 226 Hz probe tone for **children 6 months and over**
- Disposable ear tips of various sizes.
- Tympanometry printer (fully charged) and spare paper rolls (as applicable).

Process

Steps	Additional Information
<p>1. Preparation for screening session</p> <ul style="list-style-type: none"> • Check the operation of the tympanometer and printer before use. 	<ul style="list-style-type: none"> • Refer to the manufacturer instructions for operation and annual calibration details. • The tympanometer is to be tested at the

Steps	Additional Information
<ul style="list-style-type: none"> Secure a suitable room with minimal external noise. Check health records to obtain relevant health history, if available. 	<ul style="list-style-type: none"> start of each day, prior to commencing the procedure. In school settings, ask teacher about any concerns for individual children.
<p>2. Engagement and consent</p> <ul style="list-style-type: none"> Review past and current ear health: <ul style="list-style-type: none"> In child health settings ask parent/caregiver about health history In School Entry Health Assessments (SEHA) review parent/caregiver responses in CHS409-1 or CHS409-5 In other school-aged contacts review parent/caregiver responses in CHS719. Explain the procedure to the child and parent/caregiver, if present. Allow time for discussion of concerns. Ensure written or verbal parent/caregiver consent is obtained prior to tympanometry. 	<ul style="list-style-type: none"> See <i>Hearing and ear health</i> guideline for ear health history guide. When parent/caregivers are present, encourage involvement with the procedure, where possible.
<p>3. Prior to tympanometry</p> <ul style="list-style-type: none"> Conduct otoscopy first. If any contraindications to tympanometry are present (as listed in key points), do not proceed. Ask the parent/caregiver to hold the child's head securely against their chest and use their other arm to secure the child's arms and body to stop any sudden movement. Older children may prefer to stand or sit. To prepare the child for the examination, show the child the tympanometer. Explain to the child and the parent/caregiver that when the tympanometer probe is inserted into the ear, they will hear a humming sound. 	<ul style="list-style-type: none"> Tympanometry can proceed if otoscopy indicates the presence of cerumen, a narrow or bending ear canal, or an open or blocked grommet.⁴ The procedure should be discontinued immediately if there is any evidence of pain. Ask the child to stay quiet and still. They should not be speaking, sucking or swallowing during this test.
<p>4. Tympanometry procedure</p> <ul style="list-style-type: none"> Select an ear tip slightly larger than the external auditory canal. 	<ul style="list-style-type: none"> The examiner should be positioned at the same level as the child's ear, with a

Steps	Additional Information
<ul style="list-style-type: none"> • <u>For infants</u>, gently pull the pinna down and back with one hand. Use the other hand to insert the probe into the external auditory canal. • <u>For children</u>, gently pull the pinna up and back with one hand. Use the other hand to insert the probe into the external auditory canal. • An air-tight seal is created by gently rotating the wrist towards the child's eye, (so the screen is on top and can be viewed). • Watch the screen to confirm that a seal has been achieved, and then hold the tympanometer still. • When the test has been completed, remove ear probe by gently rotating the wrist to break the seal. • Record the measurements (as displayed on the screen) for pressure, compliance and ear canal volume. • Repeat procedure on other ear. 	<p>clear view of the tympanometer screen.</p> <ul style="list-style-type: none"> • Stabilise hands by keeping one hand on the child's pinna and the other hand holding the tympanometer. • If a clear result is not achieved, repeat up to three times. • If using a printer, scan or photocopy the tympanogram and attach to electronic health record or print and save a paper record in the clients file. • Use of printers is determined according to CAHS-CH or local WACHS processes. • Use CHS409-2 to record results for SEHA contacts and CHS423 for other contacts prior to entering in electronic records.
<p>5. Interpreting results</p> <ul style="list-style-type: none"> • Results are classified as follows: <p>Type A – Normal middle ear pressure peaks (+50 to -200 daPa) for children and normal compliance (0.3 to 1.5 cc).¹</p> <p>See example.</p> 	<ul style="list-style-type: none"> • Results are to be considered together with screening questions and otoscopy, (and audiology if applicable), to make clinical judgements about the need for referral and review. <p>Type A results</p> <p>Type A tympanograms represent normal ear canal volume, middle ear pressure and compliance function.¹</p> <ul style="list-style-type: none"> • Type A tympanogram result represents a properly functioning Eustachian tube and normal middle ear function.¹ • Type As (shallow) tympanogram result with normal ear pressure but reduced compliance may indicate normal middle ear function or may suggest a stiff middle ear system caused by ossicular fixation¹. • Type Ad (deep) tympanogram result with normal ear pressure but increased

Steps	Additional Information
<p>Type B – No compliance (no air pressure peaks), described as ‘flat’ tympanograms.</p> <p>See example.</p>  <ul style="list-style-type: none"> • Type C – Abnormally low middle ear pressure indicating Eustachian tube dysfunction.¹ <p>See example.</p>  <p>Note: Abnormally low middle ear pressure - peak less than 200 daPa for children.¹</p>	<p>compliance indicates a flaccid or hypermobile middle ear system. This may suggest an ossicular subluxation or a healed tympanic membrane perforation.¹</p> <p>Type B results</p> <p>Type B tympanograms represents a deviation in ear canal volume, middle ear pressure and/or compliance function.</p> <ul style="list-style-type: none"> • Type B tympanogram with normal ear canal volume usually indicates middle ear effusion. It may also indicate thickened tympanic membrane or perforation.¹ • Type B tympanogram result with high ear canal volume may indicate a tympanic membrane perforation, a patent grommet or T tube.¹ • Type B tympanogram result with low ear canal volume may indicate the probe is blocked by cerumen or a foreign body. It may indicate that the probe tip is against the side of the external auditory canal.¹ <p>Type C results</p> <p>Type C tympanograms represents a deviation in ear canal volume, middle ear pressure and/or compliance function.</p> <ul style="list-style-type: none"> • Type C tympanogram result with normal compliance but low middle ear pressure indicates a Eustachian tube dysfunction without ear effusion.¹ • Type Cs (shallow) tympanogram result with reduced compliance and low middle ear pressure indicates Eustachian tube dysfunction with fluid and air in the middle ear.¹ • Type Cd (deep) tympanogram result with increased compliance and low middle ear pressure indicates ossicular subluxation, or healed tympanic membrane perforation with Eustachian tube dysfunction.¹

Steps	Additional Information
<p>6. Communicate results with parents</p> <ul style="list-style-type: none"> • If parent/caregiver present, discuss tympanometry findings including any concerns. • If parent/caregiver not present; <ul style="list-style-type: none"> ○ Contact to discuss if there are any concerns. Ask about recent illnesses. ○ Provide results in writing using CHS409-6A <i>Results for parents</i> for SEHA contacts and CHS423A for other contacts. 	<ul style="list-style-type: none"> • If unable to contact parent/caregiver by phone, follow CAHS-CH and WACHS processes to provide effective communication with family. • Discuss relevant strategies with parents/caregiver and with the child: <ul style="list-style-type: none"> ○ Nose blowing followed by washing hands and face. ○ Chew hard crunchy fruit and vegetables (e.g. carrots or apples) to help open the Eustachian tube. ○ Breathe Blow Cough activities (see Related external resources) ○ For infants, encourage breast feeding.
<p>7. Referral and review</p> <ul style="list-style-type: none"> • Where a tympanogram represents a deviation from normal: <ul style="list-style-type: none"> ○ Consider a recheck in 4-6 weeks in cases of recent upper respiratory tract infection illness ○ Provide referral to audiologist, medical practitioner or other health practitioner. • Discuss and seek consent for referral from parent/caregiver. • Include otoscopy and tympanometry results in referral. Include audiometry results, if conducted. 	<ul style="list-style-type: none"> • Adherence to CAHS-CH and WACHS clinical handover processes is required when handing over, or referring a client within, or outside of the health service. • Follow up with patients/caregivers to determine if the referral has been actioned.

Documentation

Community health staff will document relevant findings according to CAHS-CH and WACHS processes.

References

1. Coates H, Kong K, Mackendrick A, Bumbak P, Perry C, Friedland P, Morris P & Chunghyeon. *Aboriginal, Torres Strait Islander and Pacific Islander Ear Health Manual*. Perth: Garnett Passe and Rodney Williams Foundation, 2020

2. Commonwealth Department of Health and Ageing. *Recommendations for clinical care guidelines on the management of otitis media in Aboriginal and Torres Strait Islander population*. Menzies School of Health Research, Commonwealth Department of Health and Ageing: Canberra. 2011.
3. Government of Western Australia. *WA Child Ear Health Strategy*. Perth; 2017.
4. Hearing Australia, *Tympanometry training for primary health services*, online training resource (no date).

Related policies, procedures and guidelines

The following documents can be accessed in the **Clinical Nursing Manual** via the [HealthPoint](#) link, [Internet](#) link or for WACHS staff in the [WACHS Policy](#) link

Audiometry

Clinical Handover - Nursing

Hearing and ear health

Otoscopy

Physical assessment 0 – 4 years

Universal Contact - School Entry Health Assessment

Universal Contacts – 8 week, 4 months, 12 months, 2 years

Vulnerable Populations

The following documents can be accessed in the [CAHS-CH Operational Manual](#)

Client identification

Consent for services

Hand Hygiene

Infection control manual

The following documents can be accessed in [WACHS Policy](#)

Ear tissue spearing, irrigation and ear drop installation procedure

Enhanced Child Health Schedule

The following documents can be accessed in the [Department of Health Policy Frameworks](#)

[Clinical Governance, Safety and Quality](#)

Clinical Handover Policy ([MP0095](#))

Clinical Incident Management Policy ([MP 0122/19](#))


Related CAHS-CH forms
The following forms can be accessed from the CAHS-Community Health Forms page on HealthPoint
CHS409-1 SEHA Parent Questionnaire
CHS409-5 School Entry Health Consultation for Education Support Students
CHS409-6A <i>Results for parents</i>
CHS423 Ear Health Assessment Results
CHS423A School Ear Health Assessment – Results for Parents
CHS663 Clinical Handover/Referral
CHS719 Ear Health Screening Consent

Related WACHS resources
The following resources can be accessed from WACHS Learning Management System Capabiliti
Community health staff
Ear Health Module 1 – Overview (EHOV EL1)
Ear Health Module 2 – Otoscopy (EHOT EL1)
Ear Health Module 3 – Tympanometry (EHTT EL1)
Ear Health Module 4 – Play Audiometry (EHPA EL1)
Ear Health Module 5 – Referrals (EHRE EL1)

Related external resources
Coates H, Kong K, Mackendrick A, Bumbak P, Perry C, Friedland P, Morrisw P & Chungheon. Aboriginal, Torres Strait Islander and Pacific Islander <u>Ear Health Manual</u> . Perth: Garnett Passe and Rodney Williams Foundation, 2020
Hearing Australia. <u>Tympanometry training for primay health services</u> (online training resource).
<u>PLUM and HATS speech resource</u> – Pictures and questions to assist with talking to parents about hearing, speech and language, National Acoustic Laboratories.
<u>Blow-Breathe-Cough Program</u> . Hearing Australia resources for teachers and early childhood educators to promote ear health.

Care for Kid's Ears. A wealth of information and resources for parents, early childhood educators, teachers and health professionals. Includes material in several different language groups.

This document can be made available in alternative formats on request for a person with a disability.

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Compassion

Excellence

Collaboration

Accountability

Equity

Respect

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