National Vision and Hearing Screening Protocols
Revised 2014
# Contents

## Introduction 1

## Programme summary 2
- The programme 2
- Cohort groups 2
- Test environments/locations 3
- Competencies 3
- Test equipment 3
- Resources 4
- Quality requirements 4

## Hearing screening 5
- Overview of hearing screening 5
- Pathway 1: Initial screening audiometry (sweep test) or rescreen 9
- Pathway 2: Screening audiometry (hearing concerns) 12
- Screening technique: tympanometry 16

## Vision screening 19
- Overview of vision screening 19
- Screening technique: Parr letter-matching vision charts or Sheridan Gardner charts 22
- Screening technique: Snellen eye chart 28
- Colour vision: Ishihara pseudoisochromatic plate 30

## List of Tables
- Table 1: Risk factors for hearing related developmental and learning difficulties 11
- Table 2: Sequence of screening frequencies and pass levels 13

## List of Figures
- Figure 1: Pathway 1 – initial screening (sweep) or rescreen audiometry clinical pathway 14
- Figure 2: Pathway 2— Screening audiometry (hearing concerns) clinical pathway 15
- Figure 3: Vision screening clinical pathway and referral at four years old 25
- Figure 4: Vision screening clinical pathway and referral at five to seven years 26
- Figure 5: Vision screening clinical pathway and referral for Year 7 (and others) 26
Introduction

The National Vision and Hearing Screening Protocols (National Protocols) describe the best practice requirements for Vision Hearing Technicians (VHTs) who are delivering the National Vision and Hearing Screening Programme.

The National Protocols provide an outline of the screening process, but are not a training manual. Personnel delivering this screening programme need to have attained or be working towards the NZQA National Certificate in Community Support Services (Vision and Hearing Screening) (Level 3) and comply with national competencies (refer to page 3).

This document should be read in conjunction with the appropriate National Service Specifications, which the Ministry of Health uses to purchase Vision Hearing Screening services from District Health Boards.

This document is in two sections:

- Hearing screening protocols (pages 5–18)
- Vision screening protocols (pages 19–30)

If you have any questions or queries about the National Vision and Hearing Screening Programme or this document, please contact the Ministry of Health (info@health.govt.nz).
Programme summary

The programme

- Mass screening of a defined cohort of children (4 and 11 years old) to identify undetected hearing loss and reduced visual acuity requiring further assessment and/or treatment.
- Follow up and targeted screening of children who may have missed earlier screening opportunities.
- Referrals to appropriate health professionals, using identified pass/fail criteria.
- Documentation and reporting of vision and hearing screening data.

Cohort groups

4 years (B4 School Check)
- Initial screening (sweep) or rescreen audiometry (and tympanometry if required).
- Distance visual acuity screening is used to identify children with reduced vision and possible amblyopia.

New entrants and new immigrants
- Initial screening (sweep) and vision screening ie, children who have not previously had a B4 School Check.
- Follow up testing from B4 School Check.

Hearing concerns
- Screening audiometry depending on the ability of the children.

Year 7 (11-year-olds)
- Distance visual acuity screening to detect children with myopia or other conditions causing reduced acuity.
- Ishihara colour vision screening for boys.

3 years
- At individual DHB’s discretion, targeted tympanometry screening of groups at high-risk of harm from glue ear.
Test environments/locations

- Registered pre-school/early childhood education centres and kohanga reo.
- Community venues including churches, marae and community halls.
- State/private primary schools.
- State/private intermediate schools.
- Defined clinic settings.
- All environments are to comply with National Protocol requirements for light and sound levels or the VHT must make arrangements to use the environments at times when compliance is achievable.

Competencies

VHTs who provide vision and hearing screening services must have attained or be working towards the National Certificate in Community Support Services (Vision and Hearing Screening) (Level 3) (see www.careerforce.org.nz).

They must also:

- be employed for a minimum of 16 hours per week for vision and hearing screening work
- receive ongoing professional development relevant to the screening processes specified in the National Protocols and attend the annual Training Seminar (at least every second year)
- have a biennial review/assessment of their competence
- have completed training in the use of the Ministry of Education’s ENROL database and the Ministry of Health’s B4 School Check database.

Where personnel provide either vision screening or hearing screening alone, they still must meet the above requirements for employment, experience, review and training.

In cases where registered nurses or other health professionals carrying out vision and hearing screening, they do not need to be dedicated to vision and hearing screening for 16 hours per week but must meet all other competency requirements.

Test equipment

- Screening audiometer calibrated annually (0.5 kHz to 4kHz @ 0–100 dB presentation range) fitted with noise-attenuating audiocups.
- Screening tympanometer calibrated annually (+200--400 daPa range).
- Pebbles and a container
- Sound level meter
- Parr letter-matching vision chart (with and without confusion bars) or an equivalent Sheridan Gardner chart.
- Snellen eye chart.
- Ishihara pseudoisochromatic plates for colour deficiency (24-plate edition).
- Retractable 5 m tape measure.
- Rigid plastic eye patch.
• Hand-held eye occluder (Denver model or similar).
• Alcohol wipes, handrub and Milton solution.
• Light level meter (illuminance meter, lux meter).

**Resources**

Keeping an eye on your child’s vision (B4 school vision screening) (HE2278) is a Ministry of Health resource available from HealthEd website (www.healthed.govt.nz) in multiple languages.

Pass and refer brochures for use with all four and five year olds screened are available on line (www.health.govt.nz)

Copies of the Spectacle Subsidy brochure can be ordered through Enable New Zealand (freephone 080017 1981). Copies of the subsidy for glasses and vision test brochures in a number of languages can be printed from the Ministry of Health’s website (www.health.govt.nz).

**Quality requirements**

• Standard consent process prior to screening.
• Standard format for feedback of screening results to parent/caregiver of each child post-screening.
• Standard format of recording results onto the relevant national database to enable national reporting.
• Ministry of Health requirements as specified in the relevant National Service Specification and the National Protocols.
Hearing screening

The hearing screen of four-year-olds is part of an overall framework of hearing screening and Well Child/Tamariki Ora hearing surveillance. This screen follows the newborn hearing screening as part of the Universal Newborn Hearing Screening and Early Intervention Programme (UNHSEIP) shortly after birth and subsequent surveillance at core well child checks.

Screening audiometry and tympanometry (if required) are the screening tests to be administered.

Overview of hearing screening

Purpose

The purpose of this component is to:

- detect the presence of hearing impairment and/or otitis media effusion
- refer to appropriate agencies.

Key messages

The screening protocol is designed to identify hearing loss that is likely to interfere with normal speech, language development and learning, and to find children with persistent middle ear disorder as this also causes a significant hearing loss. This screen is also designed to target, detect and refer children where there are hearing-related developmental or learning difficulties (referred to as risk factors), so that appropriate intervention can be provided prior to or early in a child’s primary education.

Funding for services

Parents of children under 18 years who are eligible for health services and who have hearing problems are not asked to pay for audiological services, rehabilitation services or assistive devices. These costs are funded by the Ministry of Health and the Ministry of Education.

Age of child

This screening is conducted as soon as possible after the child turns four years old.

If a child has missed this component of the B4 School Check before starting school, then they will be checked at school (following consent process).

Repeat screening will also be provided to those children who need a follow-up test as a result of earlier screening.

Personnel

This screening is normally carried out by a VHT, but sometimes by other competent health practitioners.
Protocols

Frequency of visits
Venues should be visited regularly to ensure that all children are screened and that rescreens can be done in a timely fashion. Several visits may not always be possible in very small, remote rural areas. In these cases, serial testing could be carried out in a scheduled clinic setting.

Venue organisation
Before visiting an early childhood centre or school for screening, you should:
• notify the venue of your intended visit and ask that quiet activities are planned for when hearing screening is being carried out
• obtain the list of children requiring screening (ie, ENROL, preschool attendance list
• ensure consent process with parents has been completed.

Consent
Although VHTs are still covered by Section 125 of the Health Act (1956), all DHBs should now have implemented a consent process to encourage parents to make informed choices about their child’s health. In addition, the recording of results in the national B4 School Check database requires the informed consent of parents. Therefore, all services delivering vision and hearing screening should implement an opt-off consent process. Section 125 should only be used in exceptional circumstances where the school, early childhood centre, or health services have concerns for a child’s welfare.

The consent process should include information for parents about what their child is being screened for and questions about whether the child is already under the care of an audiologist or ORL, and/or has grommets or a hearing aid.

Setting for hearing screening
Preschool hearing screening is generally carried out in community based early childhood education centres or in clinic settings. Screening of school-age children is generally carried out in schools.

It is important that the VHT obtains a suitable room for hearing screening. Inappropriate conditions may compromise the validity of screening. A range of setting may be used for hearing screening, according to local availability. The conditions discussed below apply to community settings, as well as clinic settings.

Type of room: The room in which the hearing screening (and tympanometry if required) takes place must:
• be quiet and free of distractions
• have soft furnishings and floor coverings to absorb noise.

In a school or preschool, the most suitable room is usually the school library or an office.

Minimise ambient noise: The degree of ambient noise in the room in which the hearing screening will take place must be less than 40 dBA. Check the ambient noise with a sound level meter at the beginning of the screening session and at any other time you consider it necessary, when ambient noise levels increase.
If the noise level exceeds 40 dBA, speak to the staff and ask for noise levels to be reduced. Use approved noise attenuating headset cups in noisier environments to offset the noise to the required level. If appropriate background noise cannot be obtained, do not continue with the testing as the results are likely to be invalid.

**Equipment needed for hearing screening**

To conduct a hearing screening, you will need:

- an audiometer, tympanometer and ancillary equipment
- an appropriate chair and a table or desk on which to set up the audiometer and paperwork
- a set of record sheets
- a sound-level meter
- headphones
- pebbles and a container
- a chair for the child being screened.

Audiometers and tympanometers need to be calibrated regularly. An independently audited laboratory must conduct a basic calibration annually with full traceability to National Standards (International Accreditation New Zealand). Headphones are calibrated to a particular audiometer and so are not interchangeable.

**Hygiene protocols for hearing screening**

**Audiometry:** Hearing screen involves the placement of headphones over a child’s ears. (Note: Audiometry should not be performed on children with discharging ears, or where the ear or surrounding skin is inflamed or broken. These children need referral to the GP or ear nurse and should be offered a rescreen when the issue is resolved).

**Procedures:** *Back at base* – Check headphones regularly. If cleaning is required, carefully remove rubber cushions from headphones and wipe with warm soapy water. Ensure cushions are totally dry before replacing. (Note: If headphone cushions become cracked or porous they must be replaced to maintain hygiene).

**Tympanometry:** Middle-ear screens involve the placement of rubber tip at the opening of ear canal. (Note: Tympanometry is not performed on children with discharging ears, or where the skin is broken or inflamed).

**Procedures**

- *During screening* – Change to a clean and unused rubber tip between each child screened.
- *Back at base* – Ensure all used tips are wiped clean and any debris (eg, ear wax) removed and placed in the dish of Milton solution. The tips should be totally submerged in the solution so that all surfaces are covered. After the required soaking period, (manufacturer’s recommendation) the tips should be left to drain onto clean absorbent tissue. When dry, they should be stored in their covered containers.

**Personnel:** Where VHTs have cuts or abrasions of the skin that may be susceptible to infection (ie, to the hands) it is advisable to wear disposable plastic gloves. Regular hand washing during screening is recommended. Where there is no access to a hand-basin, a topical antibacterial solution handrub or similar is suitable.
Suggested cleaning products are:

- alcohol swabs: two-ply – medium grade (saturated with 70 percent isopropyl alcohol) in sterile individual packages
- handrub: Microshield Handrub (containing chlorhexidine gluconate 0.5 percent w/v in 70 percent v/v ethanol) or similar.
Pathway 1: Initial screening audiometry (sweep test) or rescreen

The procedure for initial screening (also known as the sweep test) is based on the American Speech-Language-Hearing Association screening guidelines (ASHA 1997). The technique relies on a conditioned response to sound. The screen is difficult for children under three years of age or children with developmental or behavioural problems – note that these children should be referred for audiological assessment. The success of the screening test depends on achieving a conditioned response.

Preparing the child for Initial screening audiometry (conditioning)

Bring the child close to the audiometer (child must be no more than 30 cm from the headphones) and explain that you will be playing a simple game. Tell the child that you will be making some sounds or beeps with the machine.

Leave the headphones on the desk with headphones facing toward child.

Demonstrate with a 1000 Hz tone at 100 dB.

Explain to the child that, to play the game, each time they hear a beep they must drop a pebble into the container.

Repeat presentation of tone 1000 Hz, at 100 dB and drop another pebble into the container at the sound of the tone. Repeat this a few times, and vary the presentation time between each beep so that the child understands that they must wait for the sound.

The child should then be able to demonstrate that they are able to drop a pebble at the sound of the tone. The child must repeat this a few times to show they thoroughly understand the task.

If the child is unable to sit still and participate, then they are not ready to be screened and will need to be put on a rescreen schedule. If the VHT has concerns about their hearing, they should be referred to an audiologist for an audiometric assessment, using techniques that are more appropriate for the child’s developmental age.

When the child is fully conditioned and ready to begin the test, follow the procedure set out below.

Procedure for Initial screening audiometry

The flowchart for this pathway is shown in Figure 1.

IMPORTANT! Reduce the intensity level of the tone from 100 dB to 40 dB. Failure to reduce the sound level may cause pain or discomfort to the child.

Place the headphones on the child and present a 1000 Hz tone at 40 dB in the right ear. If the child responds, present a 1000 Hz tone at 40 dB in the left ear.
If the child responds, switch back to right ear and test the following tones.

- Reduce the intensity to 20 dB at 1000 Hz tone and present it.
- If the child responds, present a 2000 Hz tone at 20 dB.
- If the child responds, present a 4000 Hz tone at 20 dB.
- If the child responds, present a 500 Hz tone at 30 dB. (Note increased level.)

If the child responds to all these tones, then test the left ear in the same way, starting with the 500 Hz tone at 30 dB.

Possible outcomes for the screen

Formal hearing screening as part of the WCTO Schedule is undertaken at four years of age as part of the B4 School Check. This screen has four possible outcomes:

- **Not tested** because unable/unwilling to participate. If the child is unable to participate, note the result as ‘not tested’, record the result as a ‘rescreen’ and rescreen the child in three months’ time.

- **Pass.** If the child hears audiometry screening levels of 20 dB at 1000, 2000 and 4000 Hz and 30 dB at 500 Hz bilaterally, record the child’s hearing test as a ‘pass’.

- **Rescreen.** If the child hears 40 dB bilaterally at 1000 Hz, but does not respond to the next or any other tone, record the result as a ‘rescreen’.

- **Refer.** If the child does not respond to 40 dB in either the right or the left ear at 1000 Hz, the result is a ‘refer’. (Document this as ‘40dB not achieved’ in referral or record as >40 dB.)

Procedure for each outcome

1. **The child is unable to participate.** If the child is unable to participate the result is not tested. Arrange a repeat of initial test in three months’ time. If the child is unable to participate on the second attempt, they should be referred to an audiologist for an audiometric assessment, using techniques that are more appropriate for the child’s developmental age.

2. **The child passes all tones bilaterally.** If the child responds to all tones presented to both ears, the result is a pass and no further action is required. Record the result of the screening test in the B4 School Check database. If the child is over five years, one week of age then the result should be recorded in the ENROL database only.

3. **The child responds at 40 dB bilaterally but fails lower-intensity tones.** If the child responds at 40 dB bilaterally, and then does not respond to the next or any of the following tones, the screen result is a rescreen.

   Stop the test and record the result as a rescreen and undertake tympanometry. The child should be rescreened within three months using Pathway 1 Initial screening audiometry (sweep test) or rescreen, or Pathway 2 Screening audiometry (hearing concerns) at the discretion of the VHT

   **Note:** If there are concerns about speech/language, development or behaviour or any risk factors (see Table 1), the child should be referred (see below). The preschool and parents/caregivers of children who require a rescreen should be notified when a rescreen is scheduled.
4. **The child does not respond to 40 dB in either ear.** If the child does not initially respond at 40 dB in either the right or the left ear, the screen result is **refer**.

- Record the result as **refer** and undertake tympanometry.
- If they pass tympanometry, refer to an audiologist.
- If they fail tympanometry, refer to a GP or ear nurse.
- The child’s hearing must be tested following treatment by GP or ear nurse to rule out an underlying sensorineural hearing loss. It is the responsibility of the GP or ear nurse to arrange this test with an audiologist.

### Table 1: Risk factors for hearing related developmental and learning difficulties

<table>
<thead>
<tr>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent hearing loss independent of otitis media with effusion. Provided these children have already been identified and are being cared for, they should not be part of the screening programme but should be entered in the statistics.</td>
</tr>
<tr>
<td>Suspected or diagnosed speech and language delay.</td>
</tr>
<tr>
<td>Autism spectrum disorder or other pervasive developmental disorders.</td>
</tr>
<tr>
<td>Syndromes (eg, Down Syndrome) or craniofacial disorders that include cognitive, speech and language delays.</td>
</tr>
<tr>
<td>Blindness or uncorrectable visual impairment.</td>
</tr>
<tr>
<td>Cleft palate with or without an associated syndrome.</td>
</tr>
<tr>
<td>Developmental delay.</td>
</tr>
<tr>
<td>Significant socioeconomic disadvantage.</td>
</tr>
</tbody>
</table>

**Recording of results**

The results and outcomes (ie, not tested, pass, rescreen or refer) for B4 School Check audiometry must be recorded in the B4 School Check database and/or ENROL database, depending on the age of the child. The Ministry of Education ENROL database is now getting regular updates from the B4 School Check database. However, where children are unmatched or start school without having had a B4 School Check, their results will need to be manually entered on ENROL.
Pathway 2: Screening audiometry (hearing concerns)

A child’s parent/caregiver or teacher may occasionally have concerns about the child’s health, development, behaviour or learning and wonder whether a hearing problem is causing these symptoms or difficulties. Sometimes an older child will complain of hearing difficulties or hearing-related symptoms such as tinnitus or balance problems.

Those requesting a hearing test should be informed that screening is not a full diagnostic hearing assessment, and a child should be referred to an audiologist if there are ongoing concerns. The results and outcomes must be recorded in the ENROL database.

This is the appropriate screening test to be undertaken if a child is referred with concerns about a possible hearing loss. However if the child has poor concentration skills, it may be necessary to offer Pathway 1 Initial screening audiometry (sweep test) (Figure 1).

The flowchart for Pathway 2 Screening audiometry (hearing concerns) is shown in Figure 2.

This test protocol may also be used by the VHT who is undertaking a rescreen following a ‘Refer’ at an initial screen.

Note: All children on initial screen should be tested with initial screening (sweep) audiometry (Figure 1) unless the test is a hearing concern.

Screening audiometry may assist GPs, ear nurses and audiology clinics to triage waiting lists for those children awaiting further assessment.

Procedure for Pathway 2: Screening audiometry (hearing concerns)

The screen has two steps. The first step is to familiarise the child with the screening tones. Once that is achieved, the VHT should begin the test and record the child’s responses.

Familiarisation is undertaken to make sure that the child is able to reliably perform the response task. The child must be presented with a signal loud enough to evoke a clear response. Prepare the child for screening in the same way as in the initial screening (sweep test) audiometry, then proceed as follows.

Screening determination

The level of hearing is defined as the lowest decibel hearing level at which a response reliably occurs. The tones to be used are 1–2 second duration pure-tone stimuli at 500, 1000, 2000 and 4000 Hz.

Note that the minimum levels to be tested to are: 25 dB at all test frequencies except 500 Hz at 30 dB.
Screening procedure

1. Place the headphones on child.
2. Start at 1000 Hz at 40 dB and reduce intensity in 5 dB steps until the child passes at 25 dB, or record last response.
3. Present next tone at 2000 Hz at 40 dB, and continue test sequence. That is, reduce intensity in 5 dB steps until the child passes at 25 dB, or record last response.
4. Repeat steps at 4000 Hz and 500 Hz (minimum 30 dB).
5. Switch to left ear and repeat test, beginning at 500, 1000, 2000 and 4000 Hz at 40 dB.
6. If the child does not respond at 40 dB, record this result (>40dB) and present tone at next frequency (Hz). The practitioner is required to complete the test. This result is refer: (see Referral pathways).
7. Proceed to tympanometry screening and enter the results onto the Ministry of Health’s B4 School Check database or the Ministry of Education’s ENROL database. Refer these children as per the clinical pathway and referral criteria in Screening audiometry shown in Figure 2.

Screening audiometry (hearing concerns) – pass result

If the child responds at passing level, as shown in Table 2, enter the results onto the Ministry of Health’s B4 School Check database or the Ministry of Education’s ENROL database. No further action is required.

Table 2: Sequence of screening frequencies and pass levels

<table>
<thead>
<tr>
<th>Ear</th>
<th>Frequency (Hz)</th>
<th>Amplitude (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right ear</td>
<td>1000</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td>Left ear</td>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>25</td>
</tr>
</tbody>
</table>

Referral pathways

The VHT will need to provide a copy of the results of the audiometry test as shown in Table 2, tympanometry (if required), and any relevant observations of the child back to the person who requested the audiometric assessment.

Referral pathways can vary according to local requirements, but in general referral for suspected sensorineural losses should be made to audiology, and for suspected conductive loss to a GP or ear nurse where they are available. However, it is important to recognise that a sensorineural hearing loss may be masked by a conductive loss, and the conductive loss must be treated and the child retested once this has resolved.
Note: The child’s hearing must be screened again to rule out an underlying sensorineural loss. This is the responsibility of the GP or ear nurse to arrange this test with an audiologist.

Key to flowchart symbols

Figure 1: Pathway 1 – Initial screening (sweep) or rescreen audiometry clinical pathway
Figure 2: Pathway 2 — Screening audiometry (hearing concerns) clinical pathway

```
Present 1000 Hz tone at 40 dB right ear

Does child respond?

Yes

Reduce by 5 dB and test

No

Record 40 dB not achieved and test at next frequency, starting at 40 dB

Result: REFER
Undertake tympanometry and refer as appropriate

Does child respond?

No

Yes

Does child respond down to 25 dB?*

No

Record achieved level test at next frequency, starting at 40 dB

Yes

Tested all frequencies right ear

Switch to left ear and test all frequencies as with right ear, starting at 500 Hz

Pass all frequencies both ears

Result is PASS
Record audiogram and report back to parents and referrer

* Down to 30 dB at 500 Hz.
Screening technique: tympanometry

Children who are having tympanometry must have first had audiometry screening. Normal audiometry (ie, bilateral pass responses) means no further screening needs to be done. The tympanometry procedures below all follow an abnormal screening test, with the following exception: in some district health boards, targeted tympanometry screening of groups at high risk of harm from glue ear is undertaken.

Tympanometry screens for middle-ear function, and involves the placement of rubber tip at the opening of ear canal.

**Note:** Tympanometry should not be performed on children with discharging ears, or where the skin is broken or inflamed. These children should be referred for treatment and rescreened when their condition is treated.

**Tympanometry is not required for children with grommets**

Children with patent grommets are likely to have an abnormal tympanogram. Before the tympanometry screen, parents should be asked as part of the consent process whether the child has grommets. If the child has grommets, no further action is required. If the VHT is unsure whether grommets are in place they should undertake tympanometry. The result is likely to show a flat (type B) tympanogram with a high middle ear volume (above 1.5 ml).

**Preparing the child for tympanometry**

Follow these steps to prepare the child for the tympanometry screen.

1. Ask the child to stand in front of you, and explain that you will be using your ‘special camera’ to take a measurement/picture of their ears.
2. Show the child the tympanometer screen to reassure them; liken it to a small TV.
3. Tell the child they will need to stand still for just a minute while you take the picture.
4. When you feel the child understands and is ready, begin the procedure.

**Procedure for tympanometry**

Change to a clean, unused rubber tip between each child screened.

Follow these steps to undertake the tympanometry screen.

1. Turn the child so that their right ear is facing you.
2. Place the tympanometer probe at the opening of the child’s ear canal and run a screen.
   - If the screen result is pass, record the result. Go to step 4.
   - If the screen is abnormal, go to step 3.
3. Repeat the test.
   - If the result is a pass, record the result. Go to step 4.
   - If the result is abnormal, record the result, including the physical volume measure. Go to step 4.
4. Turn the child so their left ear is facing you.

5. Place the tympanometer probe at the opening of the child’s ear canal and run a screen.
   - If the screen result is a pass, record the result. This is the end of the procedure.
   - If the screen is abnormal, go to step 6.

6. Repeat the screen.
   - If the result is pass, record the result. This is the end of the procedure.
   - If the result is abnormal, record the result, including the physical volume measure. Rescreen in three months’ time or refer using the appropriate pathway.

The results and outcomes (ie, pass, rescreen or refer) for tympanometry screening must be recorded in the B4 School Check database and Enrol database.

**After the screening**

**Notification to parents**

Parents will be notified of results following a screening test.

Pass and refer brochures for use with all four- and five-year-olds screened are available online (www.health.govt.nz).

**Preschool and school recording systems**

The results and outcomes (ie, pass, rescreen or refer) for B4 School Check audiometry must be recorded in the B4 School Check database and/or ENROL database.

There are two national databases for recording hearing results:

- Ministry of Education’s ENROL database
- Ministry of Health’s B4 School Check Information System.

Hearing screening results must be entered to meet the national reporting requirements for hearing screening. The default system for entering the hearing screening results is the B4 School Check database. Results will be transferred centrally to the ENROL system.

**Follow-up**

Ear nurses, GPs, and audiologists are asked to inform the referrer of their findings and proposed treatments. This information is recorded for future reference.

If no feedback information has been received from the referral, a follow-up letter or phone call to the family should be made to see if any action has been taken. If there is no response to this contact, then the case should be referred to the Public Health Nurse Services or Community Health Team. The information provided must be recorded for future reference.

Where a child has already been assessed and determined as needing hearing aids or another assistive device (ie, cochlear implants, FM systems) but is not wearing them, or where a child failed to attend a hospital audiology clinic appointment, the school’s nurse or public health nurse should be informed. No further screening is warranted.
Cleaning equipment back at base

Check audiometer headphones regularly. If cleaning is required, carefully remove rubber cushions from headphones and wipe with warm soapy water. Ensure cushions are totally dry before placing them back in the headphones.

| Note: | If headphone cushions become cracked or porous, they must be replaced to maintain hygiene. |

Ensure all used tympanometer tips are wiped clean of any debris (e.g., ear wax), then place in the dish of Milton solution. Milton solution tablets (or similar antiseptic solution) are acceptable for cleaning tympanometer tips. The tips should be totally submerged in the solution so that all surfaces are covered. The solution must be mixed according to the manufacturer’s recommendations and must be changed daily.

After soaking for the required period (manufacturer’s recommendation), leave the tips to drain onto clean absorbent tissue. When dry, store them in their covered containers.

Referral pathways for tympanometry

**Tympanogram is normal**

If audiometry screening test is abnormal and the tympanogram is normal, the child may have a sensorineural hearing loss. In this situation, refer the child to audiology for further assessment.

**Tympanogram result cannot be obtained**

If you are unable to gain a seal (i.e., there is an air leak) when trying to run a tympanogram, then:

- record ‘no seal’ on the child’s notes
- refer the child to a GP or ear nurse for further assessment (note as a refer).

**Tympanogram is abnormal**

- If the tympanogram shows no peak and the physical volume measure is under 0.3 ml or over 1.5 ml, refer the child immediately to a GP/ear nurse.
- If the tympanometry result shows no peak (i.e., it is a flat graph), and the physical volume measure is 0.3–1.5 ml, rescreen the child in three months’ time.
- If a rescreen tympanometry result shows no peak, refer the child to a GP/ear nurse.
- Children with the conditions listed in Table 1 above are at high risk for developmental and learning difficulties, which otitis media with effusion is likely to exacerbate. If they fail their hearing test and have an abnormal tympanogram in either ear or both ears, refer them straight away.

| Note: | The child’s hearing must be screened again to rule out an underlying sensorineural loss. This is the responsibility of the GP or ear nurse to arrange this test with an audiologist. |

References

Vision screening

Overview of vision screening

Purpose
The purpose of this screening test is twofold:

- Identify children who may have amblyopia (lazy eye) at an age when it may still be treatable.
- Measure visual acuity and refer children who are unable to complete this screen for further assessment.

Key messages
The prevalence of visual deficits in the preschool population is estimated to be 10–15 percent. Treatment for amblyopia, the primary focus of preschool vision screening, is most beneficial if started before the child starts school. Around 1–3 percent of preschool children have amblyopia which can lead to permanent vision loss in one eye if not treated early.

If the child is currently under the care of an ophthalmic/optometric practitioner, a screening test is unnecessary, whether the child wears glasses or not.

B4 School Check and Year 7 vision screening is part of the National Vision and Hearing Screening Programme. Best practice requirements for vision and hearing technicians are described in the National Vision and Hearing Screening Protocols.

If a child has missed the vision and hearing component of the B4 School Check before starting school, then they will be screened at school (following consent process). The screening will also capture those who need a follow-up test as a result of earlier screening.

Personnel
This screening is normally carried out by a VHT, but sometimes by other competent health practitioners.

Protocol

Frequency of visits
Venues should be visited regularly to ensure rescreens can be achieved. It is acknowledged that several visits may not always be possible in very small, remote rural areas. In these cases, rescreening could be carried out in a scheduled clinic setting.

Venue organisation
Before visiting an early childhood centre or school, you should:

- notify the venue of your intended visit and ask that quiet activities be planned for when vision screening is being carried out
- obtain the list of children requiring screening (eg, ENROL, preschool attendance lists)
- ensure the informed consent of parents has been completed.
Consent
Although VHTs are still covered by Section 125 of the Health Act 1956, all DHBs should now have implemented a consent process to encourage parents to make informed choices about their child’s health. In addition, the recording of results in the national B4 School Check database requires the informed consent of parents. Therefore, all services delivering vision and hearing screening should implement an opt-off consent process. Section 125 should only be used in exceptional circumstances where the school, early childhood centre or health services have concerns for a child’s welfare.

The consent process should include information for parents about what their child is being screened for and asking about whether the child is already under the care of a vision specialist and/or has glasses.

Setting for vision screening
Preschool vision screening is generally carried out in early childhood education centres or clinic settings. Screening of school age children is generally carried out in schools.

Vision screening requires a room that is free of distractions and more than 4 m long. The room should be uniformly and brightly illuminated. It should have a light level of at least 300 lux in the room with about 500 lux to illuminate the test chart. If you are unsure whether the lighting is sufficient, carry out a formal light meter test.

Equipment needed for vision screening
To conduct a vision screening, you will need:

- 4 m Parr letter-matching vision book with and without confusion bars with key card (or equivalent Sheridan Gardner charts)
- Rigid plastic eye patch
- Snellen eye chart
- Hand-held eye occluder (Denver model or similar)
- retractable 5 m tape measure
- masking tape
- light meter.

Hygiene protocols for vision screening
Screening involves the placement of a rigid plastic eye patch over the child’s eye.

Note: Vision screening is not performed on children with inflamed eyes, a stye, or where the surrounding skin is broken or inflamed. These children should be referred for treatment (with parental consent) and booked for a rescreen at a later date.
**Procedures**

During screening – wipe rigid eye patch with alcohol swab after each screen. Allow to dry completely before using on a child.

Back at base – wipe eye patch thoroughly wiped with alcohol swab and store it in a clean container.

**Note:** Where VHTs have cuts or abrasions of the skin that may be susceptible to infection (ie, to the hands), it is advisable to wear disposable plastic gloves. Regular hand washing during screening is recommended. Where there is no access to a hand-basin, a topical antibacterial solution handrub or similar is suitable.

**Suggested cleaning products**

Suggested cleaning products are:

- alcohol swabs: two ply – medium grade (saturated with 70% isopropyl alcohol) in sterile individual packages.
- handrub: Microshield Handrub (containing chlorhexidine gluconate 0.5% w/v in 70% v/v ethanol) or similar.
Screening technique: Parr letter-matching vision charts or Sheridan Gardner charts

The screening is conducted exactly 4 m from the child and at the same level as the child’s eyes. Measure 4 m from the child with the tape measure, and mark the floor at both ends with a piece of masking tape.

Ensure that the chart (book) and the key card:
- match (ie, both have confusion bars)
- have a matte finish so that the child cannot see reflections
- do not have marks such as fingerprints or pen ink.

Also make sure the child is not facing a window or other bright light source that could make the chart difficult for them to see.

Remember that although the screen is done at 4 m, the results (eg, 6/6 or 6/12) are written as though the test was undertaken at 6 m. (Do not record the results as 4/4 etc.)

Preparing the child for Parr letter-matching or Sheridan Gardner charts

1. Ask the child to sit so that the masking tape on the mat/floor and their eyes are level (approximately 60 cm distance).
2. Explain to the child that you will be playing a simple game.
3. Show the child a large letter (shape) from your book and point to the letter that is the same on their card.
4. Show the child another large letter and explain that they have to find the same shape. Assist the child if needed.
5. Change the letter and ask the child to find the same shape.
6. When you feel the child understands the task, show the child the eye patch and suggest they need to be a ‘pirate’ to play the game.

Procedure for Parr letter-matching or Sheridan Gardner charts

1. Place the eye patch over the child’s left eye.
2. Move to the 4 m point. Ensure no other children are sitting between you and the child being screened.
3. Beginning with the largest letter, show the child progressively smaller letters from each level. Encourage the child as much as possible. Continue until the child has difficulty identifying the letters.
4. Record the smallest letter size at which the child correctly matches two out of three letter shapes at any level. Use the conversion table on the back cover of the book (ie, 6/30, 6/18, 6/12, 6/9, 6/6).
5. Place the eye patch over the child’s right eye.
6. Move to the 4 m point.

7. Beginning with the largest letter, show the child progressively smaller letters from each level. Show the letters in a different order from that which you showed the child in step 3. Encourage the child as much as possible. Continue until the child has difficulty identifying the letters.

8. Record the smallest letter size at which the child correctly matches two out of three letter shapes at any level. Use the conversion table on the back cover of the book.

   **Note:** Record 6/6, 6/6 when you show all three 6/6 letters and the child can achieve two.

9. Parr letter-matching vision test (with confusion bars) is the recommended screening test for all children younger than seven years old. If the child has difficulty understanding the test, consider using the Parr letter-matching vision test **without** confusion bars.

   **Note:** If this test is used, the child must achieve a result of 6/6 in both eyes at the B4 School Check (four years).

   Children not achieving this should be rescreened (ie result is 6/9 both eyes) or referred (worse than 6/9 either eye) with a note to the referrer that the Parr chart without confusion bars was used.

   **Five to seven** year olds screened **without** confusion bars who achieve a 6/6 result in both eyes, should be rescreened within 12 months. If their visual acuity is worse than 6/9 in either or both eyes, they should be referred with a note that Parr letter-matching vision test without confusion bars was used.

**Screening outcome**

This screen has three possible outcomes: a **pass, rescreen or refer**. Rescreens should be notified to the preschool and the parents and done as scheduled.

**Pass, rescreen and refer criteria for vision screening**

**Vision is 6/9 or better in both eyes at the B4 School Check**

- The child’s vision screening is considered a pass.
- Note the measurements of vision on the child’s records.
- Take no further action.

**Vision is 6/9 in one eye and 6/6 in the other at the B4 School Check or New Entrant Check test (5–7 years)**

Children aged four, five, and six years who have a visual acuity of 6/6 in one eye and 6/9 in the other should be rescreened within six months. This is because one eye may be improving or one eye getting worse. A rescreen will distinguish the two possible options.

- Note the measurements of vision on the child’s record.
- Arrange a rescreen for within three to six months’ time.

**Vision is 6/12 or worse in either or both eyes at the B4 School Check or New Entrant test (5–7 years)**

- Refer the child for further assessment according to the Ministry of Health’s referral guidelines.
Vision is 6/9 in both eyes at New Entrant Check

- Arrange a rescreen within 12 months.

On rescreen

If the child’s vision is 6/6 in both eyes, the rescreen is considered a pass and no further action is required. If there is no change in the child’s vision (ie, they are 6/9 in one eye and 6/6 in the other) or their vision has become worse in either eye (ie, they are 6/9 in both eyes, or 6/12 or worse in either eye), refer the child for further assessment according to the Ministry of Health referral guidelines (see Referral pathways below).

After the screening

Notification to parents

Parents will be notified of results following a screening test. Pass and refer brochures for use with all four- and five-year-olds screened are available online: www.health.govt.nz

Children who are identified as requiring a referral should be given an Enable Spectacle Subsidy brochure.

Copies of the Spectacle Subsidy brochure can be ordered through Enable New Zealand (freephone 0800 17 1981). Copies of the subsidy for glasses and vision test brochures in a number of languages can be printed from the Ministry of Health’s website (www.health.govt.nz).

Subsidies for glasses/spectacles and eye exams

Children with vision problems, aged 15 years and under, from low-income families may be able to get funding assistance for examinations, frames, lenses, eye patches and repairs. The child will need to have an assessment by a vision assessor who is registered as an assessor for this subsidy. The accredited vision assessor will assess a child’s vision needs and may recommend glasses or other vision equipment. An accredited assessor is usually an optometrist, eye specialist, or a service coordinator for the Royal New Zealand Foundation of the Blind. Not all optometrists and eye specialists are accredited vision assessors. The screener should have an up-to-date list of accredited assessors in their area.

There are brochures available for families to explain who is eligible for the subsidy. You can view this brochure and read further information at the Ministry of Health website (www.health.govt.nz).

If the child requires a referral and their parent has a Community Services Card, advise the parent to contact Enable New Zealand to find a vision assessor in their area (freephone 0800 17 1981).

Follow-up

Local records must be kept of all children who have been screened including those who have passed, those requiring a rescreen, and those who have been referred. Parents, ophthalmologists, optometrists and orthoptists are asked to inform the referrer of the findings and proposed treatment. This information is recorded for future reference.
If feedback information has not been received from the referral, a follow-up letter or phone call to the family should be made to see if any action has been taken. If there is no response to this contact, then the case should be referred to the Public Health Nurse Services or Community Health Team. This information must be recorded for future reference.

Where a child has already been assessed and determined as needing glasses but is not wearing them, or where a child failed to attend an appointment with a hospital eye clinic, ophthalmologist or optometrist, the school’s nurse or the public health nurse should be informed. No further screening is required.

**Preschool and school recording systems**

There is one main national database for recording vision results: the Ministry of Health’s B4 School Check Information System. Vision screening results must be entered to meet the national reporting requirements for vision screening, including the B4 School Check. The Ministry of Health and the Ministry of Education have developed a process for transferring vision screening data into the ENROL database. Results for Year 7 are recorded directly into ENROL.

**Referral pathways**

**Figure 3: Vision screening clinical pathway and referral at four years old**
Figure 4: Vision screening clinical pathway and referral at five to seven years

Figure 5: Vision screening clinical pathway and referral for Year 7 (and others)
Children failing a formal visual acuity screening

A four-year-old or new entrant child who is referred from the vision screen with unequal visual acuity or has a result of 6/12 or worse should receive further professional investigation.

There are three possible referral scenarios.

1. A four-year-old or new entrant child who has distance vision that is equally reduced in each eye or with two or more lines difference in the vision between the eyes should be referred to either an ophthalmologist or an optometrist, depending on practitioner availability and parental preference.

   NB: If a four-year-old or new entrant child with greater than two lines difference between the visual acuity in each eye is referred to an optometrist, referrers should consult with the New Zealand Association of Optometrists about optometrists available in their area who have appropriate training, experience and interest in seeing younger children.

2. A new entrant child who has a 6/9, 6/9 distance vision result should be rescreened within 12 months. If at rescreening the result is worse than a 6/6, 6/6, the child should be referred to an ophthalmologist or optometrist, depending on parental preference and practitioner availability.

3. A new entrant child with unequal vision of less than two lines difference should be rescreened at next visit.

The ophthalmologist at the hospital eye clinic or the optometrist to whom the child is referred should acknowledge receipt of the referral, and inform both the referrer and the child’s GP of the outcome of the referral.

Offer referral if concerns about child’s vision

A child’s caregiver or teacher may occasionally have concerns about a child’s health, development, behaviour or learning and wonder whether a vision problem is causing these symptoms or difficulties.

Those requesting a vision test should be informed that screening is not a full diagnostic visual assessment, and a child should be referred to an optometrist or eye specialist if there are concerns. The results and outcomes must be recorded in the ENROL database.

It may be necessary to offer a referral of a comprehensive vision assessment for the child, as the screen does not test all aspects of vision.

Following a parent-initiated, teacher-initiated or self-referral, the health practitioner consulted must work within their scope of practice to ensure that the family receives a timely, high-quality service that addresses their concerns.

Resources

Keeping an eye on your child’s vision (B4 school vision screening) (HE2278) is a Ministry of Health resource for parents/caregivers, available from its HealthEd website (www.healthed.govt.nz) in multiple languages.
Screening technique: Snellen eye chart

The screen is conducted with the Snellen eye chart exactly 4 m from the child and at the same level as the child’s eyes. Measure 4 m from the child with the tape measure, and mark the floor at both ends with a piece of masking tape. Ensure that the Snellen chart has a matte finish to ensure the child cannot see reflections. Make sure the child is not facing a window or other bright light source that could make the chart difficult for them to see.

Preparing the child for Snellen vision screen
1. Stand the child behind the 4 mm mark, with their toes on the masking tape line.
2. Explain to the child that you will point to random letters on the chart and ask the child to identify each letter.
3. Ensure that the child knows the names of the letters.

Procedure for Snellen vision screen
1. Place the occluder in position with the child’s right eye visible. Explain that the child is to hold the occluder in place until asked to move it.
2. Turn the eye chart over. Beginning with the largest letter, point to progressively smaller letters (two or three letters from each level is sufficient). Select letters randomly. Encourage the child as much as possible. Continue until the child has difficulty identifying the letters.
3. Record the smallest letter size at which the child identified all letters (ie, the whole line) correctly.
4. Ask the child to turn the occluder over, so their left eye is visible.
5. Turn the eye chart over. Beginning with the largest letter, point to progressively smaller letters (two or three letters from each level is sufficient). Select letters randomly and in a different order from that in step 2. Encourage the child as much as possible. Continue until the child has difficulty identifying the letters.
6. Record the smallest letter size at which the child identified all letters (ie, the whole line) correctly.

Referral pathways
If the child is under the ongoing care of an ophthalmic practitioner (an ophthalmologist or optometrist) and has been prescribed glasses:
- the child should not be screened
- if the child is screened, a referral is unnecessary no matter what the vision results are, but contact the parent or caregiver to provide them with the results and to make sure the child has had a recent vision examination.

Offer referral if concerns about child’s vision
If at any stage, a teacher, parent or caregiver thinks the child has any vision or development-related problems, it may be necessary to refer the child for a comprehensive vision examination and assessment (see referral guidelines), as the screening test may not detect some visual conditions.
Caregivers presenting to a health practitioner with concerns about their child’s vision

A child’s caregiver or teacher may occasionally have concerns about a child’s health, development, behaviour or learning and wonder whether a vision problem is causing these symptoms or difficulties. Sometimes an older child will complain of vision difficulties. Depending on the child’s age, local services and caregiver preferences the initial presentation could be to a VHT, a nurse, an optometrist or a GP.

Following a parent, child or teacher initiated self-referral; the health practitioner consulted must work within their scope of practice to ensure that the family receives a timely high quality service as described below.

Health practitioner role

- The VHT should screen visual acuity in the appropriate manner for the child’s age and development and refer onward if required with the results of the visual acuity screen and any relevant observations of the child.
- A nurse or GP should measure and record visual acuities, undertake a clinical examination of the eye with other appropriate examination of the child and make a referral or institute management if required.
- An optometrist should obtain a history, measure and record visual acuities, examine the external and internal structures of the eye, assess ocular motility, fusion, convergence, accommodation, pupil reactions, and conduct all other assessments necessary to determine a diagnosis. The optometrist should make a referral or institute management if required and appropriate.

Referrals

- In general infants and children under three years of age with visual acuity and other problems should be referred to an ophthalmologist for further assessment.
- In certain situations access issues and parental preferences may mean that an infant or child under three years is referred to an optometrist. Referrers should regularly consult with the New Zealand Association of Optometrists (NZAO) about optometrists available in their area who have appropriate training, experience and interest in seeing younger children.
- Children over three years of age with visual acuity abnormalities could be referred either to the ophthalmologist at a hospital eye clinic or to an optometrist.

Children failing a formal visual acuity screening

Formal vision screening as part of the New Zealand Well Child/Tamariki Ora schedule is undertaken at four years of age as part of the B4School check and at 11 years of age. Vision screening for children aged 11 years has two possible outcomes; a pass or referral (a failure to meet the performance level considered acceptable on the occasion of the screening).

A child who is referred from the vision screening with a visual acuity of 6/12 or worse in either eye should receive further professional investigation.
Colour vision: Ishihara pseudoisochromatic plate

Conditions
Illuminate with indirect daylight (do not use in direct sun). The light level must be 500–600 lux. The plate must be held about 75 cm (30”) with the child’s line of sight perpendicular to the page (if the test is held at a normal reading distance the visibility of the numbers is reduced and the test is more difficult because the coloured dots making up the numbers are more obvious). Make sure that no other child can see the screening or overhear the responses of the child you are screening.

Equipment
This screening uses the 24-plate edition of the Ishihara Test for Colour Deficiency. The Ishihara books must be replaced at least every seven years.

Procedure
Explain that you will be flipping through the pages of the book and asking the child to either identify the number or numbers on each page or to let you know if there is no number (some pages have no numbers). Reassure the child that there is no ‘trick’. The order of the plates may be jumbled to eliminate learning effects.

Presentation
Make sure the child can identify the number on plate one correctly. Vision must be better than 6/60 for this plate. Continue to present each of the test plates two through 17 (in the 24-plate edition), allowing approximately three seconds each plate and count the number of plates misread. Do not count as a fail if a child has self-corrected. Where a single plate has two numbers on it, an error on either one or both numbers counts as a single error. Note the number of failed plates.

Ishihara colour vision screen (Ishihara pseudoisochromatic plate)
On the 24-plate edition if three or less errors are made, record as ‘Colour Vision: Pass’ on the child’s records. The word normal is not used, as this is a screening test result only and is not a full colour vision assessment by an optometrist.

On the 24-plate edition if more than three errors are made on the number plates (2 to 17) then a colour vision defect is almost certain to be present. Record as ‘Colour Vision: Defect’. The number of errors made on Ishihara is not a reliable estimate of the severity of any colour vision defect.

No referral is warranted, unless further diagnosis is required. The child and parents should be informed so they can discuss career options. Also if a colour vision defect is present then some educational methods, which use colour coding, can be compromised. There are no rescreen criteria for colour vision screening. A defect result warrants a notification to the parent.

Recording of Ishihara colour vision
The results of this screen must be recorded in the Ministry of Education’s ENROL database.