3.7  Vision and hearing

3.7.1  Vision

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## Background

Clear vision is identified as being vital to the development and wellbeing of children, while a failure to recognise sight disorders at onset is known to increase vulnerability to learning difficulties and delays in achieving many early developmental milestones.\(^1\)\(^-\)\(^3\) Vision conditions, when left untreated in early childhood, have the potential to affect lifelong visual potential and, at worst, lead to blindness.\(^3\) Additionally, careful assessment may also facilitate early detection of neurologic metabolic or genetic disorders which have loss of vision as a symptom.\(^4\)

A key function of the Western Australian Child Health Services Birth to School Entry Universal Contact Schedule and the Enhanced Aboriginal Child Health Schedule is to identify early health issues, disabilities and delay which impact on the health, development and wellbeing of the child.\(^2\) The current contact schedules provide an ideal opportunity to assess children through the use of standardised, evidence-based screening tools.\(^2\)

Underpinned by the principles of access and equity, screening is intended for all members of an identified target population who do not display symptoms of the disease or condition being screened for.\(^5\) Ultimately, the minimally invasive methods used in early childhood to reduce individual risk, or to improve early detection of common conditions, will reduce the burden of the condition in the wider community.\(^5\) Figure 1 outlines the principles of early disease detection as defined by the World Health Organisation (WHO).

### Condition:
- The condition should be an important health problem.
- There should be a recognisable latent or early symptomatic stage.
- The natural history of the condition should be adequately understood.

### Test:
- There should be a suitable test or examination.
- The test should be acceptable to the population.

### Treatment
- There should be an acceptable treatment for patients with recognised disease.

### Screening Program
- There should be an agreed policy on whom to treat as patients.
- Facilities for diagnosis and treatment should be available.
- The cost of case-findings should be economically balanced in relation to possible expenditure on medical care as a whole.
- Case–findings should be a continuing process and not a ‘once for all’ project.

**Figure 1: WHO principles of early disease detection.\(^5\),\(^7\)**
Development of the visual system and vision

Development of the visual system, beginning with the physical structure of the eye, starts early in foetal life. Whilst the neuro-components of the system develop towards the end of gestation and continue into the early neonatal period, the basic structure of the eye, including the cornea, lens, iris, pupil and eyelids remain immature until 34-36 weeks’ gestation when the infant can begin to limit light exposure.6

The retina is the neurologic part of the eye and most of the critical processes in its development occur between 24 weeks gestation and four months of age; any adverse events experienced during this time usually do not alter the structure (excluding retrolental fibroplasia, also known as Retinopathy of Prematurity [ROP]) but will impact function.6

The critical period of visual maturation, which ultimately allows clear images whilst simultaneously accommodating and fixating on an object, is affected by three main factors; genetics, endogenous stimuli and exogenous stimuli.4, 6 The processes involved in the development of sensory organs such as the eye are under genetic control and will proceed even in the absence of activity or stimulation. Endogenous stimuli such as brain-generated cell activity begins early in development, whilst a variety of exogenous - or external - stimuli is required to develop the visual experience in infants and children; these stimuli should provide 'focus, attention, novelty and sufficient contrast to see shapes and lines'.6(p200)

After birth, stimulation of the visual system is best achieved by positioning the infant approximately 20-30 centimetres from the mother’s face and may be enhanced in dim ambient light, with some light directed on to the mother’s face to allow for contrast of features.6 Additionally, of particular importance to the development of the visual system is the establishment and protection of REM (rapid eye movement) sleep and sleep cycles, both before and at birth.6 The disruption of either is known to cause significant interference to development and result in the loss of critical relationships between specific parts of the visual system.6

At birth, infants are sensitive to light and will turn their head towards large, diffuse sources of light and away from sudden, bright light.8

Rapid visual development occurs in the first three months of life, with visual acuity rising from 6/60 at birth to adult values of 6/6 (previously known as 20/20) by the end of the first year.8 From a very young age babies are attracted to looking at faces and patterns, provided they are within 30 centimetres, to maintain interest and fixation.8 Normal visual function is critically linked with a number of other developmental milestones such as fine motor skills, gross motor movements and social interaction, and this relationship is illustrated in Figure 2.1, 2, 8
**Figure 2: Aspects of visual functioning**

Table 1 below outlines the expected milestones for vision development in young children.

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Expected visual development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>Should blink to flash and turns towards diffuse light</td>
</tr>
<tr>
<td>1-4</td>
<td>Should show special interest in human face, stare at objects held close. Follow faces and objects held near. Watch own hands. Watch an adult at 1.5m</td>
</tr>
<tr>
<td>5-9</td>
<td>Should fixate 2.5cm cube at 30cms and then 1.5mm object (e.g. 100’s &amp; 1000’s) at 30cm by the end of 9 months. Many fundamental functions such as depth perception, relative perception of objects and smooth following should now be in place.</td>
</tr>
<tr>
<td>24 -30</td>
<td>Can match pictures of reducing sizes</td>
</tr>
<tr>
<td>36-48</td>
<td>Can match letters</td>
</tr>
</tbody>
</table>

**Table 1: Expected milestones for vision development in young children.**

**Loss of vision and disorders of the eye in early childhood**

Accurate prevalence statistics for vision disorders in Australian children are difficult to source due to the high number of undiagnosed, mainly refractive errors. However, the Royal Institute for Deaf and Blind Children (2014) estimate that vision impairment affects one in 25 Australian children, while an NHS study from 2004/05 found long and short sightedness to be amongst the top eight, most frequently reported, long-term conditions for children under the age of 15.
According to the 2004–05 ABS National Aboriginal and Torres Strait Islander Health Survey, Aboriginal children aged 0–14 years were about as likely as non-Aboriginal children to report long-term eye conditions (8% compared to 10% respectively).

The World Health Organisation (WHO 2014) uses four levels to describe visual function: normal vision, moderate impairment, severe impairment and blindness. Severe and moderate visual impairment are often grouped together and termed low vision.\(^1^\)

Vision impairments are functional limitations and most commonly affect acuity (i.e. sharpness and clarity), visual fields (normal ranges of sight) and colour.\(^2^\)

Legal blindness in Australia means that someone with vision impairment can see an object at six metres, that someone without vision impairment could see from 60 metres, and/or when the combined visual field for both eyes is less than ten degrees (as opposed to 170 degrees for someone with normal vision).\(^3^\)

Risk factors

Globally, approximately 90% of all people with a visual impairment live in a developing country, and it is estimated that 80% of all visual impairment can be prevented or cured.\(^4^\) In Australia, the most prevalent causes of vision impairment and blindness are age-related degenerative diseases such as macular degeneration and cataract, and uncorrected refractive error.\(^5^\) In children, however, impairment or loss is most likely to be attributed to:

- Genetic conditions.
- Maternal infections experienced during pregnancy (e.g., rubella, cytomegalovirus, venereal diseases, toxoplasmosis).
- Consequences of disease (e.g. diabetes, glaucoma, trachoma).
- Complications associated with extreme prematurity.
- Birth complications.
- Trauma, poisoning, and tumors.\(^6^\)

The following are considered 'red flags' which may assist in determining the need for referral to an ophthalmologist:

- Not looking at carer’s face or a bright object when held close, by six weeks.
- Not giving eye contact by eight weeks.
- Abnormal head posture.
- Not showing interest or not attempting to pick up small toys by 5 months.
- Absence of sharp visual fixation to 1.5mm objects after 9 months
- Erratic eye movements
- Eyes that cross, turn in or out or move independently
- Only using one eye to look at things\(^8^\)
Vision assessment

Following is brief overview of common vision assessments, and which age groups they are used for.

<table>
<thead>
<tr>
<th>Name of test:</th>
<th>Aim:</th>
<th>Target group:</th>
</tr>
</thead>
</table>
| **Red Reflex** (Bruckner Test) | To detect opacities in the pupil or corneal abnormality, and abnormalities of the back of the eye. The potential for strabismus can also be identified. | Neonates, infants and children. Performed at:  
✓ Each BTSE Universal Contact. |
| **Corneal Light Reflex Test** (Hirschberg Test) | To detect strabismus (squint). | Infants and young children. Performed at:  
✓ Each BTSE Universal Contact.  
✓ SEHA |
| **Distance vision testing** (using Lea Symbols Chart) | To identify amblyopia and unequal refractive errors using the 15 line Lea Symbols Chart. | Young children, 3-3.5 years. Performed at:  
✓ 3 year old check (targeted)  
✓ SEHA |
| **Distance vision testing** (using Snellen Alphabetical Chart) | To assess and record the visual acuity of clients who are literate in English. | Children over 6 years (targeted). Adults (targeted). |
| **Cover Test** | To detect a manifest strabismus. | Preschool and school-aged children, 3-3.5 years. Performed at:  
✓ 3 year old check (targeted)  
✓ SEHA |

Children often do not complain if their vision is blurred, if they see double, or if they compensate by using only one eye as they are unlikely to make valid comparisons with their peers. However, much loss of vision in early childhood is preventable if detected and treated early, further bolstering the rationale for screening in early childhood.\(^1\ 2\) Table 2 highlights some of the commonly occurring disorders of the eye, symptoms, causes and associated CACH procedures or documents.
<table>
<thead>
<tr>
<th>Disorder</th>
<th>Main causes(^{14-22})</th>
<th>Symptoms(^{14, 15, 17-19, 21, 22})</th>
<th>Related procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strabismus</td>
<td>Abnormalities in the muscles and nerves surrounding the eyes.</td>
<td>Crossed eyes</td>
<td>6.2.2 Red Reflex Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Double vision</td>
<td>6.2.3 Corneal Light Reflex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uncoordinated eye movements</td>
<td>6.2.4 Distance Vision Test (Lea)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vision loss</td>
<td>6.2.5 Cover test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loss of depth perception</td>
<td>6.2.6 Distance Vision Test (Snellen)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abnormal head position</td>
<td></td>
</tr>
<tr>
<td>Amblyopia</td>
<td>Untreated strabismus.</td>
<td>Underdevelopment of 3D vision.</td>
<td>6.2.2 Red Reflex Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loss of vision</td>
<td>6.2.3 Corneal Light Reflex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.2.4 Distance Vision Test (Lea)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.2.5 Cover test</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.2.6 Distance Vision Test (Snellen)</td>
</tr>
<tr>
<td>Congenital cataract</td>
<td>Congenital anomalies. Infection in mother while pregnant e.g. Rubella, MMR. Adverse reaction to certain drugs, in utero.</td>
<td>Opacity of the lens.</td>
<td>6.2.2 Red Reflex Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.2.3 Corneal Light Reflex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.8.7 Referral form to the Ophthalmologist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHS418 Information to Ophthalmologist from Community Health</td>
</tr>
</tbody>
</table>

\(^{14-22}\) References from 14-22

6.2.2 Red Reflex Test
6.2.3 Corneal Light Reflex
6.2.4 Distance Vision Test (Lea)
6.2.5 Cover test
6.2.6 Distance Vision Test (Snellen)
<table>
<thead>
<tr>
<th>Disorder</th>
<th>Main causes(^{14-22})</th>
<th>Symptoms(^{14, 15, 17-19, 21, 22})</th>
<th>Related procedures</th>
</tr>
</thead>
</table>
| Congenital glaucoma            | Congenital anomalies causing incorrect development of the eye’s drainage system, leading to increased pressure and damage to the optic nerve. | Enlarged eyes.  
Cloudiness of the cornea.  
Photosensitivity.                                                                 | 6.2.2 Red Reflex Test  
6.2.3 Corneal Light Reflex  
3.8.7 Referral form to the Ophthalmologist |
| Conjunctivitis                 | Bacterial or viral infection.                                                                | Irritated, red eye.  
Excessive tear production.  
Pus discharge.  
Swollen eyelids.  
Photophobia                                                                  | 3.8.6 Guide to completing a physical assessment of a child. |
| Lacrimal system blockage       | Congenital anomalies.  
Chronic sinusitis.  
Nose trauma.  
Nose polyps.  
Conjunctivitis.                                                             | Production of tears in the neonate.  
Watering eye.  
Discharge of pus.  
Crusted mucus along the eyelashes.  
Increased susceptibility to eye infections.                     | 3.8.6 Guide to completing a physical assessment of a child. |

*Also known as a blocked tear duct.*

| Nystagmus                      | Abnormal function of the areas of the brain which control eye movement due to congenital anomalies, trauma or infection | Blurred vision.  
Abnormal head posture.                                                        | 6.2.2 Red Reflex Test  
6.2.3 Corneal Light Reflex  
6.2.5 Cover test  
3.8.7 Referral form to the Ophthalmologist  
CHS418 Information to |
<table>
<thead>
<tr>
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<th>Main causes(^{14-22})</th>
<th>Symptoms(^{14, 15, 17-19, 21, 22})</th>
<th>Related procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(Cancer of the eye)</em></td>
<td></td>
<td></td>
<td>6.2.2 Red Reflex Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.2.3 Corneal Light Reflex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.2.5 Cover test</td>
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<tr>
<td></td>
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<td></td>
<td>3.8.7 Referral form to the Ophthalmologist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHS418 Information to Ophthalmologist from Community Health</td>
</tr>
<tr>
<td>Retrolental fibroplasia</td>
<td>Scarring of the retina due to unstable oxygen levels in the blood. Premature birth.</td>
<td>None; only detected by an ophthalmologic examination.</td>
<td>6.2.2 Red Reflex Test</td>
</tr>
<tr>
<td><em>(Also known as Retinopathy of Prematurity)</em></td>
<td></td>
<td></td>
<td>6.2.3 Corneal Light Reflex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.2.5 Cover test</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.8.7 Referral form to the Ophthalmologist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CHS418 Information to Ophthalmologist from Community Health</td>
</tr>
</tbody>
</table>

**Table 2: Common childhood eye disorders**
### General principles

#### Prevention

The World Health Organisation (2013, p1) suggests ‘prevention of blindness [and visual impairment] should be an integral part of primary health care’, via a combination of primary, secondary and tertiary prevention strategies, as outlined in Table 3 below.

<table>
<thead>
<tr>
<th></th>
<th>Primary prevention strategies</th>
<th>Secondary prevention strategies</th>
<th>Tertiary prevention strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prenatal</strong></td>
<td>Immunisation.</td>
<td>Screening of high risk groups.</td>
<td>Education support.</td>
</tr>
<tr>
<td></td>
<td>Health education.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nutrition, dietary supplementation.</td>
<td></td>
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<tr>
<td></td>
<td>Genetic counselling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Immunisation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved personal hygiene and living conditions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Injury prevention.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early detection and treatment of type 1 diabetes.</td>
<td>Treatment when available.</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Example prevention strategies during early life.23

#### Detection

It is understood that the earlier the vision impairment is identified and confirmed, the more likely it is that the child’s potential will be maximised through appropriate visual aid provision. As such, early detection via universal and targeted screening programs is central to reducing the burden of vision impairment for the individual and their community.1, 5
Birth to School Entry Universal Contact Schedule (BTSE):

- All West Australian families are offered the Birth to School Entry Universal Contact Schedule in the community health setting.
- The Universal contacts occur at the key developmental ages of 0-10 days, 6-8 weeks, 3-4 months, 8 months, 18 months and three years. Risk factors and assessments for vision are conducted at these times according to the physical assessment guidelines.
- Children with identified concerns are offered referral, liaison, advocacy and follow-up.
- All children are offered the School Entry Health Assessment (SEHA) at either kindergarten or pre-primary, which includes eye health screening via vision assessment using Lea Symbols Chart, Cover Test and Corneal Light Reflex Test. For children with identified concerns, referral, liaison, advocacy and follow-up also occurs.

Enhanced Aboriginal Child Health Schedule (EACHS):

- Aboriginal families who are identified as having additional needs are offered access to the Enhanced Aboriginal Child Health Schedule.
- This incorporates a more comprehensive series of child health screening and surveillance assessments, with additional eye health screening opportunities, for children aged 0 – 5 years (up to 15 contacts).
- Where appropriate referrals are made to specialist services including Aboriginal Medical Services.

Management

Effective management strategies depend on accurate assessment. In most cases, prompt management can assist in prevention of serious long term effects. Some common management strategies are listed in table three, under ‘Tertiary Prevention’.

Role of community health staff

- Maintain competency in a range of procedures which aim to detect early vision deficits.
- Identify and use the best methods for raising awareness about eye disease and/or vision problems.
- Learn how to prevent and manage eye diseases and vision problems.
- Communicate effectively with patients using visual and/or oral language skills.
- Use appropriate technology effectively and critically, showing responsibility towards the health of the patient.
- Be culturally sensitive across a range of social contexts.
Documentation

Use any of the following forms to note results for vision testing:

- Child Health - CHS 560
- School Health - CHS 409-2 or CHS 412- School health progress notes
- CHS 142- Referral to Community Health Nurse
- Personal Health Record (purple book).
- 3.8.13 Enhanced Aboriginal Child Health Record.
- CHS 663 Referral from Community Health

Follow-up

Vision impairment requires review and management by specialist services and as such, interventions are not usually carried out by CHNs. However, re-testing the child in a controlled environment before referral is sometimes indicated to avoid inaccurate results. Follow-up also includes actions taken by the CHN to support the child and their family through the provision of education and reinforcement of healthy behaviours to prevent or manage the diagnosed issue.

An abnormal Red Reflex may indicate neonatal or early childhood conditions including congenital cataract, congenital glaucoma and retinoblastoma - all of which require immediate action and referral for specialist review. Retinoblastoma can be fatal if untreated and it is therefore important to ensure prompt treatment of the tumour.

The following services are useful in provision of additional assessment, care and support for children with eye health and/or vision issues.

Medical Practitioner

Where eye or vision abnormalities are detected, a referral to a medical practitioner is required. They can then refer to an ophthalmologist or optometrist for monitoring and/or treatment, where required.

Ophthalmologist

Referral to an ophthalmologist is usually the recommended referral pathway when an eye disorder is initially detected. The CHS418 – Information to Ophthalmologist form may be completed by community health professionals for the parent to give directly to the ophthalmologist once the appointment occurs. These forms will assist monitoring of referral outcomes.

Optometrist

Referral to an optometrist may be undertaken to expedite follow-up where distance or other factors impact on prompt review by ophthalmology services. Referrals may be made for children older than eight years, for treatment of refractive errors (without
amblyopia present). There is some evidence to suggest that an improvement in visual acuity results from correction of refractive errors.

Use of the community education and support groups, such as Lions Eye Institute and Vision Australia can be helpful for families to source information and engage with other families experiencing similar difficulties.

See Appendix 1 for Vision referral and follow-up flow chart.

**Related professional development**
- Vision and Hearing Skills Orientation Study Days – CACH WFD
- Clinical Practice Updates (CPU) - CACH WFD.

**Related policies, procedures and guidelines**

<table>
<thead>
<tr>
<th>Related policies, procedures and guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2.1 Child Health Policy Rational Document 2010</td>
</tr>
<tr>
<td>3.2.2 Policy for Universal Child Health Services in WA</td>
</tr>
<tr>
<td>3.7.2 Vision behaviour development grid</td>
</tr>
<tr>
<td>6.2 Vision assessment procedures</td>
</tr>
<tr>
<td>4.4.2 School Entry Health Assessments</td>
</tr>
<tr>
<td>3.8.5 How children develop</td>
</tr>
<tr>
<td>3.8.6 Guide to completing a physical assessment of an infant and child</td>
</tr>
</tbody>
</table>

**Useful resources**

- West Australian vaccination schedule (2014)
- Universal Child and School Health Schedule
- Your baby’s eyes
- Colour Blindness

<table>
<thead>
<tr>
<th>Policy Owner</th>
<th>Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director Statewide Policy Unit.</td>
<td>Birth to School Entry</td>
</tr>
</tbody>
</table>
References


