Important notes on these guidelines:

This document is intended for optometrists in clinical practice for their use in assessing when a visual field test is required and what type of test should be used.

These guidelines are not for Medicare purposes - there will be occasions when visual field assessment is indicated but will not be covered by Medicare.

Establishing a baseline and identifying progression of any visual field defect is absolutely essential in clinical management. However it is beyond the scope of these guidelines to discuss decibel levels and the number of points lost that constitutes a visual field loss, or how progression is best detected and monitored. Practitioners are recommended to compare data to age-normal control data from recent literature, and consider the further reading recommended at the end of the document.

These guidelines are not a substitute for legal responsibilities and optometrists must ensure that they comply with State and Federal Law and Common Law responsibilities.

The field of vision is frequently disturbed in ocular and neurological disorders. Visual field testing allows detection of some of these disorders and differentiation between disorders. It is considered essential for the diagnosis and management of glaucoma, is commonly used in neurological disease and aspects of retinal disease, and to evaluate vision standards and visual disability.

The normal patient can see 60 degrees nasally, 110 degrees temporally, 75 degrees inferiorly and 60 degrees superiorly. The incidence of visual field loss in the general population is approximately 3 to 5 per cent and incidence increases with age. It is worth noting that not all visual field defects are clinically significant and detection of a visual field defect with routine testing may not always alter patient management.

Practitioners who do not possess appropriate visual field testing instrumentation should ensure that patients for whom visual field testing is indicated are referred to an optometric colleague for this testing unless the indications are such that referral to an ophthalmologist is more appropriate.

Establishing a baseline visual field

It is highly important to establish a reliable baseline visual field measurement. Typically all initial or abnormal visual fields results are repeated and at least 2 tests will be required to establish baseline measurements. Many variables influence reliability including fixation losses, high false positive or

---

1 Alward, W. Glaucoma the requisites in ophthalmology. Krachmer, J. Editor; Mosby, St Louis; 2000; p57-61
negative responses as well as the acknowledged learning effect which can mimic certain defects.\(^4,5\)

Some patients are unable to complete visual field testing for physical, medical or intellectual reasons.

**Table 1. General indications for visual field testing (see Appendix 1 for more detailed indications)**

Not all visual field testing indications meet requirements for Items 10940 or 10941 described in the Optometric Medicare Benefits Schedule

- To detect clinically significant visual field defects in disease processes as early as possible to facilitate diagnosis, referral and appropriate management.
- To investigate unexplained symptoms and signs which may be associated with disorders of the visual pathways.
- To establish the extent, depth and other characteristics of non-progressive or clinically insignificant disorders that may affect the visual field for baseline measure. This is to facilitate the detection of any defect superimposed on the initial disorder at a later date.
- To monitor any progression of established or previously diagnosed conditions.
- To determine the fitness of patients to meet visual standards.

**Confrontation**

Confrontation is a simple screening test used to identify gross defects. It is routinely performed in practice. Confrontation is useful when examining bedridden patients, young children\(^6\), patients with reduced attention spans or in initial visual field assessment following head trauma.

The American Academy of Ophthalmology\(^7\) and the American Optometric Association\(^8\) recommend screening of the visual field by confrontation and further assessment of visual fields as indicated by and dependent upon patient history, examination findings and professional judgement.

**Amsler chart (grid)**

The Amsler chart is a rapid qualitative technique designed to test the central 10 degrees of the visual field.\(^9\) It is widely used for a quick assessment of macular function and for symptoms of metamorphopsia.\(^10\) The usual test distance is 28-30cm and the test is administered monocularly using appropriate reading correction.\(^11\)

---

11 Royal College of Ophthalmologists Hydroxychloroquine and Ocular Toxicity Recommendations on Screening October 2009 www.rcophth.ac.uk
The Amsler chart is relatively insensitive and nonspecific yet may be used to monitor and detect changes in monocular central vision at home by patients with age-related macular degeneration\(^\text{12}\), hydroxychloroquine retinopathy and other macular conditions.\(^\text{13}\)

Patients with AMD should monitor their central vision regularly with an Amsler chart, which may indicate the onset of neovascular disease.\(^\text{14}\) Despite it not being widely recommended for clinical diagnostic use\(^\text{15}\), current best practice involves issuing patients with an Amsler chart for daily or weekly observation with the instruction to attend for immediate assessment should any new distortion be perceived.\(^\text{16,17}\)

**Automated Perimetry**

Visual field testing using automated perimetry is not yet considered an essential component of a routine visual examination in optometric practice, although some practitioners routinely administer some form of automated perimetry on their patients to provide baseline data for future reference.\(^\text{5,6}\) It is important to note that Medicare benefits will not be paid for visual field testing performed on this basis alone. Automated perimetry is generally considered feasible in subjects with a developmental age of at least 9 years.\(^\text{18}\)

**Screening**

Suprathreshold (screening) tests are designed to efficiently evaluate visual field status. As such they are used for screening purposes and for patients who are inexperienced or incapable of completing detailed visual field examinations.\(^\text{19}\) Recent improvements in threshold algorithms\(^\text{13-16}\) have substantially reduced the time taken by threshold perimetry and have made screening largely redundant, except for large defects. Suprathreshold testing is not appropriate for monitoring disease progression as it does not quantify the depth of visual field defects.\(^\text{20}\) Medicare will not reimburse fees for screening visual field tests.

**Threshold**

Threshold visual field testing refers to the intensity or brightness of the stimulus that can be detected 50% of the time. During a threshold test, a stimulus is first presented 6 decibels (dB) brighter than expected for the given patient. If it is not seen initially the intensity is increased 4dB each time until it is seen. Then the intensity is decreased 4dB each time until it is no longer seen. After this it is

\(^\text{14}\) Alexander P, Baxter J. Dry vs. wet age-related macular degeneration BMJ 2010 http://www.bmj.com/content/340/bmj.c981.short/reply
\(^\text{18}\) Royal College of Ophthalmologists The Ocular Side-Effects of Vigabatrin (Sabril) Information and Guidance for Screening March 2008 www.rcophth.ac.uk
\(^\text{19}\) Sample PA et al. Imaging and Perimetry Society Standards and Guidelines Optom Vis Sci 2011;88:4-7
increased again 2dB at a time until it is seen again. Based on these readings a threshold value is determined.\textsuperscript{21}

Most automated perimeters now incorporate modifications to conventional threshold (staircase) testing. These include threshold estimation algorithms that offer faster test strategies – Swedish Interactive Test Algorithm (SITA) and Zippy Estimation by Sequential Testing (ZEST).\textsuperscript{22,23} Generally SITA-standard is the more commonly used program for patients with known glaucoma. SITA-fast is reserved for patients who are glaucoma suspects or those who can sit at the machine only very briefly.\textsuperscript{24}

Threshold perimetry should be used when establishing a patient’s baseline visual field as well as for monitoring (the progression of) a known defect.\textsuperscript{25} Establishing a good, reliable baseline measure and then using consistent strategy and test pattern is best to detect and monitor progression.

**Frequency Doubling Technology**

Frequency doubling technology (FDT) is based on the phenomenon in which alternating light and dark bars appear to have twice the actual number of bars when shown at low spatial frequency (<1cpd) and high temporal frequency (>15Hz) counterface flicker.\textsuperscript{26} FDT is function-specific and targets the magnocellular ganglion cells.

FDT perimetry has both screening and full-thresholding modes and typically takes between 1-5 minutes. FDT does not have the sensitivity and specificity to detect early glaucoma efficiently in a population but may be effective to screen if trying to detect more advanced glaucoma. It is also thought to be a weak predictor of progressive damage to the optic nerve assessed by structure or worsening standard automated perimetry (SAP).

Matrix FDT represents an advance in FDT, with modifications to stimulus size and the use of the Zippy Estimation of Sequential Thresholding (ZEST) algorithm. It is thought to perform about as well as SAP.

**Standard Automated Perimetry (white-on-white)**

Standard automated perimetry (SAP) is a nonspecific test of visual function that is used to determine the minimum threshold necessary to detect the presence of a static white light stimulus of constant size in various locations of the visual field. It is the cornerstone of visual field testing; quantification of visual field loss is performed using threshold tests. SAP is the current clinical standard for the detection and management of glaucoma, although a certain threshold amount of retinal ganglion cell

\textsuperscript{22} King-Smith PE et al. Efficient and unbiased modifications of the QUEST threshold method: theory, simulations, experimental evaluation and practical implementation. Vision Res. 1994 Apr;34(7):885-912
\textsuperscript{24} Dersu I, et al, Understanding Visual Fields, Part 2; Humphrey Visual Fields, J Ophthalmic Med Technology, 2006;Volume 2(2)
\textsuperscript{26} Jampel et al, Assessment of Visual Function in Glaucoma A Report by the American Academy of Ophthalmology, Ophthalmology 2011;118:986-1002
death is required for the appearance of an initial visual field defect (this threshold varies between patients). One limitation of SAP is that it is totally dependent on patient input.

**Short Wavelength Automated Perimetry**

Short-wavelength automated perimetry (SWAP), or blue-on-yellow perimetry, uses a blue stimulus against a bright yellow background to selectively test the blue cones and their ganglion cell connections. SWAP is commercially available on certain perimeters, utilising SITA technology.

**Peripheral field testing**

Peripheral testing should be considered in neurological disease, some retinal diseases (e.g. retinitis pigmentosa, retinal detachment) or when assessing patients against visual standards. A full field screening technique or a combination of a central threshold test and peripheral suprathreshold screening test may be practical and shorten test times.

**Kinetic Perimetry**

Although not routine in optometric clinical practice, kinetic perimetry is essential for assessment of neurological deficits where standard automated perimetry has some shortcomings (such as extent in degrees). Goldmann perimetry is an example of kinetic perimetry. In kinetic perimetry, test objects are moved (by the examiner) from outside the boundary of visual perception toward fixation. When the patient perceives the particular test object, a set of visual threshold points are plotted and the line that connects these thresholds is called an isopter. Most defects are represented by changes in the isopter. Goldmann visual field testing utilises different target types that can be varied according to size and light intensity. Other indications for Goldmann testing are when the full extent of the visual field needs to be tested, if the patient responds better to the test format or occasionally to confirm SAP results.

**Glaucoma and visual field testing**

The frequency of visual field testing for patients with established glaucoma and in assessing patients suspected of having glaucoma is beyond the scope of these guidelines.

The NHMRC Guidelines for the Screening, Prognosis, Diagnosis, Management and Prevention of Glaucoma 2010 lists key recommendations and evidence statements about patient management. Recommendation 8, “Assess with a comprehensive medical history, a full eye examination and investigate appropriately” describes ‘appropriate investigations’ as “standard automated perimetry

---

27 Kerrigan-Baumrind LA, Quigley HA, Pease ME, Kerrigan DF, Mitchell RS. Number of ganglion cells in glaucomatous eyes compared with threshold visual field tests in the same persons. Invest Ophthalmol Vis Sci 2000;41:741-748
32 Spector R. Visual Fields Ch 116
(white-on-white) including comparison with age-corrected normal on a point-wise, regional (eg. hemifield) and global basis.”

It is prudent to again note how important it is to establish a baseline measurement of a patient’s visual field and that this may take 2 or more tests to determine. Only then can you determine whether there is future progression.

Monitoring any progression of visual field deficits in glaucoma has been the subject of many investigations. A glaucoma staging system (GSS) based on visual field results has been established which may assist practitioners in their decision making.

Systemic medication and visual field testing

Hydroxychloroquine is used primarily for rheumatoid arthritis and systemic lupus erythematosus. Chloroquine works similarly though it is used less frequently. Possible ocular side effects include retinal toxicity which can lead to permanent visual impairment, though the incidence is very low and generally takes several years to develop.

The American Academy of Ophthalmology recommends a systematic approach when caring for patients who take these medicines which is determined by risk status. Risk status is based on factors such as drug dose and duration of intake. AAO recommends all patients have a baseline examination upon commencing therapy. Annual screening should begin after 5 years - sooner if there are unusual risk factors. Amsler grid testing is no longer recommended. Multifocal electroretinogram (mERG), spectral domain optical coherence tomography (SD-OCT) or fundus autofluorescence (FAF) are recommended in conjunction with 10-2 automated fields.

Vigabatrin (Sabril) is an anti-epileptic drug used for the treatment of partial epilepsy. Visual field defects in patients taking Vigabatrin have been reported in literature since the 1990s. A baseline visual field should be obtained (by patients able to complete visual field testing) before commencing treatment and then repeated every 6 months for 5 years. It can then be extended to annually in patients who have no defect detected.

The American Optometric Association has produced a summary of potential ocular toxicity effects of selected medications and how to monitor for these which can be viewed online http://www.aoa.org/x5496.xml

---

34 Mills, R. et al, Categorizing the Stage of Glaucoma From Pre-Diagnosis to End-Stage Disease, Am J Ophthalmology 2006;141:24-30
35 Ojaimi E, Guymer R, Wong TY & Harper CA Hydroxychloroquine retinopathy: screening needed to prevent blindness. MJA (letters) 192;11:668-669
36 Royal College of Ophthalmologists Hydroxychloroquine and Ocular Toxicity Recommendations on Screening October 2009 www.rcophth.ac.uk
38 Royal College of Ophthalmologists The Ocular Side-Effects of Vigabatrin (Sabril) Information and Guidance for Screening March 2008 www.rcophth.ac.uk
Further reading

National Health and Medical Research Council Guidelines for the Screening, Prognosis, Diagnosis, Management and Prevention of Glaucoma 2010

The NHMRC is Australia’s peak body for supporting health and medical research; for developing health advice for the Australian community, health professionals and governments; and for providing advice on ethical behaviour in health care and in the conduct of health and medical research.

The latest NHMRC Guidelines for the Screening, Prognosis, Diagnosis, Management and Prevention of Glaucoma were published in 2010 and are available at:


The guidelines offer a review and summary of the relative merits of visual field testing strategies as well as advice on grading glaucoma based on automated perimetry results. The guidelines suggest automated perimetry regimens for monitoring of visual field status from establishment of baseline tests to determining functional change.


The NICE Guidance document Glaucoma – diagnosis and management of chronic open angle glaucoma and ocular hypertension lists recommended testing schedules for patients under suspicion for or with glaucoma and was considered as part of the concordance process of the Australian Government’s 2010/11 Quality Framework review of MBS perimetry items. It was published in April 2009 and may be viewed online: http://guidance.nice.org.uk/CG85/Guidance/pdf/English

The Imaging and Perimetry Society Standards and Guidelines published in 2011 aim to provide “standards, recommendations, guidelines and requirements for the application of perimetry to clinical ophthalmic practice and scientific study.”
Appendix 1: Indications for performing automated visual field testing

*note these indications are not exhaustive nor will Medicare always cover such testing. Consult the OAA Billing Guide or the Optometric MBS available online for further details.

1. Risk factors for glaucoma

The NHMRC practitioner guideline for the Screening, Prognosis, Diagnosis, Management and Prevention of Glaucoma 2010 considers glaucoma risk factors as those obtainable via patient history or obtained from ocular examination and allocates them a degree of risk. The table below is an adaptation of Table 6.1 and Table 6.2 which is useful for determining where automated visual field testing is indicated.

<table>
<thead>
<tr>
<th>Strength of risk</th>
<th>Strength of evidence</th>
<th>**</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTREMELY HIGH 12x or more</td>
<td>IOP&gt;26mmHg Central corneal thickness &lt;555micron</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIGH 3x or more</td>
<td>Age over 80 years IOP&gt;24mmHg Family history Specific ethnic origin</td>
<td>Cup:disc ratio &gt;0.7 Cup:disc ratio asymmetry &gt;0.2 Optic nerve rim haemorrhage</td>
<td></td>
</tr>
<tr>
<td>MODERATE 2x or more</td>
<td>Diabetes Myopia Age over 65 years</td>
<td>Cup disc ratio &gt;0.5 Rural location Steroid use Exfoliation</td>
<td>Eye injury</td>
</tr>
<tr>
<td>LOW Over 1x</td>
<td>Migraine High blood pressure IOP&gt;21mmHg</td>
<td>Age over 50 years</td>
<td>Smoking</td>
</tr>
</tbody>
</table>

2. Investigation of intracranial disorders potentially affecting the visual pathways

- Transient ischaemic attack
- Cerebrovascular accident
- Known or suspected carotid artery insufficiency
- Significant head trauma
- Intracranial space taking lesions
- Cranial nerve abnormalities, gaze palsies
- Atypical visual aura or differentiation of migraine symptoms

---

3. Investigation/differentiation of optic nerve disorders
   - optic disc oedema, optic disc pallor
   - afferent pupil defects or other abnormal pupil reactions
   - known or suspected multiple sclerosis
   - acquired colour vision loss
   - baseline measurements of congenital optic nerve abnormalities (e.g. optic nerve drusen, optic nerve pits, tilted disc syndrome)

4. Unexplained symptoms such as
   - ocular/peri ocular/retro bulbar pain
   - reduction in visual acuity
   - subjective visual field loss or positive scotoma

5. Abnormalities detected with confrontation

6. Monitoring of potential ocular toxicity of systemic drugs\(^{41}\)

---

\(^{41}\) http://www.aoa.org/x5496.xml