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## Vision screening in infants, children and youth

The importance of screening for visual problems in childhood is based on the recognition that 5% to 10% of preschoolers will have difficulties which, if left untreated, may interfere with the proper development of visual acuity. The present position statement is an update to the 1998 statement (1).

A Cochrane review of literature from 1966 to 2004 on screening for correctable visual acuity defects in school-aged children and adolescents found “no robust trials available that allow the benefits of school vision screening to be measured. The disadvantage of attending school with a visual acuity deficit also needs to be quantified. The impact of a screening program will depend on the geographical, and the socio-economic setting in which it is conducted” (2). However, major refractive errors can occur in 5% to 7% of preschoolers (3,4); individual randomized, longitudinal studies report that early screening has been associated with a decrease in the prevalence of amblyopia and improved acuity by 60% (5). Screening before three years of age is associated with a 70% lower prevalence of amblyopia after treatment (4,6). The single and most effective test for amblyopia is the determination of visual acuity by noninvasive testing. A Cochrane review on screening specifically for amblyopia (1966 to 2005) concluded that “the lack of data from randomized controlled trials makes it difficult to analyze the impact of screening programs on the prevalence of amblyopia. The absence of such evidence cannot be taken to mean that vision screening is not beneficial; simply that this intervention has not yet been tested in robust studies” (7). Adverse effects on educational and social development, as well as limitations to career choice are obvious consequences of poor visual acuity. Uncorrected amblyopia is a significant risk factor for total blindness, in the case of injury or disease, in the better functioning eye.

The American Academy of Ophthalmology and the American Academy of Pediatrics (6) recommend visual assessment from birth and at all routine health supervisory visits. The child’s anatomy and function should be checked at regular infant and well-child visits, and visual acuity should be assessed at the preschool stage as well as when there is a complaint. Infants with a known risk (retinopathy of prematurity, Down’s syndrome, etc) or significant family

history (congenital glaucoma, strabismus) should be referred for further evaluation (6).

Photoscreening is a photographic technique that can identify significant refractive differences and opacities in the reflex. This technology, which uses digital camera-like equipment, has been recently studied in large populations of young children and compared with traditional methods of acuity assessment. In 2002, the American Academy of Pediatrics (8) made recommendations on the use of photoscreening for children, yet identified the need for additional research on its cost-effectiveness and efficacy. More recent published information, including the Lions Clubs International photoscreening study (9), which reported on 400,000 preschool children screened in 17 programs in the United States and Taiwan, found the procedure to be cost-effective with a positive predictive value of over 80%. A statewide-free photoscreening program in Alaska offered to 13,255 children, one to five years of age, reported a positive predictive value of over 95% (10). However, the negative predictive value of these rather large studies has not been clearly established; therefore, the safety of this promising technology remains unknown compared with conventional methods. There appears to be some agreement on the cost-effectiveness as well as the efficacy of photoscreening in preschoolers (10,11). This technology, however, is not appropriate for office-based primary care and assessment of infants and children.

### DEFINITIONS

#### Amblyopia

Reduced vision in the absence of ocular disease, which occurs when the brain does not recognize the input from that eye. Two common causes are strabismus and a difference in refractive error.

#### Refractive error

Inability of the eye to focus the image, which is usually correctable with a lens.

#### Strabismus

Misalignment of the eye in any direction; may be constant or intermittent. Pseudostrabismus occurs most often when a broad nasal bridge covers the nasal sclera unequally. This can be determined by the presence of a symmetrical corneal light reflex.

**Cataract**

Opacification of the crystalline lens.

### CLINICALLY USEFUL NORMAL VISUAL DEVELOPMENT LANDMARKS (12)

- Face follow: Birth to four weeks of age.
- Visual following: Three months of age.
- Visual acuity measurable with appropriate chart: 42 months of age.

### COMMON SCREENING AND ASSESSMENT TESTS

#### Red reflex

Reflection of orange-red light from the retina through the pupil, seen at 0.5 m distance through the ophthalmoscope set on '2' diopters. The light should be equal in brightness and colour, and should fill the pupil completely.

#### Cornea light reflection

Small focal bright white reflection of light on the cornea, which should be symmetrically positioned close to the centre of each cornea.

#### Fundoscopy examination

Examination of the posterior segment of the eye using an ophthalmoscope.

#### Cover-uncover test

Performed by covering one eye at a time while the child fixates on a target. The uncovered eye should not move. The covered eye should also not reposition when exposed. If any such movement occurs during this test, providing vision is good (fixation is well maintained), the child should be referred for further assessment.

#### Vision testing methods

Use age-appropriate instruments, recognizing that recommendations depend on cognitive ability. The highest level of the chart recognizable by the child should be used. (Most children who are four years of age can recognize Snellen letters and numbers).

- Logarithm of the minimum angle of resolution, Lea Hyvärin (LogMAR LH) chart (standardized validated identifiable shapes) from 42 months of age.
- HOTV chart (four-letter shapes), tumbling E chart or Lea symbols (shapes) from 36 months of age.
- LogMAR Snellen chart (letters of the alphabet or numbers) after six years of age.
- The Allen chart (pictograms), previously widely used, is now thought to be too culturally specific to be helpful.

Testing is performed at 3 m (one eye at a time, the suspected better eye first). All screening tools described here are designed to be used by nonophthalmological personnel,

with minimal training including physicians, school health nurses, etc (13).

### RECOMMENDATIONS (AT INFANT AND WELL-CHILD VISITS)

The levels of evidence reported in these recommendations use the criteria outlined by the Canadian Task Force on Preventive Health Care (14).

- Newborn to three months of age (level of evidence rating BII):
  - o A complete examination of the skin and external eye structures including the conjunctiva, cornea, iris and pupils.
  - o An inspection of the red reflex to rule out lenticular opacities or major posterior eye disease.
  - o Failure of visualization or abnormalities of the reflex are indications for an urgent referral to an ophthalmologist.
  - o High-risk newborns (at risk of retinopathy of prematurity and family histories of hereditary ocular diseases) should be examined by an ophthalmologist.
- Six to 12 months of age (level of evidence rating BII):
  - o Conduct examination as above.
  - o Ocular alignment should be observed to detect strabismus. The corneal light reflex should be central and the cover-uncover test should be normal.
  - o Fixation and following a target are observed.
- Three to five years of age (level of evidence rating AII):
  - o Conduct examination as above.
  - o Visual acuity testing should be completed with an age-appropriate tool.
- Six to eighteen years of age (level of evidence rating BIII):
  - o Screen as above whenever routine health examinations are conducted.
  - o Examine whenever complaints occur.

Routine comprehensive professional eye examinations of healthy children with no risk factors have no proven benefit (6). School-aged children who pass visual examinations and screenings but have reading difficulties should be referred to a reading specialist educator for further assessment. Any infant or child with abnormalities on examination, or who does not pass visual screening, should be referred for further assessment. Infants and children with risk factors, such as developmental delay, should also be fully examined by a well-trained eye care professional (6). It is imperative that access to appropriate professional ophthalmological expertise is readily available and provided by the public health care system of Canada.

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