



Visual System Assessment in Infants, Children, and Young Adults by Pediatricians

COMMITTEE ON PRACTICE AND AMBULATORY MEDICINE, SECTION ON OPHTHALMOLOGY, AMERICAN ASSOCIATION OF CERTIFIED ORTHOPTISTS, AMERICAN ASSOCIATION FOR PEDIATRIC OPHTHALMOLOGY AND STRABISMUS, AMERICAN ACADEMY OF OPHTHALMOLOGY

Appropriate visual assessments help identify children who may benefit from early interventions to correct or improve vision. Examination of the eyes and visual system should begin in the nursery and continue throughout both childhood and adolescence during routine well-child visits in the medical home. Newborn infants should be examined using inspection and red reflex testing to detect structural ocular abnormalities, such as cataract, corneal opacity, and ptosis. Instrument-based screening, if available, should be first attempted between 12 months and 3 years of age and at annual well-child visits until acuity can be tested directly. Direct testing of visual acuity can often begin by 4 years of age, using age-appropriate symbols (optotypes). Children found to have an ocular abnormality or who fail a vision assessment should be referred to a pediatric ophthalmologist or an eye care specialist appropriately trained to treat pediatric patients.

abstract

INTRODUCTION

This policy statement and its accompanying clinical report, "Procedures for the Evaluation of the Visual System by Pediatricians,"¹ supplant the 2012 policy statement "Instrument-Based Pediatric Vision Screening,"² the 2003 policy statement "Eye Examination in Infants, Children, and Young Adults by Pediatricians,"³ and the policy statement "Red Reflex Examination in Neonates, Infants, and Children."⁴ This statement is coauthored by the American Academy of Ophthalmology, the American Association for Pediatric Ophthalmology and Strabismus, and the American Association of Certified Orthoptists.

Eye examinations and vision assessments are critical for the detection of conditions that often result in visual impairment, signify serious systemic disease, lead to problems with school performance, and, in some cases, threaten the child's life. Through careful evaluation of the visual system, retinal abnormalities, cataracts, glaucoma, retinoblastoma, strabismus, and

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neurologic disorders, including amblyopia, can be identified. Ocular problems can also be the first indicator of general health concerns. Timely treatment of these conditions is critical, as is the education of parents with respect to the importance of timely follow-up and documentation in the medical record that the education occurred. Regular vision screening assessments in early childhood reduce the risk of persistent amblyopia at 7 years of age by more than 50%.⁵ However, vision screening cannot be expected to detect all causes of amblyopia.

TIMING OF EXAMINATIONS AND SCREENING

Preterm infants should initially be evaluated under the guidance of the American Academy of Pediatrics policy statement “Retinopathy of Prematurity Screening”⁶ and referred for a specialized eye examination by an ophthalmologist experienced in evaluating and treating infants, if required. Similar referral to a specialist should be made for newborn infants with family histories of congenital cataracts, retinoblastoma, or metabolic disease or in whom systemic disease associated with serious ocular abnormalities is suspected. Because family history is an important risk factor for amblyopia and strabismus, pediatric clinicians should consider referring children who have first-degree relatives with these conditions; referral should take place promptly if symptoms or signs are present and, if not, once a child is of sufficient age to cooperate for examinations.⁷ Otherwise healthy children should be screened in the primary care setting at the intervals provided in Table 1. Because ocular problems can be the initial manifestation of neurologic or systemic disease, pediatricians should be aware of subtle but important findings that can be detected through screening or careful examination of

TABLE 1 Periodicity Schedule for Visual System Assessment in Infants, Children, and Young Adults

Assessment	Newborn to 6 mo	6–12 mo	1–3 y	4–5 y	6 y and older
Ocular history	x	x	x	x	x
External inspection of lids and eyes	x	x	x	x	x
Red reflex testing	x	x	x	x	x
Pupil examination	x	x	x	x	x
Ocular motility assessment	—	x	x	x	x
Instrument-based screening ^a when available	—	^b	x	x	^c
Visual acuity fixate and follow response	x ^f	x	x	—	—
Visual acuity age- appropriate optotype ^d assessment	—	—	x ^e	x	x

^a Current Procedural Terminology code 99174.

^b The American Academy of Ophthalmology (AAO) has recommended instrument-based screening at age 6 mo. However, the rate of false-positive results is high for this age group, and the likelihood of ophthalmic intervention is low.¹⁶ A future AAO policy statement will likely reconcile what appears to be a discrepancy.

^c Instrument-based screening at any age is suggested if unable to test visual acuity monocularly with age-appropriate optotypes.

^d Current Procedural Terminology code 99173.

^e Visual acuity screening may be attempted in cooperative 3-y-old children.

^f Development of fixating on and following a target should occur by 6 months of age; children who do not meet this milestone should be referred.

the ocular system. A history of epiphora associated with photophobia or the presence of cloudy or enlarged corneas should prompt timely referral to rule out glaucoma. Ptosis, when associated with anisocoria, can be the harbinger of neuro-ophthalmologic disease and should also warrant referral. A bright or yellow red reflex or, conversely, a dull or absent red reflex, can be an indication of a significant abnormality that necessitates further evaluation by a pediatric eye care specialist. Details of the history and examination procedures are provided in the accompanying clinical report.

Instrument-based screening devices for vision screening are available commercially and have had extensive validation, both in field studies^{8–11} and, more recently, in the pediatrician’s offices.^{12,13} Screening instruments detect amblyopia, high refractive error, and strabismus, which are the most common conditions producing visual impairment in children.^{14,15} If available, they can be used at any age but have better success after 18 months of age.^{9,16} Instrument-based screening can be repeated at each annual preventive medicine encounter through 5 years of age or until visual acuity can be

assessed reliably using optotypes. Using these techniques in children younger than 6 years can enhance detection of conditions that may lead to amblyopia and/or strabismus compared with traditional methods of assessment.¹² The recent US Preventive Services Task Force statement supporting the use of these technologies for preschool vision screening¹⁷ should prove useful in ensuring adequate payment for these services.

The use of optotype-based (traditional) acuity algorithms remains current practice for children aged 4 years and older. Acuity screening becomes more reliable and efficient in children aged 6 years and older. Details regarding the techniques for evaluating visual acuity with optotype-based screening are provided in the accompanying clinical report.¹ Instrument-based screening may be a helpful alternative in screening developmentally delayed children of any age.¹⁸

PROCEDURES FOR EYE EVALUATION

Detailed explanations for obtaining the visual system history and examining the afferent and efferent visual system in infants and children are provided in the accompanying

clinical report on visual assessment in the infant and children.¹

SUMMARY

Evaluation of the visual system should begin in infancy and continue at regular intervals throughout childhood and adolescence. Serial visual system screenings in the medical home, using validated techniques, provide an effective mechanism for the detection and subsequent referral of potentially treatable visual system disorders.

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REFERENCES

1. American Academy of Pediatrics. Section on Ophthalmology; American Association for Pediatric Ophthalmology and Strabismus; American Academy of Ophthalmology; American Association of Certified Orthoptists. Procedures for the evaluation of the visual system by pediatricians. *Pediatrics*. 2015; (in press)
2. Miller JM, Lessin HR; American Academy of Pediatrics Section on Ophthalmology; Committee on Practice and Ambulatory Medicine; American Academy of Ophthalmology; American Association for Pediatric Ophthalmology and Strabismus; American Association of Certified Orthoptists. Instrument-based pediatric vision screening policy statement. *Pediatrics*. 2012;130(5):983–986
3. Committee on Practice and Ambulatory Medicine, Section on Ophthalmology. American Association of Certified Orthoptists; American Association for Pediatric Ophthalmology and Strabismus; American Academy of Ophthalmology. Eye examination in infants, children, and young adults by pediatricians. *Pediatrics*. 2003;111(4 pt 1):902–907
4. American Academy of Pediatrics; Section on Ophthalmology; American Association for Pediatric Ophthalmology and Strabismus; American Academy of Ophthalmology; American Association of Certified Orthoptists. Red reflex examination in neonates, infants, and children. *Pediatrics*. 2008;122(6):1401–1404
5. de Koning HJ, Groenewoud JH, Lantau VK, et al. Effectiveness of screening for amblyopia and other eye disorders in a prospective birth cohort study. *J Med Screen*. 2013;20(2):66–72
6. Fierson WM; American Academy of Pediatrics Section on Ophthalmology; American Academy of Ophthalmology; American Association for Pediatric Ophthalmology and Strabismus; American Association of Certified Orthoptists. Screening examination of premature infants for retinopathy of prematurity. *Pediatrics*. 2013;131(1):189–195
7. Shah S, Torner J, Mehta A. Prevalence of amblyogenic risk factors in siblings of patients with accommodative esotropia. *J AAPOS*. 2008;12(5):487–489
8. Longmuir SQ, Boese EA, Pfeifer W, Zimmerman B, Short L, Scott WE. Practical community photoscreening in very young children. *Pediatrics*. 2013; 131(3). Available at: www.pediatrics.org/cgi/content/full/131/3/e764
9. Longmuir SQ, Pfeifer W, Leon A, Olson RJ, Short L, Scott WE. Nine-year results of a volunteer lay network photoscreening program of 147 809 children using a photoscreener in Iowa. *Ophthalmology*. 2010;117(10):1869–1875
10. Bloomberg JD, Suh DW. The accuracy of the plusoptix A08 photoscreener in detecting risk factors for amblyopia in central Iowa. *J AAPOS*. 2013;17(3):301–304
11. Ransbarger KM, Dunbar JA, Choi SE, Khazaeni LM. Results of a community vision-screening program using the Spot photoscreener. *J AAPOS*. 2013;17(5):516–520
12. Salcido AA, Bradley J, Donahue SP. Predictive value of photoscreening and traditional screening of preschool children. *J AAPOS*. 2005;9(2):114–120
13. Halegoua J, Schwartz RH. Vision photoscreening of infants and young children in a primary care pediatric office: can it identify asymptomatic treatable amblyopic risk factors? *Clin Pediatr (Phila)*. 2015;54(1):33–39
14. Donnelly UM. Horizontal strabismus worldwide—what are the risk factors? *Ophthalmic Epidemiol*. 2012;19(3): 117–119
15. Chia A, Lin X, Dirani M, et al. Risk factors for strabismus and amblyopia in young Singapore Chinese children. *Ophthalmic Epidemiol*. 2013;20(3):138–147
16. Donahue SP, Johnson TM. Age-based refinement of referral criteria for photoscreening. *Ophthalmology*. 2001; 108(12):2309–2314, discussion 2314–2315
17. US Preventive Services Task Force. Vision screening for children 1 to 5 years of age: US Preventive Services Task Force Recommendation statement. *Pediatrics*. 2011;127(2):340–346
18. Singman E, Matta N, Fairward A, Silbert D. Evaluation of plusoptix photoscreening during examinations of children with autism. *Strabismus*. 2013;21(2):103–105

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