



The Clinician's Guide to Pediatric Instrument-Based Vision Screening

How to incorporate instrument-based vision
screening into a pediatric practice

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Importance of Eye Health

Vision problems are common among children, with 19 million worldwide living with a vision disorder.¹ Oftentimes, vision disorders have no noticeable symptoms,² and as a result, children may not realize they see the world differently than others.³

Uncorrected vision disorders can impact a child's cognitive, emotional, neurological, and physical development, potentially resulting in behavior problems, interference with early literacy and learning, and even permanent vision loss.⁵

**19 million
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Early detection and treatment of vision problems in childhood is crucial, as 80% of vision disorders can be prevented or cured.¹ Unfortunately, according to the [CDC](#), only one in three children in the U.S. has received eye care services before the age of six.⁴



Common Pediatric Eye Problems

One in twenty children is at risk for permanent vision loss due to vision disorders like amblyopia.⁶ Vision loss can be caused by a wide range of factors including damage to the eye, incorrect eye shape, or issues within the brain.⁷

Equal input from both eyes is vital for normal development of the vision system in babies and young children.⁸ A child's vision may be permanently impaired if the eyes are unable to send clear images to the brain.⁸

Some of the most common disabling vision disorders among U.S. children are various refractive errors (e.g., myopia, hyperopia), amblyopia and strabismus.⁴

Common Pediatric Eye Problems

Vision Disorder	Cause	Effect
Myopia (nearsightedness)	<ul style="list-style-type: none"> • Eyeball is too long⁴ • Images are formed in front of the retina⁴ • Primarily hereditary⁴ 	<ul style="list-style-type: none"> • Distant objects appear out of focus⁴ • Most common refractive error⁴ • Impacts at least 25% of the population⁴ • May become apparent between the ages of 8-12, and may deteriorate until early adulthood⁴
Hyperopia (farsightedness)	<ul style="list-style-type: none"> • Eyeball is too short⁴ • Images are formed behind the back wall of the eye⁴ 	<ul style="list-style-type: none"> • Near objects appear out of focus⁴ • May exist in infancy but disappears as the size of the eye grows over time⁴
Astigmatism (blurred vision)	<ul style="list-style-type: none"> • Cornea is oval shaped as opposed to round⁴ • Most corneas have a mild degree of astigmatism⁴ • Usually inherited⁴ 	<ul style="list-style-type: none"> • Difficulty focusing on images clearly at any distance⁴ • The more uneven the cornea, the greater the image distortion⁴
Amblyopia (lazy eye)	<ul style="list-style-type: none"> • Brain receives unequal images from both eyes⁴ 	<ul style="list-style-type: none"> • #1 cause of vision loss in U.S. children⁶ • Amblyopic eye may become functionally blind if left untreated⁴ • The earlier the treatment, the more likely it will be successful⁴
Strabismus (eye misalignment)	<ul style="list-style-type: none"> • The eye muscles do not work together, causing the eyes to be misaligned⁴ • May be caused by birth injuries, heredity, muscle attachments, and neurodevelopmental conditions⁴ 	<ul style="list-style-type: none"> • One eye may turn in (cross-eye), out (walleye), up or down⁴ • Can develop into amblyopia if left untreated • Impacts 3-5% of children in the U.S.⁴
Anisometropia (unequal refractive power)	<ul style="list-style-type: none"> • Different refractive power in each eye⁹ 	<ul style="list-style-type: none"> • Unequal focus between the two eyes⁹ • May result in amblyopia⁹
Anisocoria (unequal pupil size)	<ul style="list-style-type: none"> • Unequal pupil sizes¹⁰ • May be caused by an underlying medical condition¹⁰ 	<ul style="list-style-type: none"> • May vary day-to-day or even switch eyes¹⁰ • Impacts about 20% of the population¹⁰

Key Takeaway

Common vision disorders among children in the U.S. include refractive errors, amblyopia and strabismus.⁴ Early detection and treatment is key for the development of healthy vision.



Signs of Eye Trouble

It's important for healthcare professionals to listen carefully to parents who express that their children may be experiencing visual impairment.

Signs of vision problems include:^{7, 11}

- Closing or covering one eye
- Squinting
- Complaints of blurry objects
- Difficulty doing close-up work
- Holding objects close to eyes
- Blinking more than usual
- Watering of eyes
- Red-rimmed, crusted or swollen eyelids
- Tilting their head

Healthcare providers should examine family histories regarding vision disorders or early use of glasses.¹² In addition, healthcare professionals should ask parents questions to determine any vision problems.

Examples of questions that may help uncover vision disorders include:¹²

- 1 “Do you think your child sees well?”
- 2 “Does your child hold objects close to their eyes?”
- 3 “Do your child’s eyes appear straight?”
- 4 “Do your child’s eyes seem to cross?”

Key Takeaway

It's important for healthcare professionals to listen and seek out more information from parents, as well as explore family histories to determine any vision abnormalities in children.



Vision Screening Versus Eye Exams

Among preschool children, less than 15% receive comprehensive eye examinations and less than 22% undergo vision screenings.¹³ The evaluation of the visual system can help detect conditions like strabismus and amblyopia that distort or suppress normal visual images.² Without early detection and treatment, these vision conditions may lead to permanent vision loss.²

Vision screenings and comprehensive eye exams are complementary methods for evaluating vision disorders in children.⁴ [The American Academy of Family Physicians](#), [American Academy of Ophthalmology](#), [American Academy of Pediatrics](#), [American Association of Certified Orthoptists](#), and [American Association for Pediatric Ophthalmology and Strabismus](#) recommend a combination of eye exams and vision screenings by primary care providers with the referral for a comprehensive eye exam conducted by an eye doctor.⁴

It is important to understand the difference between vision screenings and comprehensive eye exams. A vision screening can help identify vision problems but does not replace a professional eye exam.⁴

Vision Screening

Pediatric vision screening is the first line of defense for early detection of potential vision problems, when treatment is more likely to be effective.¹⁴ Vision screening is an efficient and cost-effective method that can help identify children who have, or are at risk for, developing vision disorders such as:¹⁵

- Myopia
- Hyperopia
- Astigmatism
- Anisometropia
- Strabismus
- Anisocoria

The [U.S. Preventative Services Task Force](#) (USPSTF) recommends all children between the ages of three and five receive at least one vision screening to help detect vision problems.¹³ Vision screenings can be conducted by primary care providers, eye care professionals and trained laypersons using various methods such as objective testing (e.g., instrument-based vision screenings) and subjective testing (e.g., visual acuity testing).¹⁶ ¹⁷ A child should be referred to a pediatric ophthalmologist for further evaluation if they fail a vision screening test.¹⁸



Comprehensive Eye Exams

Vision screening can help detect a vision disorder, but a comprehensive eye exam is necessary for a formal diagnosis. A comprehensive eye exam by an eye doctor (optometrist or ophthalmologist) is required to detect vision disorders early and help prevent vision loss.¹³ During the exam, various tests are performed to evaluate visual acuity, depth perception, eye alignment, and eye movement.¹³ Eye drops are used to dilate the pupil, enabling a more thorough investigation of the eye.

The [American Optometric Association](#) recommends that asymptomatic or low-risk children have a comprehensive eye exam at age three, followed by another exam prior to entering first grade, and then at least every two years afterward.⁴ Additionally, it is appropriate for high-risk children to bypass vision screening and be directly referred to an eye care professional.¹⁴

Risk factors for eye and vision problems include:¹⁴

- Children born prematurely
- Children with neurodevelopmental conditions
- Children with diseases that may impact vision
- Children who have a parent or sibling with strabismus or amblyopia
- Children with noticeable abnormalities (e.g., crossed eyes)
- Children who exhibit symptoms of decreased vision (e.g., squinting)

Key Takeaway

It is important to know the difference between vision screening and a comprehensive eye exam. Vision screening can help detect a vision problem, but a comprehensive eye exam by an eye doctor is necessary for diagnosis.



Healthcare Providers and Pediatric Eye Health

Primary care providers, eye care professionals, trained laypersons, and vision rehabilitation specialists are all professions that have an essential role in vision and eye health.⁴

Primary Care Providers

Primary care providers, specifically pediatricians, play an important role in eye health as they have regular contact with children.⁴ Routine check-ups provide an excellent opportunity to assess vision and overall eye health to help promote early detection of vision disorders.⁴ These visits should include an overview of family history, age-appropriate vision screening tests and physical evaluation of the eyes.⁴

Eye Care Professionals

A comprehensive eye exam is the “gold standard” of eye care.⁴ A professional dilated eye exam by an ophthalmologist or an optometrist is imperative for evaluating children’s eye health and for making a formal diagnosis before starting treatment.⁴ Any child who is experiencing impaired vision should receive an eye exam by an eye doctor.⁴

Trained Laypersons

Trained laypersons, such as school nurses or community volunteers, can conduct vision screenings in various settings such as schools, mobile vision screening units, community events, and beyond. For instance, the [Lions Club](#) partners with medical professionals and volunteers to perform vision screening events in communities to help detect children at risk for vision loss.

Vision Rehabilitation Specialists

Vision rehabilitation specialists help train children with vision disorders to use the vision they have more effectively.⁴

Key Takeaway

In addition to parents, there is a broad array of healthcare professionals that can have a profound impact on eye health and detecting vision disorders including primary care providers, eye care professionals, trained laypersons, and vision rehabilitation specialists.⁴

Instrument-Based Vision Screening

An instrument-based vision screener is a device that can help identify vision conditions or risk factors that may cause decreased vision or amblyopia.¹⁹ An instrument-based vision screener takes an image of the eyes to measure refractive error and ocular misalignments, and is as easy as having a photo taken with a digital camera.^{6, 19} Other names for instrument-based vision screening include automated screening, autorefractor, objective screening, and photostcreening.²



The [Welch Allyn Spot™ Vision Screener](#) is one example of an instrument-based vision screener that can help users quickly and easily detect vision issues on patients from six months of age through adult.¹⁵ The Spot Vision Screener detects common vision problems such as myopia, hyperopia, astigmatism, anisometropia, strabismus, and anisocoria.¹⁵



For instance, Michelle Williams, RN, and Nurse Manager for Lifespan Health, utilized this device to help identify her son Parker's vision disorder during a community screening event.

[Read more about Parker's story here.](#)

The [AAP](#), [AAPOS](#), [AACO](#), and [AAO](#) recommend instrument-based vision screening for children who are unable to perform a visual acuity chart test.²⁰ Instrument-based vision screening is especially useful for:¹⁹

- All children ages 1-3 years, as they are usually unable to read a visual acuity chart.
- Some children ages 3-5 years who are unable to read a visual acuity chart.

- Other children with developmental disabilities who are unable to read a visual acuity chart.

Instrument-based vision screeners do not typically test visual acuity directly. Therefore, these devices should not replace visual acuity screening with eye charts.¹⁹ Additionally, instrument-based vision screening should not replace comprehensive eye exams, as they do not detect eye diseases that are unrelated to refractive errors.²⁰

Key Takeaway

An instrument-based vision screener is a device that can help detect vision conditions or risk factors that may cause decreased vision or amblyopia. These devices are particularly useful for children who are unable to read a visual acuity chart.



Selecting the Right Instrument-Based Vision Screener for Your Practice

Pediatricians should look for instrument-based vision screeners that are easy to operate and have a high capture rate.¹ Pediatricians should also consider the device capabilities and how vision risk factors are captured. For example, some instrument-based vision screeners do not provide instant results and may rely on an overread service by an ophthalmologist to detect risk factors for astigmatism, strabismus, and anisocoria. Purchase options for an instrument-based vision screener will vary by manufacturer and may include [leasing options](#). Pediatricians should consider the [economic impact of instrument-based vision screening](#) prior to selecting a device.

Pediatricians familiar with the concepts of sensitivity and specificity, and how various devices perform in respect to referral criteria, will find it easy to select the most appropriate instrument-based vision screener for their practice.²

Selecting referral criteria with high sensitivity will result in few cases of missed disease, but may cause children with normal vision to be incorrectly referred.² Alternately, choosing referral criteria with high specificity will minimize over-referrals, but some children with disease may be missed.² The manufacturer's referral criteria is typically balanced for good sensitivity and specificity. If pediatricians wish to alter the device referral criteria, consultation with a local eye care professional may help limit both over- and under-referrals.

Key Takeaway

Pediatricians should consider multiple factors including ease of operation, capture rate, risk factor screening capabilities, and purchase options before making a decision on an instrument-based vision screener.



Implementing an Instrument-Based Vision Screening Program into Your Practice

Modern instrument-based screening technology makes implementation of a screening program simple and affordable. Often, these programs are more successful when pediatricians partner closely with local ophthalmologists who have experience treating children's vision disorders.¹² Ophthalmologists can help clarify questions regarding vision screening procedures and indications for eye-exam referral.¹² In addition, pediatricians should consider working with families of children who fail a vision screening to ensure referred children receive appropriate eye care and exams.²

Key Takeaway

When implementing an instrument-based vision screening program, pediatricians should consider partnering with local ophthalmologists who are experienced in treating pediatric vision conditions.

Reimbursement

The USPSTF recommends instrument-based vision screening with a [“B” level evidence rating](#), meaning there is high certainty that the net benefit is moderate and that the practice should provide this particular service.² The [Affordable Care Act](#) requires health plans to cover preventative services that have an “A” or “B” level evidence rating.²

Reimbursement coding for vision screening is dependent upon the vision screening technique, for example:²

- CPT® code [99177](#) can be used for instrument-based vision screeners that produce an immediate result in the office.
- CPT code [99174](#) can be used for instrument-based vision screeners that require remote interpretation of images.

Instrument-based vision screeners can [pay for themselves](#)² with an average commercial coverage of approximately \$25.00.²² In addition, the [Americans with Disability Act](#) offers [federal tax advantages](#) for the purchase of an instrument-based vision screener.²



Key Takeaway

Reimbursement for instrument-based vision screeners is available using the appropriate CPT codes. As a result, instrument-based vision screeners can pay for themselves with reimbursement.



Instrument-Based Vision Screening Can Help Eradicate Preventable Blindness

The [National Eye Institute](#) estimates that amblyopia affects up to three percent of children in the U.S.,¹⁹ costing \$10 billion annually.⁶ These statistics highlight the importance of conducting vision screenings on children as an aid in the early detection and treatment of amblyopia.

Instrument-based vision screening provides an opportunity for all children to be screened during regular check-ups with their pediatrician.² As a result, more children will be referred to eye doctors during the early stages of amblyopia and strabismus, shifting the care delivery to a preventative stage and thus potentially eliminating vision loss in children.²

Interested in learning how you can help eradicate preventable blindness? Contact your local [Welch Allyn representative](#) to learn more about how integrating instrument-based vision screeners into your practice can help facilitate early detection and treatment of vision disorders in children.

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