


CHDP VISION SCREENING


Vision problems and guidelines



Child Health and Disability Prevention (CHDP) Program
Systems of Care Division (SCD)
California Department of Health Care Services

CHDP VISION SCREENING

Vision problems and guidelines



3

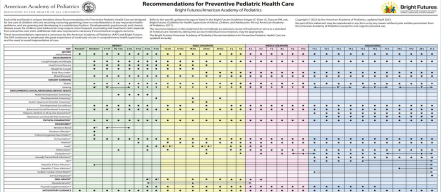
Learning Objectives

- Understand the importance of vision screening during childhood.
- Become aware of eye problems that affect vision.
- Describe and implement the CHDP program guidelines for referral and follow-up.

4

Why Perform Vision Screening?

- Recommended as part of the American Academy of Pediatrics [Bright Futures Periodicity Schedule](#)
- For ages where risk assessment is required



5

Why Perform Vision Screening?

- The first line of defense to detect preventable vision loss in children
- Vision problems often go undetected because:
 - Young children may not realize they cannot see properly
 - Many eye problems do not cause pain or discomfort
 - Many eye problems may not be obvious
- Early detection of amblyopia - "lazy eye"
 - Leading cause of vision loss among children

Amblyopia

and common causes

6

7 **Amblyopia**

- Amblyopia is the leading cause of vision loss among children.
- Eyes and brain are not working together.
- One eye sees a blurred view and the other a normal view. The brain only processes the normal view.
- Amblyopia affects 2-3% of children in the United States.
 - About 4.5 million children with preventable vision loss.
 - Reference: National Eye Institute (NEI)

8 **Amblyopia**

Amblyopia can only develop during childhood.

- If not treated in childhood, amblyopia may result in permanent vision loss.
- The most common cause of vision loss in adults 20 to 70 years of age is untreated childhood amblyopia.



9 **Amblyopia**


Common causes are:

- untreated or unequal refractive errors (nearsighted, farsighted, astigmatism)
- strabismus "crossed eyes"
- obstruction (e.g. ptosis, cataract)

10 **Common Causes of Amblyopia**

1. Types of refractive errors


a. Myopia "nearsighted": does not see objects well at far distances



11 **Common Causes of Amblyopia**

1. Types of refractive errors

b. Hyperopia "farsighted": does not see objects well at close distances



12 **Common Causes of Amblyopia**

1. Types of refractive errors

c. Astigmatism: an irregular curve in the eye causing blurry vision at all distances

Astigmatism causes blur along one direction

ABCD

Vertical lines may be more blurred

ABCD


Horizontal lines can be more blurred

13

Common Causes of Amblyopia

2. **Strabismus** "crossed eyes": misalignment of the eyes

- May have double vision
- One or both eyes turning in
- One or both eyes turning out
- One eye turning up or down




14

Common Causes of Amblyopia

3. **Obstruction**

Ptosis: drooping of an eyelid due to a weak lid muscle.

- May obstruct vision
- Look for chin elevation in these children.




15

Common Causes of Amblyopia

4. **Obstruction**

Cataract: condition in which the lens of the eye becomes progressively cloudy, resulting in blurred vision.



16

Screening Early is Best

- School-aged vision screening may be too late.
- Amblyopia is harder to treat after 5 years of age.
- By 7 years of age, some vision loss from amblyopia may become permanent.

17

Barriers to Screening

- Poor cooperation of young children
- Takes time to perform
- Staff not adequately trained
- Poor reimbursement for physicians

Visual Acuity

Screening different age groups



19 **What is visual acuity?**

Visual acuity is the clarity or sharpness of vision.

As defined by the American Optometric Association

20 **Newborn to 3 years of age**

Procedures for the Evaluation of the Visual System
Pediatrics January 2016

- Take a health history: Are there eye problems in close relatives?
- Check vision (tracking), eye movement (motility) and alignment (strabismus)
- Check pupils and red reflexes (round, equal, bright)

NOTE: This assessment can also be done on older children of any age with developmental delays.

21 **Pass/Fail Guidelines**
Age-Dependent

NEW AGE-DEPENDENT PASS CRITERIA:

- 3 years old: Correctly identifying 3 or more symbols on the 20/50 line with each eye.
- 4 years old: Correctly identifying 3 or more symbols on the 20/40 line with each eye.
- 5 years and older: Correctly identifying 3 or more symbols on the 20/32 line with each eye.
- Two line difference only for threshold method

22 **Ages 3 through 5 years**
Recommended Chart Types

LEA or HOTV Symbols

23 **3 year olds**

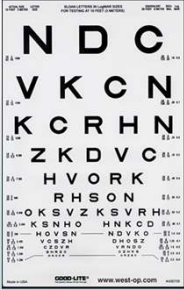
- Must be able to identify 3 or more of the 20/50 line with each eye.
- Screening is done at 10 feet.
- Opposite eye must be fully covered.

24 **4 years year olds**

- Must be able to identify 3 or more of the 20/40 line with each eye.
- Screening is done at 10 feet.
- Opposite eye must be fully covered.

25 **5 years and older**

- Sloan Letters Chart
 - Preferred over Snellen Letters.

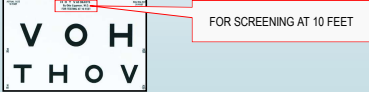


26 **5 years and older**

- Must be able to identify 3 or more of the 20/32 line (or 20/30 in Snellen chart) with each eye.
- Use LEA symbols, HOTV letters for children who do not know their letters.
- Use Sloan letters for children who know their letters.
 - Preferred over Snellen letters chart
 - Snellen letters chart have a 20/30 line

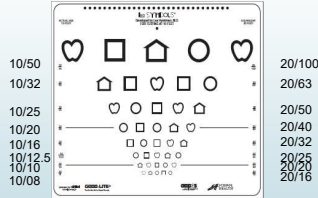
27 **5 years and older**

- Screening distance is 10-feet using a 10-foot chart.
- Fully cover opposite eye.
- Repeat screening every 1-2 years.
- Risk assessment should be done when screening is not required.



28 **Documentation**

- 10/xx on left side of chart is screening distance.
- 20/xx on right side of chart is 20 foot equivalency also known as the number to document.




10/50	20/100
10/32	20/63
10/25	20/50
10/20	20/40
10/16	20/32
10/12.5	20/25
10/10	20/20
10/8	20/16

Guidelines To Follow


29

30 **Vision Screening Charts Not Recommended**




31 **Occlusion of Non-tested Eye**

- Adhesive patches are best.
- For all screening methods, completely cover the eye not being screened to prevent peeking.




32 **Occluders**

Acceptable




Not Recommended




33 **Occluders**

These occluders are acceptable only *IF* eye patch or tape is not available or is not tolerated

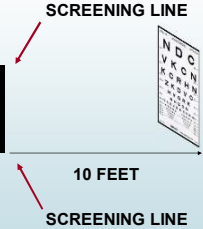


Only for age 10 years and older



34 **Key Points**

- Screening line marked at 10 feet on the floor.
- Screening line is directly in front of eye chart.
- Child should stand with arch of each foot on line.
- Vision screening area
 - Out of traffic area
 - Have adequate lighting



35 **Key Points**

- Eye chart should be at child's eye level.
- Each eye should be screened separately (monocularly).**
 - BRIEFLY point at optotype:**
 - holding pointer at optotype makes optotype easier to identify.
 - Instead . . . briefly point under or over top of optotype and quickly remove pointer.
 - If line has a box around optotypes, stay outside the box with pointer.
- Either critical line or threshold screening may be used (critical line method is preferred)

36 **Automatic Referral**

Children with the following disorders should bypass screening and should be referred directly to an eye specialist:
 Document in chart the reason why screening was not performed

- Recognized eye disorders (e.g. strabismus, ptosis)
- Known neurodevelopmental disorders:
 - Hearing impairment
 - Motor abnormalities (e.g. cerebral palsy)
 - Down Syndrome
 - Cognitive impairment
 - Autism spectrum disorder
 - Speech delay

43 **What is the Difference Between Vision Screening with Eye Charts and Vision Screening with Devices?**

- Vision screening with eye charts measure the actual visual acuity (e.g. 20/20).
- Vision screening devices DO NOT measure visual acuity directly.
 - Screening instruments test for eye conditions or risk factors that are known to cause decreased vision or amblyopia.

44 **Common Vision Screening Instruments**

Welch Allyn "Spot" Welch Allyn SureSight Righton Retinomax PlusOptixS12R

CHDP Visual Acuity Screening Procedure

For Children Ages 3 Years and Older

45

46 **Objectives**

- Identify the two different types of vision screening methods
- Identify the steps of visual acuity screening and document results
- Demonstrate the ability to perform a CHDP visual acuity screening

47 **Two Screening Options**

Threshold

Critical Line

20/50 critical line chart

LEA Symbols charts

48 **Critical Line Screening: FASTER**

- Only read a single "critical" line with each eye.
- Each chart has two boxed "critical lines" - one for each eye. The top line of large optotypes (symbols/letters) is for practice before starting screening.

LEA symbols chart

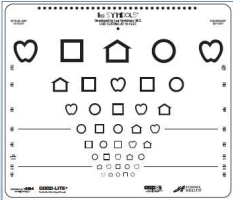
SLOAN letters chart

20/32 critical line charts

49 **Threshold Screening**

Description

- Reading down the eye chart as far as possible.
- Threshold line is the smallest line child can pass.
- Can identify 2-line difference between the eyes.



50 **Pre-Screening & Conditioning the child**

51 **Pre-Screening/Conditioning**

- Identify correct chart (and correct critical line) for child
- Child may stand or sit on a chair at 10 foot line
- Adjust the chart at child's eye level.
- Make sure child understands the screening procedure. Child may choose the name for each symbol.
- Children who are shy or nonverbal have the option to use the matching response card to match the symbol the screener is pointing to on the chart.
- Ask child to identify symbols on the 20/100 line with both eyes uncovered. Make sure child understands the screening procedure.
 - BRIEFLY** point at optotype

52 **The Threshold Process**

53 **Threshold Screening**

Screening Procedure

- Use adhesive patch to cover the eye that is not being tested. **Begin screening by testing right eye first**
- Beginning at the top line, ask the child to identify the first symbol on the **left** side of each line. Move down the chart until the child misses a symbol.
- When a symbol is missed, return to the line above and ask the child to identify **ALL** symbols on that line.
 - If 3 or more symbols are correctly identified, move down to the next line.
- On each lower line, continue asking child to identify each symbol until the child misses 3 on a line.
 - Have child identify the whole line even when 3 or more symbols are missed.

54 **Threshold Screening**

Screening Procedure - continued

- Document visual acuity for the right eye as the last line the child correctly identified 3 or more symbols.
- Repeat procedure with the right eye covered, starting with the first symbol on the **right** side of each line.
- When child responds, give verbal praise ("good", "right", etc.) even if child is incorrect.
- Document visual acuity for left eye as the last line the child correctly identified 3 or more symbols.

55 **Threshold Screening**

NEW AGE-DEPENDENT PASS CRITERIA:

- 3 years old: Correctly identifying 3 or more symbols on the 20/50 line (or any line below) with each eye.
- 4 years old: Correctly identifying 3 or more symbols on the 20/40 line (or any line below) with each eye.
- 5 years and older: Correctly identifying 3 or more symbols on the 20/32 line (or any line below) with each eye.

56 **LEA Symbols – Threshold Screening Fail and Rescreen Within 6 Months or Refer**

NEW AGE-DEPENDENT FAIL CRITERIA:

- 3 years old: Missing 3 or more symbols on the 20/50 line, or any line above the 20/50 line, with either eye.
- 4 years old: Missing 3 or more symbols on the 20/40 line, or any line above the 20/40 line, with either eye.
- 5 years and older: Missing 3 or more symbols on the 20/32 line, or any line above the 20/32 line, with either eye.
- Two line difference between the eyes, even within the passing range (e.g., 20/20 and 20/32).

57 **Sample 3 Year Old Pass Right Eye**

Record Results: Last line where 3 or more symbols were correctly identified.

R Eye Pass at 20/20 (10/10)

58 **Sample 3 Year Old Pass Left Eye**

Record Results: Last line where 3 or more symbols were correctly identified.

L Eye Pass at 20/25 (10/12.5)

59 **Documentation**

Last Name: DOE First Name: JANET MRN# 12345
 PLACE OF SCREENING: OFFICE Age: 3

Vision Screen Date: 7-20-16 Comments: Pass

	Right Eye	Left Eye
Without Glasses	20 /20	20 /25
With Glasses	/	/

Referred To: _____
 Signature & Title of Person Performing Test _____

60 **Sample 3 Year Old Fail Right Eye**

Record Results: Last line where 3 or more symbols were correctly identified.

R Eye Fail at 20/63 (10/32)

61

Documentation

Last Name: DOE	First Name: JANET	MRN# 12345
PLACE OF SCREENING: OFFICE		Age: 3

Vision Screen Date: 7-20-16 Comments: Fail

	Right Eye	Left Eye
Without Glasses	20 /63	20 /63
With Glasses	/	/

Referred To: Dr. Eye

Signature & Title of Person Performing Test

62

Sample 3 Year Old Fail (2 Line Difference)

R Eye Pass at 20/32 (10/16)

Record Results: Last line where 3 or more symbols were correctly identified.

L Eye Pass at 20/20 (10/10)

Fail due to 2 line difference

63

Documentation

Last Name: DOE	First Name: JANET	MRN# 12345
PLACE OF SCREENING: OFFICE		Age: 3

Vision Screen Date: 7-20-16 Comments: Fail due to 2 line difference

	Right Eye	Left Eye
Without Glasses	20 /32	20 /20
With Glasses	/	/

Referred To: Dr. Eye

Signature & Title of Person Performing Test

64

Threshold Screening

Screening Procedure Using Split Charts/Column

If vision chart has lines that split into 2 charts/column:

- The left column is for screening the right eye
 - When child is reading a full line of the left column, child reads left to right
- The right column is for screening the left eye.
 - When child is reading a full line of the right column, child reads right to left

65

Critical Line Screening

66

Critical Line Screening

NEW AGE-DEPENDENT PASS CRITERIA:

- 3 years old: Correctly identifying 3 or more symbols on the 20/50 line with each eye.
- 4 years old: Correctly identifying 3 or more symbols on the 20/40 line with each eye.
- 5 years and older: Correctly identifying 3 or more symbols on the 20/32 line with each eye.

67 **Critical Line Screening**

Choose chart to match the child's age

- One chart for 3 years (36-47 months)
- One chart for 4 years (48-59 months)
- One chart for 5 years and older

68 **Critical Line Screening**
Chart options

- Use critical line chart
- Block all lines except for critical line and top line. Add 4 black lines around window opening.
- Full chart *

*Using a full chart for a critical line screening can cause an information overload for preschoolers

69 **Critical Line Screening**

- When conditioning child cover right and left eye screening boxes
- When screening right eye, cover L eye and bottom box
- When screening left eye, cover R eye and top box

70 **Critical Line Screening**

Screening Procedure

- Use adhesive patch to cover the eye that is not being tested. Begin screening by testing right eye first
- Occlude the left eye
- The child must correctly identify 3 or more symbols to pass. Document pass or fail for the right eye.
- Occlude the right eye.
- Ask child to identify symbols on the bottom boxed line for the left eye.
- The child must correctly identify 3 or more symbols to pass. Document pass or fail for the left eye

71 **Documentation**

Last Name: DOE First Name: JANET MRN# 12345
 PLACE OF SCREENING: OFFICE Age: 3

Vision Screen Date: 7-20-16 Comments: Pass

	Right Eye	Left Eye
Without Glasses	20 /50	20 /50
With Glasses	/	/

Referred To: _____
 Signature & Title of Person Performing Test _____

72 **Acknowledgments**

- These guidelines are based on recommendations from the American Academy of Pediatrics (AAP) and the National Expert Panel of the National Center for Children's Vision and Eye Health (NCCVEH) at Prevent Blindness.
- These slides have been adapted from the American Association for Pediatric Ophthalmology and Strabismus (AAPOS) with their permission.

73

References and Links

- [Visual System Assessment in Infants, Children and Young Adults by Pediatricians](#)
 - American Academy of Pediatrics Policy Statement
 - Pediatrics. January 2016. Volume 137. Issue 1
- [Procedures for the Evaluation of the Visual System by Pediatricians](#)
 - American Academy of Pediatrics Clinical Report
 - Pediatrics. January 2016. Volume 137. Issue 1

74

References and Links

- [Bright Future and Preventative Medicine Coding Fact Sheet](#)
 - American Academy of Pediatrics
 - Updated 2020
- [Vision Screening for Children 36 to < 72 Months: Recommended Practices](#)
 - National Expert Panel to the National Center for Children's Vision and Eye Health
 - Optometry and Vision Science. January 2015. Volume 92. No. 1
- [CHDP 2017 Vision Screening Health Assessment Guidelines](#)
- [AAPOS Vision Screening Recommendations](#)



Pass Criteria for Vision Screen Practicum

- ✓ Identifies correct vision chart to use for screening
- ✓ Identifies correct critical line for age
- ✓ States correct vision chart placement
- ✓ Starts with matching game
- ✓ Identifies acceptable occluders to use
- ✓ Tests right eye first, then left eye
- ✓ Briefly points to optotypes without covering them
- ✓ Correctly answers, "If child unable to complete screening, when should you repeat the screening?"

Practice Materials Required

- Vision screening chart (LEA, HOTV, Sloan)
- Occluder (2" hypoallergenic paper tape, occlusion patch)
- Matching cards

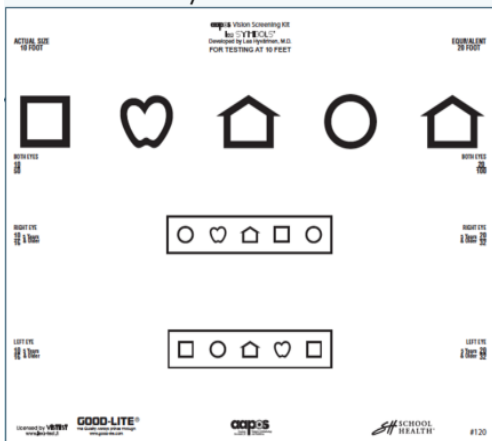


You will need a device with a camera and a microphone so we can see and hear you during the practicum.

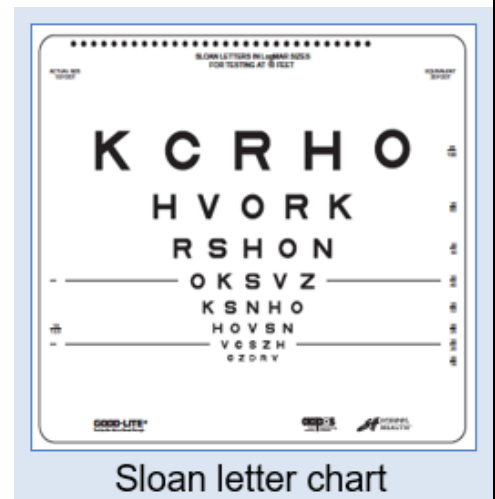
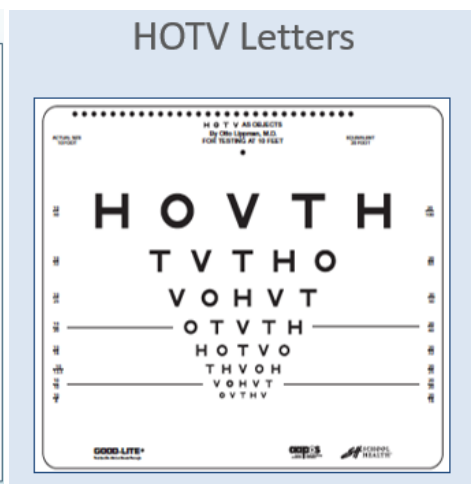
Age-Dependent Critical Lines

3 years old	20/50 line
4 years old	20/40 line
5 years old and older	20/32 (20/30) line

LEA symbols chart



HOTV Letters



Sloan letter chart

Critical Line Screening

Pre-screening/Conditioning

1. Identify Correct Chart & Critical Line for age.
2. Position child at 10 feet.
3. Adjust the chart at child's eye level.
4. Play the matching game - Child to identify symbols on the 20/100 line with both eyes uncovered.

Screening Procedure

5. **Occlude the Left Eye. (You are testing the right eye)**
6. Ask child to identify symbols on Critical Line for age.
7. The child must correctly identify 3 or more symbols to pass. Document *pass* or *did not pass* for the right eye.
8. **Occlude the Right Eye. (You are testing the left eye).**
9. Ask child to identify symbols on Critical Line for age.
10. The child must correctly identify 3 or more symbols to pass. Document *pass* or *did not pass* for the left eye.
11. Praise child for playing the game/screening whether pass or did not pass.

Age-Dependent Critical Lines

New AAP Guidelines:

3 years old	20/50 line
4 years old	20/40 line
5 years old and older	20/32 (20/30) line

Other Guidelines to follow

- Child may stand or sit on a chair at 10 foot line
- Make sure child understands the screening procedure. If not, recondition.
- Child may choose any name for each symbol.
- Children who are shy or nonverbal have the option to use the matching response card to match the symbol the screener is pointing to on the chart.
- When pointing at the optotypes, **briefly point** under or over top of optotype and quickly remove pointer. If line has a box around optotypes, stay outside the box with pointer.
- To begin the screening: Begin screening by **testing right eye first, then the left**
- If patches are not available or not tolerated, use occluder glasses.
 - For children 10 years and older only, may use black paddle occlude, if patches are not available.
- If the child is unable to cooperate during the screening, make a second attempt the same day (i.e. later during the same visit). If not possible, reschedule as soon as possible by scheduling a follow up screening appointment before child leaves (no later than 6 months).



Threshold Method Screening

Pre-screening/Conditioning

1. Identify Correct Chart & Critical Line for age.
2. Position child at 10 feet.
3. Adjust the chart at child's eye level.
4. Play the matching game - Child to identify symbols on the 20/100 line with both eyes uncovered.

Screening Procedure

5. **Occlude the Left Eye (you are testing the right eye).**
6. Beginning at the top line, ask the child to identify the first symbol on the **Left** side of each line.
7. Move down ↓ the chart until the child misses a symbol.
8. When a symbol is missed, ↵ return to the line above and ask the child to identify ALL symbols on that line.
 - If 3 or more symbols are correctly identified, Move down ↓ to the next line.
9. On each lower line, continue asking child to identify each symbol until the child misses 3 on a line.
 - Have child identify the whole line even when 3 or more symbols are missed.
10. Document visual acuity for the right as the last line the child correctly identified 3 or more symbols
11. The child must correctly identify 3 or more symbols to pass. Document *pass* or *did not pass* for the right eye.
12. **Occlude the Right Eye (you are testing the left eye).**
13. Repeat procedure with the right eye covered, starting with the first symbol on the **Right** side of each line.
14. Document visual acuity for the left eye as the last line the child correctly identified 3 or more symbols.
15. Praise child for playing the game/screening whether pass or did not pass.

Age-Dependent Lines for Threshold Method

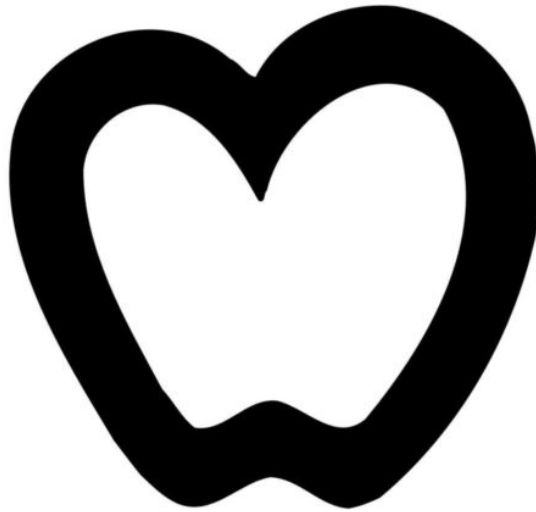
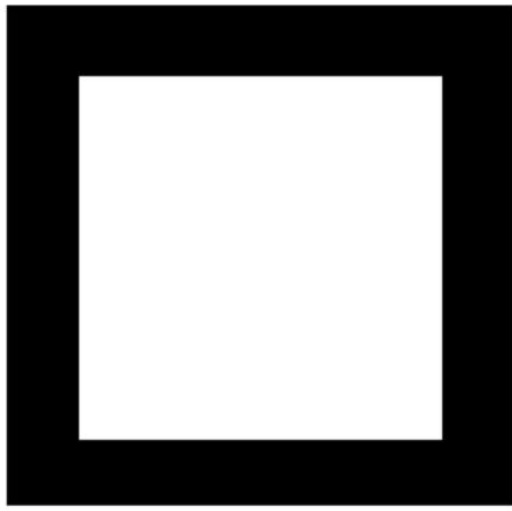
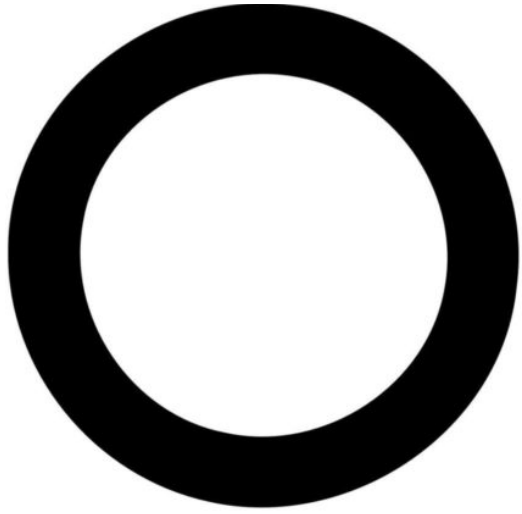
New AAP Guidelines:

3 years old	20/50 line
4 years old	20/40 line
5 years old and older	20/32 (20/30) line
*Two line difference between the eyes, even within the passing range (e.g. 20/20 and 20/32)	

Other Guidelines to Follow

- Child may stand or sit on a chair at 10 foot line
- Make sure child understands the screening procedure. If not, recondition.
- Child may choose any name for each symbol.
- Children who are shy or nonverbal have the option to use the matching response card to match the symbol the screener is pointing to on the chart.
- When pointing at the optotypes, **briefly point** under or over top of optotype and quickly remove pointer. If line has a box around optotypes, stay outside the box with pointer.
- To begin the screening: Begin screening by **testing right eye first, then the left**
- If patches are not available or not tolerated, use occluder glasses.
 - For children 10 years and older only, may use black paddle occlude, if patches are not available.
- If the child is unable to cooperate during the screening, make a second attempt the same day (i.e. later during the same visit). If not possible, reschedule as soon as possible by scheduling a follow up screening appointment before child leaves (no later than 6 months).





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Sample CHDP Vision Screening Referral Form

Child's first name: _____ Child's last name: _____

Date of exam: _____

Primary Care Provider Name: _____

Primary Care Provider Phone No.: _____

Primary Care Provider Address: _____

Reason for referral:

- | | | |
|---|--|--|
| <input type="checkbox"/> History | <input type="checkbox"/> Corneal light reflex | <input type="checkbox"/> Ophthalmoscopy |
| <input type="checkbox"/> External exam | <input type="checkbox"/> Cover test | <input type="checkbox"/> Visual acuity screening |
| <input type="checkbox"/> Red reflex testing | <input type="checkbox"/> Fix and follow response | <input type="checkbox"/> Instrument-based vision screening |
| <input type="checkbox"/> Pupil exam | | |

Explanation:

Referred to:

(continued)

20. Verify results as soon as possible, and follow up, as appropriate.
21. Confirm initial screening was accomplished, verify results, and follow up, as appropriate. See "Hyperbilirubinemia in the Newborn Infant: 35 Weeks Gestation: An Update With Clarifications" (<https://pediatrics.aappublications.org/content/124/4/1193>).
22. Screening for critical congenital heart disease using pulse oximetry should be performed in newborns, after 24 hours of age, before discharge from the hospital, per Endorsement of Health and Human Services Recommendation for Pulse Oximetry Screening for Critical Congenital Heart Disease" (<http://pediatrics.aappublications.org/content/129/1/190.full>).
23. Schedules, per the AAP Committee on Infectious Diseases, are available at https://redbook.solutions.aap.org/55/immunization_schedules.aspx. Every visit should be an opportunity to update and complete a child's immunizations.
24. Perform risk assessment or screening, as appropriate, per recommendations in the current edition of the AAP *Pediatric Nutrition: Policy of the American Academy of Pediatrics* (Iron chapter).
25. For children at risk of lead exposure, see "Prevention of Childhood Lead Toxicity" (<http://pediatrics.aappublications.org/content/138/1/e20161493>) and "Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention" (http://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_030712.pdf).
26. Perform risk assessments or screenings as appropriate, based on universal screening requirements for patients with Medicaid or in high prevalence areas.
27. Tuberculosis testing per recommendations of the AAP Committee on Infectious Diseases, published in the current edition of the AAP *Red Book: Report of the Committee on Infectious Diseases*. Testing should be performed on recognition of high-risk factors and Adolescents" (http://www.ncbi.nlm.nih.gov/guidelines/cd_peds/index.htm).
29. Adolescents should be screened for sexually transmitted infections (STIs) per recommendations in the current edition of the AAP *Red Book: Report of the Committee on Infectious Diseases*.
30. Adolescents should be screened for HIV according to the US Preventive Services Task Force (USPSTF) recommendations (<https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/human-immunodeficiency-virus-hiv-infection-screening>) once between the ages of 15 and 18, making every effort to preserve confidentiality of the adolescent. Those at increased risk of HIV infection, including those who are sexually active, participate in injection drug use, or are being tested for other STIs, should be tested for HIV and reassessed annually.
31. All individuals should be screened for hepatitis C virus (HCV) infection according to the USPSTF (<https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/hepatitis-c-screening>) and Centers for Disease Control and Prevention (CDC) recommendations (<https://www.cdc.gov/mmwr/volumes/69/rr/r6902a1.htm>) at least once between the ages of 18 and 79. Those at increased risk of HCV infection, including those who are persons with past or current injection drug use, should be tested for HCV infection and reassessed annually.
32. See USPSTF recommendations (<https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/cervical-cancer-screening>). Indications for pelvic examinations prior to age 21 are noted in "Gynecologic Examination for Adolescents in the Pediatric Office Setting" (<http://pediatrics.aappublications.org/content/126/3/583.full>).
33. Assess whether the child has a dental home. If no dental home is identified, perform a risk assessment (<https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Oral-Health/Pages/Oral-Health-Practice-Toolkit.aspx>) and refer to a dental home. Recommend brushing with fluoride toothpaste in the proper dosage for age. See "Maintaining and Improving the Oral Health of Young Children" (<http://pediatrics.aappublications.org/content/134/6/1224>).
34. Perform a risk assessment (<https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Oral-Health/Pages/Oral-Health-Practice-Toolkit.aspx>). See "Maintaining and Improving the Oral Health of Young Children" (<http://pediatrics.aappublications.org/content/134/6/1224>).
35. See USPSTF recommendations (<https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/dental-caries-in-children-from-birth-through-age-5-years-screening>). Once teeth are present, fluoride varnish may be applied to all children every 3 to 6 months in the primary care or dental office. Indications for fluoride use are noted in "Fluoride Use in Caries Prevention in the Primary Care Setting" (<http://pediatrics.aappublications.org/content/134/3/526>).
36. If primary water source is deficient in fluoride, consider oral fluoride supplementation. See "Fluoride Use in Caries Prevention in the Primary Care Setting" (<http://pediatrics.aappublications.org/content/134/3/526>).

Summary of Changes Made to the Bright Futures/AAP Recommendations for Preventive Pediatric Health Care (Periodicity Schedule)

This schedule reflects changes approved in November 2020 and published in March 2021. For updates and a list of previous changes made, visit www.aap.org/periodicityschedule.

CHANGES MADE IN NOVEMBER 2020

DEVELOPMENTAL

- Footnote 11 has been updated to read as follows: "Screening should occur per 'Promoting Optimal Development: Identifying Infant and Young Children With Developmental Disorders Through Developmental Surveillance and Screening' (<https://pediatrics.aappublications.org/content/145/1/e20193449>)."

AUTISM SPECTRUM DISORDER

- Footnote 12 has been updated to read as follows: "Screening should occur per 'Identification, Evaluation, and Management of Children With Autism Spectrum Disorder' (<https://pediatrics.aappublications.org/content/145/1/e20193447>)."

HEPATITIS C VIRUS INFECTION

- Screening for hepatitis C virus infection has been added to occur at least once between the ages of 18 and 79 years (to be consistent with recommendations of the USPSTF and CDC).
- Footnote 31 has been added to read as follows: "All individuals should be screened for hepatitis C virus (HCV) infection according to the USPSTF (<https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/hepatitis-c-screening>) and Centers for Disease Control and Prevention (CDC) recommendations (<https://www.cdc.gov/mmwr/volumes/69/rr/r6902a1.htm>) at least once between the ages of 18 and 79. Those at increased risk of HCV infection, including those who are persons with past or current injection drug use, should be tested for HCV infection and reassessed annually."
- Footnotes 31 through 35 have been renumbered as footnotes 32 through 36.

CHANGES MADE IN OCTOBER 2019

MATERNAL DEPRESSION

- Footnote 16 has been updated to read as follows: "Screening should occur per 'Incorporating Recognition and Management of Perinatal Depression Into Pediatric Practice' (<https://pediatrics.aappublications.org/content/143/1/e20183259>)."

CHANGES MADE IN DECEMBER 2018

BLOOD PRESSURE

- Footnote 6 has been updated to read as follows: "Screening should occur per 'Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents' (<http://pediatrics.aappublications.org/content/140/3/e20171904>). Blood pressure measurement in infants and children with specific risk conditions should be performed at visits before age 3 years."

ANEMIA

- Footnote 24 has been updated to read as follows: "Perform risk assessment or screening, as appropriate, per recommendations in the current edition of the AAP *Pediatric Nutrition: Policy of the American Academy of Pediatrics* (Iron chapter)."

LEAD

- Footnote 25 has been updated to read as follows: "For children at risk of lead exposure, see 'Prevention of Childhood Lead Toxicity' (<http://pediatrics.aappublications.org/content/138/1/e20161493>) and 'Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention' (https://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_030712.pdf)."



HRSA

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VISION SCREENING

RATIONALE

Vision screening is vital in identifying visual and systemic disorders. Vision screening begins in infancy and continues throughout childhood and adolescence during well-child visits. Appropriate visual assessments can help children obtain early interventions to correct or improve vision. Eye examination and visual assessments are important in detecting conditions that can lead to visual impairment, signify serious systemic disease, poor school performance, and life-threatening conditions.¹ Ocular problems can be an early sign of general health concerns. In addition, regular vision screening assessments at an early age can reduce the risk of persistent amblyopia at 7 years of age by more than 50%.²

The vision screening guidelines below are based on the 2016 AAP Clinical Report – [Procedures for the Evaluation of the Visual System by Pediatricians](http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf); available at: <http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf>, unless otherwise noted.

SCREENING REQUIREMENTS

- All pediatric health care providers should be familiar with the most recent version of eye examination and screening guidelines of the American Association for Pediatric Ophthalmology and Strabismus, the American Academy of Ophthalmology, and the American Academy of Pediatrics.
- Screeners are required to attend their local Vision Screening Training led by CHDP staff or another agency approved by their local CHDP program for certification in visual acuity screening. Certification must be renewed every four years.
- Please review Table 1 from the 2016 AAP Clinical Report – [Procedures for the Evaluation of the Visual System by Pediatricians](http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf); (<http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf>). CHDP provider offices are strongly recommended to keep hard copies available for screener's use.
- Screen for visual problems at each health assessment visit. Please see Vision Screening Guideline, Table 1: Overview of Vision Screening Assessments for a description of vision screening assessments and procedures.
 - Screening should include history, external exam, red reflex testing, pupil exam, corneal light reflex, cover test, fix and follow response, and ophthalmoscopy.
 - Perform visual acuity screening for children 3 years and older.
 - Ophthalmoscopy should be done for older, cooperative children to visualize structures in the back of the eye.

VISION SCREENING

- Instrument-based vision screening (e.g. autorefractometry or photoscreening) may be used if unable to conduct an optotype-based visual acuity screening. This method can be attempted beginning at age 12 months please refer to the AAP Bright Futures [Recommendations for Preventive Pediatric Health Care](http://www.aap.org/en-us/professional-resources/practice-support/Periodicity/Periodicity%20Schedule_FINAL.pdf), http://www.aap.org/en-us/professional-resources/practice-support/Periodicity/Periodicity%20Schedule_FINAL.pdf
- Visual Acuity Screening
 - Visual acuity screening should be done in a well-lit room, free of visual and auditory distractions. The eye chart should be at the child's eye level.
 - Each eye should be screened separately (monocularly), ensuring child does not peek with other eye.
 - Proper selection of age-appropriate optotypes (symbols or letters) and testing methods are important in obtaining accurate screening results. Use eye charts with lines of optotypes or matching cards with lines (crowding bars) around each optotype to obtain the most accurate visual acuity assessment. Crowding bars around the optotype make individual symbols/letters more difficult to identify when amblyopia is present, thereby increasing the sensitivity in detecting amblyopia.
- Either critical line or threshold screening may be used.
 - Threshold screening begins by asking the child to identify optotypes at the top line of the eye chart and continue down each line until the child can no longer identify the majority of optotypes in a line. Threshold screening enables the screener to identify small differences between each eye (i.e. two-line difference). Threshold screening can be relatively time-consuming and can potentially result in loss of attention, especially for younger children. Results obtained via threshold screening may not be as accurate as those derived by critical line screening may.
 - Critical line screening is an effective alternative to threshold screening that requires less time to administer. The "critical line" is the age-dependent line a child is expected to see normally and pass. The critical line to pass becomes smaller as age increases. Passing the critical line screening requires the child to correctly identify the majority of the optotypes present on the critical line appropriate for his or her age. Critical line screening, however, does not allow for identifying a two-line difference between eyes.

VISION SCREENING

- Screen children ages 3-5 years using LEA SYMBOLS® and HOTV letters.
 - LEA symbols and HOTV letters charts are standardized and have validated optotypes that provide the most accurate vision assessment.
 - Matching/response cards can be used with LEA symbols and HOTV letters charts for children who may be timid or non-verbal.
 - Screening distance is 10 feet. This short distance will enhance interaction between the child and screener without decreasing accuracy of screening results.
 - Allen figures, Lighthouse characters, and Sail Boat Chart are not standardized and not recommended for use in visual acuity screening.
 - The Tumbling E or Landolt C charts are also not recommended for vision screening because young children may not have yet developed the skill to express direction or orientation of these optotypes.
- Screen children who comfortably know their letters using Sloan letters or Snellen letters chart. May be used as early as age 5 years.
 - Sloan letter charts are standardized and therefore preferable to Snellen letters.
 - A screening distance of 10 feet is recommended.
 - Children who are unable to recognize letters should be screened using a standardized LEA symbols or HOTV letters chart.
 - Repeat screening every 1-2 years.
- Use adhesive patches or 2-inch wide hypoallergenic paper tape for effective occlusion.Error! Bookmark not defined.,Error! Bookmark not defined.
- Instrument-based vision screening (e.g. autorefraction or photoscreening) may be used if unable to complete an optotype-based visual acuity screening. This method can be attempted as early as 12 months of age. Instrument-based screening requires little cooperation from the child and is quick to administer. It is useful for nonverbal, preverbal, and timid children.Error! Bookmark not defined. Neither autorefraction nor photoscreening measure visual acuity, but both can identify ocular abnormalities that could lead to or indicate vision problems. The referral criteria may vary depending on the instrument used. Instrument-based vision screening involves

VISION SCREENING

substantial costs and may not be suitable for all provider offices. Children who can complete optotype-based screening should be screened using the appropriate method for their age.

- CHDP Providers who are considering instrument-based vision screening can refer to the American Academy of Pediatrics' Instrument-Based Pediatric Vision Screening Policy Statement³ for further guidance at:
<http://pediatrics.aappublications.org/content/pediatrics/early/2012/10/24/peds.2012-2548.full.pdf>

Bright Futures*

Please refer to Bright Futures Guidelines and Pocket Guide.

(<https://brightfutures.aap.org/materials-and-tools/guidelines-and-pocket-guide/Pages/default.aspx>). For periodicity schedules for vision risk assessment and vision testing please refer to the AAP Bright Futures [Recommendations for Preventive Pediatric Health Care](http://www.aap.org/en-us/professional-resources/practice-support/Periodicity/Periodicity%20Schedule_FINAL.pdf) (http://www.aap.org/en-us/professional-resources/practice-support/Periodicity/Periodicity%20Schedule_FINAL.pdf)

CONSIDERATIONS FOR REFERRAL, TREATMENT, AND/OR FOLLOW-UP

- Refer any eye conditions to the appropriate specialist.
- Children with the following conditions should bypass screenings and be automatically referred to an ophthalmologist or optometrist experienced in treating children for an eye examination.⁴
 - Recognized eye disorders (e.g. strabismus, ptosis)
 - Known neurodevelopmental disorders
 - Hearing impairment
 - Motor abnormalities (e.g. cerebral palsy)
 - Down syndrome
 - Cognitive impairment
 - Autism spectrum disorders
 - Speech delay
 - Systemic diseases present

VISION SCREENING

- Taking medications that may cause eye disorders
- First-degree relative with strabismus or amblyopia
- Prematurity: less than 32 weeks of gestation
- Parent believes child has vision problem
- Age-Dependent Referral Criteria for Visual Acuity Screening:
 - **Age 3 years:** Failure to correctly identify the majority of optotypes on the 10/25 (20/50) line, or worse, in either eye.
 - **Age 4 years:** Failure to correctly identify the majority of optotypes on the 10/20 (20/40) line, or worse, in either eye.
 - **Ages 5 years and older:** Failure to correctly identify the majority of optotypes on the 10/15 (20/30 or 20/32 on some charts) line, or worse, in either eye.
 - **Age 3 years and older (threshold method only):** a two-line difference between eyes, even within the passing range (e.g. a 4 year old with 20/20 in one eye and 20/32 in the other eye).
- Untestable Children and Rescreening Guidelines⁴
 - If child is unable to cooperate during the screening, a second attempt should be made the same day (i.e. later during the same visit). If same day rescreening is not possible, reschedule as soon as possible, but no later than 6 months.
- When vision screening is unsuccessful, children should be referred to an ophthalmologist or optometrist experienced in the care of children for an eye examination.

*American Academy of Pediatrics materials linked to with permission for reference only. Use of these materials beyond the scope of these guidelines must be reviewed and approved by the American Academy of Pediatrics, who can be reached at marketing@aap.org.

VISION SCREENING

References

1. Donahue, S, Baker, C. Procedures for the Evaluation of the Visual System by Pediatricians. *Pediatrics*. 2016; 137 (1): 1-9.
2. Donahue, S, Baker, C. Visual System Assessment in Infants, Children, and Young Adults by Pediatricians. *Pediatrics*. 2015. Policy Statement.
3. American Academy of Pediatrics. [Instrument-Based Pediatric Vision Screening Policy Statement](#). Published October 29, 2012. Accessed July 28, 2014.
4. Cotter, S, Cyert, L, Miller, J, et al. Vision Screening for Children 36 to <72 Months: Recommended Practices. *Journal of Optometry & Vision Science*. 2015; 92(1): 6-16. doi: 10.1097/OPX.0000000000000429

Table1– OVERVIEW OF VISION SCREENING ASSESSMENTS*

Assessment	Procedures
Family History and Parent Observations	Ask about family history of eye disorders such as strabismus, amblyopia, cataracts, refractive error, as well as eye surgery and use of glasses during childhood in parents or siblings. Ask parents for any observations or concerns about their child’s vision.
External Exam	Using a penlight, examine the eyelids, conjunctiva, sclera, cornea, and iris. Refer to a pediatric eye care specialist if abnormalities are present, such as ptosis, nonresolving conjunctivitis, or presence of cloudy or enlarged corneas and/or photophobia.
Red Reflex	Perform in a darkened room to maximize pupil dilation. It is not necessary to use eye drops for further pupil dilation. Set direct ophthalmoscope to “0” and while viewing through it at an arm’s length distance from the child, evaluate both pupils simultaneously as child looks at the light. The screener can move closer to the child to assess each eye individually. The observed red reflexes should be light orange-yellow in color in lightly pigmented eyes or a dark red in darkly pigmented brown eyes. The two red reflexes should be identical in color, brightness, and size. Bright white or yellow reflex, or a dull or absent red reflex can be a sign of significant abnormality and necessitates a referral.
Pupil Exam	Pupils should be equal, round and equally reactive to light. Unequal pupil shape or differences in diameter greater than 1 mm are often due to an eye injury, disease or neurological disorder. A difference of less than 1 mm in pupil size can occur

VISION SCREENING

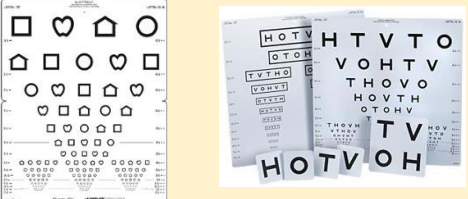


Assessment	Procedures
	normally and are generally benign unless presenting along with ptosis or an ocular motility deficit.
Corneal Light Reflex	Using a penlight directed at the child's face from arm's length away, check for symmetry of the white pinpoint light reflexes while the child gazes at the light. Normally these reflexes fall symmetrically in or near the center of the pupils. Asymmetry of the reflexes is typically a sign of strabismus.
Cover Test	Have the child look at a small object, such as a small toy or sticker on a tongue depressor. As the child fixates on the target, cover each eye alternately. A shift in an eye's alignment as it fixates on the target may indicate possible strabismus.
Ophthalmoscopy	<p>For older, cooperative children, the direct ophthalmoscope can be used to visualize structures in the back of the eye, such as the optic nerve, retinal blood vessels, and central retina.</p> <p>While child is looking into the distance at a target, use the ophthalmoscope to (starting at +10 lens) gradually move as close to the eye as possible while dialing less lens power until retinal vessels come into focus. Follow these vessels to view the optic nerve. A normal optic nerve is yellow-pink and generally flat. To view the foveal reflex, ask the child to look directly at the ophthalmoscope light. A normal foveal reflex should appear bright and sharp. Retinal hemorrhages can be present after a vaginal delivery but may also be a sign of severe child abuse. A swollen optic nerve may be a sign of increased intracranial pressure.</p>
Fix and Follow Response	<p>Evaluate the child's ability to fixate on and follow an object or toy held before the child. Perform with both eyes open first, and then repeat with each eye alternately covered. Determine if each eye can fixate on the object, maintain fixation for a short time, and then follow the object as it is moved in various directions.</p> <p>If the child demonstrates poor fixation and follow response when screened binocularly after 3 months of age, or demonstrates asymmetrical responses between the 2 eyes at any age, a referral is necessary for further evaluation.</p>
Visual Acuity	Visual acuity screening should be done in a well-lit room, free of visual and auditory distractions. The eye chart should be at the child's eye level. Each eye should be screened separately (monocularly), ensuring child does not peek with other eye. Use adhesive patches or 2-inch wide hypoallergenic paper tape for effective occlusion. ^{1,4} Either critical line or threshold screening may be used.

VISION SCREENING

Assessment	Procedures
	<p>Screen children ages 3-5 years using standardized LEA symbols or HOTV letters charts. LEA symbols and HOTV letters charts are standardized and have validated optotypes that provide the most accurate vision assessment. Matching/response cards can be used with LEA symbols and HOTV symbols charts for children who may be timid or non-verbal. Screening distance is 10 feet. This short distance will enhance interaction between the child and screener without decreasing the accuracy of screening results.</p> <p>Screen children who comfortably know their letters using Sloan letters or Snellen letters chart. Sloan letter charts are standardized and therefore preferable to Snellen letters. A screening distance of 10 feet is recommended.</p> <p>Children who are unable to recognize letters should be screened using a standardized LEA symbols or HOTV letters chart.</p>
Instrument-Based Screening	<p>Instrument-based vision screening (e.g. autorefraction or photoscreening) may be used if unable to complete an optotype-based visual acuity screening. This method can be attempted as early as 12 months of age. Instrument-based screening requires little cooperation from the child and is quick to administer. It is useful for nonverbal, preverbal, and timid children. Neither autorefraction nor photoscreening measure visual acuity, but both can identify ocular abnormalities that could lead to or indicate vision problems. The referral criteria may vary depending on the instrument used. Instrument-based vision screening involves substantial costs and may not be suitable for all provider offices. Children who can complete optotype-based screening should be screened using the appropriate method for their age.</p>

*Table 1 is synopsis of screening recommendations outlined in the 2016 AAP Clinical Report Procedures for the Evaluation of the Visual System by Pediatricians

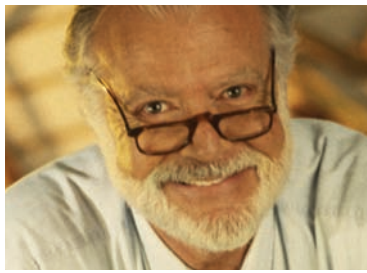
The Vision Screening Health Assessment Guideline #27 has been updated and viewable on the State CHDP Website <http://www.dhcs.ca.gov/services/chdp/Pages/HAG.aspx> . For your convenience, please see the below highlighted areas that have changed. For more information, you may register for an upcoming Vision Screening Training with our CHDP office.

<p>Visual Acuity Screening</p>	<p>Testing both eyes together is no longer necessary. Each eye should be screened separately (monocularly), ensuring the child does not peek with the other eye.</p> <p>Screening is at 10 ft (no longer 20 ft). It enhances interaction with the child without decreasing accuracy. DO NOT PERFORM A 10 FT SCREENING USING A 20 FT CHART.</p>
<p>Screening Methods</p>	<p>Critical line or Threshold Method can be used to screen: http://www.dhcs.ca.gov/services/chdp/Pages/HAG.aspx</p>
<p>Screening Tools – Vision Charts</p>	<p>3-5 years old: LEA SYMBOLS® OR HOTV letters.</p>  <p>5 years old and up: SLOAN Preferred over Snellen. Spacing between the lines is also consistent. This results in a more accurate visual acuity test.</p> 
<p>Follow-up</p>	<p>If the child is unable to cooperate during the screening, make a second attempt the same day (i.e. later during the same visit). If not possible, reschedule as soon as possible.</p>
<p>Occluder</p>	<p>Adhesive occlusion patches and/or 2 inch wide hypoallergenic paper tape are recommended as the best-method of occlusion. It is most important that the eye not being tested is adequately occluded to prevent peeking.</p> <p><i>Exceptions:</i> If patches are unavailable or are not tolerated:</p> <ul style="list-style-type: none"> • Specially designed occlusion glasses can be used. • Use paddle occluder for children aged 10 years and older. 

Vision Screening Recommendations

AGE	TESTS	REFERRAL CRITERIA COMMENTS
Newborn to 12 months	<ul style="list-style-type: none"> Ocular history Vision assessment External inspection of the eyes and lids Ocular motility assessment Pupil examination Red reflex examination 	<ul style="list-style-type: none"> Refer infants who do not track well after 3 months of age. Refer infants with an abnormal red reflex or history of retinoblastoma in a parent or sibling.
12 to 36 months	<ul style="list-style-type: none"> Ocular history Vision assessment External inspection of the eyes and lids Ocular motility assessment Pupil examination Red reflex examination Visual acuity testing Objective screening device "photoscreening" Ophthalmoscopy 	<ul style="list-style-type: none"> Refer infants with strabismus. Refer infants with chronic tearing or discharge. Refer children who fail photoscreening.
36 months to 5 years	<ul style="list-style-type: none"> Ocular History Vision assessment External inspection of the eyes and lids Ocular motility assessment Pupil examination Red reflex examination Visual acuity testing (preferred) or photoscreening Ophthalmoscopy 	<p>Visual Acuity Thresholds:</p> <ul style="list-style-type: none"> Ages 36-47 months: Must correctly identify the majority of the optotypes on the 20/50 line to pass. Ages 48-59 months: Must correctly identify the majority of the optotypes on the 20/40 line to pass. Refer children who fail photoscreening.
5 years and older*	<ul style="list-style-type: none"> Ocular history Vision assessment External inspection of the eyes and lids Ocular motility assessment Pupil examination Red reflex examination Visual acuity testing Ophthalmoscopy 	<ul style="list-style-type: none"> Refer children who cannot read at least 20/32 with either eye. Must be able to identify the majority of the optotypes on the 20/32 line. Refer children not reading at grade level.

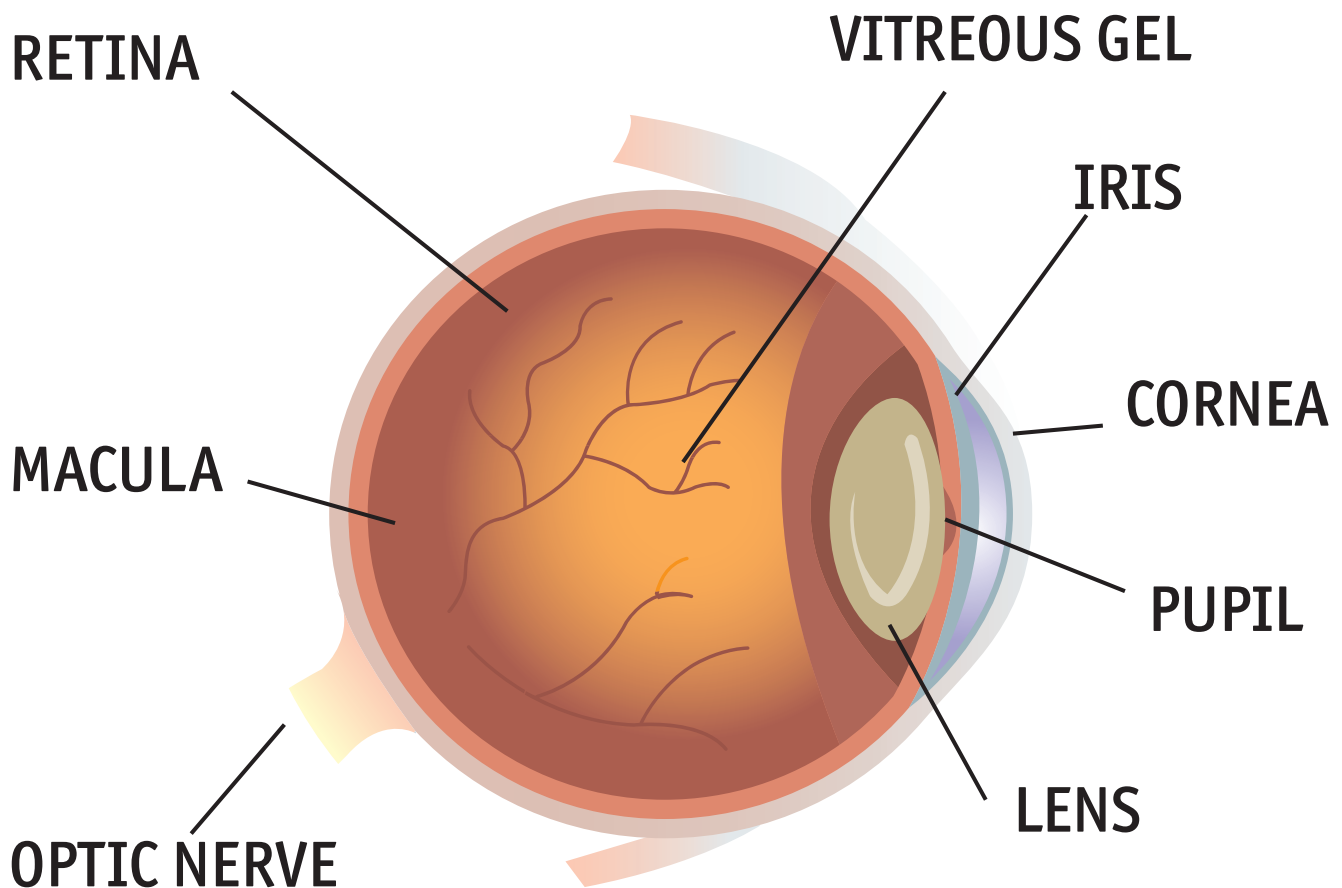
*Repeat screening every 1-2 years after age 5.



See Well for a Lifetime

PARTS OF THE EYE

To understand eye problems, it helps to know the different parts that make up the eye and the functions of these parts.



Please refer to the back of this handout for the descriptions of these main parts of the eye and their functions.

Here are descriptions of some of the main parts of the eye:

Cornea: The cornea is the clear outer part of the eye's focusing system located at the front of the eye.

Iris: The iris is the colored part of the eye that regulates the amount of light entering the eye.

Lens: The lens is a clear part of the eye behind the iris that helps to focus light, or an image, on the retina.

Macula: The macula is the small, sensitive area of the retina that gives central vision. It is located in the center of the retina.

Optic nerve: The optic nerve is the largest sensory nerve of the eye. It carries impulses for sight from the retina to the brain.

Pupil: The pupil is the opening at the center of the iris. The iris adjusts the size of the pupil and controls the amount of light that can enter the eye.

Retina: The retina is the light-sensitive tissue at the back of the eye. The retina converts light into electrical impulses that are sent to the brain through the optic nerve.

Vitreous gel: The vitreous gel is a transparent, colorless mass that fills the rear two-thirds of the eyeball, between the lens and the retina.

Pediatric Vision Screening Guidance during the COVID-19 Pandemic

AMERICAN ASSOCIATION FOR PEDIATRIC OPHTHALMOLOGY AND STRABISMUS
VISION SCREENING COMMITTEE

The sole purpose of this document is to provide guidance on conducting vision screening as part of regular preventative care activities in programs such as Early Head Start, Head Start, and in schools. This document is based on the evidence available at the time of publishing but is not a substitute for sound judgment and public health guidelines in place and with which schools should comply.

The American Academy of Pediatrics (AAP), through its [AAP guidance on school re-entry](#) focusing on mitigating COVID-19 risks, and the federal Center for Disease Control (CDC) with its [back to school guidelines](#), serve as important references to help schools and other educational programs adjust to changing needs during the COVID-19 pandemic.

Vision screening remains an important component of regular pediatric preventative health care and should continue during the COVID-19 pandemic whenever possible. Vision screening can identify children who may otherwise have no outward symptoms of subtle ocular abnormalities or blurred vision that, if untreated, may lead to permanent vision loss or impaired academic performance in school. Fortunately, vision screening activities require only a brief exposure to a child. Such interactions in which social distancing of less than 6 feet cannot be maintained typically fall within the CDC finding that the use of [facial coverings](#) and limiting of such contacts to less than 15 minutes are effective in reducing the risk of infection transmission. In addition to wearing masks,

[handwashing, staying home when sick](#) and careful [cleaning and disinfection](#) are other important principles to follow when vision screening.

Masks

It is understood face coverings may be challenging for some children to wear. Several articles are accessible on-line that provide further insights into helping young children wear masks.

- [Should young children wear masks?](#)
- [Children may be afraid of masks.](#)
- [Worried about your child wearing a mask at school this fall?](#)

In addition to regular face masks, eye safety goggles/full face plastic masks may also be recommended by public health authorities.

Cleaning and Disinfection

During **visual acuity-based screening sessions**, wipe clean any surfaces touched by the child (e.g., plastic occluders, occluder glasses and matching response cards) between each use. Visual acuity charts should be wiped clean before and after each screening session to protect the screener.

Consider using disposable matching cards and eye occluders or individual adhesive eye patches to cover the non-tested eye during vision screening. To complete an accurate screening assessment,

care should always be taken to ensure the child cannot peak around the cover during any point of the screening.

During **electronic instrument-based screening sessions** wipe clean any surfaces on the units touched by individual screeners before and after each screening session. Instrument-based screening is performed at a testing distance of about one meter but lasts only a few seconds. This method of screening may be permitted by local health authorities as long as masks are worn by the screener and whenever possible, the child as well.

Modify Screening Areas and Sessions

Follow guidelines for social distancing as much as possible before, during and after screening sessions, being careful to wear masks whenever social distancing cannot be maintained.

Vision screening performed either through or around a plexiglass partition may be feasible. The partition can act as a clear barrier when social distancing for instrument-based screening cannot be maintained. (Some instrument models may function better than others when focused through such partitions.)

Administering vision screening sessions outdoors in a shaded area may be feasible, especially for visual acuity screening. However, a young child's pupil size may be too small in daylight for electronic vision screening devices to function properly.

Any optional vision screening tests (eg color vision testing, near visual acuity testing and stereoacuity testing) should be avoided in order to minimize screening time. While the covers of color vision books can be wiped clean, the hard-cardboard pages may not be. If color vision testing is indicated, children should not touch the pages directly. Good alternatives to finger pointing may be the use of a pencil eraser or a fine paint brush. Such pointers should be wiped clean between each use.

Outside Vision Screeners Visiting Schools

If a school or program designates outside individuals as essential workers to continue vision screening sessions, public health measures should be followed prior to entry into the school, such as: hand washing, wearing masks, [symptom checking](#) and perhaps separating visits by a single individual to separate schools by several days.

Regular vision screening routines in schools or programs may need to be deferred whenever public health advisories recommend that children remain at home. However, vision screening should still be conducted in a pediatrician's office as part of regular well child visits. The American Academy of Pediatrics strongly encourages families to schedule and [keep regular well child checks](#) as the best way to promote good overall health throughout the coronavirus pandemic.

While home vision screening tests with cell phone or laptop apps, or with visual acuity cards, are available for parents, none have been evaluated for their reliability in the home setting. If a parent suspects a vision or eye problem, a pediatrician or pediatric eye care provider should be contacted to examine the child.

Conclusion

Vision screening serves to identify children who may otherwise have no outward symptoms of subtle ocular abnormalities or blurred vision that, if untreated, may lead to permanent vision loss or impaired academic performance in school. Personal prevention practices, including handwashing, cloth face coverings, staying home when sick, and careful cleaning and disinfection are important principles to follow to mitigate transmission risk during vision screening. While school and community vision screening routines may need to be deferred in some areas, vision screening should still be conducted as part of the regular well child visits in a pediatrician's office. When ocular concerns exist, with or without a vision screening, a thorough examination by a pediatric eye care provider is recommended.

Approved by the AAPOS Board of Directors August 3, 2020



News Articles, Focus on Subspecialties

Screen children with neurodevelopmental disabilities for vision problems

by Sharon S. Lehman M.D., FAAP; Kenneth W. Norwood Jr. M.D., FAAP

Many children with neurodevelopmental disabilities such as cerebral palsy and spina bifida have deficits in their senses, with vision impairment perhaps being the most limiting to successful participation in life.

Several studies have found that vision care represents one of the greatest unmet needs for children with special health care needs. In addition, infants and toddlers who are socially at risk with functional vision difficulties make up one of the highest subgroups of developmental vulnerability.

Examination of the eyes is a routine part of a well-child check. Thus, pediatricians are in a unique position to detect vision impairment in children with neurodevelopmental disabilities and ensure that appropriate referrals and intervention occur and classroom accommodations are made.

In January 2016, the Academy published a clinical report and policy statement that provide guidance on how to evaluate and when to refer children for full ophthalmologic evaluation (see resources). The documents, issued along with the American Association of Certified Orthoptists, the American Association for Pediatric Ophthalmology and Strabismus, and the American Academy of Ophthalmology, emphasize that ocular problems can be the initial manifestation of systemic or neurologic disease such as retinoblastoma or neuroblastoma in addition to identifying vision-threatening ocular conditions.

Taking a history

Obtaining a history eliciting parental concerns and family history is essential. As discussed in the policy, identification of a family history of serious eye disorders such as retinoblastoma, childhood cataracts or glaucoma, strabismus and amblyopia are indications for evaluation by an ophthalmologist experienced in the care of children. Parental concerns about vision also are an indication for full ophthalmologic evaluation.

It is important to ask specifically about vision concerns when obtaining a history about a child with complex medical problems. The family may be more focused on concerns about respiratory or neurologic problems and forget to bring up vision issues, or they may have a misconception that nothing can be done to help their child use his or her vision more effectively.

Overcoming screening challenges

It is possible for pediatricians to screen children with neurodevelopmental disabilities for vision problems, but it may be challenging due to cognitive impairment, processing delays, inability to cooperate, multiple sensory deficits and expressive language delay. The screening may need to be adjusted and may take more time, for instance in children with cortical visual impairment who display latency due to a delayed response because of extra time needed for processing and responding to the visual stimuli.

It is important to match the screening technique to the developmental age of the child instead of chronologic age. Interesting toys and charts with pictures or symbols may be used for acuity testing. The recommended charts for younger children are those with Lea symbols or HOTV (limited number of symmetric letters). Providing the child with matching cards can be helpful in obtaining cooperation when testing acuity. Using critical line testing instead of threshold line testing as discussed in the 2016 clinical report takes less time and may be particularly helpful in children with neurodevelopmental disabilities.

Instrument-based screening which identifies refractive and structural risk factors for amblyopia also can be used



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to screen a child who is nonverbal or cannot cooperate for recognition acuity. This technique is quick, and noncontact and distraction techniques can be used to obtain cooperation. It requires less sustained attention from the child.

The physical exam of the eye looking at the alignment, eyelid position and anterior and posterior aspect (red reflex) also should be performed. If the recommended vision screening cannot be performed or abnormalities are found on physical examination, the child should be referred for full ophthalmologic evaluation.

Pediatricians should have a low threshold for sending a child with a neurodevelopmental disability for full ophthalmologic evaluation if there are any concerns about vision or if the child has a medical condition in which there is a significant risk of ocular abnormalities or visual conditions.

Complex neurodevelopmental disability is among the conditions where evaluation by a pediatric ophthalmologist or eye care specialist appropriately trained to treat pediatric patients is necessary because of the risk of significant visual disability affecting the child's ability to learn and reach his or her potential.

Dr. Lehman is immediate past chair of the AAP Section on Ophthalmology Executive Committee. Dr. Norwood is chair of the AAP Council on Children with Disabilities Executive Committee.

Resources

- [AAP clinical report "Procedures for the Evaluation of the Visual System by Pediatricians"](#)
- [AAP policy statement "Visual System Assessment in Infants, Children, and Young Adults by Pediatricians"](#)



Procedures for the Evaluation of the Visual System by Pediatricians

Sean P. Donahue, MD, PhD, FAAP, Cynthia N Baker, MD, FAAP, 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

Vision screening is crucial for the detection of visual and systemic disorders. It should begin in the newborn nursery and continue throughout childhood. This clinical report provides details regarding methods for pediatricians to use for screening.

abstract

This clinical report supplements the combined policy statement from the American Academy of Pediatrics (AAP), American Association for Pediatric Ophthalmology and Strabismus, American Academy of Ophthalmology, and American Association of Certified Orthoptists titled “Visual System Assessment in Infants, Children, and Young Adults by Pediatricians.”¹ The clinical report and accompanying policy statement 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 2008 AAP policy statement “Red Reflex Examination in Neonates Infants and Children.”⁴ The policy statement articulates the screening criteria and screening methods, and the clinical report explains the various evaluation procedures that are available for use by the pediatrician or primary care physician.

VISUAL SYSTEM HISTORY ASSESSMENT

Relevant family history regarding eye disorders (cataracts, strabismus, amblyopia, and refractive error), eye surgery, and the use of glasses during childhood in parents or siblings should be explored. Parents’ observations are also valuable in the history and review of systems. Questions that can be asked include:

1. Do your child’s eyes appear unusual?
2. Does your child seem to see well?
3. Does your child exhibit difficulty with near or distance vision?
4. Do your child’s eyes appear straight or do they seem to cross?
5. Do your child’s eyelids droop or does one eyelid tend to close?
6. Has your child ever had an eye injury?

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The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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OCULAR EXAMINATION

The ocular examination consists of the external examination, pupil examination, red reflex testing to assess ocular media, the examination of the ocular fundus by using ophthalmoscopy, and an assessment of visual function.

EXTERNAL EXAMINATION (LIDS/ORBIT/ CONJUNCTIVA/CORNEA/IRIS)

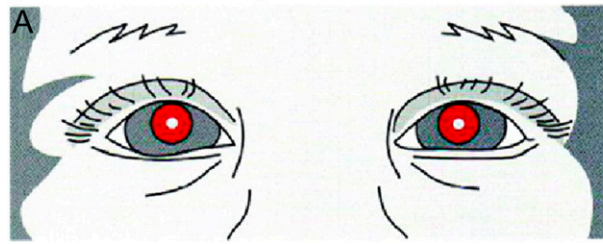
External examination of the ocular structures consists of a penlight evaluation of the eyelids, conjunctiva, sclera, cornea, and iris. Detection of abnormalities, such as ptosis, nonresolving conjunctivitis, or the presence of cloudy or enlarged corneas and/or photophobia, necessitates timely referral to an eye care specialist appropriately trained to treat children. Nasolacrimal duct obstruction that has not resolved by 1 year of age also should lead to referral. Thyroid disease can manifest by increased visibility of the superior cornea caused by eyelid retraction.

RED REFLEX TESTING

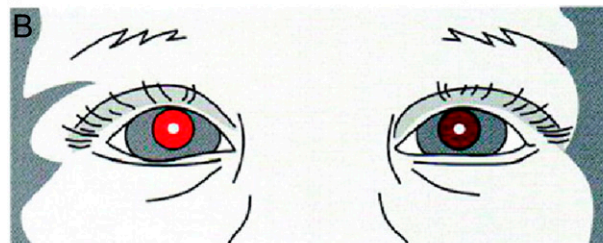
Red reflexes from the retinas can be used by the physician to great advantage. The red reflex test, or Bruckner test if performed binocularly, is used to detect opacities in the visual axis, such as a cataract or corneal abnormality, as well as abnormalities in the posterior segment, such as retinoblastoma or retinal detachment. The examiner also may detect subtle differences in the red reflex between the eyes, consistent with the presence of strabismus or refractive errors. The inequality of the red reflection or the interference with the red reflection can be noted in various conditions (Fig 1).

Red reflex testing should be performed in a darkened room (to maximize pupil dilation). Eye drops to further dilate the pupils are not necessary. The direct ophthalmoscope is set on "0," and while viewing

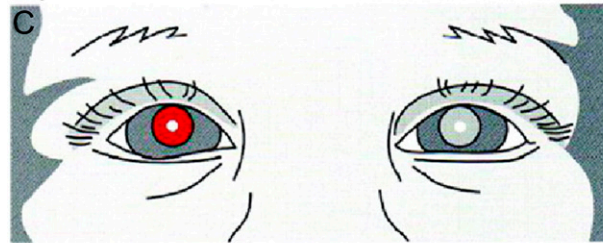
↓ **NORMAL**—Child looks at light. Both red reflections are equal.



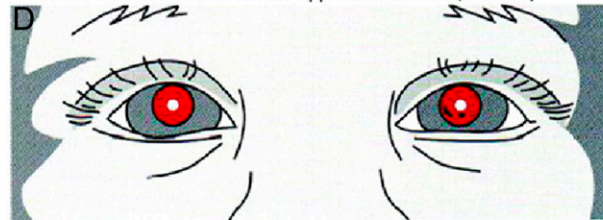
↓ **UNEQUAL REFRACTION**—One red reflection is brighter than the other.



↓ **NO REFLEX (CATARACT)**—The presence of lens or other media opacities blocks the red reflection or diminishes it.



↓ **FOREIGN BODY/ABRASION (LEFT CORNEA)**—The red reflection from the pupil will back-light corneal defects or foreign bodies. Movement of the examiner's head in one direction will appear to move the corneal defects in the opposite direction. (Parallax)



↓ **STRABISMUS**—The red reflection is more intense from the deviated eye.

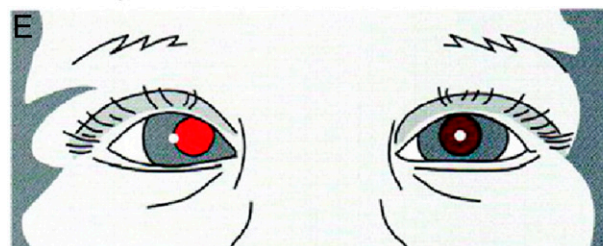


FIGURE 1

Red reflex examination. A, **NORMAL**: Child looks at light. Both red reflections are equal. B, **UNEQUAL REFRACTION**: One red reflection is brighter than the other. C, **NO REFLEX (CATARACT)**: The presence of lens or other media opacities blocks the red reflection or diminishes it. D, **FOREIGN BODY/ABRASION (LEFT CORNEA)**: The red reflection from the pupil will back-light corneal defects or foreign bodies. Movement of the examiner's head in one direction will appear to move the corneal defects in the opposite direction. E, **STRABISMUS**: The corneal light reflex is temporally displaced in the misaligned right eye, indicating esotropia. (Used with permission of Alfred G. Smith, MD, ©1991.)

through it at a distance of approximately arm's length from the child, both pupils are evaluated simultaneously as the child looks at the light. To view more detail, the examiner can move closer to the child to assess each eye individually. The observed red reflexes can be compared and should be a light orange-yellow in color in lightly pigmented eyes or a dark red in darkly pigmented brown eyes. If normal, the 2 red reflexes should be identical in color, brightness, and size. A bright white or yellow reflex or, conversely, a dull or absent red reflex can be an indication of a significant abnormality that necessitates further evaluation by a pediatric ophthalmologist, or if unavailable, a comprehensive ophthalmologist or optometrist with specialized interest in the treatment of children, and who uses cycloplegia (dilating drops) as part of his or her routine evaluation. Because there is often considerable variation in the qualitative nature of the red reflex among patients without eye abnormalities, the frequent, routine assessment of the red reflex will help the primary care physician better distinguish an abnormality of the reflex from a normal one.

PUPIL EXAMINATION

Both pupils should be equal, round, and equally reactive when light is directed toward either eye. Asymmetric responses to light may indicate visual system dysfunction. Moreover, asymmetry of pupil shape or difference in diameter greater than 1 mm can often be attributable to an ocular injury or disease or to a neurologic disorder. Differences in pupil size less than 1 mm can occur normally and are generally benign unless associated with ptosis or an ocular motility deficit.

OCULAR ALIGNMENT AND MOTILITY ASSESSMENT

The assessment of ocular alignment in the preschool- and early school-

aged child is also important. The development of strabismus in children may occur at any age and, although often isolated, may also represent serious orbital, intraocular, or intracranial disease.

The corneal light reflex test and the cover test are each useful in identifying the presence of strabismus as well as in differentiating true strabismus from pseudostrabismus.

The corneal light reflex test (ie, Hirschberg test) is performed with a penlight directed onto the child's face from arm's length away and by observing the symmetrical location of the white pinpoint light reflexes while the child gazes at the light. Normally, these reflexes fall symmetrically in or near the center of the pupils. An abnormal response occurs when the reflex in one eye is centered in the pupil while the reflex in the opposite eye is displaced nasally, temporally, or vertically away from the pupil center (Fig 1). This asymmetry of the reflexes typically indicates the presence of strabismus.

The cover test should be performed while the child fixates on a small, interesting target, such as a small toy or sticker on a tongue depressor. The bright beam of a penlight does not provide a comfortable target and does not adequately stimulate accommodation (focusing). As the child attends to the target, each eye is alternately covered. A shift in an eye's alignment as it assumes fixation onto the target is a possible indication of strabismus.

Strabismus in the neonatal period is not unusual, and intermittent strabismus is often a normal finding in early infancy. However, constant horizontal strabismus that persists after 4 months of age does not resolve spontaneously.⁵ Thus, any child older than 4 months with strabismus should be referred for evaluation.

Pseudostrabismus is the appearance of crossed eyes (esotropia)

attributable to the presence of prominent epicanthal skin folds that cover the medial portion of the sclera on 1 or both eyes, giving the false impression of esotropia. The inability to differentiate strabismus from pseudostrabismus also necessitates referral.

Finally, the presence of unusual eye movements in an infant or young child may indicate nystagmus or a similar disorder and often indicates decreased vision or neurologic dysfunction. Nystagmus does not resolve spontaneously and often indicates afferent visual system dysfunction or neurologic disease and necessitates further evaluation by either an ophthalmologist or neurologist.

OPHTHALMOSCOPY

Use of the direct ophthalmoscope in older, cooperative children serves to visualize structures in the back of the eye, such as the optic nerve, retinal blood vessels, and central retina (fovea). To properly visualize these structures, the child looks into the distance at a target of interest. The ophthalmoscope is dialed to a +10 lens and the examiner focuses on the pupil from ~3 inches away. The examiner then gradually moves as close to the eye as possible while sequentially dialing less lens power until retinal vessels come into focus. These vessels can be followed to identify and view the optic nerve. The normal optic nerve has a yellow-pink color and is generally flat. To view the foveal reflex, the child is asked to look directly at the light of the ophthalmoscope. The normal foveal reflex should appear bright and sharp. Retinal hemorrhages can be observed after a normal vaginal delivery but are also the harbinger of severe child abuse; a swollen optic nerve may be an indicator of increased intracranial pressure.

ASSESSMENT OF VISUAL ACUITY IN PREVERBAL CHILDREN

The assessment of visual function in this very young age group is best

accomplished by evaluating the child's ability to fixate on and follow an object held before the child. A standard assessment strategy is to determine whether each eye can independently fixate on the object, maintain fixation on it for a short period of time, and then follow it as it is moved in various directions. The child should be awake and alert for this testing, and the targeted object should be a toy or something of interest to the child. Disinterest or poor cooperation can mimic a poor vision response. This assessment should first be performed binocularly and then repeated with each eye alternately covered. If poor binocular fixation and following behavior is noted after 3 months of age, an ocular or neurologic abnormality may be present. Similarly, asymmetry in responses between the 2 eyes in children of any age necessitates further evaluation.

ASSESSMENT OF VISUAL ACUITY IN OLDER CHILDREN

Children who are old enough to delineate objects on a wall-mounted or handheld eye chart can provide a direct measurement of visual acuity. For some children, this may be accomplished as young as 3 years, but for the typical healthy child, an accurate visual acuity can be achieved with a high degree of success at 4 years and older. Eyes should be tested monocularly, ensuring that the child does not peek with the fellow eye.

With traditional visual acuity screening, the selection of age-appropriate shapes or letters and specific testing methods is crucial in obtaining the most accurate screening results. Many children can identify optotypes (figures or a selection of distinct letters formatted on chart lines or presented singly on individual cards) by 4 years of age. Eye charts using lines of optotypes or matching cards with lines (crowding

bars) around each optotype provide the most accurate assessments of visual acuity (Fig 2). Using cards with single optotypes but without crowding bars can overestimate visual acuity. Crowding bars surround an optotype and make individual letters more difficult to recognize by an amblyopic eye, thus increasing the sensitivity to detect amblyopia (Fig 2). Accurate assessment of visual acuity, therefore, is best accomplished by using a line of symbols or symbols with crowding bars around them.

The currently preferred optotypes are the LEA or HOTV symbols, although other new picture optotype acuity tests are under development.^{6,7} Allen figures, Lighthouse characters, and the Sail Boat Chart are not standardized and are no longer recommended for use, nor are the Tumbling E or Landolt C charts, because a child of preschool age may not yet have developed the ability to express the orientation of these optotypes. HOTV symbols are

easier for the young child to understand, as they are symmetric and not subject to letter reversal. With the examiner pointing to a symbol with a finger under it, a timid child can point to the optotypes that he or she recognizes on a card with similar symbols; this allows the child to effectively offer nonverbal responses during testing. Once a child can distinguish letters, a chart with letter optotypes should be used. Although the traditional Snellen chart remains in wide usage, Sloan letter charts present letters in a standardized fashion and should be used for acuity testing if they are available.

Screening Process

Large optotypes at the top of an eye chart or on handheld cards are first reviewed with the child with both eyes open to help the child understand the test. After this review, 1 eye is occluded (preferably by an occlusive patch or tape) and lines of optotypes or cards with single crowded optotypes (ie, the figure is surrounded by bars on all 4 sides) are presented to each eye separately. Effective occlusion, such as with tape or an occlusive patch of the eye not being tested, is important to eliminate the possibility of peeking.

Threshold Line Evaluation

The time-honored method of testing visual acuity has been to ask the child to start at the top of an eye chart and continue reading down each line until he or she recites the smallest line of optotypes discernable with each eye tested separately. This method is called "threshold" acuity testing and remains a common method of acuity testing. It enables one to identify the best level of visual acuity in each eye. Thus, children with near-normal acuity who still have a mild difference in acuity between each eye can be detected. However, threshold line evaluation can be sufficiently time-consuming to result in loss of attention from a young subject.

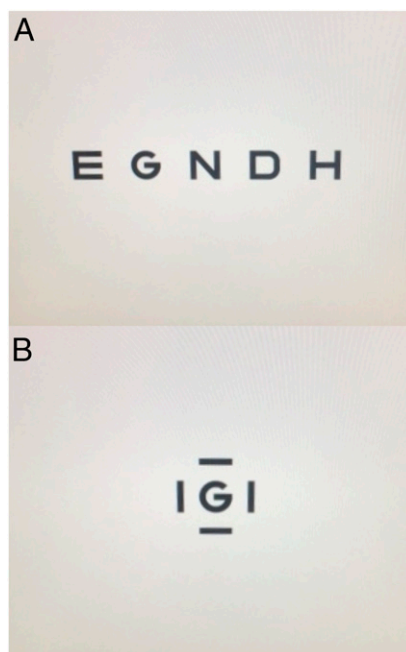


FIGURE 2
A, Five 20/50 letters presented in a row. B, Crowding bars isolate a single letter on the same 20/50 line, making it easier for a child to identify the letter, but are less subject to the "crowding phenomenon" (see text).

Critical Line Evaluation

Young children, even those with normal vision, are frequently unable to attend sufficiently to small optotypes and identify them. “Critical line” screening is an effective alternative to threshold testing for identifying children with potentially serious vision concerns and can be more quickly administered than can screening by using threshold testing. The “critical line” is the age-dependent line a child is expected to see normally and pass. For screening purposes, it is unnecessary to measure acuity below the age-specific critical line to pass the test. The critical line to pass screening becomes smaller as age increases. Most eye charts present 4 to 6 optotypes per line, and passing the screening requires the child to correctly answer a simple majority of the optotypes present on the critical line appropriate for his or her age as follows:

- Ages 36 through 47 months: If attempted at this age, the critical line to pass screening is the 20/50 line
- Ages 48 through 59 months: The critical line to pass screening is the 20/40 line
- Ages 60 months and older: The critical line to pass screening is the 20/30 line (or the 20/32 line on some charts)

Establishing an Effective Screening Environment and Methodology

It is important that the screening area be conducive for assessing visual acuity and that proper technique is used to promote accurate screening. It is important that screening personnel be trained to recognize and avoid pitfalls that reduce the accuracy of visual acuity screening. Accurate screening of visual acuity requires dedicated and skilled staff members.

1. A well-illuminated area free from distraction is important. A quiet examination room or hallway is generally sufficient for this purpose.

2. An appropriate testing distance must be used. For children up to 5 years of age, especially when pictorial optotypes are used, this distance should be set at 10 feet rather than 20 feet as a standard. This shorter distance helps to enhance interaction between the child and the individual administering the screening without decreasing the accuracy of screening results. Indeed, current standardized preschool eye charts are typically calibrated for use at 10 feet. For children 6 years and older for whom a letter chart is used, the test distance may be appropriately set at either 10 feet or at the common standard of 20 feet, as long as the chart is properly calibrated for use at that distance.

Increasingly, screening methods using short testing distances are becoming available in the form of handheld optotypes used at a testing distance of 5 feet⁸ or as computer, tablet, or smart phone-based models with testing distances within 1 to 2 feet. Although the accuracy of screening visual acuity at these shorter distances has not yet been validated in large population-based studies, the use of these methods can fit well into small clinical work areas. One computer-based application, available from the Jaeb Center for Health Research, is specifically for use by nonophthalmic health care professionals. The Jaeb Visual Acuity Screener incorporates all current screening guidelines and is available free of charge for download and unlimited use at <http://pedig.jaeb.org/JVAS.aspx>.

3. It is important to recognize that children with visual impairment may inaccurately pass a vision screening if they peek around an incompletely covered eye or if they are able to correctly guess when only 2 or 3 optotype choices are presented. Use of an adhesive patch over the nontested eye is recommended. Visually impaired children may become

uncooperative during an examination; such behavior should be considered a possible indicator of poor visual function.

4. The use of validated and standardized optotypes and acuity charts is important for an accurate assessment of vision. For this reason, only the LEA symbols and HOTV characters are recommended for preschool vision screening at this time. Other optotypes are not well validated in the screening environment.
5. Every effort should be made not to isolate shapes or letters inadvertently on a line with a finger or cover to “help” a struggling child. If performed in this manner, the visual acuity result may be made falsely elevated by blocking out the natural crowding inherent in open lines of letters. If single optotypes are presented, they should include “crowding bars.”
6. Screening visual acuity to the child’s threshold (ie, best possible acuity) may provide a less accurate result than testing to the age-appropriate critical line for that child. Critical line testing is an appropriate alternative to threshold testing, requires less time to administer, and may provide a more accurate screening assessment of a child’s visual function.

Incorporating these concepts into clinical practice offers a quick and reliable assessment of visual acuity in young children. To assist pediatricians and primary care physicians, the American Association for Pediatric Ophthalmology and Strabismus has developed a Vision Screening Kit designed specifically for young children that incorporates these important concepts. It is available commercially and can be purchased from the AAP.

For healthy children 6 years and older, testing of visual acuity using optotype-based vision charts at 10 or

20 feet remains the preferred method for screening and should be repeated every 1 to 2 years (Table 1).

Although barriers to its use exist, a level-1 Current Procedural

Terminology (CPT) code, 99173, has been established for visual acuity screening and is available to primary care physicians to seek payment for this testing.

INSTRUMENT-BASED SCREENING TECHNIQUES

Instrument-based screening is endorsed by the AAP² and by the US Preventive Services Task Force as a

TABLE 1 Eye Examination Guidelines

Function	Recommended Tests	Referral Criteria	Comments
Newborn to 6 mo			
Vision assessment	Fixation and follow response	Inconsistent or no response by 3 mo	
Ocular media clarity	Red reflex	White, pupil, dark spots, absent or asymmetric reflex	
External inspection	Direct observation	Any ocular abnormality of concern	
6 to 12 mo			
Pupil examination	Flashlight	As above for ages newborn to 6 mo, plus	
Ages 1–3 y			
Instrument-based vision screening when available (CPT 99174)	Photoscreening Autorefraction	As above for ages 6 mo to 12 mo, plus Failed screening as indicated by the device	
Distance visual acuity may be attempted at age 3 y	HOTV or LEA Symbols	Fewer than a simple majority of optotypes correct on the 10/25 (20/50) line with either eye tested monocularly at 10 ft	
Ages 4–5 y			
Distance visual acuity or instrument-based screening when available (CPT 99173)	HOTV or LEA symbols	A simple majority of figures correct on the age-appropriate critical line with either eye tested monocularly at 10 ft	<ol style="list-style-type: none"> 1. Use a well-illuminated area free from distraction. 2. Either critical line testing or threshold testing may be used (see text for details). 3. Testing distance of 10 ft is recommended for all visual acuity tests. 4. A line of figures is preferred over single figures, unless the single figures are “crowded” (see text). 5. The fellow eye should be covered by an occluder held by the examiner or by an adhesive occluder patch applied to the eye; the examiner should determine that it is not possible to peek with the nontested eye.
Ages:			
48–59 mo: 10/20 (=20/40)			
60+ mo: 10/15 (=20/30)			
or			
For threshold testing only: a 2-line difference between eyes, even with the passing range; eg, 20/15 (20/30) and 10/10 (20/20) for a 60-mo-old			
Ocular alignment	Cross cover test	Any eye movement	Child must be fixing on a target while cross cover test is performed.
Any asymmetry of pupil color, size, brightness			Direct ophthalmoscope used to view both red reflexes simultaneously in a darkened room from 2–3 feet away; detects asymmetric refractive errors as well.
Ocular media clarity	Red reflex	White pupil, dark spots in pupil, absent red reflex	Direct ophthalmoscope, darkened room. View each red reflex separately at 12–18 inches; white reflex indicates possible retinoblastoma. Dark or absent reflex indicates possible cataract.

TABLE 1 Continued

Function	Recommended Tests	Referral Criteria	Comments
Ages ≥6 y			
Distance visual acuity; instrument-based screening when available for children unable to perform acuity	Sloan letters or Snellen letters	Fewer than a simple majority of optotypes correct on the 10/15 (20/30) line with either eye tested monocularly at 10 ft	<ol style="list-style-type: none"> 1. Tests are listed in decreasing order of cognitive difficulty; the highest test that the child is capable of performing should be used. 2. Use a well-illuminated area free from distraction. 3. Either critical line testing or threshold testing may be used (see text for details). 4. Testing distance of 10 ft is recommended for all visual acuity tests. 5. A line of figures is preferred over single figures unless the single figures are "crowded" (see text). 6. The fellow eye should be covered by an occluder held by the examiner or by an adhesive occluder patch applied to the eye; the examiner should determine that it is not possible to peek out of the covered eye.
	HOTV or LEA symbols		
or			
		For threshold testing: only: a 2-line difference between eyes, even within the passing range; eg, 10/10 (20/20) and 10/15 (20/30) Any eye movement	Simultaneous red reflex test (Bruckner test). Child must be fixing on a target while cross cover test is performed.
Ocular media clarity	Red reflex	White pupil, dark spots, absent reflex	Direct ophthalmoscope, darkened room. View each red reflex separately at 12–18 inches; white reflex indicates possible retinoblastoma. Dark or absent reflex indicates possible cataract.

valid method for screening very young children.⁹ A recent randomized, controlled, multicentered crossover study demonstrated photoscreening to be superior to direct testing of visual acuity for screening well children ages 3 to 6 years in the pediatric office.¹⁰ If available, instrument-based screening can be attempted beginning at age 12 months,¹¹ and a previous study has demonstrated better eventual outcomes for children undergoing their first photoscreening before 2 years of age.¹²

Instrument-based screening can be relatively quick and requires less attention from the child compared with traditional visual acuity screening. Screening instruments identify optical and physical characteristics that indicate the presence of ocular conditions known to cause amblyopia. Similar to the code for visual acuity screening, a level-1 CPT code, 99174, has been assigned to photoscreening and

enables the primary care physician to seek payment for its use. CPT codes 99173 and 99174 are specific for visual acuity screening and photoscreening, respectively.

Two types of instrument-based vision screening are now available for use in ambulatory care settings. Although neither type provides a direct assessment of visual acuity, both identify ocular risk factors that can lead to early vision loss in children. Once children can read an eye chart easily, optotype-based acuity should

supplement instrument-based testing. The actual age for this is not yet well established and likely varies depending on the child.

The most common ocular abnormalities seen during the early childhood years are strabismus, anisometropia, and a high magnitude of uncorrected refractive errors: hypermetropia, myopia, and astigmatism. The American Association for Pediatric Ophthalmology and Strabismus has developed refractive criteria to help

TABLE 2 Amblyopia Risk Factor Targets Recommended by the American Association for Pediatric Ophthalmology and Strabismus

Age, mo	Refractive Risk Factor Targets			
	Astigmatism, D	Hyperopia, D	Anisometropia, D	Myopia, D
12–30	>2.0	>4.5	>2.5	>–3.5
31–48	>2.0	>4.5	>2.0	>–3.0
>48	>1.5	>3.0	>1.5	>–1.5
Nonrefractive Risk Factor Targets				
All ages	Media opacity >1 mm			
	Manifest strabismus >8 prism D in primary position			

D, diopters
From Donahue et al.¹⁵

primary care physicians appreciate the levels of refractive error known to increase risk of amblyopia (Table 2).¹³ Referral criteria that best detect these amblyopia risk factors may vary depending on the screening instrument used and the desired levels of sensitivity and specificity.

Photoscreening devices identify optical characteristics of the eyes to estimate refractive error, media clarity, ocular alignment, and eyelid position. Abnormalities in these characteristics constitute risk factors for the presence or development of amblyopia. Photoscreening has been shown to have high sensitivity and specificity in community and office settings.^{14–20} Photoscreening instruments assess both eyes simultaneously and the images can be interpreted by trained operators, by a central reading center, or with computer software.

Autorefractometers, like photoscreeners, also are useful for screening young children.^{21,22} Handheld autorefractors use optical methods to estimate the refractive error of each eye, 1 eye at a time, and as such, are limited in their ability to detect strabismus in the absence of an abnormal refractive error. However, autorefractors remain useful in detecting anisometropia in the absence of strabismus, which is the most common cause of amblyopia undetected at an early age.

Instrument-based devices using technology based on visual evoked potentials²³ and retinal birefringence²⁴ are currently in development and may provide additional means to assess visual acuity and ocular health in young children.

For all instrument-based devices, the sensitivity and specificity to detect an ocular abnormality has been carefully considered by their manufacturers. Typically, when a high sensitivity (ie, high rate of detection of at-risk children) is chosen, an increase in

overreferrals (ie, low specificity) results. Conversely, when a high specificity is set, there is often a low sensitivity (ie, reduced detection of at-risk children). Given these factors, the referral criteria can be adjusted for many instruments on the basis of the child's age and desired levels of sensitivity and specificity.

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ABBREVIATIONS

AAP: American Academy of Pediatrics
CPT: Current Procedural Terminology

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