Preschool Eye Screening Made Fast, Easy, and Accurate

GUIDELINES FOR PRIMARY CARE PROVIDERS

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"Try this—I just bought a hundred shares."

Learning Objectives

- Describe the importance of eye screening as part of routine well child care.
- Describe methods that enhance the accuracy of visual acuity testing ages 4 and up.
- Describe how instrument screening can be an important supplement to eye screening.

Role for Eye Screening

- Provides earliest opportunity to detect eye problems and vision loss in young children, even in the newborn.

Role for Eye Screening

- Identifies children who otherwise show no outward signs or symptoms of vision concerns

- Refer children who:
  - you find have an ocular or vision concern
  - are at increased risk for an eye disease

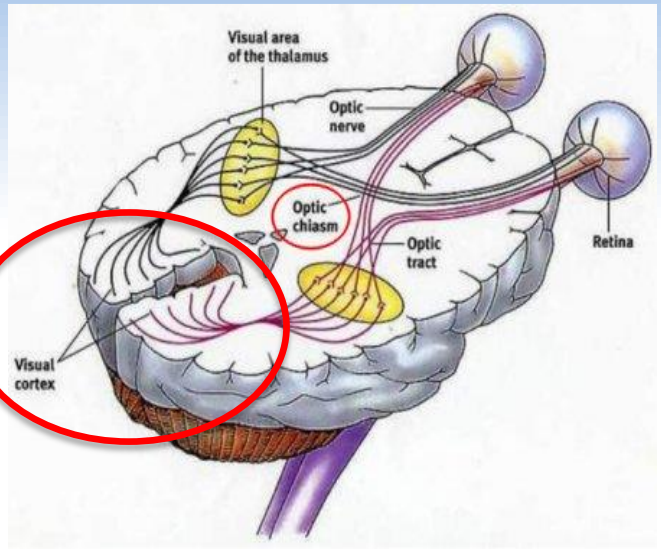
How do young children lose vision?

- Atypical refractive errors
  - Hyperopia, myopia, astigmatism
  - Anisometropia
- Strabismus
  - Esotropia, exotropia
- Congenital cataracts
- Retinal/Optic nerve abnormalities

Amblyopia

Amblyopia

- Abnormal vision development in one eye when the occipital cortex receives aberrant stimulation from that eye.
- Inability to see well with that eye, even with glasses and after ocular pathology is treated.
- Treated separately with optical penalization
  - Patching or Atropine



Untreated Amblyopia

- Results in permanent monocular vision loss in adulthood. “Lazy eye”
- Affects 1 in 20 children
  - Most common cause of vision loss in adults 20 - 70 years of age

Early Screening is Important

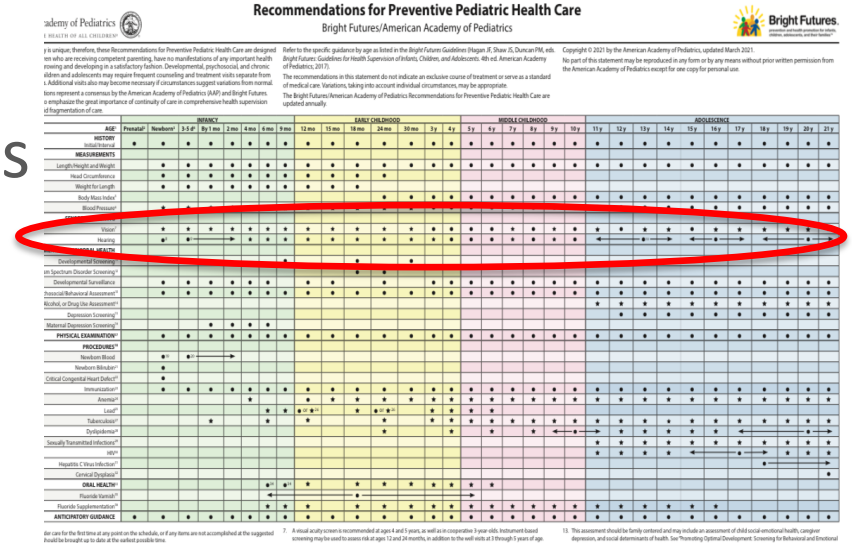
School-age vision screening may occur too late:

- With diminishing neuroplasticity, amblyopia becomes more refractory to treatment after age 5 yrs.

- Poor outcomes when tx starts after age 8-10 yrs.

Bright Futures Schedule
Eye (Vision) Screening

- Recommended as part of the American Academy of Pediatrics Bright Futures Periodicity schedule.



Recommendations for Preventive Pediatric Health Care

Bright Futures/American Academy of Pediatrics

Bright Futures.

Infancy

	INFANCY							
AGE[1]	Prenatal[2]	Newborn[3]	3-5 d[4]	By 1 mo	2 mo	4 mo	6 mo	9 mo
HISTORY Initial/Interval	●	●	●	●	●	●	●	●
MEASUREMENTS								
/Height and Weight		●	●	●	●	●	●	●
Head Circumference		●	●	●	●	●	●	●
Weight for Length		●	●	●	●	●	●	●
Body Mass Index[5]								
Blood Pressure[6]		★	★	★	★	★	★	★
NSORY SCREENING								
Vision[7]		★	★	★	★	★	★	★

★ = ocular risk assessment

● = measure visual acuity

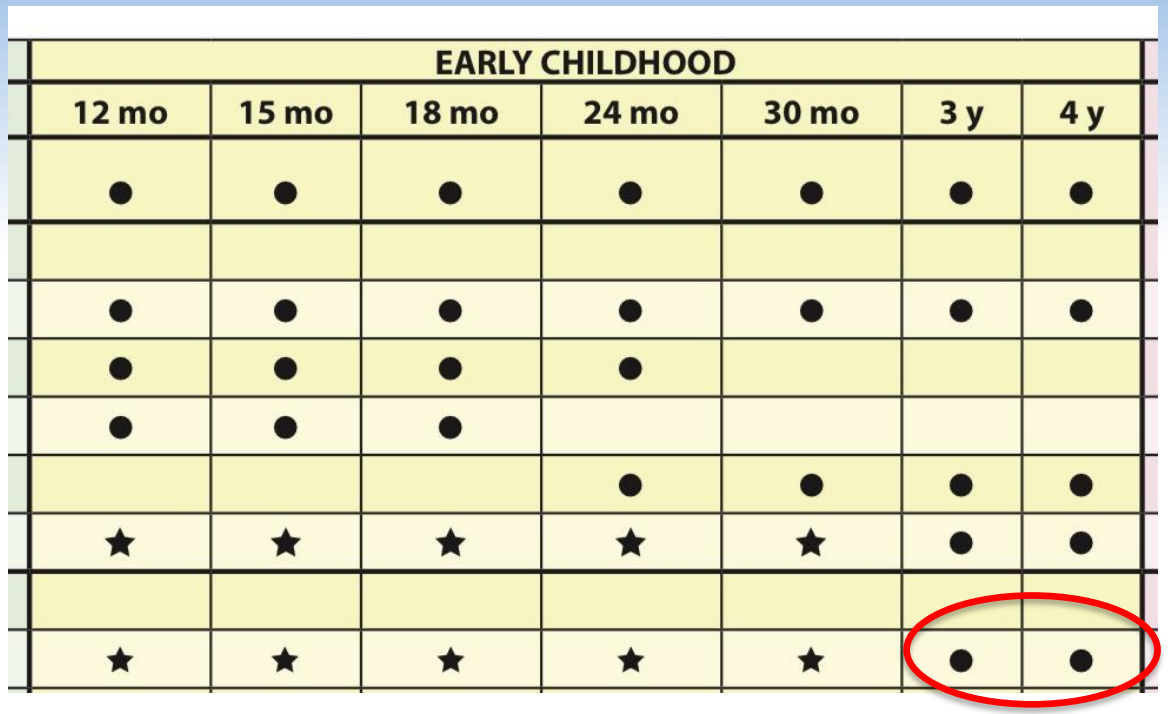
Risk Assessment

- Family hx
  - Strabismus, “lazy eye”, early glasses?
- Past Med hx
  - Prematurity, dev delays. JIA, diabetes?
- Eye hx
  - strabismus, tearing/mattering, ptosis, squinting, blurring?

Ocular Risk Assessment

- Eye exam looking for abnormalities
  - External inspection, pupils
  - Corneal light reflexes (strabismus)
  - Eye movements (fixate and follow)
  - Nystagmus
  - Red reflex assessment
    for intraocular abnormalities

Early Childhood



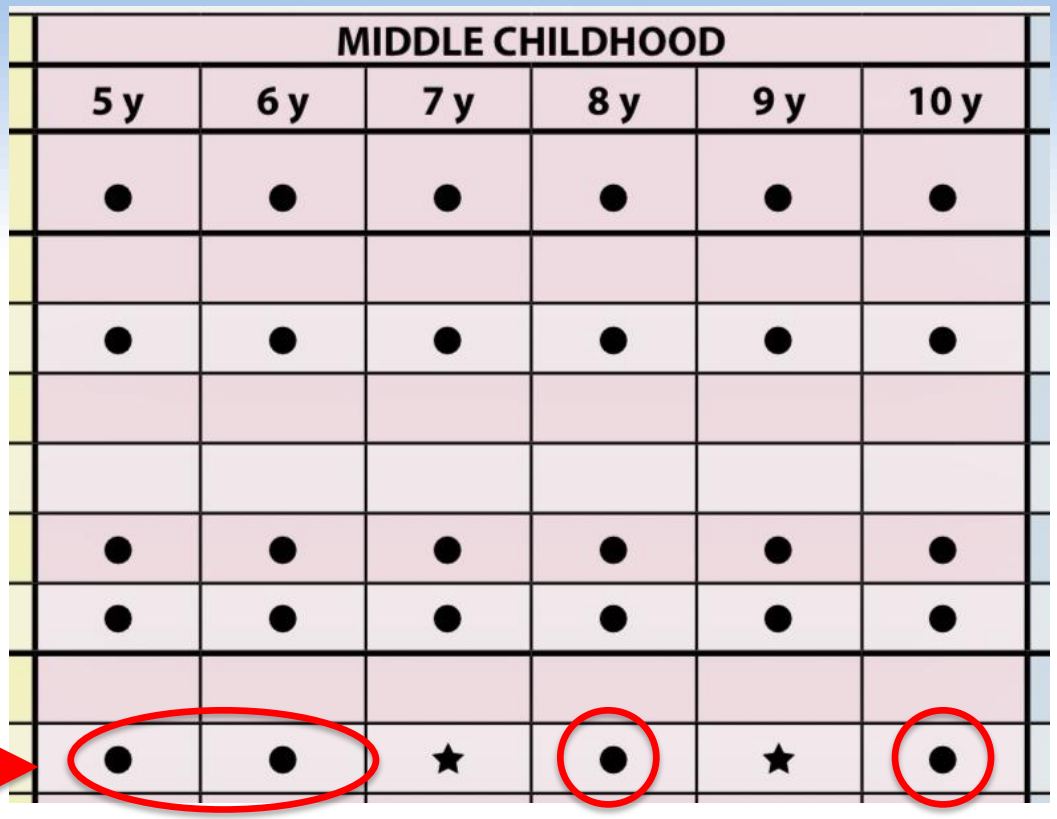
EARLY CHILDHOOD						
12 mo	15 mo	18 mo	24 mo	30 mo	3 y	4 y
●	●	●	●	●	●	●
●	●	●	●	●	●	●
●	●	●	●			
●	●	●				
			●	●	●	●
★	★	★	★	★	●	●
★	★	★	★	★	●	●

Vision

A visual acuity screen is recommended at ages 4 and 5 years, as well as in cooperative 3-year-olds.

Instrument-based screening may be used to assess risk at ages 12 and 24 months, in addition to the well-visits at 3 through 5 years of age.

Mid Childhood



● = measure visual acuity

★ =ocular risk assessment

Adolescence

ADOLESCENCE										
11 y	12 y	13 y	14 y	15 y	16 y	17 y	18 y	19 y	20 y	21 y
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●	●	●
★	●	★	★	●	★	★	★	★	★	★

Vision

● = measure visual acuity

★ = ocular risk assessment

VISUAL ACUITY SCREENING

Tips to ease frustrations

In cooperative children,
direct measurement of visual acuity
using visual acuity charts
remains the gold standard
for vision testing.

***Instrument screening does**
not assess visual acuity function but
can identify ocular risk factors
for poor vision.

Historical barriers to acuity screening

- Poor cooperation of younger children
- Time to perform in a busy office
- Staff lack confidence
- Historically poor reimbursement
- Concern for false + referrals

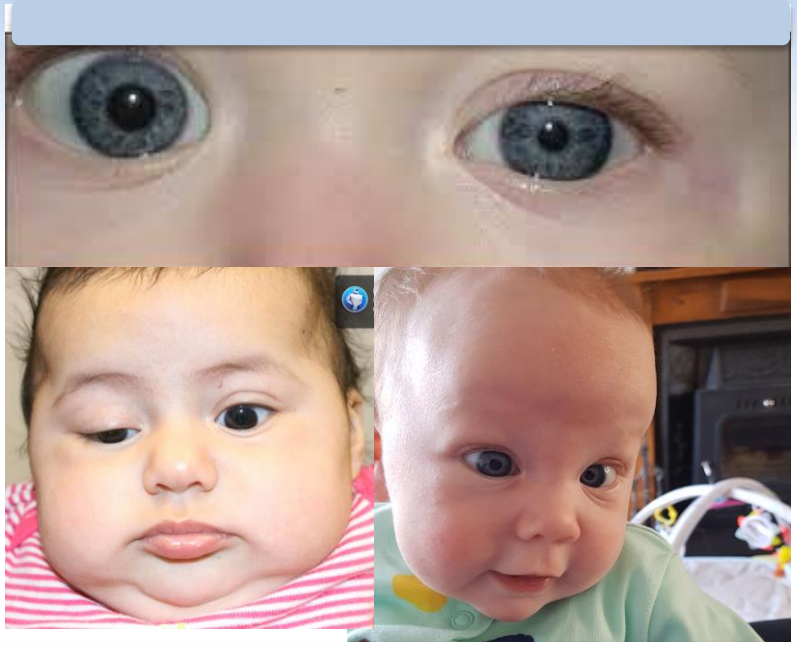
AAP Vision Screening Guidelines

Joint guidelines of AAP, AAO, AAPOS

PEDIATRICS January 2016

Age-dependent screening criteria

Newborn to 35 Months (0-2 years)



- PMHx, Fam Hx,
- Eye Hx
- Exam
  - External inspection, pupils
  - Corneal light reflex symmetry
  - Vision (fixate and follow), eye movements
  - Red Reflex testing for cataract/white pupil

36 Months to 47 Months (3 years)

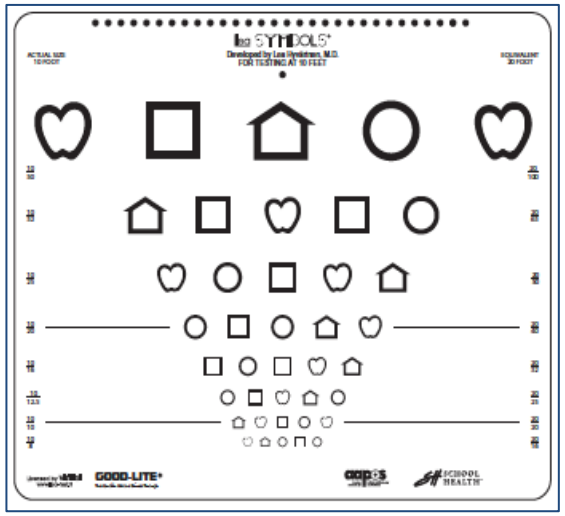
Exam:

Attempt visual acuity

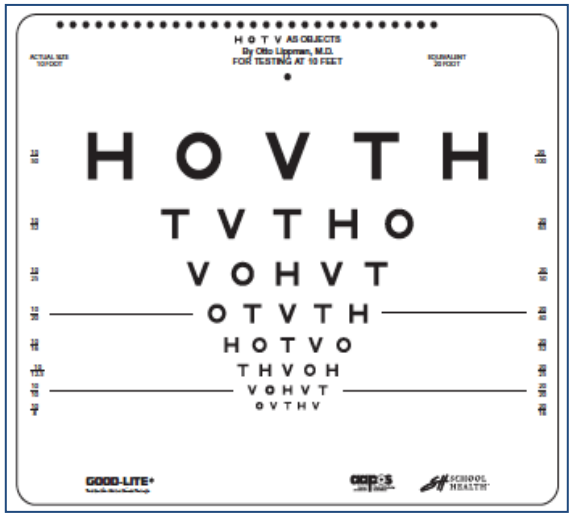
- Identify the majority of the **20/50** line with each eye.
- Testing done at **10 feet.**
- Opposite eye must be effectively covered.

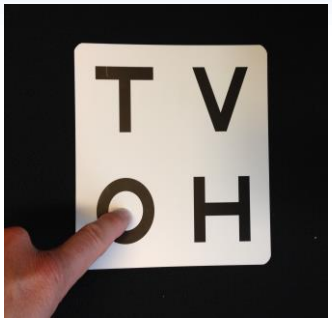
36 Months to 47 Months (3 years)
Recommended Charts

LEA Symbols



HOTV Letters





Matching Card

Chart Choices
Not Recommended

48 Months to 59 Months (4 years)

- Exam
- Identify the majority of the **20/40** letters with each eye.

Sloan letter chart

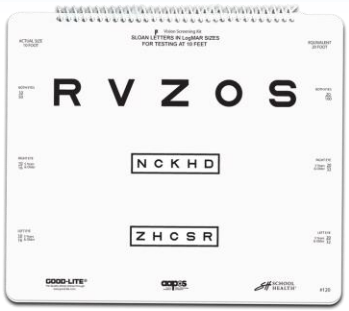
60 Months and Older (5+ years)

- Identify majority of the **20/32** line with each eye.
- Sloan Chart (shown)
  - vs Snellen Chart
- Repeat testing:
  - Every 1-3 years

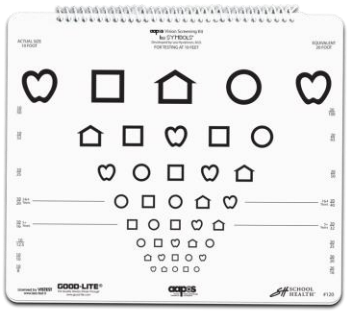
AAPOS Vision Screening Kit

Endorsed by the AAP

Screen Using Either:



Sloan Letters



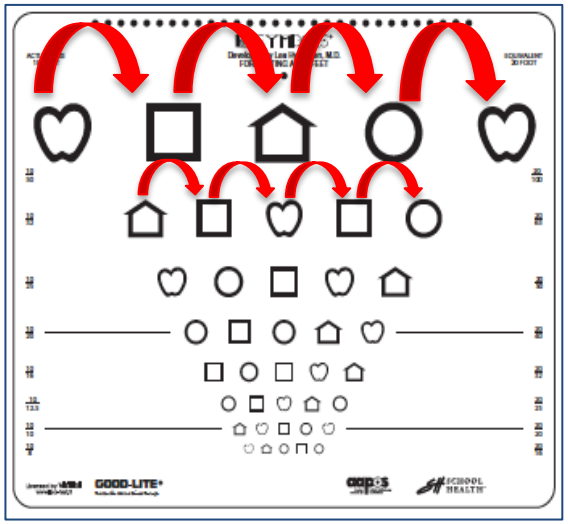
LEA Symbols

Contents:

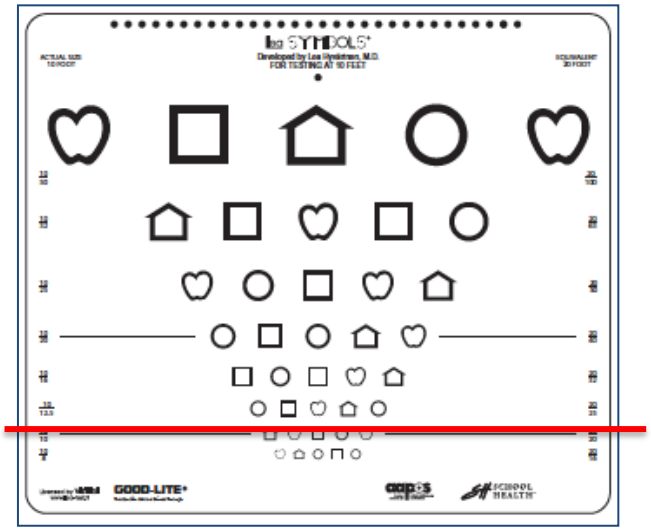
Acuity charts
Occlusive patches
Occlusive glasses
Occlusive paddle
10 ft cord
Matching card
Instructional DVD

Threshold vs Critical line
testing methods

Threshold



Age-Dependent Critical Line

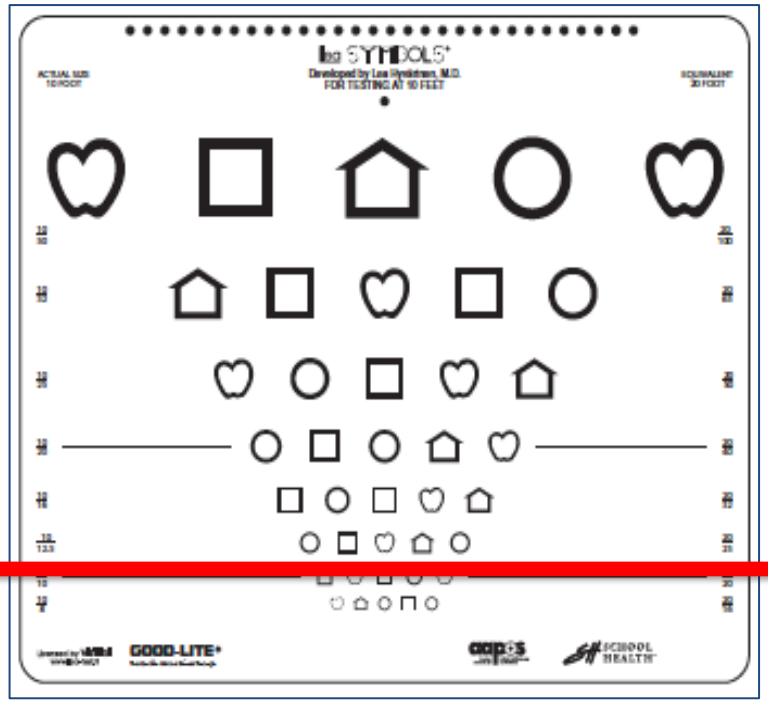


Threshold Screening

- Read down the eye chart with each eye as far as possible

- Refer if:
  - Unable to read passing line
  - Two-line difference between eyes, even if both in the normal range.

Critical Line Screening is *Faster*



Critical line determined by child's age

Good-Lite.com

Computer-Based Eye charts

Not specifically endorsed by AAP

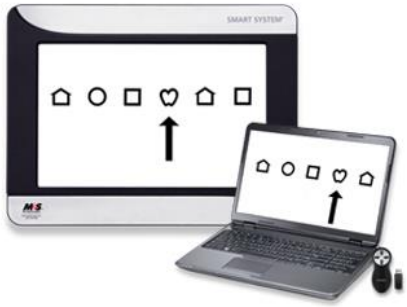
Jaeb Visual Acuity Screener

HOTV symbols

PEDIG - Public Web Site

Open Access

M&S Tech Smart System FirstTest



Computer-Based Eye charts

Not specifically endorsed by AAP

GoCheck Kids

Reimbursement for Acuity Screening

CPT 99173

- Use with screening tests of visual acuity

Instrument-Based Screening

Instrument-Based Pediatric Vision Screening Policy Statement. PEDIATRICs. 2012; 130

Joint policy of the AAP, AAO and AAPOS

Instrument-Based Screening: "Photoscreening"

- Devices detect ocular conditions associated with decreased vision.
- Helpful in children ages 1-5 years.

*** Do not replace visual acuity screening in older, cooperative children.**

Difference between acuity screening and instrument screening

- Eye charts test visual acuity
- Instruments detect common or serious ocular conditions known to cause vision loss in kids too young or unable to test acuity.
  - Large or unequal refractive errors
  - Strabismus
  - Cataract, RB

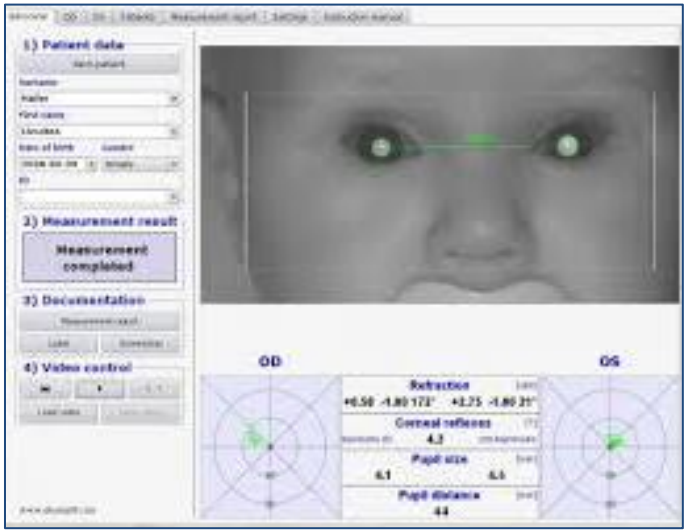
Instrument-Based Devices

Take a photographic image of the eye's reflexes and pupil color to:

1) Estimate the refractive error

2) Detect conditions that degrade or block clear line of sight (strabismus, cataract)

May not identify retina/optic nerve pathologies



Common Instrument-Based Devices

iScreen

Adaptica 2WIN

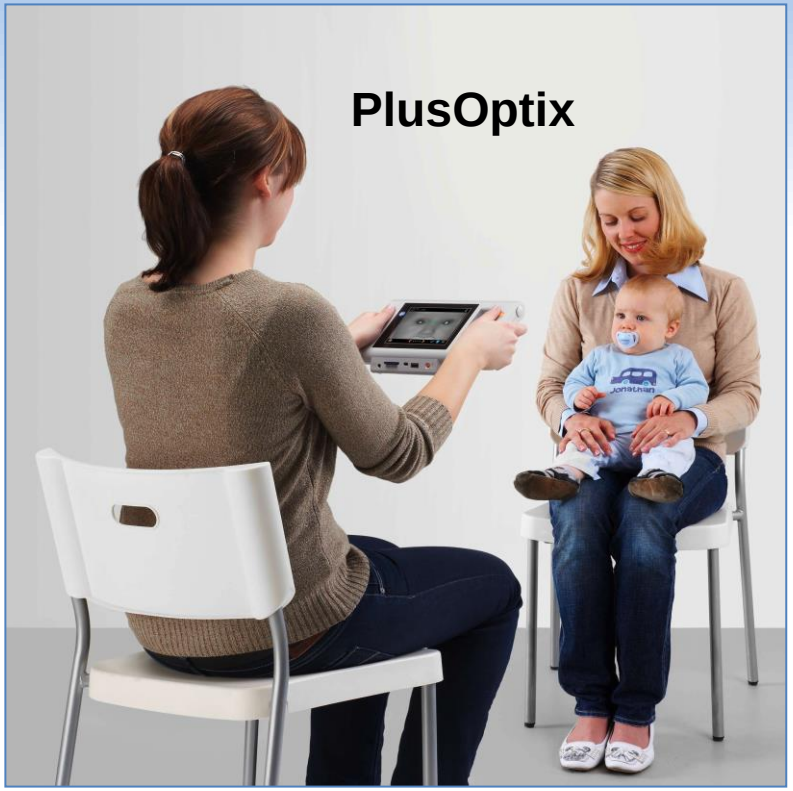
GoCheck Kids

PlusOptix

Baxter "Spot"

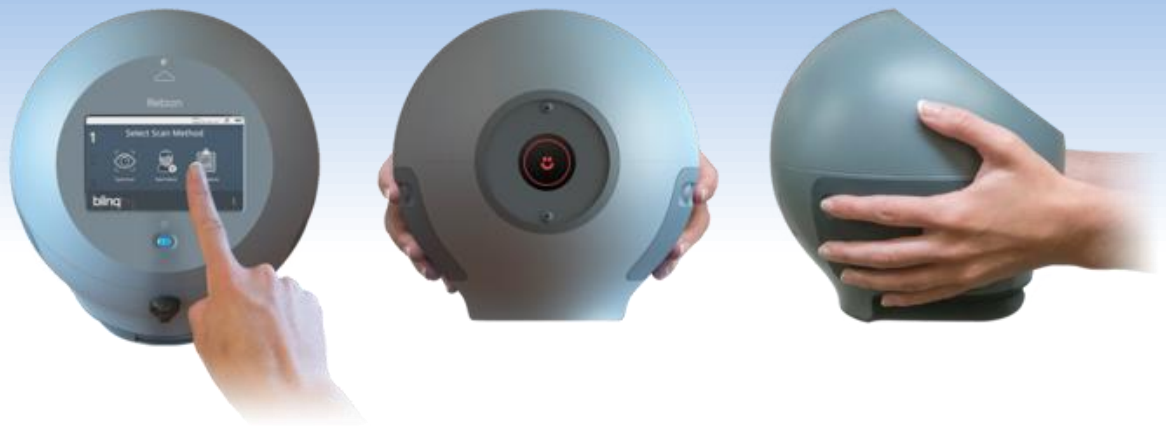
AAP endorses instrument screening but not specific products

Typical Devices in Use



Instrument screening supplements but does not replace a regular ocular assessment

Blinq
Pediatric Vision Scanner (Rebion)



- Retinal polarization scanner.
- Tests for microstrabismus
  - A marker for amblyopia itself
  - Does not test for amblyopia risk factors

AAP endorses instrument screening but not specific products

When to screen with a device?

Can attempt at age 1 yr.

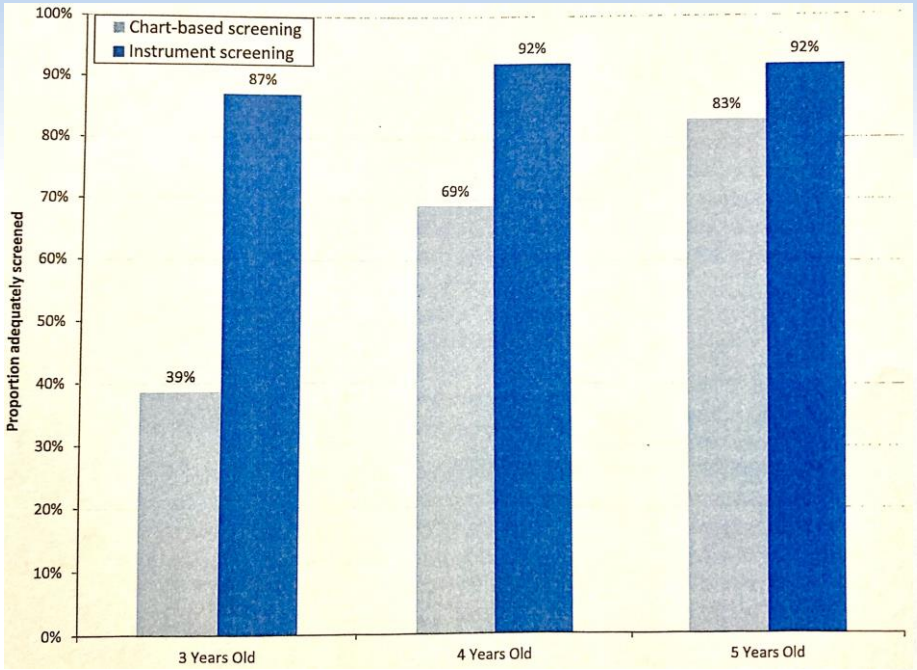
- Short attention may limit measurements.
- False positive rate may be higher.
- Ophthalmologist may choose to monitor rather than treat.
  - Eg: Moderate refractive errors

If normal, repeat until acuity can be tested

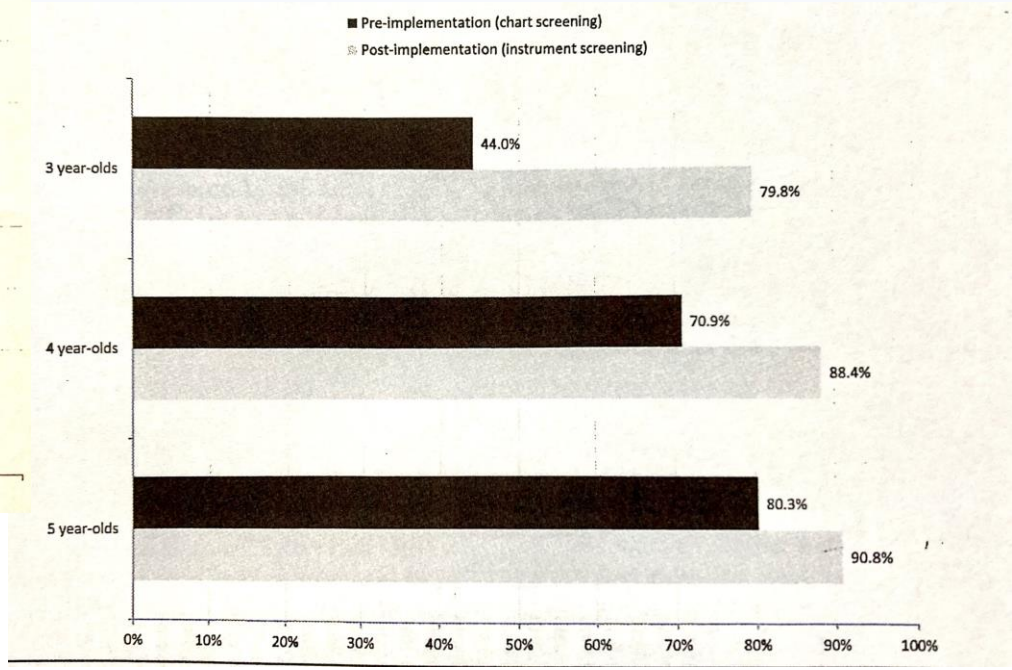
Photoscreening most useful for:

- Children ages 1-3 yrs.
  - Unable to perform visual acuity tests
- Children ages 4-5 yrs:
  - Acuity charts may be useful, but…
  - Instrument screening if child unable to perform acuity testing.
- 6+ yr-olds unable to cooperate for acuity testing

Success rates of acuity testing vs instrument screening, by age, in primary care settings



Modest et al, Implementation of Instrument-Based Vision Screening for Preschool-Age Children in Primary Care PEDIATRICS.140(1) July 2017:e20163745



Vernacchio, Louis, et al. "Primary care implementation of instrument-based vision screening for young children." *Clinical Pediatrics* 57.9 (2018): 1020-1026.

Referral Criteria for Instrument-Based Screening

Age-Dependent

Passing criteria are more generous (higher specificity) for children < 4 yo and more stringent (higher sensitivity) for children 4 yo +.

- High Specificity = low false positives
- High Sensitivity = low false negatives

Instrument Referral Criteria

- AAPOS uniform guidelines for instrument-based pediatric vision screen validation 2021 Volume 26, Issue 1, February 2022, Pages 1.e1-1.e6

Table 2. Simplified 2021 AAPOS amblyopia risk factor and visually significant refractive error failure level definitions[a]

ARF or refractive error	Age	Threshold
ARF (severity ranked)		
Media opacity		>1.0 mm
Strabismus		>8 PD manifest
Anisometropia		>1.25 D
Hyperopia		>4.00 D
Astigmatism	<4 years	>3.00 D
Visually significant refractive errors		
Astigmatism	≥4 years	>1.75 D
Myopia	<4 years	< −3.00 D
Myopia	≥4 years	< −2.00 D

Reimbursement for instrument-based screening

CPT 99174

Use with automated devices providing immediate testing results

Reimbursement for instrument-based screening

CPT 99177

Use with automated devices that use remote off-site analysis to get test results

- iScreen
- GoCheck Kids

Instrument-Based Screening

- Can be effectively implemented
- Results in improved completed screenings
- Reduces referral rates
- Still some barriers to widespread use
  - Start up cost, Reimbursement
- Does it reduce prevalence of amblyopia?

Implementation of Instrument-based Vision Screening for Preschool Age Children in Primary Care. Modest, JR, et al. PEDIATRICS 2017;140. e20163745

Which devise should I purchase?

Which devise should I purchase?

- Price
- “User-ability”
- Referral criteria options/updates
- Lease vs purchase options
- Product support
- Device vs remote screening results
- Technology updates

https://www.abcd-vision.org/vision-screening/Photoscreen Comparison A.html

Which devise should I purchase?

- Visit exhibitors
- Talk to colleagues
- Talk to your pediatric ophthalmologist
- Contact the AAP SOOp

Changes you may wish to make in practice:

1. Update your office staff on current vision screening guidelines
2. Consider critical line visual acuity screening for cooperative children
3. Incorporate instrument-based screening into your practice for 1 to 5 year-olds

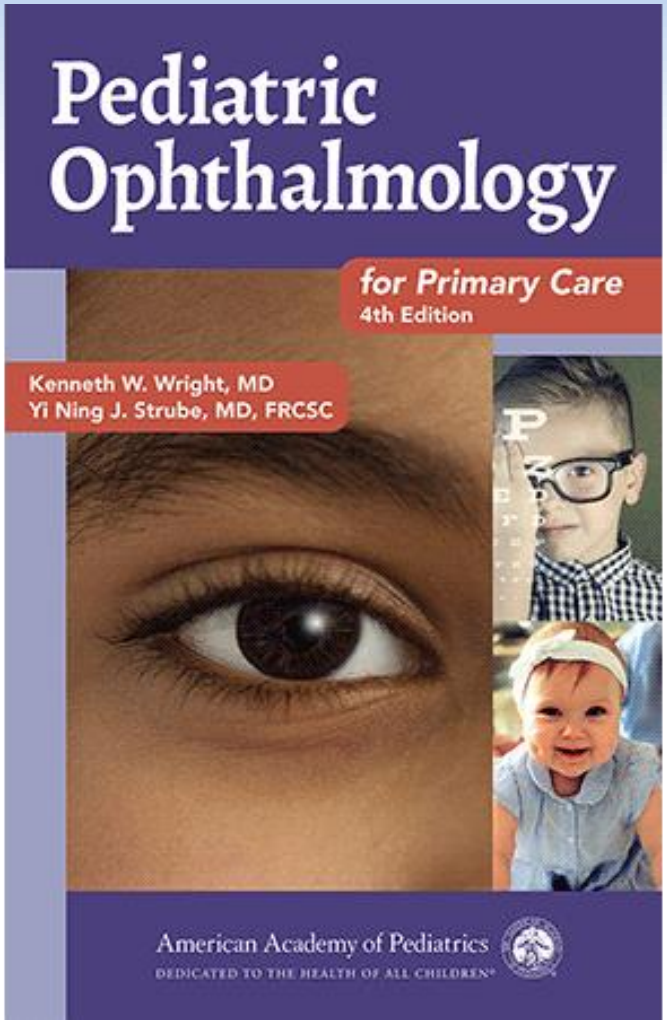
References

1. Clinical Report: *Procedures for the Evaluation of the Visual System by Pediatricians.* PEDIATRICS, 137;(1),1-9. 2016

2. Policy Statement*: Visual System Assessment in Infants, Children and Young Adults by Pediatricians.* PEDIATRICS, 137;(1), 28-30. 2016

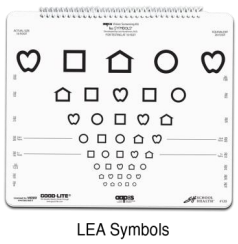
(Additional references available upon request)

AAP Resources



AAPOS Vision Screening Kit:

https://aapos.org/patients/resources/screening-kits-patients



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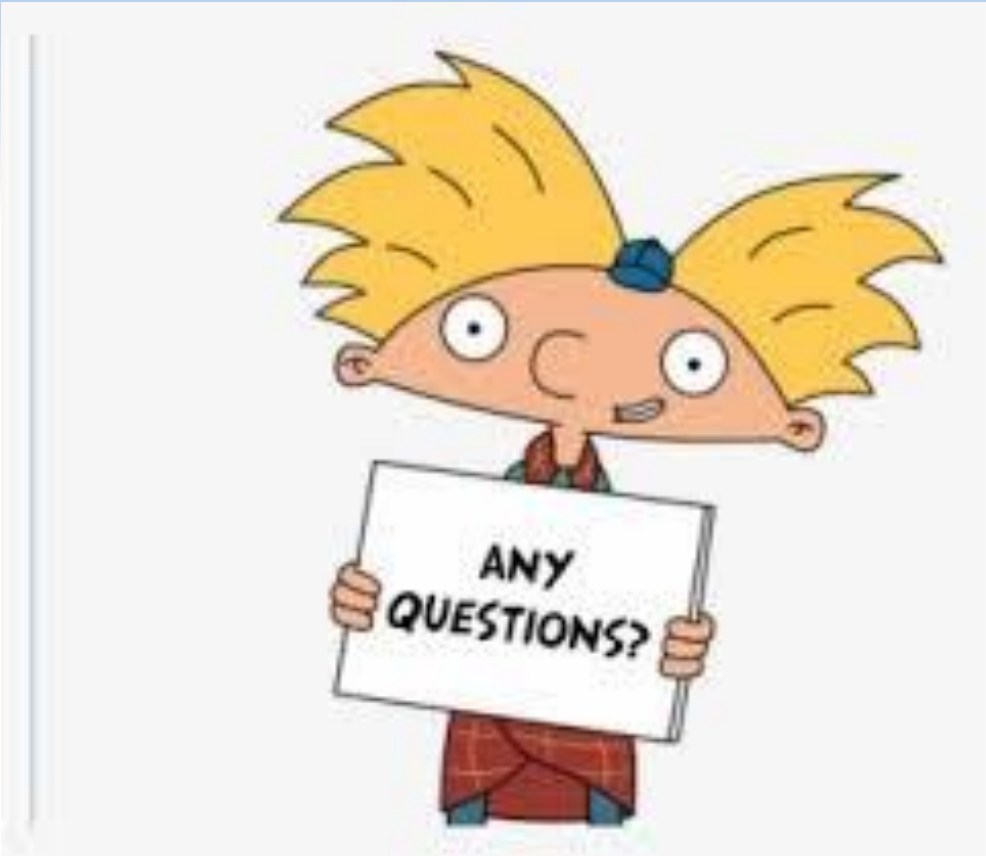

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