Pediatric Vision Screening

Guidelines for Primary Care Providers

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Financial Disclosure

- I have no financial disclosures to attest
- I will be discussing some commercial products

Overview

- Amblyopia and Risks Factors
- Age Based Screening Schedule
- Instrument Based Screening

Vision Screening

- Why?
  - Identify reduced visual acuity or risk factors that threaten normal visual development
- Objectives:
  - Assess vision, ocular alignment and presence of structural eye disease
  - Communicate results to patient and family
  - Refer all children who either fail vision screening or are unable to fully cooperate

Pediatric Eye Diseases

- Refractive Errors
  - Hyperopia, Myopia, Astigmatism
  - Anisometropia
- Strabismus
  - Esotropia, Exotropia, Hypertropia
- Media Opacities
  - Congenital cataracts
  - Ptosis, corneal opacities

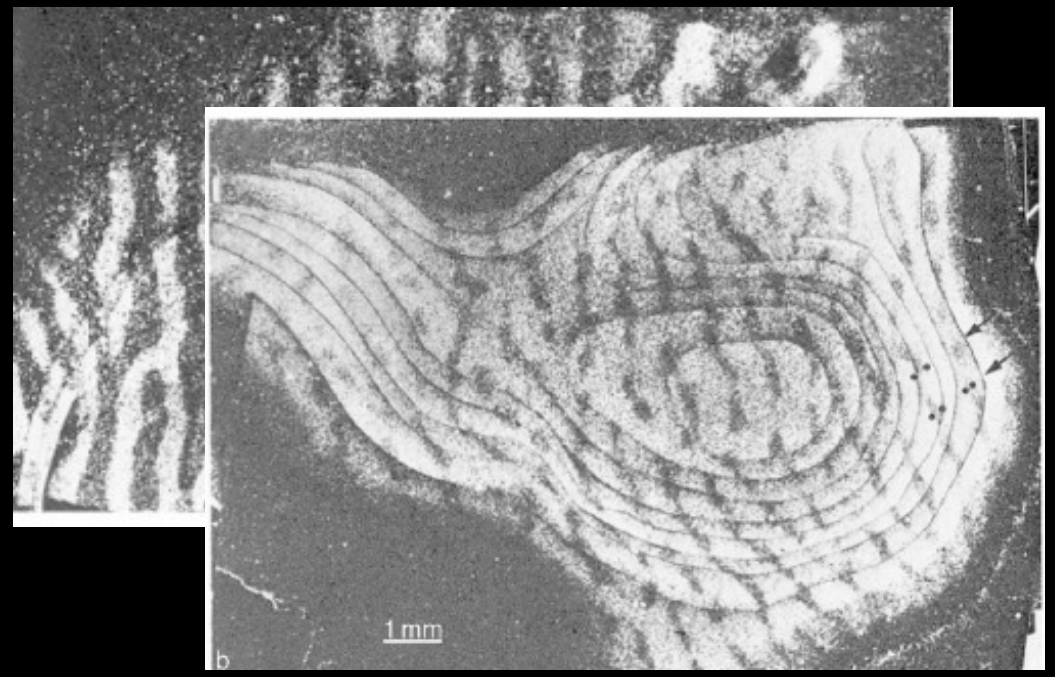
→ AMBLYOPIA

- Retina and Optic Nerve abnormalities

Amblyopia

- Abnormal **visual development** resulting in unilateral (or bilateral) reduction of best corrected visual acuity that cannot be attributed directly to the effect of any structural abnormality of the eye or visual pathways
- CORTICAL PROCESS

- 0.8 – 3 % in children 6-72 months



Amblyopia

- Etiology
  - Refractive – refractive errors
  - Strabismic – eye misalignment
  - Deprivational – blurring of visual axis
    - Most severe and difficult to treat – amblyopia is deeper and develops faster
- Treatment
  - Treat underlying cause
    - Glasses, strabismus surgery, cataract surgery
  - Promote use of amblyopic eye
    - Patching/Occlusion therapy, pharmacologic penalization, dichoptic therapy

Amblyopia and Vision Development

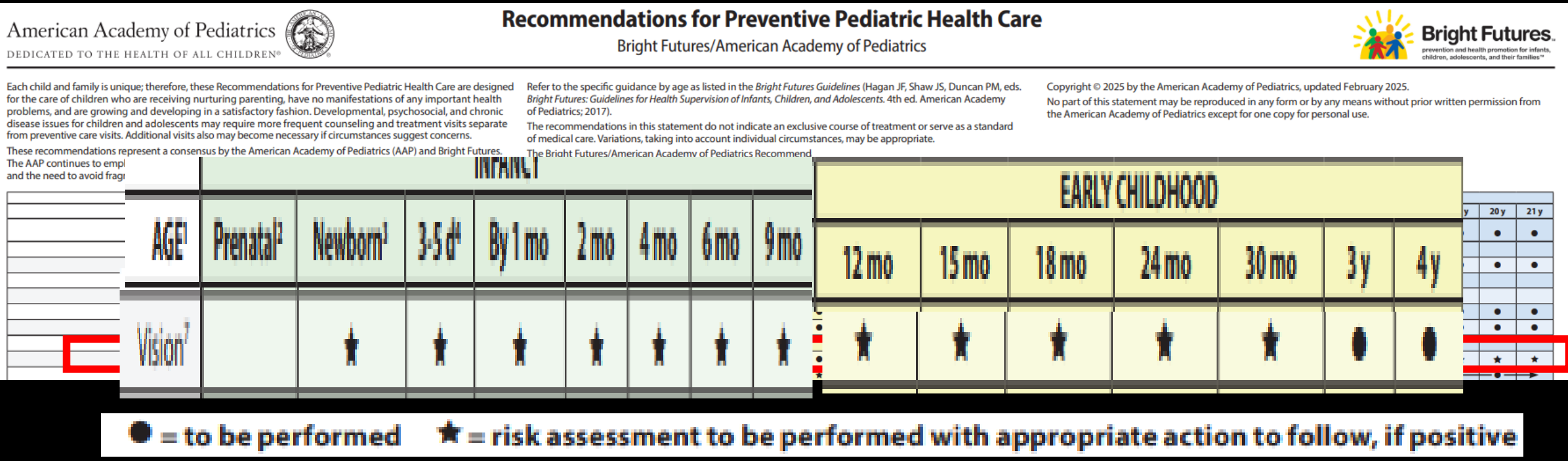
- Visual acuity develops = birth to 3-5 years of age
- Visual deprivation can cause amblyopia = a few months to 7-8 years of age
- Amblyopia treatment may be effective = up to about 9 years old
  - However, amblyopia can be more difficult to treat with diminishing neuroplasticity after 5 years old
  - The earlier amblyopia is detected, the higher the likelihood of vision recovery

Rationale for Screening

- Amblyopia does not always present with readily identifiable signs or symptoms
- Eye problems / vision impairment can present at different stages

- Vision screening should be performed periodically throughout childhood
- The combined sensitivity of a series of screening encounters is much higher than a single screening test

Age Based Screening – AAP Bright Futures



American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Recommendations for Preventive Pediatric Health Care

Bright Futures/American Academy of Pediatrics

Bright Futures
prevention and health promotion for infants, children, adolescents, and their families™

Each child and family is unique; therefore, these Recommendations for Preventive Pediatric Health Care are designed for the care of children who are receiving nurturing parenting, have no manifestations of any important health problems, and are growing and developing in a satisfactory fashion. Developmental, psychosocial, and chronic disease issues for children and adolescents may require more frequent counseling and treatment visits separate from preventive care visits. Additional visits also may become necessary if circumstances suggest concerns.

These recommendations represent a consensus by the American Academy of Pediatrics (AAP) and Bright Futures. The AAP continues to empl
and the need to avoid fragı

Refer to the specific guidance by age as listed in the *Bright Futures Guidelines* (Hagan JF, Shaw JS, Duncan PM, eds. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*. 4th ed. American Academy of Pediatrics; 2017).

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

The Bright Futures/American Academy of Pediatrics Recommend

	INFANCY								EARLY CHILDHOOD									
AGE[1]	Prenatal[2]	Newborn[3]	3–5 d[4]	By 1 mo	2 mo	4 mo	6 mo	9 mo	12 mo	15 mo	18 mo	24 mo	30 mo	3 y	4 y	20 y	21 y
Vision[7]		★	★	★	★	★	★	★	★	★	★	★	★	●	●	●	●

● = to be performed ★ = risk assessment to be performed with appropriate action to follow, if positive

https://downloads-aap-org.ochsner.idm.oclc.org/AAP/PDF/periodicity_schedule.pdf

Age based screening - AAO

TABLE 1 AGE-APPROPRIATE METHODS FOR PEDIATRIC VISION SCREENING AND CRITERIA FOR REFERRAL

Method	Indications for Referral	Recommended Age					
		Newborn–6 months	6–12 months	1–3 years	3–4 years	4–5 years	Every 1–2 yrs age 5
Red reflex test	Absent, white, dull, opacified, or asymmetric	•	•	•	•	•	•
External inspection	Structural abnormality (e.g., ptosis)	•	•	•	•	•	•
Pupillary examination	Irregular shape, unequal size, poor or unequal reaction to light	•	•	•	•	•	•
Fix and follow	Failure to fix and follow	Cooperative infant ≥3 months	•	•			
Corneal light reflection	Asymmetric or displaced	Cooperative infant ≥3 months	•	•	•	•	•
Instrument-based screening*	Failure to meet screening criteria		Cooperative infant ≥6 months	•	•	•	•
Cover test	Refixation movement of uncovered eye				•	•	•
Distance visual acuity† (monocular)	Worse than 20/50 with either eye or 2 lines of difference between the eyes				•	•	•
	Worse than 20/40 with either eye or 2 lines of difference between the eyes					•	•

SOURCE: Hagan JF, Shaw JS, Duncan PM, eds. 2017, Bright Futures: Guidelines for Health Supervision of Infants, Children and Adolescents. 4th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2017.

NOTE: These recommendations are based on panel consensus. If screening is inconclusive or unsatisfactory, the child should be retested within 6 months; if inconclusive on retesting, or if retesting cannot be performed, referral for a

History

- Ocular risk assessment
  - Family hx: “lazy eye”, strabismus, early glasses, cataract, retinoblastoma
  - Medical hx: prematurity, dev delay, Trisomy 21, genetic conditions
  - Personal hx: strabismus, ptosis, squinting

Newborn – 6 Months

- External eye exam
  - RETINOSCOPY
  - External inspection
  - Pupil exam
  - Fix and follow
    - By 3 months, child should be able to fixate on visual object

		Newborn–6 months
Red reflex test	Absent, white, dull, opacified, or asymmetric	•
External inspection	Structural abnormality (e.g., ptosis)	•
Pupillary examination	Irregular shape, unequal size, poor or unequal reaction to light	•
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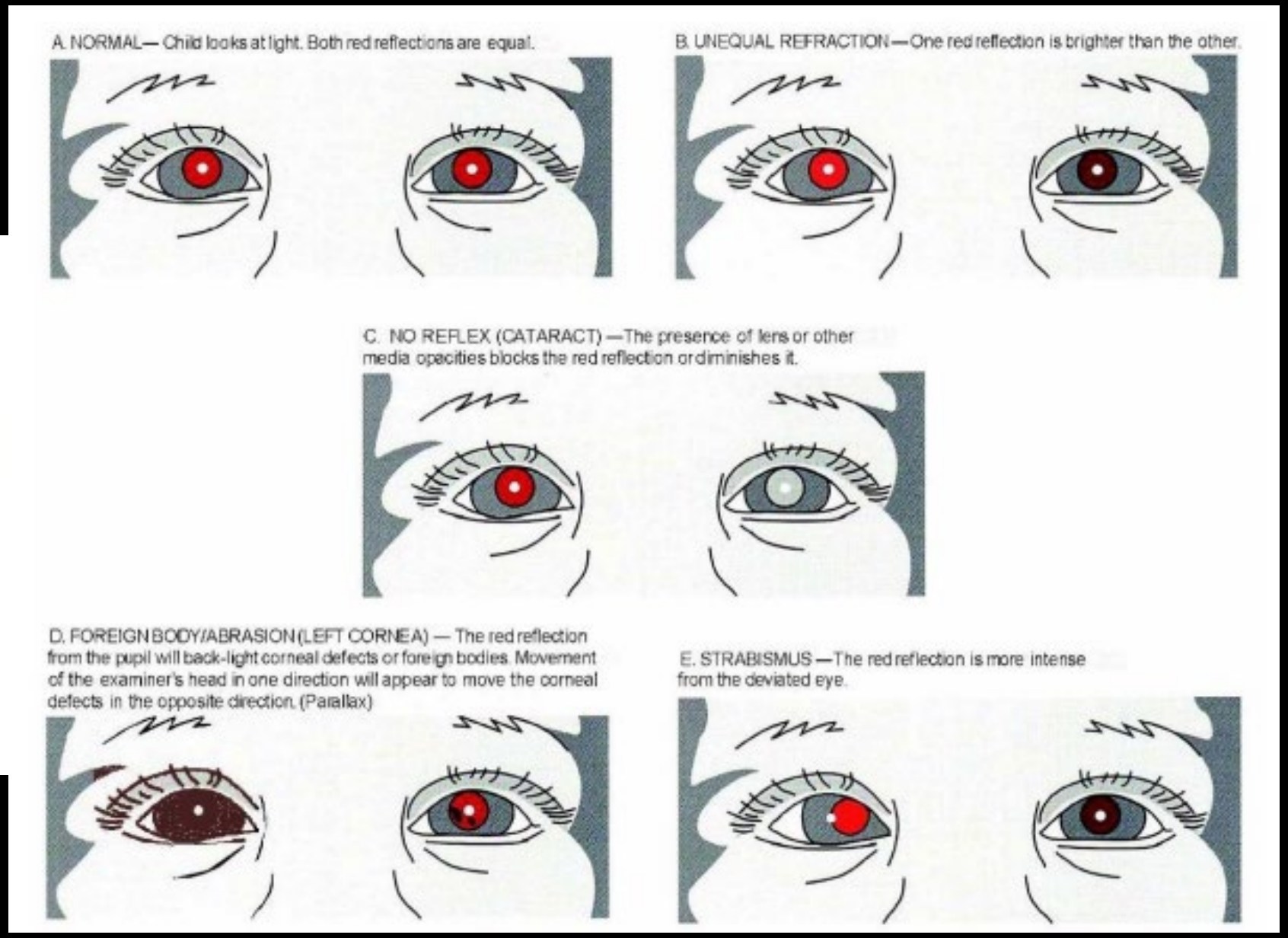
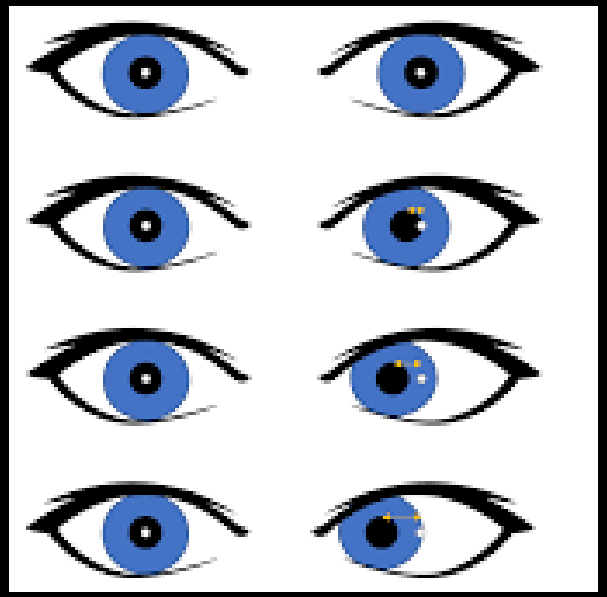
Retinoscopy



6 months – 12 months

- By 6 months, child should have normal binocular alignment
- Tests for strabismus detection
  - Hirschberg / Corneal light reflex



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Corneal light reflection	Asymmetric or displaced	Cooperative infant ≥3 months	•
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12 months – 36 months

- Still performing similar history and exam
- Instrument based screening can begin as early as 1 yo

Method	Indications for Referral	Recomme		
		Newborn–6 months	6–12 months	1–3 years
Red reflex test	Absent, white, dull, opacified, or asymmetric	•	•	•
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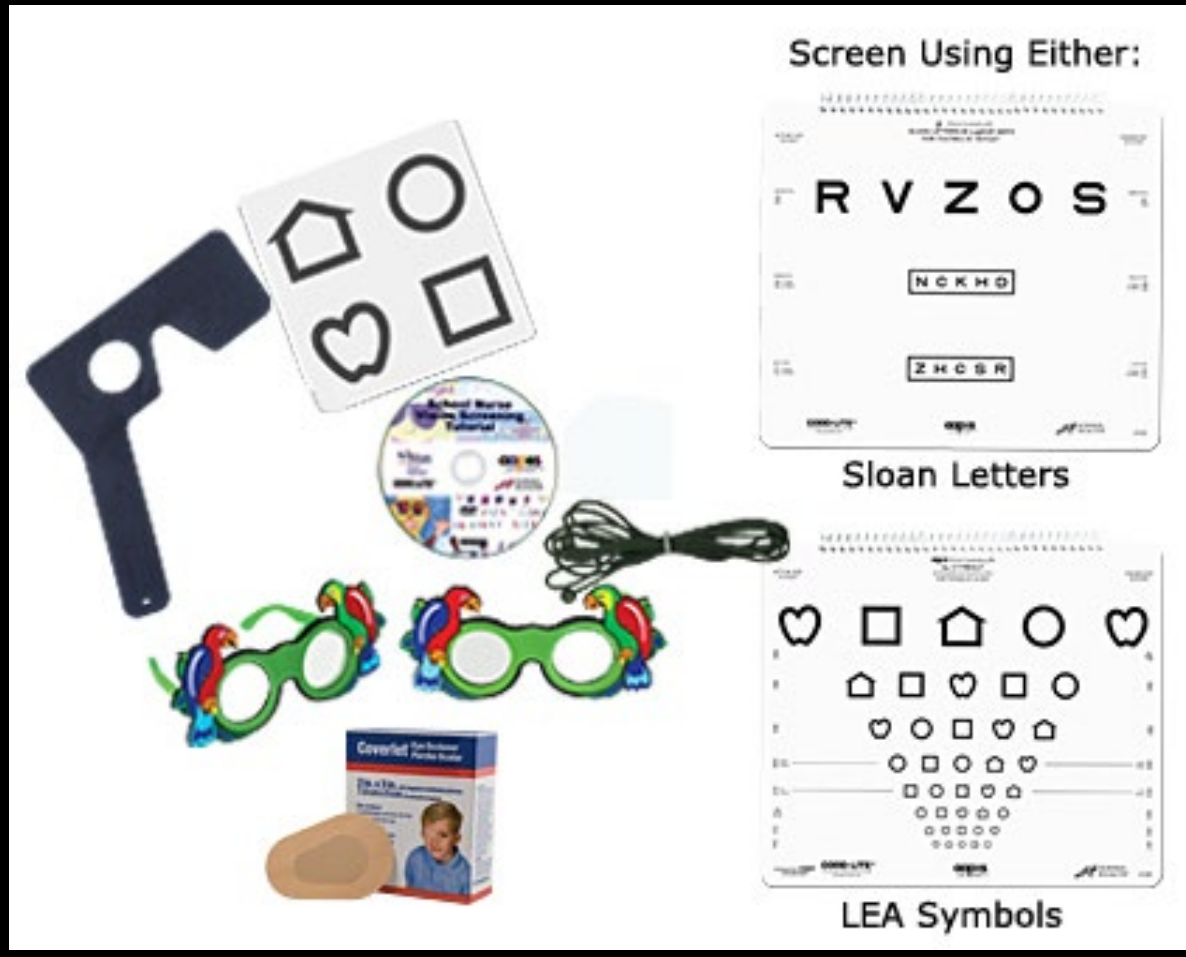
Visual Acuity Testing

- Can begin attempting visual acuity at 3 years old

- Direct measurement of visual acuity using visual acuity charts remains gold standard for vision testing
  - Instrument screening only assess for risk factors for poor vision

Visual Acuity Testing

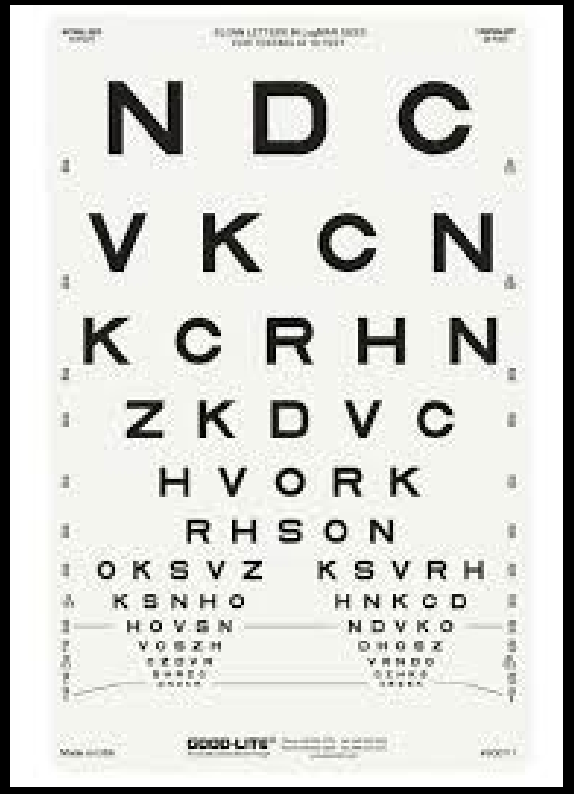
- How to?
  - Stand 10 feet away
  - One eye at a time (occlude other eye)
    - Patch
    - Handheld occluder
    - Occlusive glasses
  - Can use matching card



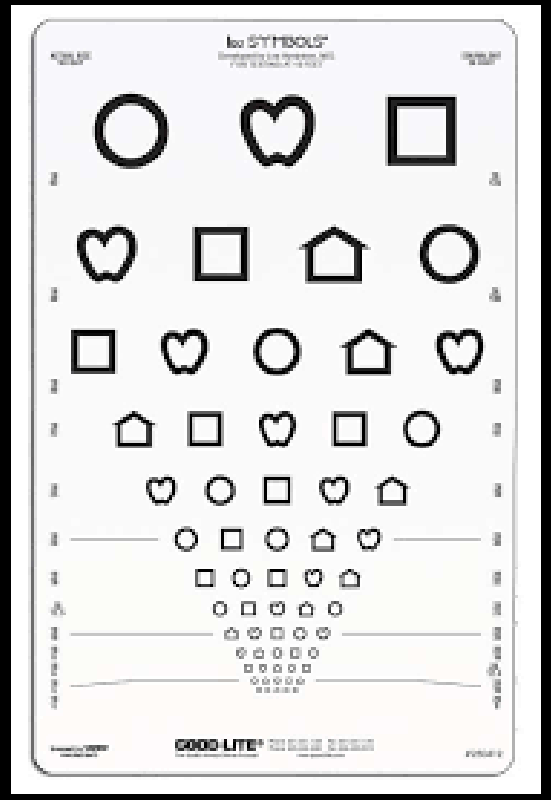
Visual Acuity Testing

- Optotypes

Sloan



LEA

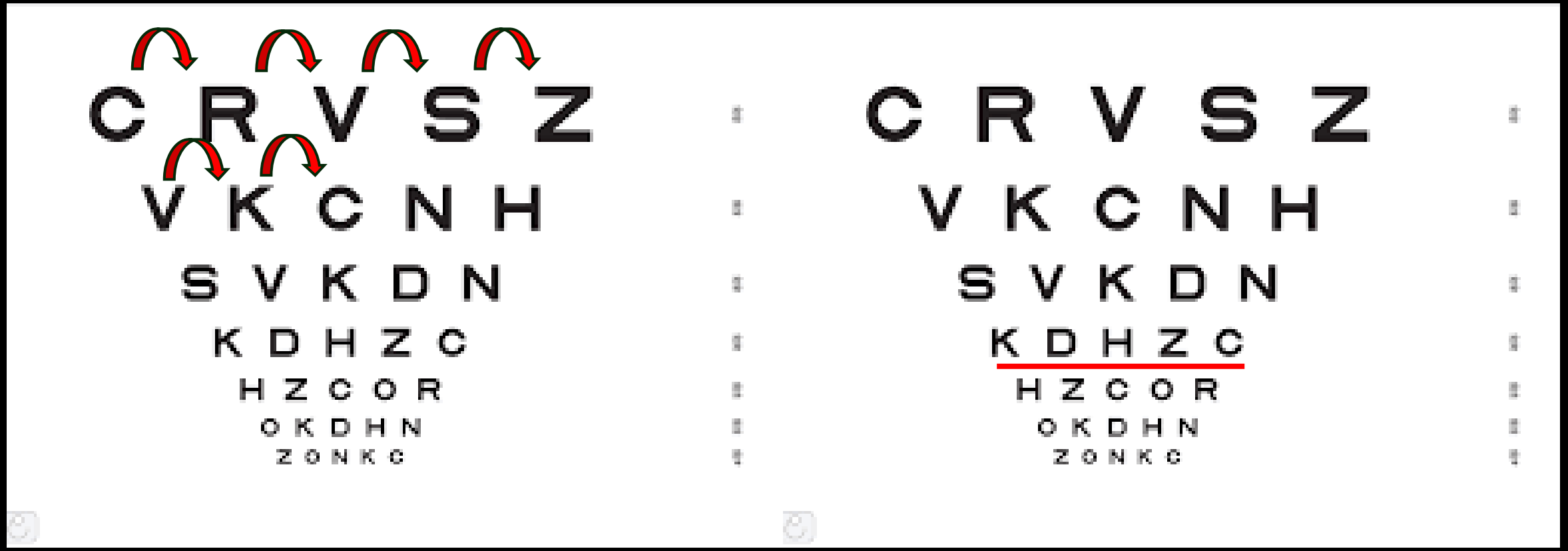


HOTV

Visual Acuity Testing

- Threshold

Critical line



36-47 months (3 years)

- Many 3 year olds can participate – can start to attempt visual acuity
- Both eyes should be able to read **20/50 line**

- LEA and HOTV Optotypes

48-59 months (4 years)

- At 4 years old, visual acuity testing becomes the gold standard
- Both eyes should be able to read **20/40 line**

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60 months and older (5+ years)

- Both eyes should be able to read **20/30 line**
- Repeat testing every 1-2 years

Reimbursement for Acuity Screening

- CPT 99173
- Screening test with VISUAL ACUITY

Instrument Based Screening

- Do NOT test visual acuity
- Detect ocular conditions associated with decreased vision using off axis photography and autorefraction of the eyes red reflex
  - Large refractive errors
  - Strabismus
  - Cataract / media opacity
- Can be helpful in ages 1-5

- Newer technologies (retinal polarization scanners) can detect for amblyopia directly

Instrument Based Screening

- Most useful for ages 1-3 when patients cannot do visual acuity testing
- Can also be used at older ages (>4), but still attempt visual acuity
  - They are not superior to visual acuity testing for those able to participate
- Can be used for uncooperative or developmentally delayed patients

Instrument Based Screening

TABLE A3-1 AMBLYOPIA RISK FACTORS AND VISUALLY SIGNIFICANT REFRACTIVE ERRORS TO BE DETECTED BY INSTRUMENT-BASED SCREENING

	< 4 years	> or = 4 years
Myopia	>3.00 D	>2.00 D
Hyperopia	>4.00 D	>4.00 D
Astigmatism	>3.00 D	>1.75 D
Anisometropia	>1.25 D	>1.25 D
Media opacities > 0.1mm*	•	•
Manifest strabismus > 8PD*	•	•

SOURCE: Data from Arnold RA, Donahue SP, Silbert DI, Longmuir SQ, Bradford GE, Peterseim MM, Hutchinson AK, O'Neil JW, de Alba. Campomanes AG, Pineles SL. American Association for Pediatric Ophthalmology and Strabismus uniform guidelines for instrument-based pediatric vision screen validation 2021. J AAPOS 2022. In Press.

D = diopter

* Risk factors should be detected in all age groups indicated.

Instrument Based Screening

- Common Devices
  - Iscreen
  - PlusOptix
  - SPOT
  - GoCheck Kids
  - 2WIN
  - Blinq (Retinal Polarization)

- AAP and AAO endorse screening but no specific products

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

Reimbursement for instrument based screening

- CPT 99177
- Use of automated device providing immediate testing results

- CPT 99174
- Use of automated devices that utilize off-site analysis for testing results

Take Away Points

- Amblyopia is a cortical process of reduced visual acuity from one or both eyes being out of focus during critical period of visual development in childhood
- Amblyopia benefits from screening because there is treatment, there is an asymptomatic/latent period, and there are diagnostic testing methods to detect prior to onset
- Retinoscopy before one month of age and beyond!
- Recommend visual acuity screening at 4 yo (can attempt at 3 yo)
- Instrument based screening devices are useful for 1-5 year olds and older children unable to participate in visual acuity tests
- Vision screening should be performed early and at regular intervals

Take Away Points – Referral Criteria

AGE	When to refer
Newborn – 6 months	Do not track well at 3 months Abnormal red reflex
6 months – 12 months	Strabismus Chronic tearing / discharge
12 months – 36 months	Patients who failed vision screens
36 months – 5 years	36 – 47 months – must identify majority of 20/50 optotypes 48 – 59 months – must identify majority of 20/40 optotypes Patients who fail vision screens
5 years and older	60 months and beyond – must identify majority of 20/30 line Patients who fail vision screens

References

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Thank you!