I have no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider(s) of commercial services discussed in this CME activity.

I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.
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

• 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.
Infancy

<table>
<thead>
<tr>
<th>AGE</th>
<th>Prenatal²</th>
<th>Newborn³</th>
<th>3-5 d⁴</th>
<th>By 1 mo</th>
<th>2 mo</th>
<th>4 mo</th>
<th>6 mo</th>
<th>9 mo</th>
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<tbody>
<tr>
<td>HISTORY</td>
<td>Initial/Interval</td>
<td>●</td>
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**MEASUREMENTS**

- /Height and Weight
- Head Circumference
- Weight for Length
- Body Mass Index⁵
- Blood Pressure⁶

**ISORY SCREENING**

- Vision⁷

★ = 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
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

**Vision**

<table>
<thead>
<tr>
<th>MIDDLE CHILDHOOD</th>
<th>5 y</th>
<th>6 y</th>
<th>7 y</th>
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- ● = measure visual acuity
- ★ ★ = ocular risk assessment
# Adolescence

<table>
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<tr>
<th>Vision</th>
<th>11 y</th>
<th>12 y</th>
<th>13 y</th>
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</table>

- ⬤ = 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
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
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

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

Jaeb Visual Acuity Screener

HOTV symbols

PEDIG - Public Web Site

M&S Tech Smart System FirstTest

Not specifically endorsed by AAP

Open Access
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

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

<table>
<thead>
<tr>
<th>ARF or refractive error</th>
<th>Age</th>
<th>Threshold</th>
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<tbody>
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<td>ARF (severity ranked)</td>
<td></td>
<td></td>
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<tr>
<td>Media opacity</td>
<td></td>
<td>&gt;1.0 mm</td>
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<td>Strabismus</td>
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<td>&gt;8 PD manifest</td>
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<td>Anisometropia</td>
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<td>&gt;1.25 D</td>
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<td>Hyperopia</td>
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<td>&gt;4.00 D</td>
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<tr>
<td>Astigmatism</td>
<td>&lt;4 years</td>
<td>&gt;3.00 D</td>
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<td>Visually significant refractive errors</td>
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<td>Astigmatism</td>
<td>≥4 years</td>
<td>&gt;1.75 D</td>
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<tr>
<td>Myopia</td>
<td>&lt;4 years</td>
<td>&lt; -3.00 D</td>
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<tr>
<td>Myopia</td>
<td>≥4 years</td>
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</table>
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


(Additional references available upon request)
AAP Resources

AAPOS Vision Screening Kit:

https://aapos.org/patients/resources/screening-kits-patients
Thank You!

_Bradfordg@hs.c.wvu.edu_