Children’s Vision:
Best Practices for Screening, Educating, and Engaging Families

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Introduction and Disclaimer

• Nearly 17 years in vision screening field

• Former Director/Lead Trainer – Vision Initiative for Children – West Virginia University Eye Institute

• Member – Advisory Committee to the National Center for Children’s Vision and Eye Health at Prevent Blindness

• Consultant – Vision Screening Committee, American Association for Pediatric Ophthalmology and Strabismus

• Current Education and Outreach Coordinator for the National Center for Children’s Vision and Eye Health at Prevent Blindness

• Current Director – Vision and Eye Health Initiatives at Good-Lite and School Health Corporation

• Not in sales . . . Focus is encourage age-appropriate, evidence-based, and best practice vision screening as part of a strong, 12-component, Vision Health System of Care
Info You Will Take Home …
4 Learning Objectives

Describe 1 tool to screen vision during baby’s 1st year of life.

Describe 3 resources for families of children referred from vision screening.

List 2 evidence-based approaches to vision screening and describe what each measures.

Describe appropriate and inappropriate occluders for optotype-based screening.

Current Evidence-Based Vision Screening Tools for Ages Birth to 3 Years

• The Infant Vision Milestones Checklist – a document for monitoring 8 vision developmental milestones during baby’s 1st year

• Instrument-based screening

• Community group using evidence-based tools for ages 1 and 2 years
8 Critical Vision Developmental Milestones to Monitor From Birth to 1st Birthday

- Many vision milestones are related to overall developmental milestones... want you to think about those milestones from a perspective of vision... or how baby’s vision could impact milestone.

- When using the tool, start at beginning with 1st milestone and end at child’s age.
The Infant Vision Milestones Checklist tool available at:

http://nationalcenter.preventblindness.org/publications-and-presentations

https://nationalcenter.preventblindness.org/sites/default/files/national/documents/8-key-development-milestones.pdf

EIGHT KEY VISION DEVELOPMENT MILESTONES TO MONITOR FROM BIRTH TO FIRST BIRTHDAY

Lea Hyvärinen, MD, PhD and P. Kay Nottingham Chaplin, EdD (version 11.17.17)

- Begin with 1st milestone, regardless of child’s age.
- Check first box if baby meets milestone – check 2nd box if baby does not meet milestone and move to next steps. Begin with 1st milestone regardless of age and stop when milestone exceeds baby’s age.

<table>
<thead>
<tr>
<th>AGE (Milestones may vary up to 6 weeks)</th>
<th>MILESTONE</th>
<th>IMPORTANCE OF MILESTONE</th>
<th>QUESTIONS TO ASK OR BEHAVIORS TO MONITOR</th>
<th>NEXT STEPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to no later than 8 weeks</td>
<td>1st Milestone</td>
<td>• Maintains stable eye contact when awake and alert, initiated by parent or caregiver.</td>
<td>□ Does baby maintain stable eye contact when awake and alert initiated by parent or caregiver? □ If “no”, move to next steps.</td>
<td>□ Refer to baby’s pediatric primary care provider to coordinate eye exam referral for an assessment to include refraction and accommodation, if possible, to determine how well baby can see.</td>
</tr>
</tbody>
</table>

Images from Lea Hyvärinen, MD, PhD

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Instruments “Approved” by NCCVEH

Welch Allyn®
Spot™ Vision Screener

Plusoptix
S12C Vision Screener

Welch Allyn®
SureSight™
Vision Screener

Disclaimer: These tools are examples of vision screening instruments for this age group. These are not shown for the purpose of sales or promotion.

Preschool-Aged Children: Undetected and Uncorrected Vision Disorders Can Impact Learning

Squinting in circle time?
Coming to the front of the group during reading to look at picture’s in the book?
5th grade – Cs & Ds. Consistently unruly in class. After VS & glasses, behaviors calmed almost immediately. 3 mo later – Bs & working on As. “You saved my nephew.”

2015 study – low-income, ages 3 through 5 yrs – found: Improvement in academic progress, confidence & behavior - increase in focus during lessons & classroom participation & interaction

317 2nd & 3rd graders – 12 high-poverty schools – Baltimore City – Children with uncorrected hyperopia did not perform as well on reading assessments compared with children without hyperopia

2015 study – ages 4 and 5 yrs with hyperopia (farsightedness ≥4.0 D) scored significantly worse on early literacy test than children with normal vision

Dioptr defined

• “Diopter” refers to the strength of a prescription lens required to give a child the clearest vision possible. The higher the number, the stronger the prescription lens.

• A child requiring 4 diopters of correction in prescription glasses, or contact lenses, would likely struggle with blurred vision, crossed eyes, or both, and would see much better with prescription glasses.


True story from Charles Short – Indiana Lions District 25C – West Lafayette, IN

- First grade reading ability found to be predictive of 11th grade reading outcomes, including:
  - Reading comprehension,
  - Vocabulary, and
  - General knowledge.

What do previous slides tell you?

- Importance of:
  - Evidence-based vision screening,
  - Follow-up eye exams,
  - Receiving vision treatment plan and related devices/materials (i.e., glasses, patching); and
  - Following treatment plan for best vision now and in the future.

Evidence-Based Vision Screening Tools & Procedures for Children Ages 3 Through 5 Years

- Optotype-Based Screening
- Instrument-Based Screening
Cast of Characters

NCCVEH:
• National Center for Children’s Vision and Eye Health at Prevent Blindness

AAP:
• American Academy of Pediatrics
• American Association for Pediatric Ophthalmology and Strabismus
• American Academy of Ophthalmology
• American Association of Certified Orthoptists

2 Approaches to Vision Screening

1. **Optotype-based screening**
   • Tests of visual acuity using optotypes to measure visual acuity as interpreted by the brain
     • *Quantifiable measurement of the sharpness or clearness of vision when identifying black optotypes on a white background using specific optotype sizes at a standardized distance*

2. **Instrument-based screening**
   • Instruments do not measure visual acuity
   • Instruments analyze images of the eyes to provide information about amblyopia and reduced vision risk factors:
     • Estimates of significant refractive error (hyperopia, myopia, astigmatism)
     • Estimates of anisometropia
     • Estimates of eye misalignment (some, not all)
Threshold & Critical Line Screening

- **Threshold screening**
  - Move down chart until child cannot correctly identify majority of optotypes

- **Critical line screening**
  - Use only line child needs to pass according to child’s age

“Not so great” charts . . .
**NOT** Recommended by NCCVEH and/or AAP

- "Sailboat"
- Allen Pictures
- Lighthouse or "House, Apple, Umbrella"
- Snellen
- Tumbling E

### Why NOT Recommended?

- The use of validated and standardized optotypes and acuity charts is important for an accurate assessment of vision.
- Charts not standardized.
- Children may not know their letters.
- Requires discrimination of direction, which is not sufficiently developed in preschool-aged children.
- Not well validated in screening environment.

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Importance of Appropriate Tools

• “Visual acuity scores can be significantly affected by the chart design.” (p. 1248)

• Excluding optotype size, “each visual acuity level on a test chart should present an essentially equivalent task”. (p. 740)

National and international distance visual acuity eye chart design recommendations

• 1980 - National Academy of Sciences-National Research Council (NAS-NRC)

• 1984 - International Council of Ophthalmology (ICO)
  • www.icoph.org/dynamic/attachments/resources/icovisualacuity1984.pdf

• 2003 - World Health Organization Prevention of Blindness & Deafness (WHO)
  • Prevention of blindness and deafness. Consultation on development of standards for characterization of vision loss and visual functioning. Geneva: WHO;2003 (WHO/PBL/03.91).

• 2010 – American National Standards Institute, Inc.
  • ANSI Z80.21-1992 (R2004) Approved May 27, 2010
Optotypes approximately equal in legibility

Horizontal between-optotype spacing = 1 optotype width

Vertical between-line spacing = height of next line down

Geometric progression of optotype sizes of 0.1 log units (logMAR, ETDRS)

5 optotypes per line

Optotypes black on white background with luminance between 80 cd/m² and 160 cd/m²

Similar recommendations across guidelines

Tips:
- Line outside optotypes
- 20/32 vs. 20/30
- 10 feet vs. 20 feet

Design guidelines = “ETDRS” or “logMAR” chart
Do the following eye charts fit national/international eye chart design guidelines? **Yes or No?**

- **NO**

**Preferred Optotypes for Ages 3 to 7 Years**

- NCCVEH
- AAP

- Recommend LEA SYMBOLS® and HOTV letters as optotypes

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Preferred Optotype Format

NCCVEH national guidelines call for using single, LEA SYMBOLS® or HOTV letter optotypes surrounded with crowding bars for children ages 3, 4, and 5 years at 5 feet

Options: Critical Line Screening at 10 feet

Sight Line Kit

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Also acceptable . . .

- 5 or 10 feet from chart to child’s eyes
- New, standardized distance charts will be at 10 feet for children and adults
- 10/xx on left side of chart with 20/xx on right side – report 20/xx

Screening Distance
Occluders – Younger Children <10 Years

Unacceptable Occluders Ages 3, 4, and 5 years

- Hand
- Tissue
- Paper or plastic cup
- Cover paddle

Why unacceptable?

Children can easily peek

To Point or Not to Point . . . ?

• Pointing to each optotype to help children know where they are on the chart is permissible.
  ❌ True or False?
  ✓

  • 1.8 “Line-by-line isolation or pointing may be used, but not letter by letter.

No Pointing at Optotypes

• 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.

“Untestable” is not a failed vision screening.

Keep track of “untestable” children.

Untestable children in VIP study were 2x as likely to have vision problems than those who passed vision screening.

If possible, rescreen untestable children same day.

If you have reason to believe that the child may perform better on another day, consider rescreening the child no later than 6 months.

Referral Criteria

NCCVEH
- Age 3 years:
  - Majority of optotypes on 20/50 line
- Ages 4 and 5 years:
  - Majority of optotypes on 20/40 line
- Ages 6 years and older:
  - Majority of optotypes on 20/32 line

AAP
- Age 3 years:
  - Majority of optotypes on 20/50 line
- Ages 4 years:
  - Majority of optotypes on 20/40 line
- Ages 5 years and older:
  - Majority of optotypes on 20/32 (or 20/30) line
  - Or 2-line difference even in passing lines (i.e., 20/20 and 20/32)
Choices for Near Vision Screening

Can do critical line only with both eyes open or one eye at a time.

2 Approaches to Vision Screening

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2. **Instrument-based screening**
   - Instruments do not measure visual acuity
   - **Instruments analyze photographic images of the eyes to provide information about reduced vision and amblyopia risk factors:**
     - Estimates of significant refractive error (hyperopia, myopia, astigmatism)
     - **Estimates of anisometropia**
     - Estimates of eye misalignment
**Instrument-Based Screening**

- **If use instruments, no need to also do visual acuity screening unless you want to check both VA and refractive error.**

- **If cannot “capture” a pass or refer result... refer child for comprehensive eye exam.**

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**REFERENCES**


• Do not attempt to convert estimated refractive error to visual acuity value.
• Child could fail vision screening with instrument, but pass with conversion and miss opportunity for eye exam.

### Conversion Chart: Refractive State to “estimated” Visual Acuity

<table>
<thead>
<tr>
<th></th>
<th>Myopia</th>
<th>Hyperopia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nearsighted</td>
<td>Farsighted</td>
</tr>
<tr>
<td>Minus (-) Sphere</td>
<td>Estimated Visual Acuity</td>
<td>Plus (+) Sphere</td>
</tr>
<tr>
<td>Ages: All</td>
<td>20/30-40</td>
<td>+2.00</td>
</tr>
<tr>
<td>Ages: 5 to 15y</td>
<td>20/50</td>
<td>+3.00</td>
</tr>
<tr>
<td>Ages: 20 to 25y</td>
<td>20/60</td>
<td>+3.25</td>
</tr>
<tr>
<td>Ages: 40 to 50y</td>
<td>20/70</td>
<td>+3.75</td>
</tr>
<tr>
<td>Ages: 60 to 70y</td>
<td>20/100</td>
<td>+4.25</td>
</tr>
<tr>
<td>Ages: 80 to 90y</td>
<td>20/200</td>
<td>+4.75</td>
</tr>
</tbody>
</table>

[1] Spherical results are based upon minus (-) cylinder convention.


Not Recommended for conversion of screening results for children screened for amblyopic risk factors.

### Instruments “Approved” by NCCVEH

- Welch Allyn® Spot™ Vision Screener
- Plusoptix S12C Vision Screener
- Welch Allyn® SureSight™ Vision Screener

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Information to Share With Parents and Caregivers

• You may see nothing in your child’s behaviors that suggests your child has a vision problem.

• Most vision problems are not like a scratch that requires a bandage.

• Screening is the only way to know if the eyes are healthy and vision is developing properly.

Parents Want to Know . . .

• What's involved in the vision screening process?
  • How long does it take?
  • Does it hurt?
  • What happens next?

• How to receive support from other parents who have gone through this (eye exam).

• Information from Parent Focus Group at 2013 National Head Start Association Parent Conference
Parents and caregivers will likely need both practical/logistical and social/emotional support for themselves and their children.

- Financial
- Transportation
- Helping parents manage follow-up appointments
- Dealing with insurance companies
- Acceptance of problem
- Dealing with cultural understanding and assumptions
- Trusting doctors

How Parents Say They Want to be Engaged in Follow-up to Eye Care

Resources to Support Families . . .

Financial Assistance Programs

Parent Education

Tips for Wearing Eye Glasses

Eyes That Thrive: http://www.preventblindness.org/eyes-thrive

http://nationalcenter.preventblindness.org/resources-2
Resources to support better eye health

Website for the National Center for Children’s Vision and Eye Health

Provider education tools

Parent/family resources

Technical assistance

Professional Development

Communication tools

http://nationalcenter.preventblindness.org

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Children’s Vision Health

How to Create a Strong Vision Health System of Care

by P Kay Nottingham Chaplin, Jean E. Remsey, and Kira Beldenado

Mackenzie, a child enrolled in Head Start, did not pass a vision screening and received glasses after a follow-up eye exam. When she returned to her classroom with her new glasses, Mackenzie asked into the room and turned around. A picture of a giraffe on the wall caught her attention. She walked to the picture, leaned at the giraffe, turned to her teacher, and said, “I don’t know giraffes had eyes!”

Children’s Vision Health: How to Create a Strong Vision Health System of Care was written by P Kay Nottingham Chaplin, Jean E. Remsey, and Kira Beldenado. The authors are members of the Advisory Board for the National Center for Children’s Vision and Eye Health. For more information, visit the website at http://nationalcenter.preventblindness.org. ©2017 P Kay Nottingham Chaplin, EdD. For personal viewing only to review and refresh knowledge. Not to be used as a stand-alone training or certification tool.

Year of Children’s Vision

- [http://nationalcenter.preventblindness.org/year-childrens-vision](http://nationalcenter.preventblindness.org/year-childrens-vision)
- Archived vision screening webinars in Resources

Helpful info and statistics for grant proposal writing . . .

NASN Vision and Eye Health Resource

(National Center for Children’s Vision and Eye Health and NASN partnership)

https://www.nasn.org/nasn-resources/practice-topics/vision-health

Info for Prevent Blindness nationally recognized vision screening certification you can do online at your own pace

http://nationalcenter.preventblindness.org/prevent-blindness-childrens-vision-screening-certification-course

800-331-2020 Nottingham@preventblindness.org