Vision’s Impact on Learning in Children

--- moderator---

Laura Anderko, PhD, RN
Georgetown University and Chair, National Center for Children’s Vision and Eye Health
Gayathri Srinivasan, MS, OD
New England College of Optometry

Marjean Taylor Kulp, OD, MS
The Ohio State University College of Optometry

Mae Millicent Winfrey Peterseim, MD
Medical University of South Carolina
Presenting Research on a Vision Development Tool for Children Ages Birth to 3

Gayathri Srinivasan, MS, OD
New England College of Optometry
Disclosures

• None
Vision screening – what, why and how
What is screening?

The Commission on Chronic Illness (CCI)\(^1\) definition:

“the presumptive identification of unrecognized disease or defect by the application of tests, examinations or other procedures which can be applied rapidly”
Why?

Vision screening in children

- Early detection and treatment of common vision problems
  - Amblyopia and its risk factors
    - Significant refractive error
  - Strabismus
Amblyopia Risk Factors

- Significant refractive errors
  - Prevalence dependent on age/race/ethnicity

- Amblyopia 2\%^{2,3}

- Estimated prevalence \sim 15\%^{4}
# How?

Current Policy on Vision Screening

Joint statement by the AAP, AAO, AAPOS, AACO

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Newborn to 6 mo</th>
<th>6-12mo</th>
<th>1-3y</th>
<th>4-5y</th>
<th>6y and older</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocular history</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>External inspection of lids and eyes</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Red reflex testing</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Pupil examination</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Ocular motility assessment</td>
<td>--</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Visual acuity fixate and follow response</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Visual acuity age-appropriate optotype assessment</td>
<td>--</td>
<td>--</td>
<td>x&lt;sup&gt;1&lt;/sup&gt;</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Instrument-based screening when available</td>
<td>--</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
Approaches to assess vision in infants and toddlers

- Visual impairment impacts
  - Motor development milestones
  - Cognitive ability
  - Overall development

- Can visual behaviors explain how a child uses his/her vision?
An Example of Abnormal Visual Behavior: What’s the Cause?

Video courtesy: Lea Hyvarinen MD
More Examples

- Looks at mom’s face very early
- Follows bright objects by 6-12 weeks
- Eye contact by age 8 weeks
- Social smile at 12 weeks
- Finding hands at 14 -16 weeks
- Recognition of familiar faces at 7-8 months
Given that traditional visual acuity tests cannot be administered in children under 3 years in a screening setting, can visual developmental milestones be used as a screening tool to detect vision problems?
Visual Development Questionnaire (VDQ)

• Questions are age appropriate for each 6 month age cohort

• Divided into two parts:
  – Visual development assessment
  – Risk assessment

• Filled out by parents/guardians
VISUAL DEVELOPMENT AND RISK ASSESSMENT SURVEY QUESTIONNAIRE
Healthy Eyes Healthy Futures Massachusetts
The New England College of Optometry

Child’s name: ____________________________ Date of Birth ___/___/______ Completed by: ____________________________

These questions are about your child’s vision development. Please read them carefully and answer the questions by placing a checkmark in the column that is most appropriate. Be sure to try each activity with your baby before answering the question. Make sure your baby is fed and well rested. Please return this questionnaire by ____________________________

**Birth-12 months:**

1. When you smile, does your child respond with a smile? __Yes___ __No___

2. Does your child recognize family members before hearing their voice? __Yes___ __No___

3. Does your child look at his/her toys or his/her hands? __Yes___ __No___

4. Does your child follow your movement across the room? For example, do his/her eyes follow you as you walk across the room? __Yes___ __No___

5. When your child looks at you or a toy does one of his/her eyes appear turned in or out while the other eye is not? __Yes___ __No___

6. Does anyone in the family have crossed-eyes or one eye that turns in a different direction? __Yes___ __No___

7. Was anyone in the family told to wear glasses at age 4 or younger? __Yes___ __No___

8. When your baby was born, did he/she have to stay in the hospital for more than 5 days? __Yes___ __No___

9. During pregnancy, did the mother smoke more than 5 packs of cigarettes per month? __Yes___ __No___

10. Was your child at least 8 weeks premature or born with low birth weight (3.5 lbs or less)? __Yes___ __No___
Pilot Study

• 249 subjects 3 months to 3 years of age

• Recruitment - Early Head Start and Early Intervention programs

• Methods:
  – Parents/guardians completed the VDQ
  – Masked examiners travelled study sites to conduct comprehensive eye examinations (gold standard)
Continued

Analysis
  – Receiver Operating Characteristics (ROC) curve

Results
  – 228 completed survey
    • Unavailable n=2
    • Incorrect n=19
  – Mean age 22.83±8.89 mo
Results

**Race/Ethnicity**

- Hispanics 34.5%
- Non-Hispanics 33.7%
- Not Available 26.5%
- Other 5.2%
ROC Curve

Area under the curve (AUC)

0.703 (0.613-0.793, 95%CI)
Results

<table>
<thead>
<tr>
<th>cutoff</th>
<th>sensitivity</th>
<th>specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>0</td>
<td>0.995</td>
</tr>
<tr>
<td>4</td>
<td>0.0513</td>
<td>0.995</td>
</tr>
<tr>
<td>4.5</td>
<td>0.0513</td>
<td>0.989</td>
</tr>
<tr>
<td>5</td>
<td>0.128</td>
<td>0.973</td>
</tr>
<tr>
<td>5.5</td>
<td>0.154</td>
<td>0.967</td>
</tr>
<tr>
<td>6</td>
<td>0.256</td>
<td>0.946</td>
</tr>
<tr>
<td>6.5</td>
<td>0.308</td>
<td>0.886</td>
</tr>
<tr>
<td>7</td>
<td>0.436</td>
<td>0.832</td>
</tr>
<tr>
<td>7.5</td>
<td>0.487</td>
<td>0.739</td>
</tr>
<tr>
<td>8</td>
<td>0.692</td>
<td>0.658</td>
</tr>
<tr>
<td>8.5</td>
<td>0.718</td>
<td>0.533</td>
</tr>
<tr>
<td>9</td>
<td>0.872</td>
<td>0.37</td>
</tr>
<tr>
<td>9.5</td>
<td>0.974</td>
<td>0.163</td>
</tr>
<tr>
<td>10</td>
<td>0.974</td>
<td>0.0598</td>
</tr>
</tbody>
</table>

- Range of pass/fail scores with sensitivity and specificity
Summary

• Average/good AUC
  – The VDQ is a fair predictor of vision problems in children

• No clear Pass/fail score for using the VDQ yet
Limitations

- Small sample size
- Sample recruited from Early Education Centers

Next Steps

- Larger sample size
- Include medical practices to evaluate validity and feasibility
Thanks
References


5. Committee On Practice And Ambulatory Medicine, Section On Ophthalmology, American Association Of Certified Orthoptists. Visual System Assessment in Infants, Children, and Young Adults by Pediatricians. Pediatrics 2016; 137:1


Impact of Uncorrected Hyperopia on Early Literacy & Attention in 4- & 5-year-olds

Marjean Kulp, OD, MS

for the Vision In Preschoolers – Hyperopia In Preschoolers (VIP-HIP) Study Group

Supported by NIH/NEI R01EY021141

The funding organization had no role in the design or conduct of this research.
Vision In Preschoolers – Hyperopia In Preschoolers (VIP-HIP) Study Group

Executive Committee:
Marjean Taylor Kulp, OD, MS (Study Chair); Elise Ciner, OD; Maureen Maguire, PhD; Bruce Moore, OD; Lynn Cyert, OD, PhD; Graham Quinn, MD, MSCE; T. Rowan Candy, PhD; Jill Pentimonti, PhD, Gui-Shuang Ying, PhD

Pennsylvania College of Optometry at Salus University:
Elise Ciner (PI, EE), Whitley Harbison (EA, C), Zack Margolies (EA), Sarah McHugh-Grant (EA), Richard Schulang (EA), Gale Orlansky (EE), Leah Sack (C), Jasmine Campbell (C)

The Ohio State University College of Optometry:
Marjean Kulp (PI), Julie Preston (EA), Andrew Toole (EE), Tamara Oechslin (EE), Nancy Stevens (C), Pam Wessel (C)

New England College of Optometry:
Bruce Moore (PI), Marcia Feist-Moore (EA), Catherine Johnson (EE), Stacy Lyons (EE), Nicole Quinn (EE), Renee Mills (C)

Data Coordinating Center at University of Pennsylvania:
Maureen Maguire (PI), Maxwell Pistilli, Gui-Shuang Ying, Mary Brightwell-Arnold, Sandra Harkins, Ellen Peskin, Maria Bianco, Chris Helker

Velma Dobson, PhD contributed to the design of the study

Educational Consultants: Robert Bradley, PhD, Laura Justice, PhD, CCC-SLP, Jill Pentimonti, PhD

NEI Liaison: Maryann Redford, DDS, MPH
Hyperopia (Farsightedness)

- **4-14% of children with moderate-high farsightedness**
  - (MEPEDS, BPEDS) Up to 1.7 million preschool children in U.S.
- **Requires extra focusing effort (accommodation)**
  - ~2x more when looking up close vs. typical child
  - Children may have a lower amount of focusing ability than previously thought (Anderson et al)
  - More variable focusing, more under accommodation with more farsightedness (Candy et al; Tarczy-Hornoch, McClelland and Saunders; Anderson et al.)

- **Associated with poorer reading & cognition in children**
  (Simons & Gassler, Rosner & Rosner, Stewart-Brown, Haslum & Butler, Quaid & Simpson, Thurston & Thurston, Narayanasmy et al, Williams, Eames)
- **May begin in preschool** (Shankar et al, Atkinson et al, Roch-Levecq et al)
VIP-HIP Study

- Do uncorrected, moderately hyperopic (farsighted) 4- and 5-year-old children perform worse on tests of early literacy & attention than emmetropes (children with typical refractive errors)?
Participants

• 492 4- & 5-year-old children in preschool & grade K
• Moderate hyperopia (farsightedness) +3 to +6 D
  – (Astigmatism ≤ 1.5D; Anisometropia ≤ 1D)
OR
• Emmetropia (typical refractive error)
  – Hyperopia ≤ +1.00D
  – Astigmatism, anisometropia & myopia all < 1D
• No eye turn, no amblyopia (lazy eye), no prior correction, no Individual Education Plan
Vision Testing

• **Visual Acuity**
  – Distance
  – Near (both eyes)

• **Accommodation**
  – Focusing ability

• **Stereoacuity**
  – Binocular Depth Perception

• **Eye Alignment**

• **Cycloplegic refraction**

• **Health**
Testing of early literacy and attention

- Examiners masked to refractive error
- Test of Preschool Early Literacy (TOPEL)
  - Designed to identify preschoolers at risk for literacy problems
    - Print Knowledge
    - Definitional Vocabulary
    - Phonological Awareness
- Attention
  - Leiter
  - Cognitive Assessment System
Statistical Methods

• **Comparison of Means - Analysis of variance**
  - Hyperopic vs. Emmetropic
  - Hyperopic ≥4D vs. Hyperopic <4D vs. Emmetropic,
  - Post-hoc pairwise comparisons, with correction of p-value using Hochberg procedure

• **Multivariable linear regression models**
  - Independent associations of hyperopia & visual functions with TOPEL scores
  - Visual function groups defined by accom. lag, near VA, stereoacuity
  - Cut points determined using limits of 95% confidence interval of emmetropes

• Adjusted for age, race/ethnicity, and parent/caregiver's education
## Table: Demographic Characteristics

<table>
<thead>
<tr>
<th>DEMOGRAPHIC</th>
<th>Emmetropes N=248</th>
<th>Hyperopes N=244</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age in months</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 to &lt;60</td>
<td>58</td>
<td>62</td>
</tr>
<tr>
<td>60 to &lt;72</td>
<td>42</td>
<td>38</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>52</td>
<td>47</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
<td>53</td>
</tr>
<tr>
<td><strong>Ethnicity and race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-hispanic black</td>
<td>60</td>
<td>57</td>
</tr>
<tr>
<td>Non-hispanic white</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>Hispanic</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Multiple/Unknown/Other</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td><strong>Preschool/Kindergarten</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Start Preschool</td>
<td>90</td>
<td>88</td>
</tr>
<tr>
<td>Other Preschool/Kindergarten</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td><strong>Ocular</strong></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Most hyperopic meridian, worse eye (D)</td>
<td>0.51</td>
<td>(0.48)</td>
</tr>
<tr>
<td>Spherical equivalent, worse eye (D)</td>
<td>0.37</td>
<td>(0.50)</td>
</tr>
</tbody>
</table>
Early Literacy Scores by Refractive Error

- **Total**: Typical 89, Farsighted 84 (p=0.01)
- **Print Knowledge**: Typical 22, Farsighted 20 (p=0.007)
- **Definitional Vocabulary**: Typical 51, Farsighted 49
- **Phonological Awareness**: Typical 15, Farsighted 15
Early Literacy Scores by Refractive Error

**Typical**
- Total: 89
- Print Knowledge: 22
- Definitional Vocabulary: 51
- Phonological Awareness: 15

**Farsighted, <4D**
- Total: 86
- Print Knowledge: 21
- Definitional Vocabulary: 49
- Phonological Awareness: 15

**Farsighted, ≥4D**
- Total: 82
- Print Knowledge: 18
- Definitional Vocabulary: 49
- Phonological Awareness: 14

Significance levels:
- Total: p=0.01
- Print Knowledge: p=0.01
- Definitional Vocabulary: p=0.003
- Phonological Awareness: p=0.01
Literacy Score by Refractive Error & Near Acuity

- **Total**
  - Typical: 89
  - Farsighted, 20/32 or better: 86
  - Farsighted, 20/40 or worse: 80
  - *p*=0.002

- **Print Knowledge**
  - Typical: 23
  - Farsighted, 20/32 or better: 21
  - Farsighted, 20/40 or worse: 18
  - *p*=0.001

- **Definitional Vocabulary**
  - Typical: 51
  - Farsighted, 20/32 or better: 50
  - Farsighted, 20/40 or worse: 48
  - *p*=0.04

- **Phonological Awareness**
  - Typical: 15
  - Farsighted, 20/32 or better: 15
  - Farsighted, 20/40 or worse: 14
  - *p* values not provided
Literacy Score by Refractive Error & Stereoacuity

- Typical
- Farsighted, 120" or better
- Farsighted, 240" or worse

<table>
<thead>
<tr>
<th>Category</th>
<th>Typical</th>
<th>Farsighted, 120&quot; or better</th>
<th>Farsighted, 240&quot; or worse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>89</td>
<td>87</td>
<td>80</td>
</tr>
<tr>
<td>Print Knowledge</td>
<td>23</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Definitional Vocabulary</td>
<td>51</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td>Phonological Awareness</td>
<td>15</td>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

p < 0.001
p = 0.009
p < 0.001
Attention Scores by Refractive Error

Leiter R: Typical 35.4, Farsighted 31.3
CAS Receptive: Typical 15.1, Farsighted 14.0

p < 0.001
Attention Scores by Refractive Error

- Leiter R:
  - Typical: 35.4
  - Farsighted, <4D: 32.0
  - Farsighted, ≥4D: 30.1

- CAS Receptive:
  - Typical: 15.1
  - Farsighted, <4D: 14.8
  - Farsighted, ≥4D: 12.5

Significance levels:
- p = 0.004
- p = 0.02
- p = 0.01
- p = 0.04
Attention by Refractive Error & Near Acuity

- Typical
- Farsighted, 20/32 or better
- Farsighted, 20/40 or worse

Leiter R
- Typical: 35.5
- Farsighted, 20/32 or better: 32.5
- Farsighted, 20/40 or worse: 29.0

CAS Receptive
- Typical: 15.2
- Farsighted, 20/32 or better: 14.9
- Farsighted, 20/40 or worse: 12.2

p-values:
- p < 0.001
- p = 0.0495
- p = 0.0495
- p = 0.004
- p = 0.01
Attention by Refractive Error & Stereoacuity

Leiter R
- Typical: 35.5
- Farsighted, 120" or better: 33.2
- Farsighted, 240" or worse: 28.6

CAS Receptive
- Typical: 15.1
- Farsighted, 120" or better: 14.8
- Farsighted, 240" or worse: 12.9

Significance:
- Leiter R: p < 0.001, p = 0.02
- CAS Receptive: p = 0.03
Proportion with $\geq 1$ reduced near visual skills

- near visual acuity, stereoacuity, focusing ability (accommodation)

- Typical Refractive Error (Emmetropes) 17%
- Moderate to High Farsighted (Hyperopes) 64%
- p<0.001
Farsighted vs. Typical Refractive Error

- Significantly lower early literacy and attention scores
- Early literacy:
  - Greatest deficits in print knowledge
    - Print awareness
    - Ability to identify letters, written words
    - Ability to identify letters associated with particular sounds
  - Similar performance for phonological awareness
    - Ability to drop and blend specific sounds in everyday words
• Greatest deficits in early literacy & attention in farsighted with reduced near visual function:
  – Near visual acuity 20/40 or worse
  – Stereoacuity 240” or worse
• Farsighted children with better near visual function performed similarly to those with typical refractive error
  – Better near visual acuity & better stereoacuity
• Test items - large, high contrast
  – Not a problem ‘seeing’ the pictures & letters
• Supports prior research showing relationship between farsightedness & reading & attention
• Moderate farsightedness may cause difficulty with:
  – Access to print, sustained focus (Intermittent blur), learning letters & their associations
• Differences are meaningful
  – Deficits in early literacy highly predictive of poor reading in later years
    • Juel, Cunningham & Stanovich, Francis et al, Torgesen & Burgess, McNamara et al, Adlof et al
  – Magnitude that warrants intervention in educational settings to maximize future reading performance
    • Lonigan et al.
  – ‘What Works Clearinghouse’ ≥+0.25 effect size “substantively important”
Does correction improve early literacy skills?
VIP-HIP References


Research to Impact – Improving Vision to Learn-Screening for Visual Problems in Childhood

Mae Millicent Winfrey Peterseim, MD
Medical University of South Carolina
Mae Millicent Peterseim MD
Storm Eye Institute / Medical University of South Carolina
Professor, Pratt Endowed Chair
Pediatric Ophthalmology
No conflict of interest
No financial interest

Pleased to be part of this distinguished panel
We all have our stories:

Children who are missed

• 8 yo amblyopia –
  “I thought everyone had a bad eye”
  heartbreaking

• 9 yo “autistic” child with high hyperopia–
  didn’t pay attention because he needed glasses!
While we all have our individual patient stories, it takes Research to impact Research to provide the big picture Research to instruct how to improve care
Research to Impact in Pediatric Vision Care

Improvements last few decades for my patients

Amblyopia – easier treatment
  Reduced patching from days to 4 or 2 hours
  or drop in eye to improve vision

Strabismus surgery – better techniques
  Straighter eyes- better binocular vision
Research to Impact in Pediatric Vision Care
Retinopathy of Prematurity—Revolution!
Reduced blindness from 1 in 10 to 1 in 500
Now “Very Unusual”
Due to
National Screening Guidelines
Improved Treatment Due to Research
Research to Impact in Pediatric Vision Care

Tremendous impact of research to improve vision and lives

Thank you!
Research to Impact in Pediatric Vision Care

Vision screening

Detects children who are at risk and should receive comprehensive exam

Research in development and evaluation of better ways to screen

National Screening Guidelines

Next few decades I want “Revolution”-

Want “Very Unusual” for child to have undetected vision problem
Vision screening - What are we looking for?

<table>
<thead>
<tr>
<th>Ophthalmic disorder</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital cataract</td>
<td>0.06%</td>
</tr>
<tr>
<td>Congenital glaucoma</td>
<td>0.01%</td>
</tr>
<tr>
<td>Retinoblastoma</td>
<td>0.005%</td>
</tr>
<tr>
<td>Strabismus</td>
<td>4%</td>
</tr>
<tr>
<td>Amblyopia</td>
<td>2-4%</td>
</tr>
<tr>
<td>Refractive errors (age 5-17)</td>
<td>9-28%</td>
</tr>
</tbody>
</table>

Children don’t know
Vision Impacts Learning and Life

Visual deficiencies affect school performance
High hyperopia associated with lower reading skills
Amblyopia most common cause of visual impairment among children
Amblyopia most common cause of monocular visual impairment among young and middle-aged adults
Amblyopia associated with lower rates of college graduation, limits occupation choice
Strabismus associated with adverse effects relationships, education and success in finding employment
These conditions are treatable. Vision screening finds at-risk children to refer for care and treatment.
Collaboration between MUSC and ABVI

Combining Automated Vision Screening With On-site Examinations in 23 Schools:

ReFocus on Children Program 2012 to 2013

Program screens >2000 children/year
Provides exam and glasses if needed at school
Provides glasses for 200 children/year
Teacher survey
Teachers overwhelmingly “Glasses help!”
Positive impact in the classroom

- reduction in squinting and overall better vision
- improvement in academic progress
- increase in the children’s focus during lessons
- increase in participation and classroom interaction
- improvement in student’s confidence and behavior
Research in Vision Screening

New technology:
Instrument-based screening devices
Include photoscreeners, photorefractors, others
“Take a picture” and pass/refer for exam
Quick and child-friendly
Marketed pediatricians, community groups
Research at MUSC/Storm Eye Institute

We have performed independent evaluations of vision screening devices

We compare results of the device to results of doctor examination

Ensure device refers children appropriately

Adequate sensitivity - not miss children
Criteria for Referral
American Association for Pediatric Ophthalmology and Strabismus Recommended Amblyopia Risk Factor Targets

<table>
<thead>
<tr>
<th>Age, months</th>
<th>Astigmatism</th>
<th>Hyperopia</th>
<th>Anisometropia</th>
<th>Myopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-30</td>
<td>&gt;2.0 diopters</td>
<td>&gt;4.5 diopters</td>
<td>&gt;2.5 diopters</td>
<td>&gt;-3.5 diopters</td>
</tr>
<tr>
<td>31-48</td>
<td>&gt;2.0 diopters</td>
<td>&gt;4.0 diopters</td>
<td>&gt;2.0 diopters</td>
<td>&gt;-3.0 diopters</td>
</tr>
<tr>
<td>&gt;48</td>
<td>&gt;1.5 diopters</td>
<td>&gt;3.0 diopters</td>
<td>&gt;1.5 diopters</td>
<td>&gt;-1.5 diopters</td>
</tr>
</tbody>
</table>

Nonrefractive Risk Factor Targets

- Media opacity >1 mm
- Manifest strabismus >8 prism diopters in primary position
Research at MUSC/Storm Eye Institute

Confirm usefulness of photoscreeners/screening devices

Published sensitivity and validation studies
Vision Screening Research: Instrument screening works

CLINICAL REPORT
Guidance for the Clinician in Rendering Pediatric Care
Procedures for the Evaluation of the Visual System by Pediatricians

AMERICAN ASSOCIATION FOR PEDIATRIC OPHTHALMOLOGY AND STRABISMUS
AMERICAN ACADEMY OF OPHTHALMOLOGY
Joint Policy Statement
PEDIATRICS Volume 137, number 1, January 2016
Uniform support
AAP, AAO, AAPOS, NCCVEH, NASN
Include photoscreening/instrument-based screeners
Age specific recommendations
Accomplishments that Improve Childhood Vision Screening

Research determine best techniques for impact

National age-specific recommendations doctors and schools

Use of photoscreening/instrument screeners

Methods and charts for threshold acuity
Accomplishments that Improve Childhood Vision Screening

CPT codes for vision screening
99173, 99174, 99177
Category I codes, meaning they have demonstrated clinical efficacy and are expected to be used widely by health care providers
Encourage reimbursement for screening
Moving Forward

Encourage adoption of recommendations
Expand access to care and treatment
Continue research to provide “big picture” to improve care
Moving Forward

Expect, in next few decades, a Vision Screening Revolution!
Say that an undetected vision problem in childhood is “Very Unusual”
Goal to provide all children best vision for learning and life