Health and Wellness:

Preparing Children to Learn Through Evidence-Based Vision Screening from Birth to 5 Years

Dr. P. Kay Nottingham Chaplin, EdD

- 18+ years in vision screening field
- *Former Director/Lead Trainer – Vision Initiative for Children – West Virginia University Eye Institute – focus on Head Start, school nurses, pediatric primary care practices*
- 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 Director – Vision and Eye Health Initiatives at Good-Lite and School Health Corporation
- *Current Education and Outreach Coordinator for the National Center for Children's Vision and Eye Health at Prevent Blindness*
- Provided 178 vision screening training workshops
- *Lectured, trained, and consulted at more than 200 international, national, state, district, and local venues, including national webinar panels, and annual conferences*
- My focus is to encourage age-appropriate and evidence-based vision screening – based on national guidelines and best practices – as part of a 12-component Strong Vision Health System of Care.

Information You Will Take Home … 3 Learning Objectives

Describe the month infants should be referred for a pediatric eye exam if a baby's eyes continue to cross or wander.

Describe 3 evidence-based vision screening tool for ages 1, 2, 3, 4, and 5 years.

Describe 3 positive outcomes in learning and behaviors after vision screening, an eye examination, and treatment.

Current State of Children's Vision in the U.S.

Up to 1 in 17 preschool-aged children in the United States has a vision problem that require treatment.

- If left untreated, these eye diseases and vision disorders can lead to **permanent** vision loss that cannot be corrected with prescription glasses, and/or
- Cause problems socially, academically, and developmentally.
- However . . . almost all (94%) of these vision problems can be found early with a vision screening . . . if children who do not pass vision screening:
  - See an eye doctor;
  - Receive treatment, if necessary; and
  - Follow the eye doctor's suggestions to improve vision.

7 Behaviors

1. Talking in class
2. Notably quiet in class
3. "Spacy" children in their own world
4. Difficulty sitting still
5. Frustrated with academic work
6. Squinting during class activities
7. Clumsiness

Talking in class – Child said he talked because he was asking other students to help him read material on board.

Notably quiet in class – Child said she stopped looking at board . . . She couldn't see material on board.

"Spacy" and in own world – Interrupt story time to come forward to see book pictures. "I can see that now!"

Difficulty sitting still – Up and moving in circle time or watching TV with brother. Loner and bored. Now sits and participates in group activities.

Gallin, P. F. (2015, May 15). Kids who can't see can't learn. The New York Times. Retrieved from http://www.nytimes.com/2015/05/15/opinion/kids-who-cant-see-cant-learn.html?_r=0 Screener and parent stories.

Frustrated with "academic work" – Before glasses, "things looked dusty". Different child, happier, less frustrated.

Squinting during class activities – "Mommy! There are numbers on that circle on the wall!"

Clumsiness until receiving glasses – "I have realized through these screenings that vision can affect a child's behavior, balance, and academic performance."

Gallin, P. F. (2015, May 15). Kids who can't see can't learn. The New York Times. Retrieved from http://www.nytimes.com/2015/05/15/opinion/kids-who-cant-see-cant-learn.html?_r=0

Screener and parent stories.

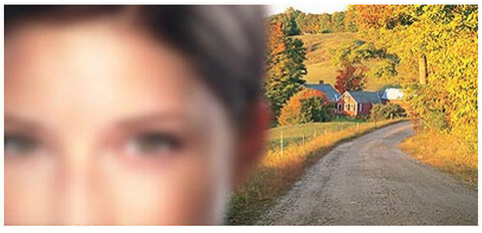
Multistate Level

- 2015 Vision in Preschoolers – Hyperopia in Preschoolers Study (VIP-HIP) found:
  - Children ages 4 and 5 years with uncorrected hyperopia (farsightedness ≥4.0 D) scored *significantly* worse on a test of early literacy than children with normal vision.
  - ≤ 4.0 D also had lower scores, but difference not statistically significant
- Performance most affected:
  - Print knowledge subtest,
  - Measuring ability to identify letters and written words

VIP-HIP Study Group, Kulp, M. T., Ciner, E., Maguire, M., Moore, B., Pentimonti, J., Pistilli, M., Cyert, L., Candy, R., Quinn, G., & Ying, G. (2016). Uncorrected hyperopia and preschool early literacy: Results of the Vision In Preschoolers – Hyperopia In Preschoolers (VIP-HIP) Study. *Ophthalmology, 123*(4), 681-689.

Diopter 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.



Multiple Inner City Schools Level

- 317 2nd and 3rd grade students in 12 high-poverty schools in Baltimore City School District in phase 1
- Poor baseline visual acuity and hyperopia associated with reduced reading achievement and worse baseline reading scores

Collins, M. E., Mudie, L., Slavin, R. E., Corcoran, R. P., Owoeye, J., Chang, D., Friedman, D. S., & Repka. M. X. (2016). Prevalence of eye disease and reading difficulty in an inner city elementary school population–preliminary results of the Baltimore Reading and Eye Disease Study (BREDS) [Abstract]. Journal of AAPOS, 20(4), e29-e30. Retrieved from http://www.jaapos.org/article/S1091-8531(16)30239-7/abstract

Single School District Level

2015 study of low-income children ages 3 through 5 years screened in South Carolina's Charleston County School District – *after diagnosis and treatment with prescription glasses* – found:

- Improvement in academic progress.
- Increase in focus during lessons.
- Increase in participation and classroom interaction.
- Improvement in confidence and behavior.

Peterseim, M. M., Papa, C. E., Parades, C., Davidson, J., Sturges, A., Oslin, C., Merritt, I., & Morrison, M. (2015). Combining automated vision screening with on-site examinations in 23 schools: ReFocus on Children Program 2012 to 2013. *Journal of Pediatric Ophthalmology & Strabismus, 52*(1), 20-24.

Early Identification &Treatment Make a Difference

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

Children who lag in 1st grade but catch up by 3rd or 5th grade have good prognosis for future reading level.

Cunningham, A. E., & Stanovich, K. E. (1997). Early reading acquisition and its relation to reading experience and ability 10 years later. *Developmental Psychology, 33*(6), 934-945.

Academic Considerations for Vision

- Improved GPA (reading and math) - more likely for hyperopes than myopes
- Increased satisfaction with school
- Reduced stress
- Improved cognition, attention span, and focus
- Improved test scores
- Less task avoidance and need for discipline
- Less labeling- ADD or ADHD
- Earlier identification leads to improved outcomes

Academic Performance of Oyler School Students after Receiving Spectacle Correction. Thesis by Kimberly L. Renner; Graduate Program in Vision Science; The Ohio State University, 2017

Healthier Students Are Better Learners: A Missing Link in School Reforms to Close the Achievement Gap. Basch, CE. EQUITY MATTERS: Research Review No. 6 Columbia University; March 2010. https://sparkpe.org/wp-content/uploads/BaschReport.pdf

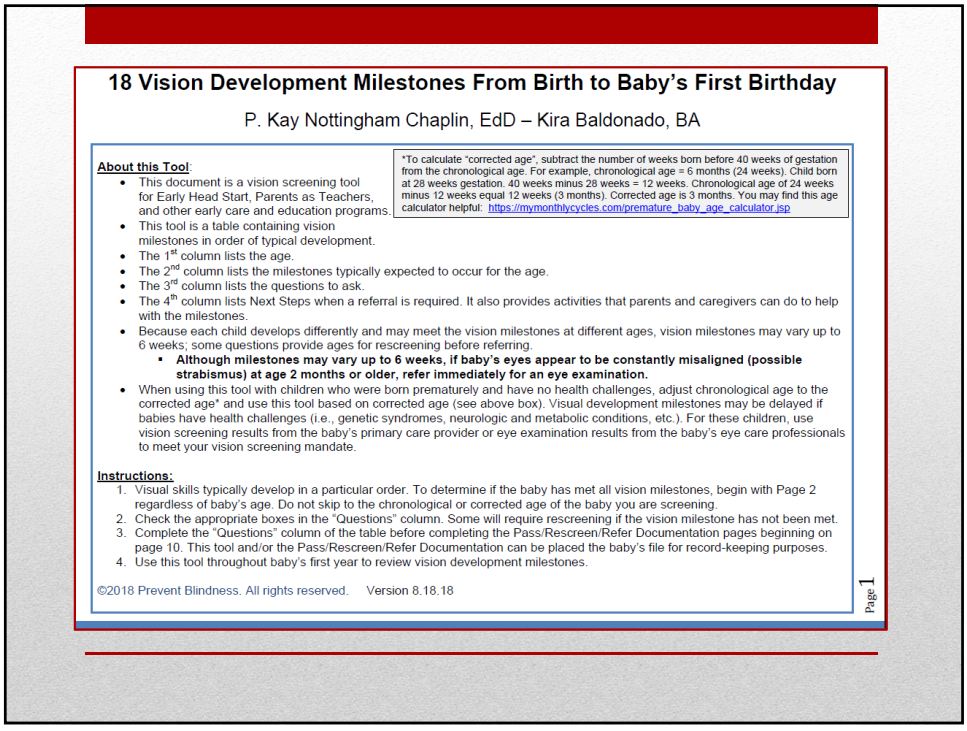
What Does an "evidence-based Approach" Mean?

The National Center on Early Childhood Health and Wellness defines evidence-based as: "an umbrella term that refers to the use of the **best research evidence** (found in health sciences literature) and **clinical expertise** (what health care providers know).

[Adapted from the National Institutes of Health https://prevention.nih.gov/resources-for-researchers/dissemination-and-implementation-resources/evidence-based-programs-practices.]

For example:

- Simply stating a tool was used to screen 10,000 children does not make the tool evidence-based.
- A peer-reviewed publication stating the tool was used to screen 10,000 children, screening results were compared with eye examination results, and the tool found 90% of children with vision disorders is an example of an evidence-based tool.



18 Vision Development Milestones From Birth to Baby's First Birthday

P. Kay Nottingham Chaplin, EdD – Kira Baldonado, BA

*To calculate "corrected age", subtract the number of weeks born before 40 weeks of gestation from the chronological age. For example, chronological age = 6 months (24 weeks). Child born at 28 weeks gestation. 40 weeks minus 28 weeks = 12 weeks. Chronological age of 24 weeks minus 12 weeks equal 12 weeks (3 months). Corrected age is 3 months. You may find this age calculator helpful: https://mymonthlycycles.com/premature_baby_age_calculator.jsp

About this Tool:

- This document is a vision screening tool for Early Head Start, Parents as Teachers, and other early care and education programs.
- This tool is a table containing vision milestones in order of typical development.
- The 1st column lists the age.
- The 2nd column lists the milestones typically expected to occur for the age.
- The 3rd column lists the questions to ask.
- The 4th column lists Next Steps when a referral is required. It also provides activities that parents and caregivers can do to help with the milestones.
- Because each child develops differently and may meet the vision milestones at different ages, vision milestones may vary up to 6 weeks; some questions provide ages for rescreening before referring.
  - **Although milestones may vary up to 6 weeks, if baby's eyes appear to be constantly misaligned (possible strabismus) at age 2 months or older, refer immediately for an eye examination.**
- When using this tool with children who were born prematurely and have no health challenges, adjust chronological age to the corrected age* and use this tool based on corrected age (see above box). Visual development milestones may be delayed if babies have health challenges (i.e., genetic syndromes, neurologic and metabolic conditions, etc.). For these children, use vision screening results from the baby's primary care provider or eye examination results from the baby's eye care professionals to meet your vision screening mandate.

Instructions:

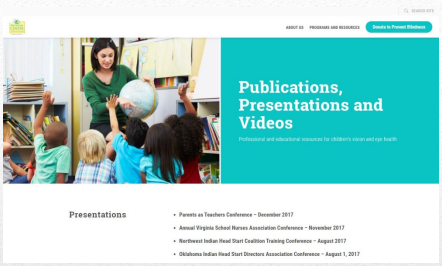
1. Visual skills typically develop in a particular order. To determine if the baby has met all vision milestones, begin with Page 2 regardless of baby's age. Do not skip to the chronological or corrected age of the baby you are screening.
2. Check the appropriate boxes in the "Questions" column. Some will require rescreening if the vision milestone has not been met.
3. Complete the "Questions" column of the table before completing the Pass/Rescreen/Refer Documentation pages beginning on page 10. This tool and/or the Pass/Rescreen/Refer Documentation can be placed the baby's file for record-keeping purposes.
4. Use this tool throughout baby's first year to review vision development milestones.

 Version 8.18.18

Page 1

Vision Developmental Milestones Check-off Tool available at:

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



Reports and Information from Prevent Blindness

- Results from 2016 National Survey of Children's Health (NSCH)
- A complete list of public health reports available from Prevent Blindness
- Children's Vision and Eye Health: A Snapshot of Current National Issues
- Eye health and safety information
- Our Vision for Children's Vision, A National Call to Action for the Advancement of Children's Vision and Eye Health
- Prevent Blindness Statement on School-Aged Vision Screening and Eye Health Programs
- 18 Vision Development Milestones From Birth to Baby's First Birthday
- 18 Vision Development Milestones From Birth to Baby's First Birthday (SPANISH)

- Time for reaching milestones can vary up to 6 weeks . . . **except milestone related to straight eyes.**
- Slides show when baby **should** reach milestones.
- Process:
  - Milestone(s) and age or age range when milestone(s) should occur
  - Questions to ask or behaviors to monitor about the milestones
  - What to do if milestones are not met . . . or next steps

- 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 reaching a milestone.

Child's Name: _____ DOB: _____ Age: _____

AGE *(Milestones may vary up to 6 weeks.)*	MILESTONE	QUESTIONS	NEXT STEPS
Birth through 1st month  Image from BabyCentre: https://www.babycentre.co.uk/t1048554/how-your-baby-learns-to-explore-photos *Picture 1 – Baby looks at object 8 to 15 inches away from face.*  Image from Zero to Three: https://www.zerotothree.org/resources/164-play-activities-for-birth-to-12-months *Picture 2 – Passing a patterned object within 8 to 15 inches of baby's face.*	1. Baby begins to focus on lights, faces, and objects 8 to 15 (20.32 – 38.1 cm) inches away from his/her face. 2. Baby begins to follow slowly moving lights, faces, and objects at near. **NEXT MILESTONE DURING AGE 2ND AND 3RD MONTHS**	1. Does baby focus on lights, faces, and objects 8 to 15 inches (20.32 – 38.1 cm) in front of his/her face? ❑ Yes (pass). ❑ Not Yet (rescreen within 6 weeks). Date for rescreen: _____ ❑ If "No" after rescreening, move to Next Steps. 2. Is baby beginning to follow slowly moving lights, faces, and objects with his/her head and eyes? ❑ Yes (pass). ❑ Not Yet (rescreen within 6 weeks). Date for rescreen: _____ ❑ If "No" after rescreening, move to Next Steps.	❑ Refer to baby's primary health care provider for further evaluation and to coordinate a referral for an eye examination. ❑ Refer to Birth to 3 Early Intervention program. ❑ Activities parents and caregivers can do: • Hold your baby in front of you, look at your baby, and slowly move your head from side to side. Play together and have fun! • Hold a patterned, high-contrast toy within 8 to 15 inches (20.32 – 38.1 cm) of your baby's face. Slowly move the object up and down or side to side. Play together and have fun! • Place a small rattle or colorful, plastic right in your baby's hands and gently shake your baby's hands in front of your baby's face. Play together and have fun!

Page 2

Home-Based Visitor/Nurse Signature: _____ Date: _____

Child's Name: _____ DOB:_____ Age:_____

AGE *(Milestones may vary up to 6 weeks.)*	MILESTONE	QUESTIONS	NEXT STEPS
During 2nd and 3rd months  Image from CDC: https://www.cdc.gov/ncbddd/actearly/milestones/photolibrary/2months.html *Picture 5 – Lively visual communication with social smile.*  Image from Lea Hyvärinen, MD, PhD http://www.lea-test.fi/index.html?start=en/assessme/lowvisio/index.html *Picture 6 – Baby turns head away from the parent.*	3. Baby begins to notice his/her hands. 4. Baby makes eye contact with parent or caregiver. 5. Baby follows moving lights, faces, people, and objects with both eyes together. 6. Baby has a social smile. **IF BABY IS AGE 3 TO 4 MONTHS, ALSO DO THE FOLLOWING MILESTONE**	3. Is baby aware of his/her hands during the 2nd month? ❑ Yes (pass). ❑ No (refer and move to Next Steps). 4. Does baby look directly at parent's or caregiver's eyes? ❑ Yes (pass). ❑ Not Yet (rescreen within 6 weeks). Date for rescreen: _____ ❑ If "No" after rescreening, move to Next Steps. 5. Is baby following moving lights, faces, people, and objects with both eyes together? ❑ Yes (pass). ❑ Not Yet (rescreen within 6 weeks). Date for rescreen: _____ ❑ If "No" after rescreening, move to Next Steps. 6. Is baby smiling at his/her parent or caregiver by age 3 months? ❑ Yes (pass). ❑ No (Refer and move to Next Steps.	❑ Refer to baby's pediatric primary health care provider for further evaluation and to coordinate a referral for an eye examination. ❑ Refer to Birth to 3 Early Intervention program. ❑ Activities parents and caregivers can do: • Look at your baby with his/her face about 8 to 15 inches from your face, wait for your baby to look at your face; and smile, sing, or talk to your baby. Play together and have fun! • Hold a favorite toy, bottle, or patterned and high-contrast object within 8 to 15 inches (20.32 – 38.1 cm) of your baby's face. Slowly move the object up and down or side to side. Play together and have fun!

Page 3

Home-Based Visitor/Nurse Signature: _____ Date: _____

Child's Name: _____ DOB:_____ Age:_____

Pass/Rescreen/Refer Documentation

Birth through 1st Month				
1. Does baby focus on lights, faces, and objects 8 to 15 inches (20.32 – 38.1 cm) in front of his/her face?	Screen Date		Rescreen Date:	
	❑ Pass	❑ Rescreen	❑ Pass	❑ Refer health care provider ❑ Refer EI
2. Is baby beginning to follow slowly moving lights, faces, and objects with his/her head and eyes?	Screen Date:		Rescreen Date:	
	❑ Pass	❑ Rescreen	❑ Pass	❑ Refer health care provider ❑ Refer EI
During 2nd and 3rd Months				
3. Is baby aware of his/her hands during the 2nd month?	Screen Date:			
	❑ Pass	❑ Refer health care provider ❑ Refer EI		
4. Does baby look directly at parent's or caregiver's eyes?	Screen Date:		Rescreen Date:	
	❑ Pass	❑ Rescreen	❑ Pass	❑ Refer health care provider ❑ Refer EI
5. Is baby following moving lights, faces, people, and objects with both eyes together?	Screen Date:		Rescreen Date:	
	❑ Pass	❑ Rescreen	❑ Pass	❑ Refer health care provider ❑ Refer EI
6. Is baby smiling at his/her parent or caregiver by age 3 months?	Screen Date:			
	❑ Pass	❑ Refer health care provider ❑ Refer EI		

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Home-Based Visitor/Nurse Signature: _____ Date: _____

Expert Contributors:

Sandra Block, OD, Med, MPH, FAAO, FCOVD
- Member of National Expert Panel to the National Center for Children's Vision and Eye Health (NCCVEH) at Prevent Blindness
- Professor; Medical Director, School Based Clinics, Director of School-Based Research at Illinois College of Optometry

Deborah Chen, PhD
- Professor Emerita in Early Childhood Special Education, Department of Special Education, California State University Northridge
- Co-author with Gail Calvello and Clare Taylor Friedman of the Parents and Infants with Visual Impairments (PAIVI) Manual, created as a 3-year project of the Blind Babies Foundation with support from the U.S. Department of Education

Megan E. Collins, MD, Pediatric Ophthalmologist
- Assistant Professor of Ophthalmology, Wilmer Eye Institute, Johns Hopkins Medicine
- A Principle Investigator of BREDS, Vision for Baltimore, and Vision for Chicago

Susan Cotter, OD, MS, FAAO
- Member of National Expert Panel to the National Center for Children's Vision and Eye Health (NCCVEH) at Prevent Blindness
- Member of Advisory Committee to the NCCVEH
- Professor at the Southern California College of Optometry at Marshall B. Ketchum University

Anne S. Nielsen, PhD
- Outreach Coordinator , Kansas State School for the Blind Manhattan Kansas Office

Resources Consulted:

Chen, D., Calvello, G., & Taylor, C. (2015). *Parents and his/her infants with visual impairments (PAIVI)* (2nd ed.). Louisville, KY: American Printing House for the Blind, Inc.

Donahue, S. P., Baker, C. N., AAP Committee on Practice and Ambulatory Medicine, AAP Section on Ophthalmology, American Association of Certified Orthoptists, American Association for Pediatric Ophthalmology and Strabismus, American Academy of Ophthalmology (2016). Procedures for the evaluation of the visual system by pediatricians. *Pediatrics, 137*(1), e20153597. Retrieved from http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf

Hyvärinen, L., Walthes, R., Jacob, N., Lawrence, L., & Nottingham Chaplin, P. K. (2016). Delayed visual development: Development of vision and visual delays. American Academy of Ophthalmology, Pediatric Ophthalmology Education Center. Retrieved from https://www.aao.org/pediatric-center-detail/delayed-visual-development-development-of-vision-v

Trubo, R. (2014). *The complete and authoritative guide. Caring for your baby and young child: Birth to age 5.* S. P. Shelov, T. R. Altmann & R. E. Hannemann (Eds.). (6th ed.). New York, NY: Bantum Books

Using the Milestones Tool – Case Profile #1

- Child's age: 5 months
  - Developmental skills exhibited:
    - Maintaining stable eye contact initiated by an adult
    - Social smile
    - Exploring hands and putting them in their mouth
    - Watching hand movements of others
    - Eyes drift and cross when tired

- Pass or Refer?
- Refer

Using the Milestones Tool – Case Profile #2

- Child's age: 9 months
  - Developmental skills exhibited:
    - Maintains stable eye contact initiated by an adult
    - Social smile
    - Exploring hands and putting them in their mouth
    - Watching hand movements of others
    - One eye turns in
    - Goal-directed arm movements
    - Recognizes parents, caregivers, and Grandpa

- Pass or Refer?
- Refer

Using the Milestones Tool – Case Profile #3

- Child's age: 9 months
  - Developmental skills exhibited:
    - Maintains stable eye contact initiated by an adult
    - Social smile
    - Exploring hands and putting them in their mouth
    - Watching hand movements of others
    - Eyes are straight
    - Goal-directed arm movements
    - Recognizes parents, caregivers, and Grandpa

- Pass or Refer?
- Pass

Vision Screening Years 1 and 2

Cast of Characters

NCCVEH:

- National Center for Children's Vision and Eye Health at Prevent Blindness
  - Optometry
  - Ophthalmology
  - Family Advocates
  - Nurses
  - Public Health Professionals
  - Educators

AAP:

- American Academy of Pediatrics
- American Association for Pediatric Ophthalmology and Strabismus
- American Academy of Ophthalmology
- American Association of Certified Orthoptists

Years 1 and 2 - Vision Screening Tools

Instrument-based screening

- Instruments assess the eye STRUCTURE, not how the brain interprets CLEARNESS of vision
- Instruments analyze digital images of the eyes to provide information about amblyopia risk factors:
  - Estimates of significant refractive error (hyperopia [farsightedness], myopia [nearsightedness], astigmatism [blurred vision at both near and far])
  - Estimates of anisometropia (significant difference of refractive error between the two eyes)
  - Estimates of eye misalignment

Instrument-Based Screening

AAP
- Use beginning at age 12 months
- Ages 1 and 2 years



Donahue, S. P., Baker, C. N., AAP Committee on Practice and Ambulatory Medicine, AAP Section on Ophthalmology, American Association of Certified Orthoptists, American Association for Pediatric Ophthalmology and Strabismus, American Academy of Ophthalmology (2016). Procedures for the evaluation of the visual system by pediatricians. *Pediatrics, 137*(1), e20153597. Retrieved from http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf

Instruments Vetted by NCCVEH Include:

Welch Allyn®
Spot™ Vision Screener

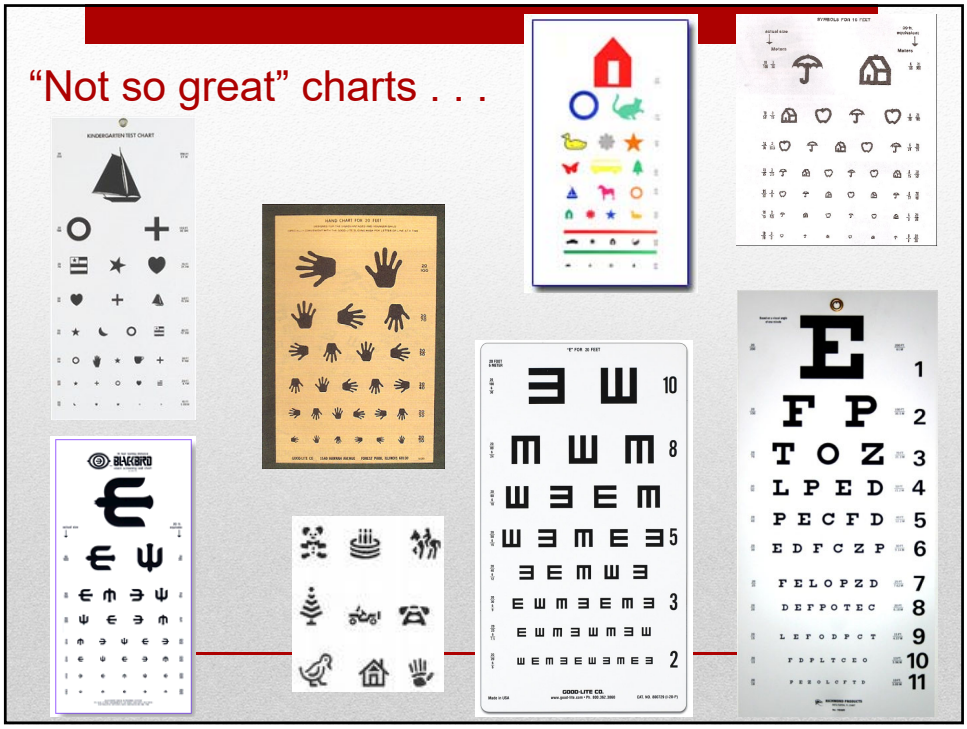
Plusoptix
S12C Vision Screener

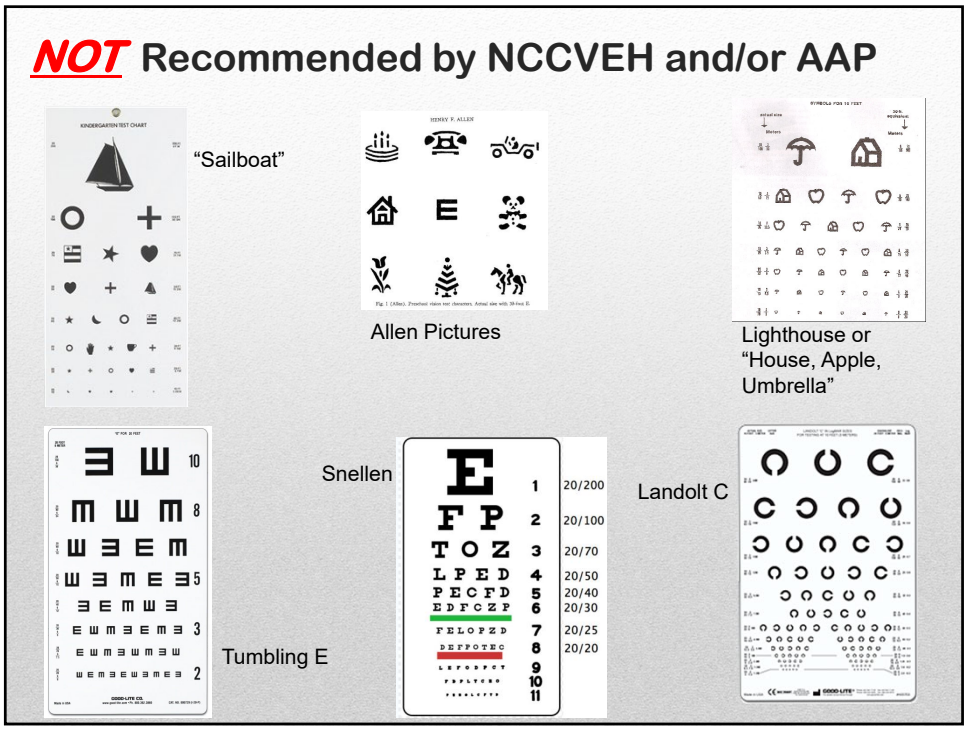
Beginning at Age 3 Years

2 Approaches to Vision Screening

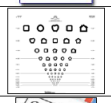
1. Optotype-based screening
- Tests of visual acuity using optotypes to measure visual acuity as interpreted by the brain
  - *Quantifiable measurement of the sharpness or clearness of vision when identifying specific optotype sizes at a standardized distance*

2. Instrument-based screening
- Instruments do not measure visual acuity
- *Instruments use an automated image acquisition and analysis system of the eyes to provide information about amblyopia risk factors:*
  - Estimates of significant refractive error (hyperopia, myopia, astigmatism)
  - *Estimates of anisometropia*
  - Estimates of eye misalignment (some, not all)





More Charts *NOT* Recommended by NCCVEH

Broken Wheel Test	
Optotypes in Color	
Patti Pics Visual Acuity Chart	
Kay Pictures®	
Michigan Preschool Test	
Titmus Vision Screening Machine	

https://nationalcenter.preventblindness.org/sites/default/files/national/documents/Characteristics_of_Visual_Acuity_Charts_for_Screening_Children_Revised_9.27.17.pdf

https://nationalcenter.preventblindness.org/programs-and-resources

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.

Cotter, S. A., Cyert, L. A., Miller, J. M., & Quinn, G. E. for the National Expert Panel to the National Center for Children's Vision and Eye Health. (2015). Vision screening for children 36 to <72 months: Recommended practices. *Optometry and Vision Science, 92*(1), 6-16. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4274336/pdf/opx-92-06.pdf

Donahue, S. P., Baker, C. N., & AAP Committee on Practice and Ambulatory Medicine, AAP Section on Ophthalmology, American Association of Certified Orthoptists, American Association for Pediatric Ophthalmology and Strabismus, American Academy of Ophthalmology (2016). Procedures for the evaluation of the visual system by pediatricians. *Pediatrics, 137*(1), e20153597. Retrieved from http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf

Importance of Appropriate Tools

- "Visual acuity scores can be significantly affected by the chart design." (p. 1248)
  - Bailey, I.L. (2012). Perspective: Visual acuity – Keeping it clear. *Optometry and Vision Science, 89*(9), 1247-1248.

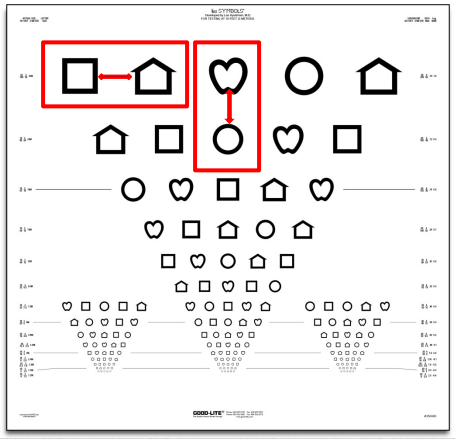
- Excluding optotype size, "each visual acuity level on a test chart should present an essentially equivalent task". (p. 740)
  - Bailey, I. L., & Lovie, J. E. (1976). New design principles for visual acuity letter charts. American Journal of Optometry & Physiological Optics, 53(11), 740-745.

National and international distance visual acuity eye chart design recommendations

- **1980 - National Academy of Sciences-National Research Council (NAS-NRC)**
  - Committee on Vision. (1980). Recommended standard procedures for the clinical measurement and specification of visual acuity. Report of working group 39. Assembly of Behavioral and Social Sciences, National Research Council, National Academy of Sciences, Washington, DC. *Advances in Ophthalmology, 41*:103–148.
- **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

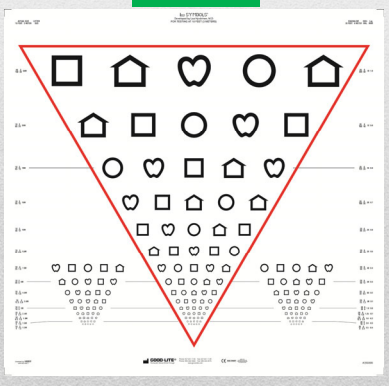


Design guidelines = "ETDRS" or "logMAR" chart

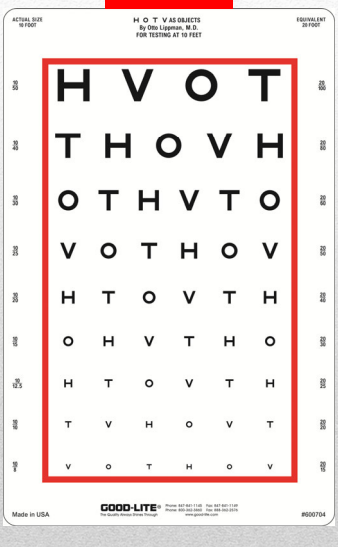
Tips:

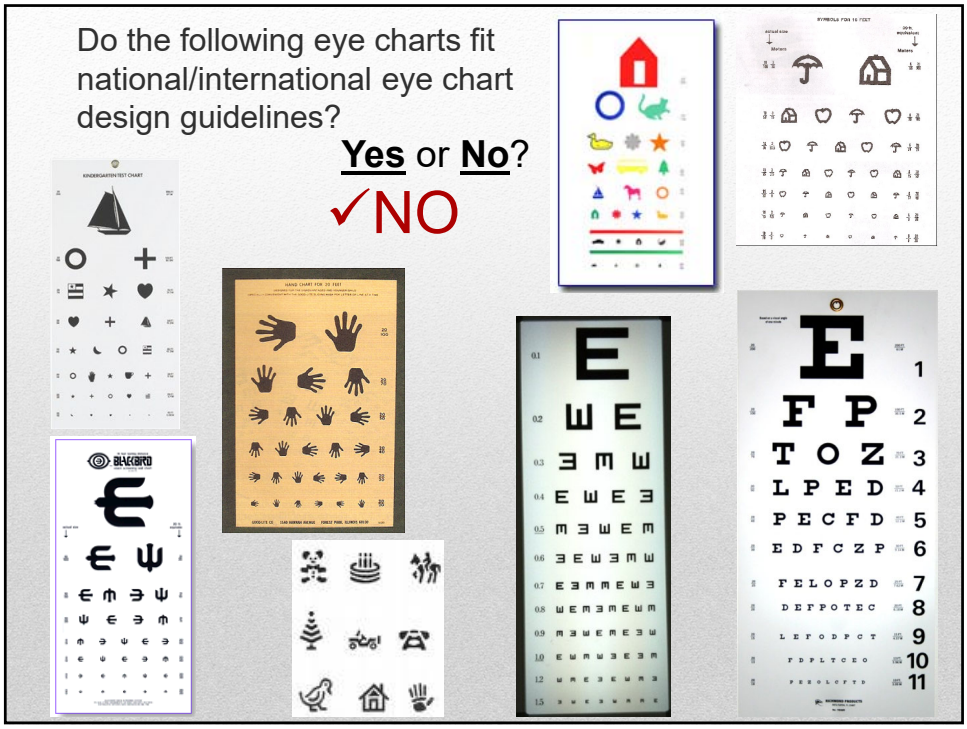
- Line outside optotypes
- 20/32 vs. 20/30
- 10 feet vs. 20 feet

YES



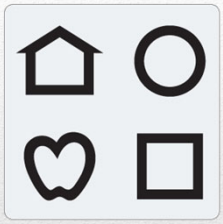
NO





Preferred Optotypes for Ages 3 to 6 Years

- NCCVEH
- AAP



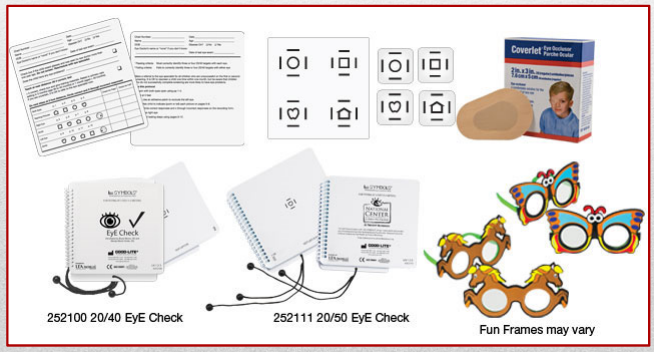
- Recommend LEA SYMBOLS® and HOTV letters as optotypes

Cotter, S. A., Cyert, L. A., Miller, J. M., & Quinn, G. E. for the National Expert Panel to the National Center for Children's Vision and Eye Health. (2015). Vision screening for children 36 to <72 months: Recommended practices. *Optometry and Vision Science, 92*(1), 6-16. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4274336/pdf/opx-92-06.pdf

Donahue, S. P., Baker, C. N., & AAP Committee on Practice and Ambulatory Medicine, AAP Section on Ophthalmology, American Association of Certified Orthoptists, American Association for Pediatric Ophthalmology and Strabismus, American Academy of Ophthalmology (2016). Procedures for the evaluation of the visual system by pediatricians. *Pediatrics, 137*(1), e20153597. Retrieved from http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf

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 <u>at 5 feet</u>



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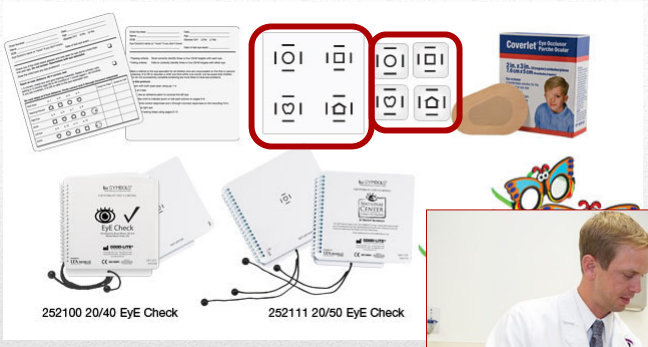

How do you use the response panel and 4 individual cards?

- Card with 4 optotypes – use as matching game
- Individual cards may be placed on floor in front of child – ask child to step on card matching optotype to identify

Options: Critical Line Screening at 10 feet

Sight Line Kit

Cotter, S. A., Cyert, L. A., Miller, J. M., & Quinn, G. E. for the National Expert Panel to the National Center for Children's Vision and Eye Health. (2015). Vision screening for children 36 to <72 months: Recommended practices. *Optometry and Vision Science, 92*(1), 6-16. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4274336/pdf/opx-92-06.pdf

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Also acceptable . . .

EyeSpy 20/20™

Visual Acuity • Depth Perception • Color Vision • Data Management

https://www.schoolhealth.com/eyespy-20-20-vision-screener
Using HOTV letters – NOT Landolt C

Screening Distance

- 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

Unacceptable Occluders Ages 3, 4, and 5 years

- Hand

- *Tissue*

- Paper or plastic cup

- *Cover paddle*

- Why unacceptable?
- *Children can easily peek*

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Occluders – Younger Children <10 Years

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?
  - ✓ False
- 1.8 "Line-by-line isolation or pointing may be used, ***but not letter by letter***

World Health Organization (2003). *Consultation on development of standards for characterization of vision loss and visual functioning.* Geneva: Switzerland. Retrieved from http://apps.who.int/iris/bitstream/10665/68601/1/WHO_PBL_03.91.pdf

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.

Vision in Preschoolers Study Group. (2007). Children unable to perform screening tests in Vision in Preschoolers Study: Proportion with ocular conditions and impact on measure of test accuracy. *Investigative Ophthalmology & Visual Science, 48*(1), 83-87.

American Academy of Ophthalmology Pediatric Ophthalmology/Strabismus Panel. (2012). Preferred Practice Pattern® Guidelines. Amblyopia. San Francisco, CA: American Academy of Ophthalmology. Retrieved from https://www.aao.org/preferred-practice-pattern/amblyopia-ppp--september-2012

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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)*

Cotter, S. A., Cyert, L. A., Miller, J. M., & Quinn, G. E. for the National Expert Panel to the National Center for Children's Vision and Eye Health. (2015). Vision screening for children 36 to <72 months: Recommended practices. *Optometry and Vision Science, 92*(1), 6-16. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4274336/pdf/opx-92-06.pdf

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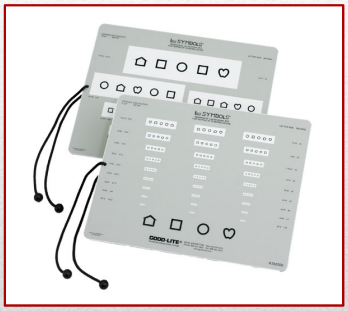
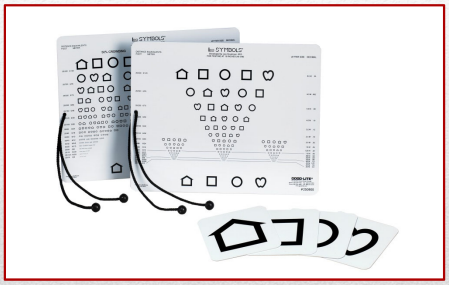
Choices for Near Vision Screening





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

Stereoacuity Screening if NOT using Spot

PASS 2 Smile Test

If Doing Color Vision Deficiency Screening . . .

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 specific optotype sizes at a standardized distance*

2. Instrument-based screening

- Instruments do not measure visual acuity
- *Instruments use an automated image acquisition and analysis system of the eyes to provide information about amblyopia risk factors:*
  - Estimates of significant refractive error (hyperopia, myopia, astigmatism)
  - *Estimates of anisometropia*
  - Estimates of eye misalignment

Instrument-Based Screening

- Use beginning at 12 months (AAP)
- Use instruments OR tests of visual acuity for children ages 3, 4, and 5 years (NCCVEH and AAP)

Donahue, S. P., Baker, C. N., & AAP Committee on Practice and Ambulatory Medicine, AAP Section on Ophthalmology, American Association of Certified Orthoptists, American Association for Pediatric Ophthalmology and Strabismus, American Academy of Ophthalmology (2016). Procedures for the evaluation of the visual system by pediatricians. *Pediatrics, 137*(1), e20153597. Retrieved from http://pediatrics.aappublications.org/content/pediatrics/early/2015/12/07/peds.2015-3597.full.pdf

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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.

Instruments Vetted by NCCVEH Include:

Welch Allyn®
Spot™ Vision Screener

Plusoptix
S12C Vision Screener

- Instruments typically will not capture readings on 100% of children (e.g., 97%).
- If doing instrument-based screening, still want optotype-based screening tool . . . just in case for other 3%.
- Example . . .

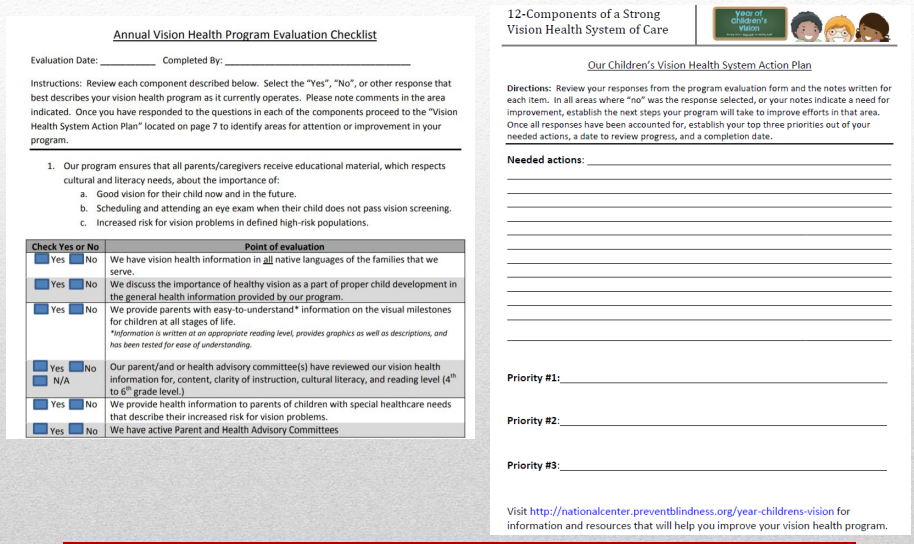
Welch Allyn®
Spot™ Vision Screener

Sight Line Kit

Vision Screening is . . .

- Part of a process…not a single event.
- 1 of 12 components of a strong vision health system of care.

Evaluating *Your* Vision Health Program



Annual Vision Health Program Evaluation Checklist

Evaluation Date: _____ Completed By: _____

Instructions: Review each component described below. Select the "Yes", "No", or other response that best describes your vision health program as it currently operates. Please note comments in the area indicated. Once you have responded to the questions in each of the components proceed to the "Vision Health System Action Plan" located on page 7 to identify areas for attention or improvement in your program.

1. Our program ensures that all parents/caregivers receive educational material, which respects cultural and literacy needs, about the importance of:
   a. Good vision for their child now and in the future.
   b. Scheduling and attending an eye exam when their child does not pass vision screening.
   c. Increased risk for vision problems in defined high-risk populations.

Check Yes or No	Point of evaluation
☐ Yes ☐ No	We have vision health information in all native languages of the families that we serve.
☐ Yes ☐ No	We discuss the importance of healthy vision as a part of proper child development in the general health information provided by our program.
☐ Yes ☐ No	We provide parents with easy-to-understand* information on the visual milestones for children at all stages of life. *Information is written at an appropriate reading level, provides graphics as well as descriptions, and has been tested for ease of understanding.
☐ Yes ☐ No ☐ N/A	Our parent/and or health advisory committee(s) have reviewed our vision health information for, content, clarity of instruction, cultural literacy, and reading level (4th to 6th grade level.)
☐ Yes ☐ No	We provide health information to parents of children with special healthcare needs that describe their increased risk for vision problems.
☐ Yes ☐ No	We have active Parent and Health Advisory Committees

12-Components of a Strong Vision Health System of Care

Year of Children's Vision

Our Children's Vision Health System Action Plan

Directions: Review your responses from the program evaluation form and the notes written for each item. In all areas where "no" was the response selected, or your notes indicate a need for improvement, establish the next steps your program will take to improve efforts in that area. Once all responses have been accounted for, establish your top three priorities out of your needed actions, a date to review progress, and a completion date.

Needed actions: _____

Priority #1: _____

Priority #2: _____

Priority #3: _____

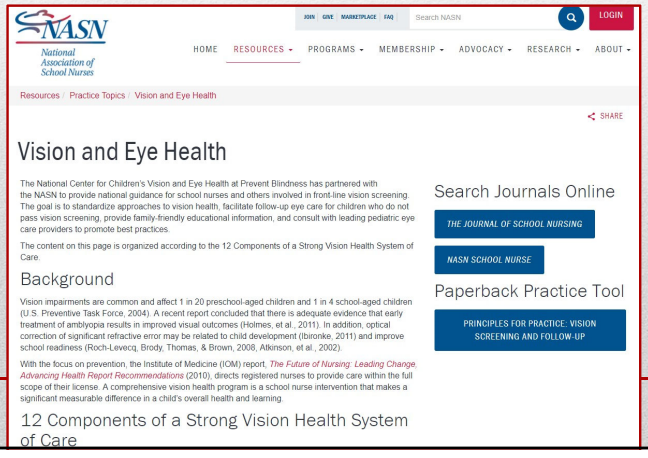
Visit http://nationalcenter.preventblindness.org/year-childrens-vision for information and resources that will help you improve your vision health program.

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

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



NASN National Association of School Nurses

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Resources / Practice Topics / Vision and Eye Health

SHARE

Vision and Eye Health

The National Center for Children's Vision and Eye Health at Prevent Blindness has partnered with the NASN to provide national guidance for school nurses and others involved in front-line vision screening. The goal is to standardize approaches to vision health, facilitate follow-up eye care for children who do not pass vision screening, provide family-friendly educational information, and consult with leading pediatric eye care providers to promote best practices.

The content on this page is organized according to the 12 Components of a Strong Vision Health System of Care.

Background

Vision impairments are common and affect 1 in 20 preschool-aged children and 1 in 4 school-aged children (U.S. Preventive Task Force, 2004). A recent report concluded that there is adequate evidence that early treatment of amblyopia results in improved visual outcomes (Holmes, et al., 2011). In addition, optical correction of significant refractive error may be related to child development (Ibironke, 2011) and improve school readiness (Roch-Levecq, Brody, Thomas, & Brown, 2008, Atkinson, et al., 2002).

With the focus on prevention, the Institute of Medicine (IOM) report, *The Future of Nursing: Leading Change, Advancing Health Report Recommendations* (2010), directs registered nurses to provide care within the full scope of their license. A comprehensive vision health program is a school nurse intervention that makes a significant measurable difference in a child's overall health and learning.

12 Components of a Strong Vision Health System of Care

Search Journals Online

THE JOURNAL OF SCHOOL NURSING

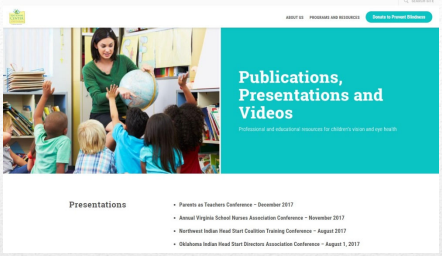
NASN SCHOOL NURSE

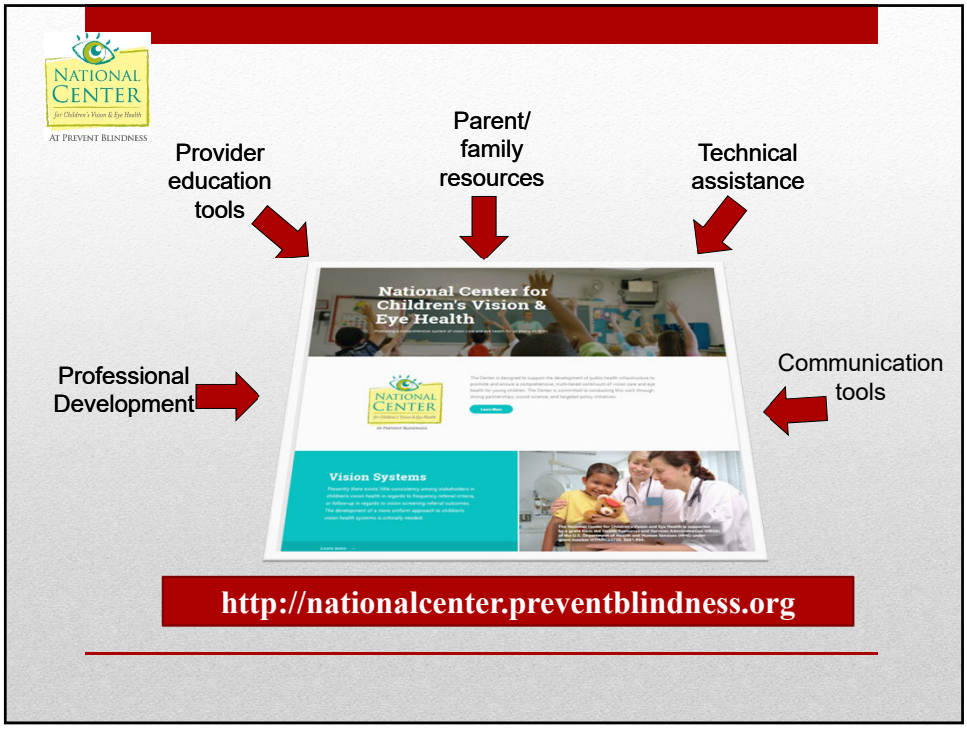
Paperback Practice Tool

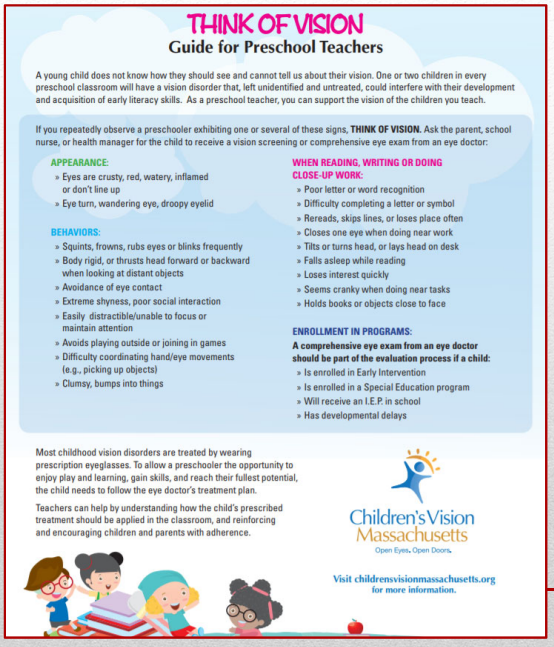
PRINCIPLES FOR PRACTICE: VISION SCREENING AND FOLLOW-UP

Vision Developmental Milestones Check-off Tool available at:

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






THINK OF VISION
Guide for Preschool Teachers

A young child does not know how they should see and cannot tell us about their vision. One or two children in every preschool classroom will have a vision disorder that, left unidentified and untreated, could interfere with their development and acquisition of early literacy skills. As a preschool teacher, you can support the vision of the children you teach.

If you repeatedly observe a preschooler exhibiting one or several of these signs, **THINK OF VISION.** Ask the parent, school nurse, or health manager for the child to receive a vision screening or comprehensive eye exam from an eye doctor:

APPEARANCE:
- Eyes are crusty, red, watery, inflamed or don't line up
- Eye turn, wandering eye, droopy eyelid

BEHAVIORS:
- Squints, frowns, rubs eyes or blinks frequently
- Body rigid, or thrusts head forward or backward when looking at distant objects
- Avoidance of eye contact
- Extreme shyness, poor social interaction
- Easily distractible/unable to focus or maintain attention
- Avoids playing outside or joining in games
- Difficulty coordinating hand/eye movements (e.g., picking up objects)
- Clumsy, bumps into things

WHEN READING, WRITING OR DOING CLOSE-UP WORK:
- Poor letter or word recognition
- Difficulty completing a letter or symbol
- Rereads, skips lines, or loses place often
- Closes one eye when doing near work
- Tilts or turns head, or lays head on desk
- Falls asleep while reading
- Loses interest quickly
- Seems cranky when doing near tasks
- Holds books or objects close to face

ENROLLMENT IN PROGRAMS:
A comprehensive eye exam from an eye doctor should be part of the evaluation process if a child:
- Is enrolled in Early Intervention
- Is enrolled in a Special Education program
- Will receive an I.E.P. in school
- Has developmental delays

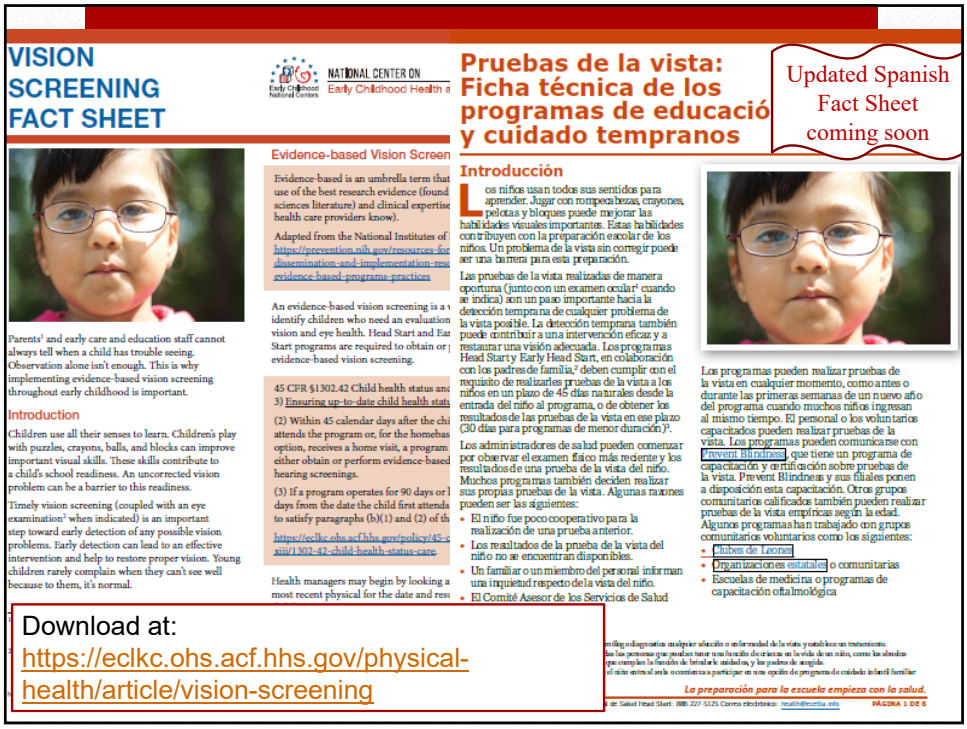
Most childhood vision disorders are treated by wearing prescription eyeglasses. To allow a preschooler the opportunity to enjoy play and learning, gain skills, and reach their fullest potential, the child needs to follow the eye doctor's treatment plan.

Teachers can help by understanding how the child's prescribed treatment should be applied in the classroom, and reinforcing and encouraging children and parents with adherence.

Children's Vision Massachusetts
Open Eyes. Open Doors.

Visit childrensvisionmassachusetts.org for more information.

https://childrensvision.preventblindness.org/sites/default/files/THINK%20OF%20VISION%2011-8-18.pdf

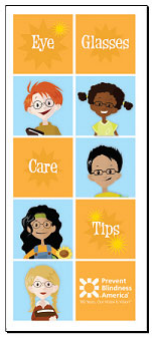


Year of Children's Vision

- http://nationalcenter.preventblindness.org/year-childrens-vision
- *Archived vision screening webinars in Resources*

Resources to Support Families . . .

Financial Assistance Programs



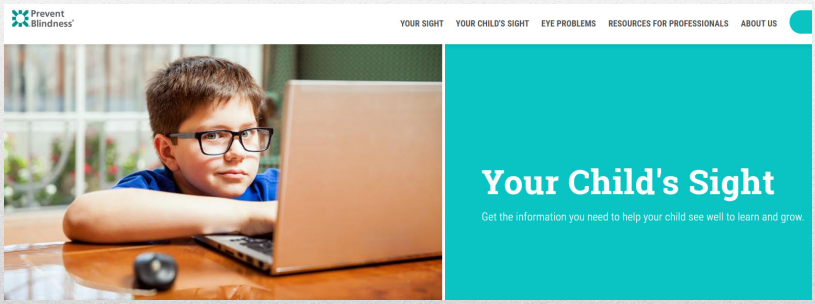
Tips for Wearing Eye Glasses https://www.preventblindness.org/your-childs-glasses

Parent Education

http://nationalcenter.preventblindness.org/resources-2

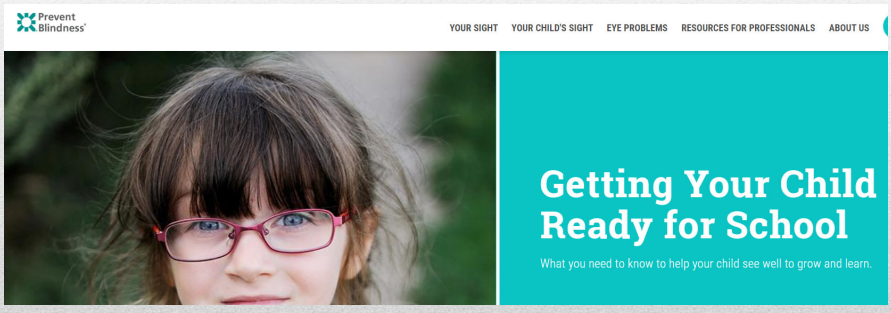
Information about Your Child's Sight from Prevent Blindness

https://www.preventblindness.org/your-childs-sight



Getting Your Child Ready for School:

https://www.preventblindness.org/getting-your-child-ready-school



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

Call to Action

- Use the info you learned to screen vision.
- Evaluate your vision and eye health program.
- Help ensure follow-up to eye care when children do not pass vision screening.

Thank you for your TIME and ATTENTION. . .

P. Kay Nottingham Chaplin, Ed.D.

kay@good-lite.com

Nottingham@preventblindness.org

304-906-2204