See What's New: Novel Eye Exam Screening Tools

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"Vision screening is a procedure performed by properly trained persons for the purpose of early identification of asymptomatic children who may have vision problems and referral to appropriate medical professionals for further evaluation."

Minnesota Department of Health

The Goal: NO EYE LEFT BEHIND

Cast a Wide net and you will definitely catch normal fish!

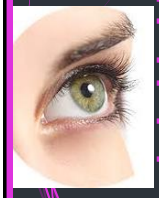
Amblyopia

- Three main reasons for amblyopia
  - Strabismic
    - Esotropia or exotropia or hypertropia
  - Deprivational
    - Cataract, corneal opacity, vitreous hemorrhage, ptosis, hemangioma
  - Refractive
    - High myopia/hyperopia or anisometropia

Newborn

- Starts with the history!!
- Goal is to identify risk factors for vision problems
  - Prematurity < 32 weeks.
  - Family history of:
    - Congenital cataracts
    - Retinoblastoma
    - Metabolic or genetic diseases
    - Amblyopia
    - Wearing glasses before 6 years of age
  - Significant developmental delay.
  - Neurological difficulties such as seizure disorders
  - Systemic diseases associated with eye abnormalities
- American Academy of Pediatrics and the National Center for Children's Vision and Eye Health (www.nationalcenter.preventblindness.org)

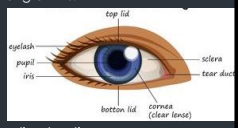
External Inspection and Observations



- Lids and lashes:
  - High enough to clear visual axis and symmetric
  - The lids should be free of lumps (chalazia/styes/hemangioma/dermoid).
  - No redness or signs of discharge along the margin.
  - The margin of the lid should be flush against the surface of the eye.
  - The child should show normal blinking during observation period.
  - Lashes should be present on the top and bottom lids of both eyes and not turn in causing them to come in contact with the eye

External Inspection and Observations

- Sclera (White part):
  - The sclera should be a shade of white.
  - There should be no new discoloration or growths.
- Iris (The color part):
  - The iris should be a complete circle.
  - Both should be the same color.
- Pupils:
  - The pupils should be clear and dark.
  - There should be no cloudiness or white discoloration.
  - The pupils should be of equal size and circular shape.

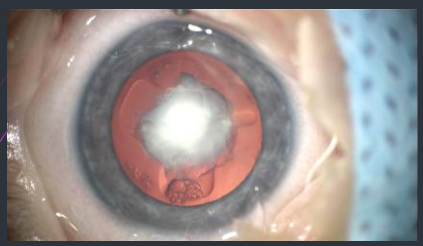


Red Reflex is the first true vision screen!

Leukocoria

- Retinoblastoma
- PHPV
- ROP
- Cataract
- Coloboma
- Uveitis
- Larval granulomatosis
- Congenital retinal fold
- Coats
- Organizing VH
- Retinal dysplasia
- Corneal opacity
- FEVR
- High myopia or anisometropia
- Myelinated nerve fiber layer
- Norrie disease
- Retinal detachment

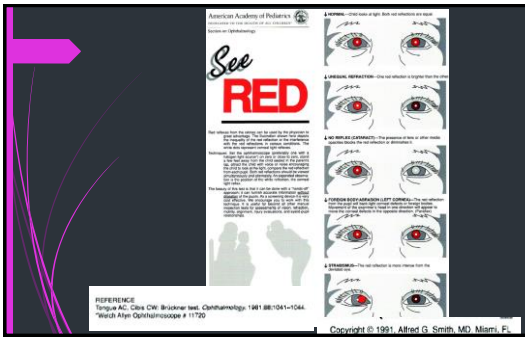
Nuclear Cataract

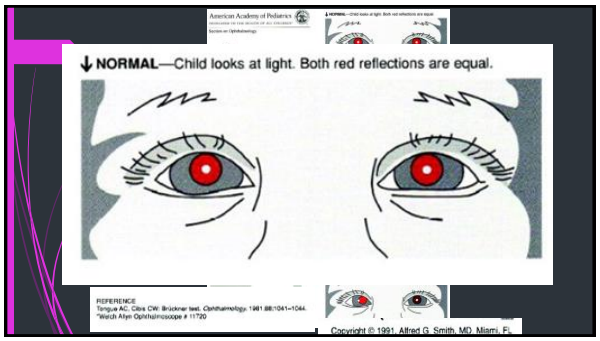


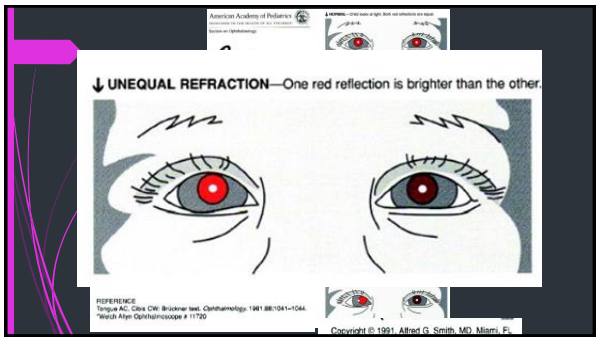
EVEN ASYMMETRY IN THE REFLEX WARRANTS REFERRAL!!!

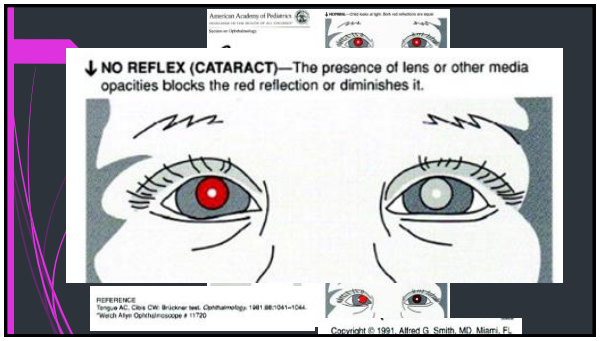
- The American Academy of Pediatrics currently recommends red reflex assessment as a component of the eye evaluation in the neonatal period and during all subsequent routine health supervision visits

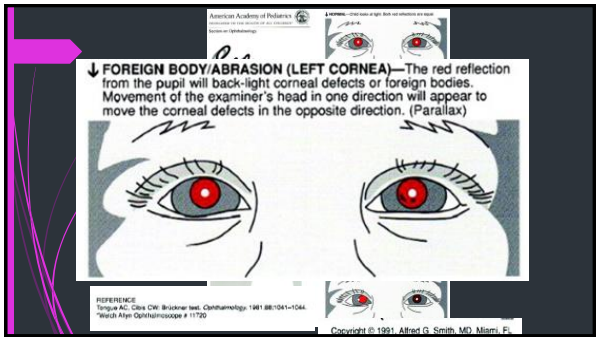
American Academy of Pediatrics, Committee on Practice and Ambulatory Medicine, Section on Ophthalmology; American Association of Certified Orthopedists; American Association for Pediatric Ophthalmology and Strabismus; American Academy of Ophthalmology. Eye examination in infants, children, and young adults by pediatricians. Pediatrics.2003;111 (4 pt 1):902– 907

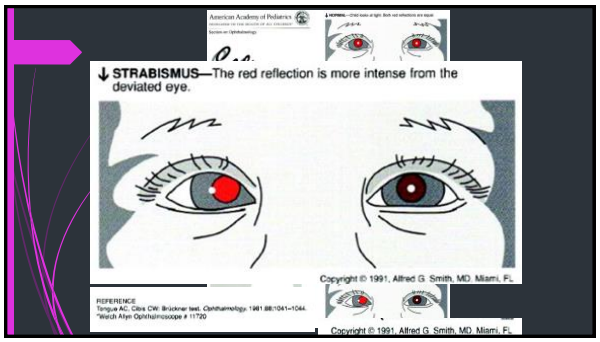












Assessing Alignment and Motility

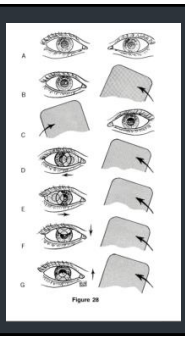
- Corneal Light reflex
  - Post newborn through 20 years of age
- Binocular Fix and Follow
  - Four months through 3 years or until visual acuity can be measured.
- Unilateral Cover Test Near and Distance
  - Near: 6 months through 20 years
  - Distance: 3 years through 20 years

Corneal Light Reflex

Esotropia vs. Pseudoesotropia

Cover Testing

- While occluding one eye you focus on the uncovered eye looking for movement of that eye to pick up fixation.
- If eye moves from in to out that is an Esotropia (D)
- If eye moves from out to in that is an Exotropia (E)
- If eye moves from up to down or down to up that is a hypertropia (F) or hypotropia (G) respectively



Distance Visual Acuity

- Three to 6 years of age
- Lea Symbols or HOTV are most well validated (can use numbers also)
- Can either have child say the name of the target or match with a card
- Must be able to correctly identify any 4 out of the 5 optotypes on the critical passing ling for age or better without a difference of two lines or more between the eyes in the PASS range.

Distance Visual Acuity

- Passing:
  - Age 3 years 10/25 (20/50) or better in each eye without a difference of two lines or more between the eyes.
  - Age 4 years 10/20 (20/40) or better in each eye without a difference of two lines or more between the eyes.
  - Age 5 years 10/16 (20/32) or better in each eye without a difference of two lines or more between the eyes.
- Age 6 years and older- Sloan letters or Snellen letters
  - 10/16 (20/32) or better in each eye without a difference of two lines or more between the eyes.

BEWARE

- Kids want to please and have the right answer!!!!
- Peekers
  - Prevent this with sticky patches or large occluders
  - NO USING HANDS
- Memorizers
  - Pick a Different line or opposite side of chart

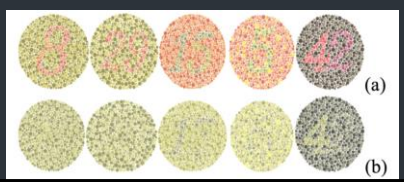
Plus Lens Screening

- If a child passes their respective distance vision screen they move onto the plus lens screen.
- Child places on +2.50 readers and is asked if the chart becomes blurry or if it is still clear.
- PASS: the chart becomes blurry indicating the glasses correct far too much hyperopia and as a result blur the patient
- Fail: the chart remains clear which indicates there may be higher levels of hyperopia that are not being noticed

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1720267/pdf/v090p00150.pdf

Color Vision Testing

- Kindergarten Males
  - Given mostly often X-linked
- Affects 1 out of 12 males
- Ishihara color plates can also use plates with shapes or have kids trace numbers



Optional Vision Tests

- Stereovision testing
- Pupillary Light Reflex
- Swinging Flashlight test for Afferent Pupillary Defect (APD)
- Instrument Based Vision Screening

Instrument Based Screeners

- PhotoScreeners
  - Use the eye's red reflex to estimate a refractive error
  - Identify other factors such as media opacity, ocular alignment, and ptosis.
- AutoRefractors
  - automated technology to estimate the refractive error of each eye
  - Most measure one eye at time which limit their ability to detect strabismus when the refractive error is normal
  - However, there are other auto refractors that can measure both eyes at the same time


PlusOptix S09 Screenshot

Common Vision Screening Instruments


Welch Allyn SureSight


Righton Retinomax


PlusOptix S12R

https://aapos.org/ahp/nurse_ppt_/nurse_ppt_lecture

Instrument Based Screeners

- Vision screening devices test for eye conditions or risk factors that may cause decreased vision or amblyopia, **they do not test for visual acuity**.
- May be electively performed on children as young as 6 months, allowing earlier detection of conditions that may lead to amblyopia.
- Good option for kids who are unable or unwilling to cooperate with routine visual acuity screening.
- Devices are recommended as an alternative (ideally more additive) to visual acuity screening with vision charts from 3 through 5 years of age.
- Not recommended for children older than 6 years of age (5yo per AAPOS) who can be screened with visual acuity charts.

Consideration for referral

Considerations:

- Age of patient
  - Passing criteria are more generous (higher thresholds) for younger children and more stringent (lower thresholds) for older children.
- Sensitivity
  - If too sensitive: high rate of detection but also high rate of referrals for false positives.
- Specificity
  - If too specific: fewer false positives but may miss some at-risk children.

AAPOS 2013 Criteria

Age, mos	Age-adjusted criteria for amblyopia risk factors			
	Anisometropia, D	Hyperopia, D	Astigmatism, D	Myopia, D
12-30	>2.5	>4.5	>2.0	>−3.5
31-48	>2.0	>4.0	>2.0	>−3.0
>48	>1.5	>3.5	>1.5	>−1.5
All ages	Manifest strabismus of >8 PD			
	Media opacity of >1 mm			

2013 Amblyopia risk factor (ARF) criteria of the American Association of Pediatric Ophthalmology and Strabismus Vision Screening Committee [3]
D , diopters; *PD* , prism diopters.

Autorefractor vs. Photoscreener

- 216 children were examined during medical mission
- Of these, 9 (4%) were found to have amblyopia risk factors based on the current referral criteria of the American Association for Pediatric Ophthalmology and Strabismus on ophthalmological examination.
- Plusoptix Photoscreener was found to have 89% sensitivity and 80% specificity;
- The SureSight autorefractor, was found to have sensitivity of 89% and specificity of 71%.

- Silbert DI, Matta NS, Ely AL. Comparison of SureSight autorefractor and plusoptiX A09 photoscreener for vision screening in rural Honduras. J AAPOS. 2014;42-4.

Validation of photoscreening technology in the general pediatrics office: a prospective study.

- Breaman J[1], Donahue SP[2]. in J AAPOS. 2016 Apr;20(2):153-8. doi: 10.1016/j.jaapos.2016.01.004.
- The first prospective, multisite evaluation of a commercially available photoscreener in the medical home.
- **METHODS**: Eleven practices in Middle Tennessee recruited over **3,100** children between 12 months and 5 years to be screened at well-child examinations.
  - Referred children received a comprehensive eye examination with cycloplegic retinoscopy. A subset of control children underwent eye examinations in an attempt to determine sensitivity and specificity.
- **RESULTS:**
  - The overall referral rate was 10%.
  - Amblyopia risk factors (ARFs) were confirmed in 47% of referred children, with positive predictive values (PPVs) of 77.8% for suspected hyperopia, 60% for myopia, 50% for anisometropia, and 44.8% for astigmatism by the 2013 guidelines of the American Association of Pediatric Ophthalmology and Strabismus Vision Screening Committee.
  - Of referred children who received follow-up, 18 (13.2%) had amblyopia.
  - No child who passed screening and had a follow-up examination had any ARFs.
- **CONCLUSIONS:** Our results replicate those of previously published field studies and provide prospective evidence that photoscreening is an effective tool for children aged 12-72 months.

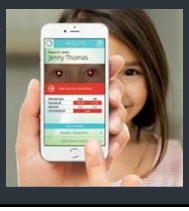
Is Instrument Based Screening Better?

- A randomized, controlled, multi-centered cross-over study demonstrated photoscreening to be superior to direct testing of visual acuity for screening of well children ages 3-6 years in the pediatric office.

Salcido AA, Bradley J, Donahue SP. Predictive value of photoscreening and traditional screening of preschool children. J AAPOS 2005 Apr;9(2):114-20.

Up and Coming…..

- GoCheck Kids Vision Screening App
- Eye Spy 20/20



Reimbursement for Instrument Based Screening

- There is a CPT code for this!!!
- For devices performing automated photoscreening or autorefraction:
  - 99174 is used for devices that require off-site interpretation
  - 99177 for devices that provide immediate pass/fail results
- For screening tests of visual acuity
  - 99173 is used for tests such as wall charts or computerized eye charts where the child identifies letters or symbols.

Take Home Points!

- Vision Screening starts at birth!
- Photoscreeners and Autorefractors DO NOT replace visual acuity testing
- If any doubt or question PLEASE send child for comprehensive exam!

Resources

- Your friendly neighborhood pediatric ophthalmologist
  - Email: laura.heinmiller@parknicollet.com
  - Cell: 610-304-5931
- http://www.health.state.mn.us/divs/cfh/topic/visionscreening/index.cfm
- Visual System Assessment in Infants, Children and Young Adults by Pediatricians
  - American Academy of Pediatrics Policy Statement
  - Pediatrics. January 2016. Volume 137. Issue 1
- Procedures for the Evaluation of the Visual System by Pediatricians
  - American Academy of Pediatrics Clinical Report
  - Pediatrics. January 2016. Volume 137. Issue 1