

Disclosures

Joanne Angle Investigator Award from Prevent Blindness 2016





Overview

- so Early Detection
- So Vision screening practices in US
- Birth to Three Study
 - Visual developmental assessment
 - Relevance to you
 - Pilot studyResults
- Future Directions
 Future Directions



Visual Development — Birth to Three Years

- Development of age appropriate visual functions
 - o Ex: Social smile established at 2 months
- Normal visual input is critical for child's development
- so Equally important to have normal visual input for visual development to occur
- - o Motor developmental milestones
 - Overall development
 - Cognitive ability



Causes of Visual Impairment

- so Amblyopia (Lazy Eye)
 - Developmental disorder that results in decreased vision in one or both eyes in the absence of eye disease
 - o Prevalence 2-3% in the US in children under 6 years of age
 - o Preventable and can be successfully treated if identified early
 - If not treated
 - Irreversible
 - Long term visual and functional consequences for the child



Causes of Visual Impairment

- n Amblyogenic risk factors
 - Significant (equal) refractive errors (farsightedness, nearsightedness, astigmatism) i.e Isoametropia
 - o Significant (unequal) refractive errors i.e Anisometropia)
 - o Eye misalignment i.e Strabismus
 - o Childhood cataracts or other media opacities
 - Prevalence 8-10% in US
- Eye Diseases − Rare
 - o Prevalence 0.1%



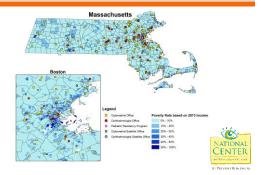
Detection Of Vision Problems

- What can we do to detect them early?

Comprehensive eye exams	Vision Screenings		
Performed by eye doctors	Performed by lay personnel (NP, Pediatricians, Early educators)		
Limited access to providers*	Relatively easy access		
Time consuming, ?efficiency	Efficient, accurate, economical		



Access to Pediatric Eyecare in MA



Children Who Should Bypass Vision Screening and Go Directly to Eye Exam

- Readily observable ocular abnormalities
- First-degree relatives with strabismus or amblyopia
 Cognitive impairment
- Systemic conditions with associated ocular abnormalities
- Hearing impairments
- Neurodevelopmental disorders
- Speech/language delays
- Autism spectrum disorders
- Prematurity and/or low birth weight



Vision Screenings in the US

- n Mandated by Federal Programs
 - o Early and Periodic Screening, Diagnosis, and Treatment Program
 - o Administration for Children and Families- Head Start/Early Head Start
 - o Maternal and Child Health Bureau
- so Recommendations by professional organizations
 - o American Academy of Ophthalmology (AAO)
 - o American Academy of Optometry (AAO)
 - American Academy of Pediatric Ophthalmology and Strabismus (AAPOS)
 - o American Academy of Pediatrics (AAP)
- Durited States Preventive Services Task Force (USPSTF)



Traditional vision screening

- Depth Perception (Stereopsis)

- no Red reflex testing
- 50 These tests are extremely difficult to perform in children below three years of age, even with training!



Vision screening in children from birth to three years

- Where do these children "collect"?
 - Pediatrician's offices
 - o Early Education and Care centers (EECs)
- - Vision screening to be performed or results obtained within 45 days
 - of enrollment (within 30 days if a Migrant program)
 - No recommendation for procedure to use
- Marican Academy of Pediatrics guidelines (AAP)
 - Pediatricians



AAP recommendations

TABLE 1 Periodicity Schedule for Visual System Assessment in Infants, Children, and Young Adults

Assessment	Newborn to 6 mo	6-12 mo	1–3 y	4-5 y	6 y and olde
Ocular history	x	X	x	X	x
External inspection of lids and eyes	x	x	x	X	x
Red reflex testing	x	X	x	X	x
Pupil examination	x	x	x	x	×
Ocular motility assessment	-	x	x	x	x
Instrument-based screening ^a when available	-	ь	X	X	c
Visual acuity fixate and follow response	xf	x	X	_	
Visual acuity age- appropriate optotype ^d assessment		. <u></u>	xe	x	x

The American Academy of Ophthalmology (A60) has recommended instrument-based screening at age 6 m.o. However, the rate of false-positive results is high for this age group, and the likelihood of ophthalmic intervention is low. **A future AA0 policy statement will likely reconcile what appears to be a discrepancy.

Instrument-based screening at any age is suggested if unable to test visual acuity monocularly with age-appropriate optotypes.





Birth to three — Bottom Line

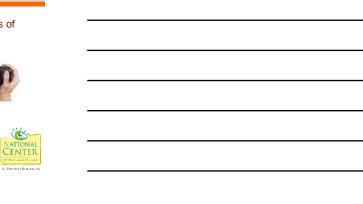
- vision screening tools should be studied for accuracy and feasibility
 - o Research is limited
- Current recommendations are either not feasible or efficient or economical
 - Patient cooperation and time consumption are the most common barriers for vision screening in this age group
- Bottom line We do not know what tools to use in this young population

What do we do then?

- Conduct more studies to test current methods of vision screening
 - o Instrument based vision screening
 - Gaining popularity
 - · Research is emerging
 - Cost







Birth To Three Study

Birth to Three Project

- № National Center for Children's Vision and Eye Health
 - Established by Prevent Blindness in 2009 and supported, in part, by the Maternal and Child Health Bureau
 - Represented by Ophthalmology, Optometry, Pediatrics, Family Advocates, and Public Health
 - Supports infrastructure to "promote and ensure comprehensive multi-tiered continuum of eye health and vision care for young children"
 - · MA selected as a pilot state
 - CVMA 75 member state-based coalition
 - · Feasibility of visual developmental questionnaire



Visual developmental questionnaire

- Developmental assessment in pediatric practice PEDS/ASQ
- n Impact on motor, social and emotional development
- - Eg: 2 month infant should make eye contact with caregivers
 - o Early toddler should start taking interest in playing with toys
- ∞ Scandinavian experience
- so Vision in current developmental tools
- - Visual developmental assessment
 - Risk assessment



Visual developmental milestones	
Red Green Orange Blue Pincer Grasp 24: Poir Rec I CALLED TO THE STATE OF THE STATE	
Visual developmental questionnaire	
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7. Does auyone in the family have crossed-eyes or one eye that turns in a different direction? 8. Was suppose in the family have crossed-eyes or one eye that turns in a different direction? 8. Was suppose in the family hadd to water glasses at age of eyyounger? Vivoles your budy have, and also place have to stay in the abogist direction of the place have the stay of the about the more than 5 days?	
7- view you entery the control was start per parties or to stay to the start per parties of the control was a stay; 11. Was your child at least 6 weeks premature or born with low hirth weight (1.5-ft)s or least)	
Why is this relevant to you?	
∞ Address gaps in vision screening recommendations	
∞ Potential for the new tool to be administered in a	
cost-effective, feasible way with minimal training	

Goals of this study

- - Newly developed tool
 - Visual developmental questionnaire
 - o Currently available tool
 - · Instrument based screening

∞ To

o Gold standard eye exam by masked eye doctors



Methods

∞ Venue

Early Education & El sites in Boston and Springfield

- Age appropriate questionnaire completed by parent
- Eye exam conducted on the On-Sight mobile van







Results

Sample

- o 249 recruited (Target 250)
 - Males 141
 - Females 108
- o Average age 23.14 mo (3-36 months)
- o 26 questionnaires were excluded from analysis
 - 21 filled out incorrect surveys
 - 3 incomplete
 - 2 missing



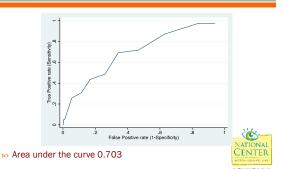
Performance Metrics For The Survey

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

Two reasonable questionnaire cut off scores with moderate sensitivity and specificity



Survey Performance (continued)



Survey Performance (Continued)

Risk factor	OR (95% CI)	P Value
Survey Score <7	3.81 (1.82-8.00)	0.000
Survey Score <8	4.32 (2.05-9.10)	0.000
Age*	1.01 (0.97-1.06)	0.606
Age**	1.01 (0.97-1.05)	0.660
Sex*	0.47 (0.21-1.05)	0.065
Sex**	0.45 (0.20-1.01)	0.053

- Odds of failing the eye exam increases 3x for score of <7 and 4x for score of <8</p>
- Age and Sex were not significant risk factors



Welch-Allyn Spot







Spot Vision Screener - Results

Spot Screener Results	ARF -	ARF +	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
Pass	159	13	62.9 (44.9-78.5)	89.8 (84.4-93.9)	55.0 (38.5-70.7)	92.4 (87.4-95.9)
Fail	18	22				

Testability

- Missing spot data in 14
- 6 truly untestable (defined as unable to measure after three failed attempts)
- 8 untestable because Spot screener manufacturing criteria is only for >6 months

Summary of Results

Questionnaire:

- ldentified two reasonable pass/fail scores with moderate sensitivity and specificity
- ₅ Good area under the curve (0.703)
- Odds ratio analysis identified strength of the predictor variables (score, age, gender) to the odds of having vision problems

Spot vision screener:

- so High specificity and moderate sensitivity
- nate high



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<u>Limitations:</u>	
© Limited sample size	
 Age wise analysis was not feasible Not enough children in 0-6 mo group 	
Future directions:	
 Large scale study Refine current version Grant opportunities 	
A PERSON BARRAN	
Conclusion of today's presentation	
 ✓ Normal visual development is critical for overall development ✓ Early detection of vision disorders ensures successful treatment 	
☑ Current vision screening practices for children below three years of age are unclear	
☑ There is a need for evidence based support for validation of current tools and novel tools	
☑ New visual developmental assessment tool shows promise in detection of vision disorders	
☑ Large scale studies are needed to confirm preliminary results NATIONAL NATION	
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Questions for the presenters?	
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