701 - B622

Ability to Measure Refraction Using the Retinomax Refractometer in African-American and Hispanic Preschool Children: The Multi-Ethnic Pediatric Eye Disease Study

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Purpose: To determine ability to measure refractive error with the Retinomax refractometer in African-American and Hispanic preschool children.

Methods: A population-based cohort of children 6-72 months of age was tested with the Retinomax device for refractive error following cyclopentolate eye drops. The right eye was tested first. Up to three attempts were made on each eye to achieve a confidence level of ≥8 in both eyes, which was considered a successful test. Age, gender, and ethnic association with testability were tested using chi-square and Mantel-Haenszel procedures.

Results: Refractive testing was attempted in 1220 Hispanic and 1236 African-American children. Overall, 88% of Hispanics and 85% of African-Americans (p=0.02) were successfully tested. Testability remained constant at 54% from age 6 to 18 months of age; increased to 79% in children 19-24 months of age; 90% in children 25-30 months of age; 95% in children 31-36 months of age; and over 97% in children 37-72 months of age (p<0.001). There were no ethnicity (p=0.09) or gender (p=0.68) related differences in testability when adjusted for age.

Conclusions: Reliable cycloplegic refractions can be achieved with the Retinomax refractometer in the majority of children as young as 6 months of age. More than 90% of children are testable by age 2 years. Testability is not related to gender or ethnic differences.

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Screening Preschoolers With Welch Allyn SureSight™ Vision Screener: Methods to Increase the Positive Predictive Value for Astigmatism

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Purpose: Amblyopia is a common cause of vision loss that may be prevented by early detection and treatment of underlying etiologies. Thus, efforts to screen young children for amblyogenic factors are important. Recently, the vision in preschoolers (VIP) study found that the Welch Allyn SureSight™ Vision Screener (WASS) has the potential to be an effective preschool screening tool. However, a field validation study of the WASS referral criteria identified by the VIP study to screen preschoolers with Welch Allyn SureSight™ Vision Screener:

Methods: As part of an ongoing vision screening program, The Tennessee Lions Outreach Program screened preschoolers for amblyogenic factors with the WASS during the spring of 2005. The WASS referral criteria identified by the VIP study to have 90% specificity were used. Children who were referred by the WASS underwent additional screening with the MTI Photoscreener. If any crescent was present on the MTI photograph, the child was referred for a formal examination including cycloplegic refraction. The standard criteria for “amblyogenic factors” published by the AAPOS Vision Screening Committee were used as exam failure criteria.

Results: Between March and May 2005, 1093 children ages 1-5 years old were screened with the WASS. Nine-hundred and sixty-nine children (87%) passed the initial screening. Ninety-nine children (9%) were referred from the screening for possible amblyogenic factors. Thirty-eight children (4%) had suspicious static visual acuity or eye alignment. Of these, 78% had abnormal eye examination using retinoscopy with dilation. The PPV of preschool vision screening.

Conclusions: The WASS has the potential to be effective in screening preschoolers for amblyogenic factors. Problematic over-referrals can be decreased with appropriate secondary screenings. Future research is needed to help define a more appropriate cutoff level for suspected amblyopia with the WASS.

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Referral Criteria for the Welsh-Allyn SureSight in Childhood Astigmatism Screening
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Purpose: Effective screening can help prevent amblyopia development in children. The Vision Initiative for Children (VIP) recently showed that the Welsh-Allyn SureSight (WASS) can be an effective screening instrument. However, in a recent field validation study, the WASS had a high over-referral rate for astigmatism (11.5%) and a low positive predictive value (PPV) of 44% using the referral criteria proposed by the VIP. An over-referral rate of 40% at 0.5D and a PPV of 90% with 0.5D cutoff values (CR: ARVO, 2005). Our aim was to refine the cylinder cutoff value in order to increase the positive predictive value of the WASS.

Methods: As part of an ongoing vision screening program, the Tennessee Lions Program has screened children for amblyogenic factors including astigmatism, anisometropia, hyperopia and high myopia. Using the published Phase I VIP criteria for 90% specificity, cylinder values greater than 1.5 would result in referral for possible astigmatism. Referred children were examined by local Ophthalmologists and the results were used as the gold standard. The data analysis looked to determine the PPV with differing cyl values ranging from 1.5-2.3 by intervals of 0.1 to determine the most effective cylinder value for screening purposes.

Results: The program screened 3238 children ages 1- to 5-years-old with the WASS. Eighty-nine percent (2980/3238) of the children passed the initial screening and nine percent (298/3238) were referred for MD/OD formal examination by the WASS for possible astigmatism. Of the 298 children referred an MD/OD with suspected cylinder, 142 (48%) have thus far received a comprehensive examination and cycloplegic refraction. Forty-seven of these children had astigmatism ± 1S in one or both eyes. The positive predictive value for a WASS C-value ≥ 1.5 was 41%. The PPV increased incrementally for each additional 0.1 unit increase in referral criteria up to approximately 2.1D which had a PPV of 60%. Except for two patients with astigmatism of 2.5D and 2.25D, no child with astigmatism ≥ 2.0 would have been missed by adjusting the referral criteria to 2.1D. There was a small but significant relationship between the reliability value of the WASS reading and the PPV.

Conclusions: Over-referrals for suspected astigmatism can be decreased with appropriate alterations in the astigmatism referral value, and the PPV can be 60% when the cutoff value for referral is increased to 2.1D. Very few children with substantial magnitude astigmatism are missed by not referring those children having WASS cylinder readouts of 1.5-2.0. A modification of the WASS with multiple sets of referral criteria based upon desired sensitivity, specificity and predictive values would be welcome.

Support: Welsh-Allyn, Lions Eye Charities, Lion's Club International Foundation, RPE

703 - B626
Accuracy of Lea Symbol and Random Dot E Testing by Trained Community Lay Personnel in a Large Preschool Vision Screening Program

Purpose: Random Dot E (RDE) and Lea Symbol (LS) testing are often recommended components of preschool vision screening guidelines to identify children with decreased central visual acuity and/or strabismus. This study seeks to better define the utility of using RDE and LS by trained community lay screeners for identifying preschool-aged children with abnormal vision.

Methods: With Institutional Review Board approval, the Vision Initiative for Children (VIC), has developed a training program incorporating the Maternal Child Health Bureau/National Eye Institute (MCHB/NEI) Interim Recommendations to certify and support community lay preschool vision screeners in the use of the LS and RDE tests. Using HIPAA-compliant documentation, screeners are encouraged to report their results to VIC. Local community optometrists and ophthalmologists are also encouraged to report their examination findings on children who failed their vision screening. All results are entered into the Program's Access database.

Results: Since 2001, 12,856 screening results have been reported on children 36-99 months of age. 2398 (19%) failed the combined RDE + LS, the RDE alone, or the LS alone. Local community optometrists and ophthalmologists have submitted examination results on 227 children who failed their vision screening. 94 (41%) children had significant amblyogenic factors using the American Association of Pediatric Ophthalmology and Strabismus (AAPOS) guidelines. For the combined RDE+LS the positive predictive value (PPV) was 55% and the negative predictive value (NPV) was 66%. There was a PPV of 44% and a NPV of 63% for the RDE alone. There was a PPV of 48% and a NPV of 83% for the LS alone.

Conclusions: If these results from a small sample of completed exams are an accurate reflection of all children screened in general, they suggest the RDE and LS can be used by trained community lay screeners with moderate accuracy in identifying preschool-age children with significant amblyogenic factors. Getting exams on children who fail their screening remains a significant challenge.

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Effectiveness of Screening for Amblyopia: Non-Compliance With Referral

Purpose: To specify causes for unsuccessful referral by the Child Health Care Center (CHC) in case of suspected amblyopia.

Methods: The Rotterdam AMblyopia Screening Effectivity Study (RAMSES) is a 7-year, prospective birth cohort study comprising 4624 children. Children underwent preverbal eye screening at ages 9, 14 and 24 months and screening with measurement of visual acuity at ages 36, 45 and 54 months. Children referred after a positive screening test as well as children from the birth cohort under treatment for amblyopia or other eye-disorders were registered. The parents whose children had been referred but were not registered as being treated, were contacted to find causes for unsuccessful referral.

We made a distinction between misclassified referral recommendation, misunderstood parental non-compliance and true non-compliance. The last group was presented a semi-structured qualitative interview.

Results: One out of five children had at least one positive test result. 40% of these were not being reported as being treated. About one sixth were misclassified as non-compliant. In the majority of cases the parents reported that they had been instructed to consult their GP (misclassified referral recommendation). Indicated reasons for true non-compliance were parental disagreement with the test result, family circumstances, lack of insight in referral, language barrier and consultation with an optometrist or optician. In most cases visual acuity at age 7 was sufficient, however.

Discussion: The complexity of the inadequate referral pattern warrants further analysis.

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Automated Detection of Accommodative-Convergence-Miosis Dysfunction in Children

Purpose: To determine whether an automated device designed to detect refractive overcorrection in adults could be used to detect occult accommodative-convergence deficits or strabismus in children.

Methods: 39 children who presented to a community pediatric ophthalmic practice underwent comprehensive clinical and orthoptic assessment. Among these patients, 24 (13M/11F; mean age 6-9 yrs) were found to have clinically significant convergence insufficiency or strabismus, and 15 (8M/7F; mean age 9-6 yrs) demonstrated no clinical abnormality on standard testing. All 39 children completed a 3-minute test with the TrilirIS C0000 automated dynamic pupillometer (Hamamatsu; Hamamatsu, Japan), which dynamically monitors bilateral pupil position (convergence/divergence) and pupil diameter (miosis/mydriasis) via 2 CCD cameras as a tri-chromatic accommodative stimulus is moved in and out from far point to near point at a rate of 1 diop/sec (3 cycles in 3 min). The rate of inward/outward stimulus excursion is thus slower than nearly its distance to its subject. Printouts of the binocular traces for convergence and pupillary diameter for the 39 subjects were coded, randomized, and subjectively assessed as normal (0), abnormal (3), or inconclusive (1) by a pediatric ophthalmologist (CM), an orthoptist (CH), an eye resident (GL) and a non-pediatric ophthalmologist (WES). The independent masked scores of all 4 judges were tallied for each subject, and those with a cumulative score ≥4 were deemed positive.

Results: Among 24 children with accommodative esotropia (n=17) or strabismus (n=7), the mean defect score was 6.75 with 19 (79%) screening positively. Among 15 referral patients failing to demonstrate clinical abnormality, the mean defect score was 2.0 with 10 (67%) screening negatively.

Conclusion: Accommodative insufficiency and strabismus may contribute significantly to learning disabilities of school age children. The unadapted TrilirIS adult pupillometer appears to have potential as a screening device for this age group. Ancillary evidence from this study population indicates that a shorter test (1 minute) with a nanotechnologized animated stimulus may enhance its practicability and specificity.

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Analysis Of Claims For EPSDT And Visual Acuity Screening In Pediatric Primary Care Settings From Alabama Medicaid
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Purpose: To examine rates of visual acuity screening in the medical homes of children aged 3-18 years who were eligible to receive Medicaid from the state of Alabama during fiscal year 2003.

Methods: Data from claims filed with a procedure code for an initial or periodic EPSDT or visual acuity screening were obtained from Alabama Medicaid for children aged 3-18 years. The number of children eligible to receive Medicaid benefits was estimated using data from the HCFA 416 form for fiscal year 2003.

Results: Percentages of children receiving EPSDT exams (claims filed / children eligible) were highest for 3 and 4 year-olds, 50% and 55%, respectively, gradually dropped to a stable value of about 30% for ages 7 - 15 years, before dropping monotonically to less that 10% at age 18. The percentage of children with claims for visual acuity (VA claims filed / EPSDT claims) was lowest at age 3 years (11%) but doubled between ages 4 (23%) and 5 (46%) and reached a constant value slightly above 50% for ages 6 - 15 yrs. About 45% of older teens received VA exams.

Conclusion: Rates of visual acuity screening in the medical home are limited by attendance to EPSDT visits. Efforts to convince primary care providers to perform visual acuity screening would have the greatest impact at pre-school age (potentially doubling coverage from about 25% to 50%). Increased vision screening of pre-schoolers should prove to be an effective intervention to improve school readiness and to prevent permanent vision loss by treating amblyopia. Further improvements in vision screening in the medical home would be more difficult, requiring broader interventions to improve attendance to well child visits.

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