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Primary vision screening: outcomes from referrals unrelated to visual acuity

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Abstract

Aim: **To evaluate the outcomes of children referred from school vision screening with an abnormality other than reduced vision and to use the results to inform our future screening protocols.**
Methods: **Service review carried out via a retrospective review of case notes. Children included were referred from Orthoptic School Screening Services on behalf of the Newcastle upon Tyne NHS Foundation Trust during the academic year September 2009 to August 2010. Referrals were based on our local vision screening protocol. Children were eligible for inclusion if they passed the visual acuity assessment but had abnormal eye movements, strabismus, or any ocular pathology.**
Results: **7600 children were screened across the entire service. Ninety-four of 7600 (1%) children were referred because of an abnormality other than reduced acuity. Of these, 3/94 (3%) declined referral and 14/94 (15%) were not brought to their first appointment, leaving 77 (82%) of those referred attending for outpatient appointments. Fifty-three of 77 (69%) were discharged without receiving treatment.**
Conclusions: **The information from this service review supports the use of cover test in the primary screening setting. Binocular single vision was restored in 45% (10/22) of treated patients. However, the testing of ocular motility, convergence and a binocular vision assessment are not supported, meaning that these tests have now been removed from our primary screening protocols.**

Key words: Child, Screening, Strabismus, Vision

Introduction

Screening can be defined as the identification of a previously undiagnosed or recognised disease and/or condition by the application of tests, examinations or other procedures which can be rapidly applied to the whole population.[1] The aim of a screening test is to separate those who have the target condition being screened for from those who do not.[1] Screening programmes should conform to the Wilson and Jungner criteria[1] and have defined parameters and protocols which highlight the condition to be screened for, the tests to be used, pass/fail criteria and referral pathways. Conditions that are the subject of screening programmes should have a treatment available that is acceptable to patients.

In 1989 the British Paediatric Association set up a multi-disciplinary working group with the specific remit of reviewing routine health checks for young children. The current fourth edition of the report from that working group, *Health for All Children*, was published in 2003. It presented the guidelines for preventive health care, health promotion and an effective community-based response.[2] Specific to vision, the working party recommended that the gold standard assessment of vision would be at age 4–5 years by an orthoptist using a linear logMAR test.[2] The report also recommended a pass level on the linear logMAR test of 0.200.[2] No additional guidance was offered with regard to the supplementary tests that are routinely carried out by primary screening orthoptic services.

Additional guidelines on vision screening produced by the Royal College of Ophthalmologists support the recommendations of the *Health for All Children* report and advocate an orthoptic vision check in school.[3] The current policy on vision screening from the National Screening Committee (NSC) advises an orthoptic-led vision screening service be offered between the ages of 4 and 5 years.[4]

The Newcastle upon Tyne Hospitals NHS Foundation Trust is responsible for the orthoptic screening services in Northumberland, Newcastle upon Tyne and Gateshead. Implementation of the vision screening guidelines produced from the *Health for All Children* report started in 2006, with Northumberland being the first area in the region commissioned by the Trust to offer an orthoptic vision screening for children aged 4–5 years commencing in September 2007. Newcastle upon Tyne was the next area to begin in September 2008, followed by Gateshead in the academic year commencing in September 2009.

All children registered at a school in these areas are offered an orthoptic assessment during reception year. Consent is gained via an opt-out system where parents have to return a slip to opt out if they do not want the test to be carried out. Referral pathways for children who fail are in place to filter children either into the Hospital Eye Service (HES) or to the Community Optometrist, dependent upon the problem identified. Children with a

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Table 1. Screening fail criteria

Test	Fail criteria
Vision	0.225 or worse (Keeler Crowded logMAR) 0.125 or worse (Crowded Kay's Pictures)
Cover test	Presence of any manifest strabismus whether intermittent or constant for any test distance Poorly controlled (assessed for via recovery) or significant (approx. 10^{Δ} or more by observation) heterophoria at any test distance
Ocular movements	Any abnormality of ocular movements. Any lid anomaly
Convergence	Inability to converge to 6 cm
Binocularity	Inability to overcome a 20^{Δ} base out prism

vision between 0.225 and 0.475 logMAR in one or both eyes and no other ocular abnormality are referred to the Community Optometrist. Those with vision of 0.500 logMAR or worse, any strabismus or extra-ocular muscle (EOM) abnormality are referred to the HES.

The aim of this service review was to evaluate the outcomes from referrals to the HES for children with a vision of 0.200 logMAR or better either eye but who fail due to another eye defect or ocular abnormality, in order to inform our future screening protocols.

Methods

We carried out a retrospective service review of all children who were screened during the academic year September 2009 to July 2010. They were enrolled in reception class at any school (state, independent or special) within the three localities covered by the Newcastle upon Tyne Hospitals NHS Foundation Trust. All children would have been aged 4–5 years when screening was carried out. Screening in all areas is carried out by a band 6 orthoptist.

Screening tests

Tests performed were:

- assessment of uniocular vision on Keeler Crowded logMAR or Crowded Kay's Pictures if the child was unable to name or match letters;
- cover test to assess ocular alignment at 1/3 m and 6 m;
- assessment of ocular motility;
- assessment of convergence via target to nose;
- assessment of binocularity assessed via the 20^{Δ} base out prism reflex test (not performed if manifest strabismus detected).

The assessment of binocularity was trialled in one of the three areas (Northumberland) only, to see whether it gave any additional information or benefit to the orthoptic assessment. A summary of the referral criteria from primary vision screening can be found in Table 1.

Inclusion criteria

Children were eligible for inclusion if they passed the visual acuity assessment in screening but failed one of the additional tests offered.

Exclusion criteria

No exclusions were in place for this service review.

Table 2. Treatment rates per strabismus type

	No. (%) treated	No. (%) observed	No. (%) discharged at first visit
E ($n = 11$)	3 (27%)	4 (36%)	4 (36%)
X ($n = 1$)	0	1 (100%)	0
E(T) ($n = 4$)	3 (75%)	1 (25%)	0
X(T) ($n = 28$)	8 (29%)	15 (54%)	5 (18%)
ET ($n = 11$)	7 (64%)	1 (9%)	3 (27%)
XT ($n = 1$)	1 (100%)	0	0
Total ($n = 56$)	22	22	12

E, esophoria; X, exophoria; E(T), intermittent esotropia; X(T), intermittent exotropia; ET, esotropia; XT, exotropia.

Table 3. Treatment rates per EOM anomaly

	No. (%) treated	No. (%) observed	No. (%) discharged at first visit
IV nerve palsy ($n = 4$)	0	3 (75%)	1 (25%)
Brown's syndrome ($n = 4$)	0	0	4 (100%)
Duane's syndrome ($n = 1$)	0	1 (100%)	0
EOM imbalance in upgaze ($n = 4$)	0	2 (50%)	2 (50%)
Total ($n = 13$)	0	6	7

Results

Across the three areas 7600 children were screened. A total of 965 children (13%) failed their eye test: 871/965 (90%) with reduced vision plus/minus strabismus and the remaining 94/965 (10%) for an abnormality other than reduced vision. Fourteen of 94 (15%) patients failed to attend their initial appointment in the HES and 3/94 (3%) declined the referral, leaving 77 available for analysis. Two children were re-referrals back into HES following previous failure to attend appointments.

Fifty-six of 77 children failed with an intermittent or constant heterotropia or a significant heterophoria, 13/77 were referred with an EOM abnormality, and the remaining 8 children were referred with additional conditions.

Twenty-two of 56 (39%) received treatment for strabismus whilst under HES care. Twelve children were given the treatment to improve cosmesis (glasses $n = 9$, surgery $n = 3$). Ten children were given treatment to restore or improve binocular vision (BV) (surgery $n = 5$, glasses $n = 3$, minus lenses treatment $n = 1$, exercises $n = 1$). The remaining 34/56 (61%) were observed or discharged. See Table 2 for treatment rates per strabismus type.

Thirteen of 77 patients were referred with an EOM anomaly. See Table 3 for treatment rates per EOM anomaly. Seven of 13 (54%) children received just one appointment and were discharged on the first visit after the condition was highlighted to them. The remaining 6/13 children (46%) were observed for between two and four visits to ensure their condition was not changing or worsening. No child was kept under observation due to poor co-operation at testing.

The remaining 8/77 children were referred with a variety of other conditions. See Table 4 for referral reason and treatment rates. Only children referred with pathology received active treatment. Referral reasons

Table 4. Referral reasons for other ocular conditions and treatment rates

	No. (%) treated	No. (%) observed	No. (%) discharged at first visit
Convergence insufficiency ($n = 3$)	0	3 (100%)	0
Pathology ($n = 3$)	2 (67%)	1 (33%)	0
BV problems ($n = 2$)	0	1 (50%)	1 (50%)
Total ($n = 8$)	2	5	1

were: ptosis, eyelid cysts and severe photophobia. Treated conditions were ptosis (lid surgery $n = 1$) and eyelid cysts (medical care $n = 1$). The child referred with photophobia was kept under observation.

Discussion

The results of this service review show that 69% (53/77) of children referred to the HES with a condition other than reduced vision were discharged without receiving any active treatment. However, referral did result in accurate diagnosis, good advice and a clear decision about management. It could be argued such advice may save future resources, referral from the optometrists for a pre-existing condition and reassurance for parents.

Of the remainder, 24/77 children (31%) received treatment, the majority of which was for strabismus. Treatment for those referred with strabismus restored or improved binocular functions in 45% (10/22).

No child in our cohort referred with an ocular motility problem, convergence insufficiency or a potential BV problem received treatment. All children referred with primary convergence insufficiency were asymptomatic although a reduced near point of convergence was recorded; they were therefore discharged from the HES with advice to seek referral should symptoms occur. Those referred with a potential BV problem showed an inability in the original screening setting to pass the motor fusion test (20^{Δ} base out prism); on retesting adequate binocular functions were demonstrated and they were therefore discharged.

Implications for practice

A decision to stop testing convergence has been taken, as a symptomatic child can present to clinic at a later date either via their general practitioner (GP) or their own optometrist. Motor fusion testing has also been removed, as both children who failed were found to have a normal examination on retesting. Ocular motility remained as part of our screening programme until September 2014. Further monitoring of patients referred via school screening showed no active treatment for these patients and the decision was made to remove it as a test.

Our screening programmes will continue to include an assessment of ocular alignment via the cover test to ensure children who may benefit from treatment are referred into the correct service, as surgical procedures are available if the condition warrants treatment.[5] It is accepted that screening programmes will inevitably also detect some non-target conditions, such as lid abnormalities, iris abnormalities and other ocular pathology; these will continue to be referred to the HES for further investigation.

Implications for further research

Further service reviews are currently in progress to evaluate the role of the cover test in primary vision screening. Children from the 2013–2014 cohort who failed only the cover test will be examined to assess the treatment outcome and benefit of referral. At present 45% of the children referred with only a cover test abnormality receive additional, beneficial treatment.

Conclusion

The results from this review support the removal of EOM, convergence and BV testing from our primary vision screening programme. At present the cover test and vision testing by an orthoptist will continue as it can be argued an orthoptic-led service using non-professionally trained staff would miss children with treatable conditions.

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