Commentary (Series editor: David Taylor)

Screening and surveillance for ophthalmic disorders and visual deficits in children in the United Kingdom

Children are a priority in "Vision 2020", the World Health Organization's recently launched global initiative for the prevention of avoidable visual impairment by the year 2020.[1] Successful implementation in the United Kingdom will depend to a greater extent on improvements in secondary and tertiary preventive strategies, to treat and rehabilitate affected children, than on the currently limited primary preventive approaches to the major paediatric eye diseases.

Early detection is important to the successful management of children with ophthalmic disorders. In recognition of this, over the past few decades in the UK diverse activities have been implemented to promote early detection of specific ophthalmic conditions in children as well as to monitor their visual development. These comprise physical examinations by various health professionals and effectively form a continuum of screening and surveillance whose purpose and value is best considered in terms of sequential gain. Although now well established, these practices have arisen haphazardly and few have been subject to rigorous evaluation of their benefits. Indeed the scientific basis of some has been seriously questioned.[2] In the UK they are undertaken within the broader context of a national programme of child health surveillance.[3] Changes in this, such as the increased emphasis on health promotion,[3] increasing responsibilities of general practitioners,[4] and reconsideration of the roles of health visitors and school nurses,[5] consequently have implications for ophthalmological screening and surveillance.

The Children's Sub-Group of the National Screening Committee (NSC) of the UK has recently reviewed screening for ophthalmic disorders and visual deficits in children for the first time. The NSC categorised existing activities into five separate screening programmes for retinopathy of prematurity (ROP) in preterm/low birthweight infants; congenital cataract and other ocular anomalies in newborn and young infants; amblyopia and impaired vision in preschool age children; impaired vision, mainly due to refractive errors, in school age children; and congenital colour vision defects in those of secondary school age. The evidence base for each programme, from completed studies, work under way, and expert opinion, was reviewed. Based on this review, national recommendations (www.nsc.nhs.uk) have been made by the NSC. In this paper we summarise each of these recommendations and discuss their implications for both clinical practice and research.

(A) Neonatal period and early infancy

(1) NSC recommendation: There should be a programme of screening for retinopathy of prematurity (ROP) comprising examination of very low birthweight or premature babies by an ophthalmologist competent to detect this condition and advise on management.

This reiterates existing guidance.[6] A national investigation of the organisation and effectiveness of current practice regarding screening for ROP has been completed recently. This is part of an on-going programme of work on the effects on visual outcome of timing of screening examinations as well as method and extent of treatment (L Haines, on behalf of the Research Unit of the Royal College of Paediatrics and Child Health, personal communication). Together with other research in this area, this will contribute to both refining screening guidelines in the UK and informing their implementation. The importance of longer term ophthalmological review of all children born preterm or of low birth weight, who are also at greater risk of other ophthalmic disorders, has been highlighted by a number of recent studies,[7] although formal guidance regarding the content and structure of this process is currently lacking.

(2) NSC recommendations: Newborn screening for media opacities, comprising examination of the pupillary red reflex, is widely accepted, but training and supervision must be improved. A repeat examination not later than six weeks, for cataract and other eye anomalies is recommended.

This reinforces previous advice to inspect the eyes, evaluate the red reflex, and inquire about visual behaviour of newborn children. It refines previous guidance[3 8] about repeating this examination as well as checking for the presence of squint and assessing visual behaviour at 6–8 weeks, to ensure that this occurs *by* 6 weeks. This practice has not been formally evaluated at national level but in a recent study of children in the UK with newly diagnosed congenital cataract, less than half were detected at the routine newborn and 6–8 week examinations.[9] Important variations are thought to exist in the practices and training of paediatricians currently responsible for these examinations.[10] Similar findings regarding the detection of congenital hip instability and congenital heart disease through these examinations[11 12] have contributed to an increasing interest in reviewing their content and timing.[13] This offers an opportunity to reconsider the ophthalmic component, especially the training and evaluation of those responsible, and the methods of recording examinations and their outcomes. Interdisciplinary development of programmes for training and assessment of health professionals involved in ophthalmic screening and surveillance has been advocated[8] but not widely undertaken. The role of alternative strategies—for example, using automated imaging techniques and other health technologies, could be profitably investigated. However, the rarity of the target disorders will continue to make formal evaluation of different approaches difficult. Thus, as with other areas of vision screening, it is necessary to gather further research evidence to inform both training and practice.

(B) Infancy to primary school age

NSC recommendations: With the exceptions of the recommendations above, under the age of 4 years, identification of vision defects should rely on parental concern and professional awareness rather than a formal screening programme. Specifically, orthoptic and health visitor primary screening for vision defects in this age group should be discontinued. Children in this age group suspected of having a vision problem should be referred.

This new recommendation is consistent with the increasing emphasis on health promotion in the national

programme of child health screening and surveillance.[3] However, there is limited knowledge of how children with ophthalmic disorders in the UK are currently identified and of their pathways of referral to ophthalmologists. Parents are often aware of a cosmetically obvious problem, such as a squint, before its identification by a health professional,[14 15] but may notice visual loss itself less frequently, often being alerted by features arising secondary to established visual deficits.[9 16 17] Parental concern does not always ensure early diagnosis by health professionals.[9 14 15 18 19]

Equally, there has been limited study of the influence of social class or ethnicity on the use of paediatric ophthalmic services in the UK, although there is evidence that children from lower socioeconomic groups are less likely than others to attend preschool vision screening programmes and to complete treatment programmes.[20–23] Notably, an association between greater deprivation and higher age at presentation of asymptomatic anisometropic amblyopia is reported to have diminished in one region in the UK since the introduction of secondary screening by orthoptists.[24] Asian children with amblyopia have previously been reported to present significantly later than their white peers[25] but whether such differences exist currently is not known. Socioeconomic and ethnic group variations in the use of ophthalmic services by adults[26 27] and in the use of other health services by children and young people,[28 29] support further investigation of the existence and impact of inequities in detection of ophthalmic disorders and the degree to which they are addressed by formal screening at different ages.

(C) Primary school age

NSC recommendations: Orthoptists should screen children in the age group 4–5 years, with the aim of testing all children by the age of 5. The mechanism for further assessing screen positive children should be defined locally. Many cases can be managed in the community, according to the protocol devised by the paediatric ophthalmic team, but children with a squint and those whose acuity is not normal with refractive correction will need to be seen by ophthalmologists.

There are considerable resource and organisational implications arising from this new recommendation, which draws substantially on a recent review of preschool vision screening[2] commissioned by the NHS Centre for Reviews and Dissemination. It is advocated as an *interim* measure pending the results of further research planned and under way on diverse aspects of amblyopia[30 31] (Wright C, Clarke M, on behalf of the steering committee, Multicentre RCT of treatment of unilateral straight eyed amblyopia detected at preschool vision screening, personal communication). This diverse research agenda includes the natural history of untreated amblyopia; the long term stability of vision after cessation of occlusion treatment; the benefits and disbenefits to the individual and to society in general of early detection and treatment; the risk and outcome of visual loss affecting the non-amblyopic eye; and, finally, the effectiveness of different treatment strategies and the degree to which they are influenced by age at onset of treatment.

(D) Secondary school age

NSC recommendations: There is insufficient evidence to judge whether or not any screening should be offered after primary school entry (currently most often at the age 11). As an alternative to routine visual acuity tests, children should be provided with information and/or education about eye care, including the need for satisfactory visual acuity for driving, availability of free eye tests, and the need to check their colour vision if they have specified career ambitions. However, the lack of any evidence as to whether children would use or benefit from such information, concerns about equity, and the relatively low cost of screening together mean that a case can still be made for testing of children, particularly in socially disadvantaged areas where parents and children may not respond to an information leaflet.

This recommendation departs from previous guidance and reflects the paucity of information about the detection and functional impact of uncorrected refractive errors and congenital colour vision defects. Variations in implementation of examinations of visual acuity and colour vision have been identified,[8 32] with serious deficiencies in testing conditions and procedures[33–35] and delays in examination being reported.[36] The future of school health nursing is uncertain[5] and a recent review seriously questioned the value of the school entry general medical examination.[37] It is not known whether the prevalence of myopia in the UK is increasing in a fashion similar to the striking secular trends in other populations[38] or whether the previously discussed socioeconomic differences in access to health care might also be expected to affect children's access to optometrists. Should the extensive research under way on myopia, including clinical treatment trials, sufficiently clarify underlying mechanisms, then early detection and treatment to reduce myopic progression might be justifiable. There remains no clear evidence for an association between colour vision impairment and educational difficulties arising from the use of colour in educational materials[39] and there is a suggestion that, despite screening, affected boys are ill informed about the possible occupational significance of their disorder.[34]

Further work is required to determine the functional impact of uncorrected refractive errors and colour vision defects and to understand how affected individuals use information about ophthalmic disorders in making decisions about social activities and career choices. In the meantime, there remains a varied list of occupations from which individuals with amblyopia[40] and colour vision defects[34] are precluded. The ophthalmic community could profitably investigate the scientific basis of these exclusion criteria.

(E) All ages

(1) NSC recommendation: Children suspected of having serious vision disorders need a full range of paediatric, developmental, ophthalmological, and genetics services.

Assessment of all children with serious visual loss by a district multidisciplinary team has been advocated for some time[8] but has not yet been implemented universally. Thus currently it is probable that many children with visual loss which is isolated or purely due to ocular disease are managed solely by ophthalmic professionals. Further work is required to improve availability of multidisciplinary assessment.

(2) NSC recommendation: Children with other major disabilities should be examined by an orthoptist and an ophthalmologist. It is considered good clinical practice that babies with a family history of an inherited eye disorder should have the opportunity of consultation with an ophthalmologist and that all infants and children with other neurodevelopmental disorders and in particular those with hearing loss should have an expert eye examination as a matter of routine.

Successful, universal implementation of this long standing recommendation depends on effective liaison between paediatric, primary care, and ophthalmic health professionals and services. Given that about half of all visually impaired children in the UK have other impairments,[8] further specific guidance is likely to be required on the organisation, structure, and content of the diverse disorder-specific schedules that are needed. This will require further investigation to determine the extent to which children

with relevant non-ophthalmic conditions undergo routine assessment by ophthalmologists and the outcomes of these examinations.

Conclusion

Effective methods of early detection of ophthalmic disorders and visual deficits in children are critical to the optimal management of affected children and their families. The need to achieve this must be balanced against the financial, time, and personal costs to individuals, the healthcare system, and society in general of ineffective, inaccurate, inefficient, or costly activities aimed at achieving early detection. The recommendations of the National Screening Committee have considerable implications for professional training, resource allocation, and service organisation nationally and locally: these now require wide debate. Equally, there is a need to gather further research evidence. The ophthalmic community is well placed to take the lead in both arenas.

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