Original Papers

Vision screening in Primary Care: how is it performed?

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Published in Internet:
11-september-2013

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Abstract

Introduction: amblyopia is the most common cause of preventable vision loss in developed countries and it affects 2-5% of the general population. Strabismus affects 3-6%. The primary objective of the vision screening program is early detection of these defects.

Objectives: to verify the existence of basic material in the medical office for vision screening and to evaluate the basic knowledge that professionals who do it should have.

Material and methods: the assessment of the existence of material in the medical office and the basic knowledge recommended by the Spanish Association of Paediatric Primary Care was performed by a survey of 29 questions. The results were subjected to statistical analysis: descriptive analysis, bivariate analysis using t-test and analysis of variance.

Results: 56 people answered our survey: 40 doctors and 16 nurses from 15 Basic Health Areas. Material absence in surgeries: 32.1% optotype, 51.8% +2D lens, 10.7% ophthalmoscope. Ignorance of material utility: 71.4% reading distance optotype, 71.4% optotype reading direction, 60.7% optotype appropriate age, 35.7% +2D lens glasses. Ignorance referral criteria: 92.9% visual acuity at 4 years, 53.6% fixed strabismus, 53.6% latent strabismus, 33.9% anisometropia. Doctors correct answers: 49.89%. Nurses correct answers: 37.23%.

Conclusions: lack of suitable material in surgeries and staff ignorance of how to use it is assessed. Lack of knowledge about normal visual development, exams to carry out and reasons for referral are also revealed. There is difference in screening if it is done by the doctor or nurse. Lack of knowledge is similar in our environment.

Key words:
• Vision screening
• Visual acuity
• Amblyopia
• Estrabismus

Cribado visual en Atención Primaria, ¿cómo se realiza?

Resumen

Introducción: la ambliopía es la causa más común de pérdida de visión prevenible en los países desarrollados, la padece el 2-5% de la población. El estrabismo afecta al 3-6%. El objetivo primordial del programa de cribado visual es detectar precozmente estos defectos.

Objetivos: constatar la existencia de material básico en las consultas para realizar cribado visual y evaluar los conocimientos básicos que deberían tener los profesionales que lo realizan.

Material y métodos: evaluación de la existencia del material en las consultas y los conocimientos básicos recomendados por la Asociación Española de Pediatría de Atención Primaria. Se realizó mediante una encuesta de 29 preguntas. Los resultados fueron sometidos a análisis estadístico: análisis descriptivo, bivariante mediante T-test y análisis de la varianza.

How to quote this article: Martín Martín R, Bilbao Sustacha JA, Collado Cucò A. Vision screening in Primary Care: how is it performed? Rev Pediatr Aten Primaria. 2013;15:221-7.

Resultados: contestaron nuestra encuesta 56 personas: 40 médicos y 16 enfermeras de 15 Áreas Básicas de Salud. Ausencia de material en consultas: 32,1% optotipo, 51,8% gafas con lentes +2 dioptrías, 10,7% oftalmoscopio. Desconocimiento de la utilidad del material: 71,4% distancia lectura optotipo, 71,4% dirección lectura optotipo, 60,7% optotipo adecuado a la edad, 35,7% gafas con lentes +2 dioptrías. Desconocimiento de los criterios de derivación: 92,9% agudeza visual a los cuatro años, 53,6% estrabismo fijo, 53,6% estrabismo latente, 33,9% anisometropía. Respuestas correctas de los médicos: 49,89%. Respuestas correctas de las enfermeras: 37,23%.

Conclusiones: se constatan la falta de material adecuado en las consultas y el desconocimiento del personal sobre cómo usarlo. Se pone de manifiesto el desconocimiento del desarrollo visual normal, las exploraciones que se deben realizar y los motivos de derivación. Y se observan diferencias en el cribado si este lo realiza el médico o la enfermera. La falta de conocimientos es similar en nuestro entorno.

Palabras clave:
• Cribado visual
• Agudeza visual
• Ambliopía
• Estrabismo

INTRODUCTION

Amblyopia is the most common preventable cause of vision loss in developed countries. It affects 2 to 5% of the general population. Strabismus affects 3 to 6% of the latter; and out of those affected with strabismus 33 to 50% eventually develop amblyopia. It is estimated that up to 20% of children of all ages suffer from significant refractive errors.

In the first six years of life, visual pathways are malleable. During visual development, the brain must receive equally clear and focused images from each eye to "learn" how to see. Any factor interfering with the visual learning process of the brain will result in a decrease in visual acuity (VA).

Early detection of defects of any kind is the main purpose of having a vision screening programme. In this study we attempted to analyse how the screening is implemented in Primary Care.

Objectives

- Verifying whether medical offices have the basic materials needed to carry out vision screenings.
- Evaluating the basic knowledge that the professionals performing vision screens should have, as specified in the 2008 guidelines of the PrevInfad group of the Spanish Association of Primary Care Paediatrics (AEPap).

MATERIALS AND METHODS

We designed a survey to assess the availability of materials in the offices and the basic knowledge specified in the PrevInfad recommendations. We formulated 29 questions; seven were about materials and 22 about examinations that the PrevInfad guidelines considered basic, reasons for referral to the ophthalmologist, and age at time of referral.

As for the materials that should be available in every office, we designed the questions keeping in mind the recommendations of PrevInfad and the 2008 Catalonia Programme of Healthcare Promotion and Preventative Activities for Paediatric Ages (PAPPS).

To evaluate the knowledge of healthcare professionals, we designed questions based on the PrevInfad guidelines, shown in **Tables 1 and 2.**

The survey dada were subjected to the following statistical analyses: descriptive analysis, bivariate analysis (t-test), and analysis of variance.

RESULTS

Of all the individuals we asked to participate in our survey, 78.87% responded; including 88.88% of the physicians (40 out of 45) and 61.53% of the nurses (16 out of 26). Out of the 56 individuals that participated, 40 were physicians and 16 were nurses working in the 15 Basic Healthcare Areas (BHA) of Tarragona, distributed in the following manner:

Table 1. Eye exam according to age

Age	Exam
Newborns	Simple inspection of the eyes of the newborn with a light (preferably an ophthalmoscope) looking for eye disorders: nystagmus, absence of red reflex, leukocoria, malformations
Infants until age when vision screening can be performed	• Monitor of ocular alignment. Manifest strabismus is considered pathological at any age, and any type of strabismus is pathological starting at six months. • Monitor vision developmental milestones.
Children 3 to 4 years of age	Visual defect screening: • Stereoscopic vision test • Visual acuity assessment by means of paediatric eye charts • Simple eye examination with a light, checking the alignment of the visual axes, the corneal light reflex, and performing the cover-uncover test
Children older than 4 years	• Detection of visual defects past the age of four is mandatory if no screening was done before with the described procedures • Due to the possibility of developing amblyopia up to 6 or 7 years of age, visual acuity will be monitored at least until that age
School children	Measurement of visual acuity in the context of routine health exams until maturity

Source: PrevInfad-AEPap, 2008.

46.4% from publicly managed BHA centres, 37.5% from BHA centres run by private management organisation 1, and 16.1% from BHA centres run by private management organisation 2.

These were the results of the survey:

An ophthalmoscope was available to 89.3% of the centres. There was no optotype in 32.1% of them. Out of the sites that had an optotype, 37.5% had one for each age group (drawings, incomplete squares, and alphabet charts); 17.9% only had the alphabet chart, and 21.4% only had the drawings chart.

Of all respondents, 89.3% were unaware of the name of the optotype they used (Wecker). The percentage that did not know the distance from which the chart should be read (2.5 metres) was 71.4%. Among respondents, 28.6% knew the chart has to be read horizontally, 48.2% would have the patient read vertically, and 12.5% would have it read at random.

Furthermore, 64.3% knew which optotype was suitable for four-year-olds (Snellen E or a similar one), and 60.7% knew which was most suitable for six-year-olds (alphabet chart).

Frames with +2D lenses were available for 48.2% of respondents. Out of the latter, 64.3% knew how to use them (hypermetropia screening), 50% knew that the appropriate age to do the screening is six years, and 41.1% reported they would screen at four years of age.

Table 2. Reasons for referral to a specialist

Manifest strabismus at any age and any type of strabismus at six months of age or later. Anomalies in normal visual performance
Every newborn and infant with eye disorders
Children four years of age and older that do not show stereoscopic vision
Any child with observed manifest or latent strabismus (triggered by the cover-uncover test) or intermittent strabismus reported by the family, even if it cannot be seen in the office
Decrease in monocular visual acuity in either eye: • Children 3 through 5 years of age: visual acuity below 0.5 • Children 6 through 7 years: visual acuity below 0.66 • Children 8 years and older: visual acuity below 1
Difference in visual acuity between both eyes greater than 10%, even if VA falls within the acceptable range

Source: PrevInfad-AEPap, 2008.

The Ishihara test was available to 62.5% of respondents. Its purpose for the screening of colour vision defects was known by 89.3%; and 71.4% reported they would perform this test between six and eight years of age.

Although a stereoscopic vision test was not available to 92.9% of respondents, 60.7% knew it is used for early diagnosis of amblyopia and testing of binocular vision. Among the respondents, 28.6% would perform it at three years of age, the youngest age at which it can be applied.

The VA that warranted a referral at four years of age was known by 7.1%; while 71.4% knew the value for six years of age.

A difference of 3 points in the VA of both eyes would be given a priority referral by 60.7% of practitioners; while 33.9% would give priority referrals to patients with lower VA values similar for both eyes.

Manifest strabismus was considered pathological since birth by 46.4% of practitioners, 25% thought it was pathological starting at six months, and 26.8% starting at 12 months.

Latent strabismus was considered pathological starting at six months from birth by 46.4% of practitioners, while 42.9% considered it was pathological after 12 months of age.

A three-month-old child seen for the first time and presenting with manifest strabismus would be referred to a specialist by 53.6% of practitioners, while 32.1% would wait for six months of age, and 12.5% would do it after 12 months of age.

A six-month-old child with an eye suspected to turn outwards would be referred to a specialist by 33.9% of practitioners, even if this could not be seen during the visit, if the parents had reported seeing it at home; 53.6% would monitor its evolution.

Of all practitioners, 58.9% knew how to use the Hirschberg test, and 62.5% knew that it can be used in children as early as 4 to 6 months after birth.

The purpose of the cover-uncover test was known by 60.7% of practitioners, though 75% did not know the minimum age at which it could be administered.

The red reflex examination would be used by 78.6% to assess for the transparency of ocular media and to rule out leukocoria.

To learn whether the job category could influence the answers we performed an analysis that

Figure 1. Correct answers of physicians and nurses to ten of the questions included in the survey

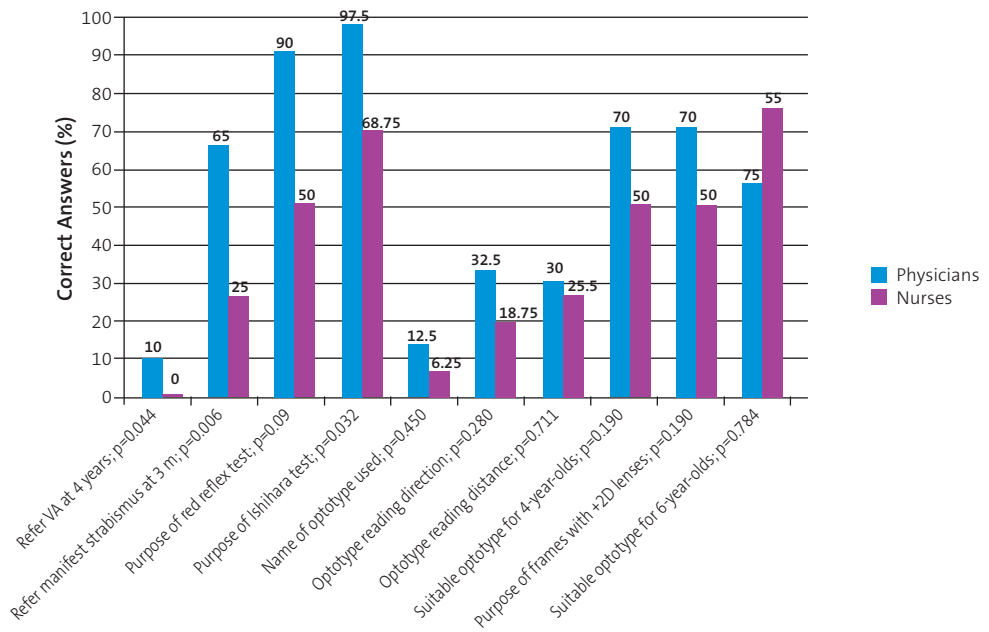


Tabla 3. Correct answers in function of work environment

Overall answers	Mean	Percentage	Range
Private management 1	10.61	46.17	3-16
Public management	10.80	46.99	3-16
Private management 2	10.22	44.44	7-16

showed a statistically significant difference in the total number of correct answers for physicians and for nurses (p = 0.007).

On average, physicians answered 11.47 questions correctly (49.89%; 95% confidence interval [CI 95%]: 45.20 to 54.58), and the range was 3-16. Nurses answered 8.56 questions correctly on average (37.23%: CI 95%: 28.52 to 45.94) and the range was 3 to 16. **Figure 1** shows the answers of physicians and nurses to ten of the survey questions.

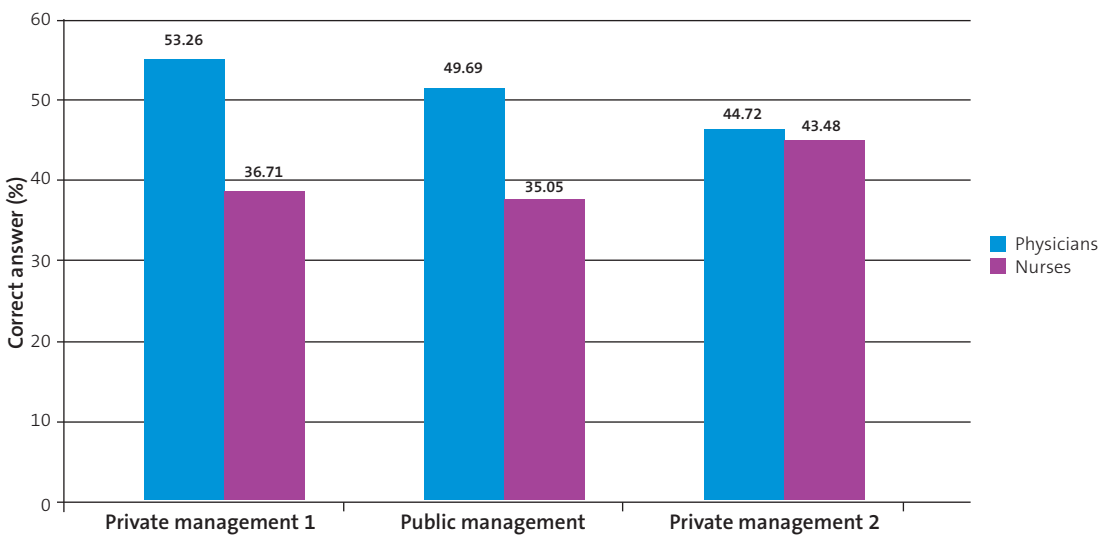
To know whether the work environment of the professionals, that is, whether they worked in a publicly managed centre or in a centre of one of the two privately managed organisations, could influence the results, we compared the answers for the three organisations. **Table 3** shows these results. We did not find any statistically significant differences between the three (p=0.922).

We analysed whether there were differences among professionals working in each of the different work environments. Neither the percentage of correct answers of physicians nor that of nurses showed statistically significant differences between these organisations (p=0.482 and p=0.859, respectively). **Figure 2** gathers the correct answers of physicians and nurses in each of the three types of centres.

DISCUSSION

The essential requirements to perform a vision screening correctly are having access to adequate materials, knowing how to use them, and understanding the characteristics of vision in each age group, what the red flags are, and when to refer to a specialist. This can hardly be achieved when a third of respondents have no optotypes and only a little over a third has optotypes for each age group. Two thirds of practitioners did not know how far

Figure 2. Correct answers of physicians and nurses in each of the three organisational structures



the child had to read the chart from, nor in which order. Nurses performed the screening in many BHA, but less than a fifth of them knew the reading order, and only one fourth knew the reading distance.

We could add to all of the above the disadvantages that come with the optotype that they were using (Wecker).

According to the guidelines of the PrevInfad group, practitioners ought to use, ideally, optotypes that allow the determination of the full range of VA; that is, charts going from 0.1 to 1 on the decimal scale. This is possible in optotypes that have at least ten rows, such as the Snellen chart, or the new logarithmic optotypes. The charts must be read from the top down, with each row being read horizontally and skipping none of the letters, first with each eye separately, and then with both at the same time. It is considered that a row has been read correctly if the patient does not make more than two mistakes in it. The VA will be that corresponding to the row above the row the patient fails to read.

The **optotype** available at the centres is not any of those recommended by the Catalonia PAPPS (Allen, Pigassou, Snellen E). We learned that the optotype available was the Wecker drawing or alphabet chart, or both. The Wecker chart does not cover the full range of VA. This can cause some problems when it comes to diagnosing an anisometropia. Its diagnosis requires a 10% or greater acuity difference between both eyes, or a difference of three or more rows in the full decimal scale. In the Wecker optotype, the last two rows correspond to 0.66 and 1. That means that there is a difference of more than 3 points between them. If a child sees the 0.66 row with one eye and the 1 row with the other, the physician has to make a referral to an ophthalmologist. But this chart does not let us know whether the child could read one of the intermediate VA rows with one of his eyes, for instance, the 0.8 row (since the chart does not have one), which would have made the referral unnecessary.

If an optotype with rows for all the values of AV were available—for instance, the Snellen chart—the exam would be more accurate. However, this one needs to be read from a distance of 5 metres, and our offices are not that long, a fact that would affect the interpretation of the results.

Conclusions

- Our study evinces the lack of materials for visual screening in many offices, and the lack of knowledge of healthcare staff as to how to use them.
- We saw that healthcare professionals had poor knowledge of what constituted normal visual development in childhood, what exams need to be performed depending on the patient's age, and the circumstances under which they should refer the patient to a specialist.
- The knowledge required for vision screening was low among all professionals, but there was a difference between physicians and nurses.
- The lack of knowledge on paediatric vision screening does not vary according to the work setting, and is similar throughout the whole area under study.
- Although primary care is the pillar of healthcare in our country, and preventative medicine should be its flagship, healthcare professionals in our environment are far from having sufficient knowledge to perform a vision screening correctly.

CONFLICT OF INTERESTS

The authors declare that they had no conflict of interests when it came to preparing and publishing this paper.

ACRONYMS

BHA: Basic Healthcare Areas • **VA:** visual acuity • **CI 95%:** 95% confidence interval • **PAPPS:** Programme of Healthcare Promotion and Preventative Activities.

RECOMMENDED BIBLIOGRAPHY

- Angulo S, Saiz A, La Vid J, Fernández O, Martínez J, Cañamares S. Campaña de detección de la ambliopía mediante el test de Brückner: resultados finales. Arch Soc Esp Oftalmol. 1992;62(4):281-6.
- Delgado Domínguez JJ. Detección de trastornos visuales. Recomendación. En: Recomendaciones PrevInfad/PAPPS [on line] [updated 2007 july; consulted on 30/08/2013]. Available on www.aepap.org/previnfad/rec_vision.htm
- Farràs Cubells O. *Screening* oftalmológico en consulta de Atención Primaria. Congreso SEPEAP, Granada, 2006 [on line] [consulted on 30/08/2013]. Available on www.sepeap.org/imagenes/secciones/Image/_USER_/Talleres_screening_oftalmologico.pdf
- Flores Visiedo CM. Detección precoz de la ambliopía. Pediatr Integral. 2005;9(6):419-25.
- Matilla MT, Buena G. Valoración de la agudeza visual en niños de edad preescolar. Gaceta Óptica. 2004; 387:24-5.
- Mengual E, Hueso JR. Ambliopía. Actualización en oftalmología pediátrica, Vol 1. EUROMEDICE. Madrid: Ediciones Médicas S.L.; 2003. p. 17-29.
- Merino Moína M, Delgado Domínguez JJ. Grupo PrevInfad/PAPPS. Taller: Detección de problemas visuales en los niños: cuándo y cómo. I Jornadas de Actualización en Pediatría de Atención Primaria. Madrid, noviembre 2008 [on line] [consulted on 30/08/2013]. Available on www.ampap.es/docencia/pdf/taller_problemas_visuales.pdf
- Protocolo de Actividades Preventivas y de Promoción de la Salud en la Edad Pediátrica. Generalitat de Catalunya. Departament de Salut; 2008. p. 79-90.
- Puertas Bordallo D. Exploración del niño estrábico. Detección precoz. Pediatr Integral. 2002;6(7):585-94.
- Puertas Bordallo D. Problemas oftalmológicos en Atención Primaria. En: AEPap ed. Curso de Actualización Pediatría 2012. Madrid: Exlibris Ediciones; 2012. p. 413-28.
- Thompson JR. The incidence and prevalence of amblyopia detected in childhood. Public Health. 1991; 69(6):796-8.

Annex. Terms and concepts	
Wecker optotype	Reading distance, 2.5 meters. Eight rows of letters that get smaller from the top row down. VA is represented as a fraction to the right of the screen, with values corresponding to (0.1), (0.12), (0.16), (0.25), (0.33), (0.5), (0.66), and (1) in decimal notation.
Ophthalmoscope	Essential to assess the transparency of the ocular media and detect congenital cataracts and secondary amblyopia if early treatment has not occurred.
Hypermetropia	Congenital physiological defect. May correct itself by 6 years of age. Past this age, hypermetropia is always considered pathological. It is diagnosed after testing VA by placing +2D lenses in front of the eye or using cycloplegic refraction to inhibit accommodation. It may lead to amblyopia or strabismus if there is a difference in VA between the eyes.
Amblyopia	Unilateral or bilateral reduction in VA due to insufficient stimulation of the brain during the period of vision development. Causes: refractive errors (strabismus), anisometropia, and blockage of the visual axis (cataract, corneal opacity...). It is treated by stimulating the visual development of the amblyopic eye and penalization of the healthy eye by means of intermittent occlusion or inhibiting accommodation. Treatment is more efficacious the earlier it is implemented and it has low efficacy at later ages.
Strabismus	Anomalous alignment of the eyes by which both visual axes do not fixate on the same object at the same time. If it is congenital or appears early it causes suppression amblyopia. The development of amblyopia does not depend on the angle or amount of eye deviation. Therefore, its early detection is considered an essential goal of vision screening, as slight deviations of the visual axis can lead to serious amblyopia.
Manifest strabismus	Pathological from the first day of life or the time it is first detected. Refer to the ophthalmologist as soon as it is diagnosed.
Latent strabismus	Misalignment of the eyes in some gaze positions after six months of age. It is sometimes reported by the family as an intermittent turn that happens under specific circumstances and that we do not manage to reproduce during the visit. Even if we do not see what the family is telling, and especially if they report the eye turning outward, we will refer the child to the ophthalmologist.
Stereoscopic vision	Ability to perceive three-dimensional depth by combining two similar but not identical images into a single one. Depth perception requires binocular vision. This ability is frequently impaired in amblyopia. There are various tests to assess for it (TNO...) that may be used starting at three years of age.
Dyschromatopsia	Deficiency in colour perception. Diagnosis is only of possible interest for future consultations. It is detected by means of the Ishihara test. It does not require treatment or a referral.

VA: visual acuity.