Short Research Article

Comparative Analysis of State Vision Screening Guidelines on the Leading Cause of Preventable Pediatric Vision Loss

ABSTRACT

Aims: To assess current school vision screening guidelines of states spread across different regions of the United States to inform quality guideline parameters and help combat preventable pediatric blindness.
Study design: Cross-sectional comparative analysis.
Methodology: States were first ordered alphabetically and then selected using an online random number generator (Alphabet Inc., Mountain View, California). States were selected until 13 available screening guidelines were identified. Each guideline was assessed using a 10-point multi-factorial scoring criteria detailed in Table 1. Descriptive statistics (mean and standard deviation) were calculated for each scoring criteria using Microsoft® Excel (version 16.63.1, Redmond, WA).
Results: Most state guidelines included what ages to screen (84.62%, 11/13), how to screen (84.62%, 11/13), and how to follow-up with students to arrange (92.31%, 12/13) and confirm eye care delivery (76.92%, 10/13). Sadly, only the minority of state guidelines described at least two main causes of amblyopia (46.15%, 6/13), and a less than one-third of school nurse vision screening guidelines discussed the window of time to save vision in amblyopia (30.77%, 4/12). Worse yet, very few nurse vision screening guidelines explained that subjectively a child can't tell you if they are at risk of developing amblyopia (15.38%, 2/13), or included two treatments for amblyopia (7.69%, 1/13) in the vision screening educational program.
Conclusion: This study found that most of the assessed vision screening guidelines outlined the process of screening and follow-up but failed to emphasize why screening is important, causes, and treatment options for amblyopia. Gaps in these training guidelines may contribute to delayed recognition and treatment for amblyopia—the leading cause of irreversible pediatric vision loss. Further improvements to vision screening guidelines are needed for school nurses and paraprofessional staff in the majority of the states evaluated.

Keywords: Amblyopia; Lazy Eye; Vision Screening; Pediatric Blindness

1. INTRODUCTION

Amblyopia, also called lazy eye, is the leading cause of preventable pediatric vision loss [1]. It occurs early on in a child's life when the neural connections of the brain are developing with the eyes. Unfortunately, when the brain does not properly obtain stimulation from one eye, it gradually loses neural connections with that eye and ultimately the ability to see from that eye and control its position, hence lazy eye [2]. After age 7, structural and functional brain damage of the occipital lobe may be permanent [3]. However, amblyopia is often reversible if treated before the age of 5 [4,5]. A 2020 study published by Fu et al. in the British Journal of Ophthalmology recently determined that the 95% confidence interval of amblyopia prevalence is between 1.17% and 1.78% [6]. The most common cause of amblyopia is uncorrected refractive error. Alternatively, more serious pathologies (cataracts, eyelid ptosis, vitreous hemorrhage, and cornea opacities) can cause stimulus loss resulting in what is termed deprivation amblyopia [7,8]. Additionally, Simmons found that children in medically underserved areas are at a disproportionately higher risk for underdiagnosis [9].

While not mandated by every state, school vision screenings serve a critical role in the early detection of amblyopia and other severe eye illnesses [10,11]. Many states' Department of Education provide screening guidelines to assist school nurses in these efforts. Once an eye care referral is made, children should be investigated for ocular pathology or the need for eyeglasses. If amblyopia is present, treatment for children aged 7 and younger is often an eye patch or atropine eye drops, both affordable and effective options [12]. By worsening vision in the stronger eye with the patch or atropine drops, the weaker eye can begin to catch up. The brain in young children begins to strengthen connections with the previously deprived eye with restoration in both vision and tracking abilities. Unfortunately, for children aged 8 and older this developmental window has largely closed, and total restoration of vision and tracking is not as common. In fact, older children may require invasive ocular alignment surgery from a pediatric ophthalmologist with only partial improvement. The purpose of this study was to conduct and present a comparative analysis of vision screening guidelines of 13 states spread across different regions of the United States.

2. METHODOLOGY

The Washington State University College of Medicine Institutional Review Board determined this study was IRB-exempt and not considered human subjects research.

States were first ordered alphabetically and then selected using an online random number generator (Alphabet Inc., Mountain View, California). States were selected until 13 available screening guidelines were identified. Each guideline was assessed using a 10-point multi-factorial scoring criteria detailed in Table 1. Criteria were selected in three different domains of pediatric vision care: 1. Underlying cause 2. Screening approach 3. Follow-up and pediatric eye care importance. Descriptive

statistics (mean and standard deviation) were calculated for each scoring criteria using Microsoft® Excel (version 16.63.1, Redmond, WA).

3. RESULTS AND DISCUSSION

Of the 27 states randomly selected, only 48.1% (13/27) provided public access to vision screening guidelines through each respective Department of Education website. The available guidelines were assessed on a 10-point grading scale. Scores ranged from 2-9 points with a mean of 5.25 points and a standard deviation of 2.33 points. Most state guidelines included what ages to screen (84.62%, 11/13), how to screen (84.62%, 11/13), and how to follow-up with students to arrange (92.31%, 12/13) and confirm eye care delivery (76.92%, 10/13).

Surprisingly, just over half of state guidelines referred to false negative and/or false positive screening risks (53.85%, 7/13) or described the main cause of preventable pediatric blindness—amblyopia (53.85%, 7/13). Sadly, only the minority of state guidelines described at least two main causes of amblyopia (46.15%, 6/13), and a less than one-third of school nurse vision screening guidelines discussed the window of time to save vision in amblyopia (30.77%, 4/12). Worse yet, very few nurse vision screening guidelines explained that typically a child cannot tell you if they are at risk of developing amblyopia (15.38%, 2/13) because their brain utilizes the good eye and on a day-to-day basis there is normal visual acuity in the good eye. Only one state (Colorado) provided education on the two treatments for amblyopia (7.69%, 1/13). Further data analysis and scores are summarized in Tables 2 and 3. Figure 1 provides a visual representation of the 13 states analyzed and their vision screening education ratings.

4. CONCLUSION

This study found that most of the assessed vision screening guidelines outlined the process of screening and follow-up but failed to emphasize the main cause and treatment of amblyopia or why screening is important before the critical period of visual development. Inconsistencies between these guidelines may contribute to delayed recognition and treatment for amblyopia—the leading cause of irreversible pediatric vision loss. Further additions to screening guidelines are needed in order to provide school nurses and paraprofessional staff a deeper understanding of amblyopia and why early intervention is crucial. Improving the quality of school vision screening education is an essential task to help combat preventable pediatric blindness.

ETHICAL APPROVAL

The Washington State University Institutional Review Board determined that this study was exempt and not considered human subjects research.

References

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