Published in final edited form as:

J Pediatr Ophthalmol Strabismus. 2007 ; 44(1): 24–44.

Preschool Vision Screening by Family Physicians

Alex R. Kemper, MD, MPH, MS and Sarah J. Clark, MPH

Dr. Kemper and Ms. Clark are from the Child Health Evaluation and Research Unit, Division of General Pediatrics, University of Michigan, Ann Arbor, Michigan

Abstract

Purpose—To determine the rate of preschool vision screening in family practice. To evaluate attitudes and beliefs about the importance of, and barriers to, preschool vision screening.

Method—Mail survey of a national sample of family physicians.

Results—The response rate was 35% (237 of 671 eligible respondents). Most (90%) considered preschool vision screening important. The majority (91%) included some component of the eye examination as part of their routine well-child care for preschool-aged children. The likelihood of formal screening increased with age (3 years, 36%; 4 years, 58%; 5 years, 73%; $P < .01$). Most (88%) used a wall chart to test for visual acuity. Stereoacuity was rarely (7%) tested. Barriers included the perception that children are uncooperative (39%) and that screening is too time-consuming (21%). Fifty-nine percent would only consider using a vision screening test if its false-positive rate was 10% or less. Some (26%) reported that all children should be examined by an optometrist or Ophthalmologist prior to school entry, regardless of any screening.

Conclusions—The rate of screening by family physicians is similar to that by pediatricians. Providing education regarding optimal vision screening strategies and expected outcomes of screening may be important for improving both the rate and the quality of preschool vision screening. Ophthalmologists may play an important role in this process through the feedback they provide to referring physicians.

Introduction

Preschool vision screening for the detection of amblyopia or amblyopiogenic factors is widely endorsed.^{1–3} Although the rate of screening is low for 3-year-old children seen in pediatric practices, the rate of screening for 4- or 5-year-old children has been reported to be between 71% and 91%.^{4,5} No data are available regarding the rate of preschool vision screening by family physicians. This is significant because family physicians are responsible for approximately 25% of outpatient visits made by children.⁶

Address correspondence to Alex R. Kemper, MD, MPH, MS, Director, Program on Pediatric Health Services Research, Duke Clinical Research Institute, P. O. Box 17969, Durham, NC27715.

The authors have no industry relationships to disclose.

The audience is advised that this continuing medical education activity may contain references to unlabeled uses of FDA-approved products or to products not approved by the FDA for use in the United States. The faculty members have been made aware of their obligation to disclose such usage.

The material presented at or in any Vindico Medical Education continuing medical education activity does not necessarily reflect the views and opinions of Vindico Medical Education or SLACK Incorporated. Neither Vindico Medical Education or SLACK Incorporated, nor the faculty endorse or recommend, any techniques, commercial products, or manufacturers. The faculty/author may discuss the use of materials and/or products that have not yet been approved by the U.S. Food and Drug Administration. All readers and continuing education participants should verify all information before treating patients or utilizing any product.

We surveyed a national sample of family physicians about their perspective of the importance of vision screening compared with other recommended screening tests for preschool-aged children (ie, hearing, blood pressure, and urinalysis),^{7,8} their current vision screening practices, and perceived barriers to vision screening. These data should be used to design interventions that will ensure the timely detection of correctable vision impairment.

Method

Instrument

We designed a survey instrument to assess family physicians' practices and attitudes toward preschool vision screening, including the relative benefit compared with other preventive services and the perceived barriers to vision screening. Questions were developed based on key themes from five focus groups of primary care providers held across Michigan during the summer of 2004. Three broad categories composed the reported barriers to vision screening: practice-related factors, test-related factors, and referral-related factors. The instrument was then pilot-tested with a separate group of primary care providers to ensure readability and clarity. The final instrument consisted of a 4-page, 20-question survey, which took less than 5 minutes to complete, on preschool vision screening and practice demographics. Questions were primarily multiple-choice or Likert scales of agreement.

Sampling Frame

We queried the American Medical Association Masterfile, the most complete U.S. database of physicians, to obtain a random national sample of 755 family physicians. Our sample excluded physicians older than 70 years, federal and military employees, physicians with a non-generalist board or sub-board certification, and physicians with a major professional activity other than office-based direct patient care. The first survey mailing, accompanied by a cover letter, \$2 participant incentive, and business reply envelope, occurred in September 2004. Two subsequent mailings to non-responders occurred at 3-week intervals, for a total of 3 mailings.

Data Analysis

Initially, general frequency responses to all survey items were determined. Then, Pearson chi-square tests of independence were used to test for association among the categorical variables. *P* values less than .05 were considered statistically significant. All analyses were performed with Stata software (version 8.2; StataCorp LP, College Station, TX). The institutional review board at the University of Michigan Medical School approved this project.

Results

Sample

Of the 755 physicians in the sample, 84 were ineligible (66 did not provide well-child care for preschool-aged children, 3 had retired or died, and 15 were unavailable for study participation). The response rate was 35% (237 of 671 eligible respondents).⁹ The practice characteristics of the respondents are listed in Table 1.

Importance of Preschool Screening

Some (26%) of the respondents reported that all children should receive an examination by an optometrist or ophthalmologist prior to school entry, regardless of any screening. Overall, most (90%) considered vision screening important. This rate was similar to that for hearing screening (87%; *P* = .18), but greater than that for blood pressure screening (53%; *P* < .01) or urinalysis (41%; *P* < .001).

Use of Screening Tests

Nearly all (91%) of the respondents included at least one component of eye examination (red reflex test, 79%; corneal light reflex test, 69%; or cover test, 72%) as part of their routine preschool well-child care. The likelihood of formal screening increased with age (age 3, 36%; age 4, 58%; age 5, 73%; $P < .01$). Most (84%) conducted formal vision screening at least once as part of their preschool well-child care. The likelihood of formal screening was not associated with the number of annual well-child visits ($P = .61$), the number of providers in the practice ($P = .28$), or the proportion of Medicaid-enrolled children ($P = .59$).

Most (88%) of the family physicians reported using a wall chart for acuity testing. A Titmus vision screening machine was used by 14%. Testing of stereoacuity was rare (7%). Use of photoscreening or autorefraction was also rare (4%).

Barriers to Vision Screening

Only 3% of the family physicians reported that screening was unnecessary because vision problems would be identified elsewhere (eg, by the family). The barriers to vision screening are summarized in Table 2. The most common barriers were factors related to screening within the practice. Among these, children's lack of cooperation with testing was the major barrier. Few respondents considered issues regarding referral to eye care specialists as a barrier to vision screening. Although test accuracy was not considered a barrier to vision screening, 59% of the family physicians reported that they would only consider using a vision screening test if its false-positive rate was 10% or less.

Discussion

We found that most family physicians endorsed preschool vision screening. The reported rate of screening was similar to that of pediatricians: low among 3 year olds and increasing with age. We were surprised that nearly 25% of respondents believed that all preschool-aged children should be examined by an optometrist or ophthalmologist prior to school entry. Although Kentucky has recently implemented legislation mandating evaluation of all children by an eye care specialist prior to entry into Head Start or public school, the added value of these examinations over routine recommended care is a subject of ongoing debate.^{10–11}

For certain types of visual impairment (eg, amblyopia resulting from cataracts), early detection is central to ensuring optimal outcomes.¹² However, one recent trial suggests that delay in diagnosis (up to age 5) does not lead to worse outcomes for other types of amblyopia.¹³ This suggests that efforts should be made to ensure formal vision screening by age 4 or 5 and early, routine use of components of the physical examination that can detect serious ocular pathology (eg, red reflex test, corneal light reflex test, and cover test). We believe that this is a feasible goal.

We were also surprised that most family physicians reported they would only consider using a vision screening test if it had a false-positive rate of 10% or less. Current data suggest that there is no test with a false-positive rate that low.¹⁴ Physician education should focus not only on the proper use of vision screening tests, but also on the acceptability of false-positive referrals. Ophthalmologists can play an important role with their feedback to referring physicians. For example, follow-up letters to primary care physicians should underscore the importance of true-positive referrals and affirm the acceptability of false-positive referrals.

There are two important limitations of this study. First, our response rate limits the ability to generalize. We suspect the perception that vision screening is not a controversial or "hot" topic lowered the response rate. Second, as with any survey of practice behavior, self-reports can overestimate the actual rate at which services are provided. Furthermore, this survey cannot

determine whether tests are used appropriately. Practice-based studies are needed to measure not only the rate but also the quality of screening. Such studies will be critical in developing recommendations for optimal screening strategy. For example, one recent study performed in the pediatric setting suggests photoscreening is superior to traditional visual acuity testing.¹⁵

Our study provides the first data regarding preschool-aged vision screening in the family practice setting. These data suggest that physician education regarding the accuracy of available tests and strategies for testing young children may improve both the rate and the quality of testing.

EDUCATIONAL OBJECTIVES

1. To determine how family physicians prioritize preschool vision screening compared with other preventive services.
2. To describe how and with what frequency family physicians provide preschool vision screening.
3. To identify strategies ophthalmologists can use to promote timely and appropriate preschool vision screening by family physicians.

See quiz on page 43; no payment required.

Acknowledgements

Supported by the National Eye Institute (K23-EY14023).

References

1. Broderick P. Pediatric vision screening for the family physician. *Am Fam Physician* 1998;58:691–700. [PubMed: 9750538]
2. Committee on Practice and Ambulatory Medicine Section on Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus American Academy of Ophthalmology. Eye examination in infants, children, and young adults by pediatricians. *Pediatrics* 2003;111:902–907. [PubMed: 12671132]
3. U.S. Preventive Services Task Force. Screening for visual impairment in children younger than age 5 years: recommendation statement. *Ann Fam Med* 2004;2:263–266. [PubMed: 15209205]
4. Wall TC, Marsh-Tootle W, Evans HH, Fargason CA, Ashworth CS, Hardin JM. Compliance with vision-screening guidelines among a national sample of pediatricians. *Ambul Pediatr* 2002;2:449–455. [PubMed: 12437391]
5. Wasserman RC, Croft CA, Brotherton SE. Preschool vision screening in pediatric practice: a study from the Pediatric Research in Office Settings (PROS) network. *Pediatrics* 1992;89:834–838. [PubMed: 1579390]
6. Freed GL, Nahra TA, Wheeler JRC. Which physicians are providing health to America's children? Trends and changes during the past 20 years. *Arch Pediatr Adolesc Med* 2004;158:22–26. [PubMed: 14706953]
7. Committee on Practice and Ambulatory Medicine. Recommendations for preventive pediatric health care. *Pediatrics* 2000;105:645–646.
8. Green, M.; Palfrey, JS., editors. Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents. 2. Arlington, VA: National Center for Education in Maternal and Child Health; 2002.
9. Council of American Survey Research Organizations. On the Definition of Response Rates: CASRO Task Force Special Report, 1982. [Accessed April 27, 2005]. Available at www.casro.org/resprates.cfm
10. Kemper AR. Valuing vision. *Pediatrics* 2004;113:404–405. [PubMed: 14754958]

11. Zaba JN, Johnson RA, Reynolds WT. Vision examinations for all children entering public school: the new Kentucky law. *Optometry* 2003;74:149–158. [PubMed: 12645848]
12. Lloyd IC, Dowler JG, Kriss A, et al. Modulation of amblyopia therapy following early surgery for unilateral congenital cataracts. *Br J Ophthalmol* 1995;79:802–806. [PubMed: 7488596]
13. Clarke MP, Wright CM, Hrisos S, Anderson JD, Henderson J, Richardson SR. Randomised controlled trial of treatment of unilateral visual impairment detected at preschool vision screening. *BMJ* 2003;327:1251. [PubMed: 14644966]
14. Schmidt P, Maguire M, Dobson V, et al. Comparison of preschool vision screening tests as administered by licensed eye care professionals in the Vision In Preschoolers Study. *Ophthalmology* 2004;111:637–650. [PubMed: 15051194]
15. Salcido AA, Bradley J, Donahue SP. Predictive value of photoscreening and traditional screening of preschool children. *J AA-POS* 2005;9:114–120.

Table 1 Characteristics of the family physicians ($N = 237$)

Characteristic	%*
Patient care	
Full-time	77
Part-time	22
Annual no. of preschool-aged well-child visits	
< 50	36
50 to 100	39
> 100	22
No. of providers in practice	
1	17
2 to 5	39
> 5	43
Proportion of patients ≤ 5 years enrolled in Medicaid	
< 10%	43
10% to 50%	34
> 50%	21

* Categories may not add to 100% due to missing values.

Table 2
Barriers to Vision Screening

Barrier	%
Practice-related factors	
Lack of training	19
Screening is too time-consuming	21
Children are not cooperative with screening	39
Test-related factors	
Lack of sensitivity	9
Lack of specificity	13
Referral-related factors	
Lack of eye care providers	17
Lack of insurance for follow-up care	25
Concern about parental reaction to false-positive referral	5