



RESEARCH ARTICLE

Results of Outreach Referral Program After Failed In-School Eye Examinations

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ABSTRACT

Background: The absence of childhood vision care has detrimental consequences on development and learning.¹ The Vision Health Initiative Committee (VHI) was established by the Centers for Disease Control and Prevention (CDC) to mandate school vision screenings.² Improved detection does not translate into vision care. Poor compliance for follow-up remains an issue. This study evaluates the effectiveness of an outreach referral program specializing in assisting families with recommended follow-up care for children following in-school eye examinations.

Methods: A mobile vision van provided in-school eye examinations and dispensed eyeglasses to at-risk children. Referrals for in-office evaluation were generated for children with more serious medical conditions. Each family was contacted via phone call and/or text message to assist in scheduling their child with an eye examination. Results of the communications were tabulated and analyzed.

Results: The mobile vision van program completed 13 260 vision screenings and provided 2185 eye examinations to children in Northeast Ohio. Out of the 2185 examinations, 238 (11%) students required further evaluation. Of those 238, the families of 165 (70%) were successfully contacted; 75 (45%) families had scheduled their own follow-up appointment, 77 (47%) families needed assistance to schedule an examination, and 13 (8%) families were not interested in further assistance. Of the 77 receiving assistance with scheduling, 54 (70%) families kept the scheduled appointment and received care at no cost.

Conclusion: This study further substantiates the health disparity in eye care. It demonstrates the importance of in-school vision examinations and the value of an outreach referral program which includes education and assistance with scheduling appointments.

Keywords: Pediatrics; Vision care; Eyeglasses; Referral; Retrospective review

INTRODUCTION

Health equity continues to be a topic of conversation for doctors and policymakers in the United States. According to the Centers for Disease Control and Prevention (CDC), health equity can be defined as the ability of all members of a community to receive fair and equal opportunities to the highest level of health care.¹ However, access to fair health care in the United States is widely determined by socioeconomic status. Vision care needs for school-age children tend to follow this trend. Without early detection and

treatment, uncorrected vision disorders can impair child development, interfere with learning, and even lead to permanent vision loss.² The CDC recognizes that vision problems substantially impact the quality of life for these children and, thus, established the Vision Health Initiative (VHI).³ The VHI's mission is to create cost-effective public health interventions to improve quality of life, increase access to needed eye care, and reduce health disparities among people with or at high risk for vision loss.⁴ According to Wahl et al and the work of the VHI, school vision screenings have





been mandated in 38 of the 50 states; Ohio is 1 of the 38 states that require vision screenings for school-age children.⁵ This allows vision problems to be identified at a much higher rate.

Unfortunately, identification of a vision problem does not guarantee a child will receive adequate care. Studies have shown that up to 62% of children never receive the recommended eye examinations after failing their school vision screening.⁶ Previous studies have identified insurance coverage, cost, and transportation as barriers to care.⁷ These barriers can be impacted, and vision care disparities improved, if complete eye examinations and eyeglasses are provided inside these high-risk schools. This was proven successful with the initiation of in-school examinations in Southeast Ohio.⁸ However, even with in-school eye examinations, children with more serious eye conditions are still being left with unmet needs. The number of parents who heed the referral recommendations and the number of high-risk children left with unmet vision needs is unknown. This study evaluates the impact an outreach referral program has on the number of students that receive the recommended follow-up care when instituted in at-risk communities in Northeast Ohio.

METHODS

Through the collaboration of 2 non-profit organizations, a mobile vision van program was established and funded in Northeast Ohio. This program was instituted to bridge the gap in vision services for underserved schools and communities in this region. School districts were hand-selected for mobile vision services based on financial need defined as greater than 50% of the students receiving free and/or reduced lunches.

The vision van spent nearly 190 days of the 2022-2023 school year on the road visiting underserved schools. Every child in kindergarten through 12th grade had their vision screened (Figure 1:A). Students failing the vision screening received an eye examination with a licensed optometrist, at the school, on the mobile van (Figure 1:B). Vision, refractive error, anterior ocular health, posterior ocular health, and intraocular pressure were assessed during this mobile clinic visit. Students in need of refractive error correction received eyeglasses at no cost to the family or school (Figure 1:C).

Children identified with a more serious eye condition such as strabismus, amblyopia, or anterior or posterior segment health concerns were referred for further evaluation and care with a community eye doctor (Figure 1:D). The standard procedure for a referral used in other national mobile vision clinics includes a letter sent home to the family notifying them of their child's ocular health problem. Additional efforts were at the discretion of the van optometrist and school nurse and varied widely. Due to lack of time and resources, this left many children, with more serious eye health complications, with unmet need.

For this study, after the standard referral letters were sent home following the in-school eye examination, a complete list of chil-

dren requiring follow-up was provided to the outreach assistant at a partnering local non-profit organization. The outreach assistants had experience and training as ophthalmic technicians and possessed general knowledge of eye diseases and treatments and were familiar with local eye doctors, making it simple to assist families with scheduling appointments. The outreach assistant received information about the family such as parent's name and phone number as well as the presumed diagnosis from the in-school eye examination. Every child needing a referral examination was included in the list to the outreach assistant. No child was excluded. The outreach assistant contacted the family via phone call or text message. Contact was attempted with each family at least 4 times.

Once contact was made, an in-depth conversation took place using the diagnosis supplied from the referral (Figure 1:E). The family was educated on the importance of follow-up care and the possible treatment options. See Appendix for a more in-depth look at conversation scripts and text message templates. The outreach assistant assigned the child to 1 of 3 categories: compliant with referral recommendations (Figure 1:F), assisted with referral recommendations (Figure 1:G), or the family was not interested in any further assistance (Figure 1:H).

The outreach assistant then focused on the subgroup of families who had not yet scheduled an appointment for an eye examination. The outreach assistant worked with the family to schedule an appointment with local eye doctors while minimizing barriers to care such as cost and transportation (Figure 1:I). These children were seen by an eye doctor close to their school district at no cost to the doctor or family. Financial responsibility for the referral examination was covered by the non-profit organization overseeing the outreach assistants. The final assessment and treatment plan was relayed back to the outreach assistant to assist in any follow-up questions the family might have.

At the conclusion of the school year, data regarding the number of children screened, examined, referred, and seen for an in-depth eye examination were tabulated and reviewed. Each child was placed in 1 of the 3 subgroups: compliant with referral recommendations, assisted with referral recommendations, or the family was not interested in any further assistance. Each subgroup was assigned a percentage based on the total number of children recommended for a referral. The effectiveness of the referral program was evaluated by analyzing the percentage of children within each subgroup and the effect of having an outreach assistant on the subgroup percentages. In the discussion, presumed and final diagnoses were analyzed to hypothesize which diagnoses are more likely to prompt the families to seek follow-up care.

RESULTS

In one school year, 13 260 students were screened at 25 schools in Northeast Ohio. These students ranged from kindergarten through 12th grade. Of those children screened, 2185 (16%) failed their



screening and received an eye examination on the mobile vision van with 1670 (13%) students receiving eyeglasses. Of the 2185 eye examinations, 238 (11%) children were referred for further evaluation. The contact information and presumed diagnosis for all 238 children was provided to the outreach assistant. The presumed diagnoses were divided into 4 main categories including strabismus [84 (35%) students], amblyopia [75 (32%) students], difficulty with refraction [64 (27%) students], and medical conditions [15 (6%) students] such as elevated intraocular pressure, retinal abnormalities, or optic nerve abnormalities. (Figure 2)

The outreach assistant attempted to reach all 238 families via phone call and/or text message. Of the 238 children referred, 165 (70%) families were successfully contacted and a conversation occurred with the outreach assistant. On average, 2 attempts were

needed to successfully reach the family. Of the families that were reached, the most successful form of communication was text message with a return phone call. Of the 165 families that were reached, 75 (45%) were compliant with referral recommendations and 13 (7.9%) families were not interested in discussing their child’s vision further. Seventy-seven (47%) families needed assistance with referral recommendations. After educating the families, our outreach assistant scheduled these children for an examination with local eye doctors (Figure 1).

Of the 77 families that were assisted through the outreach referral program, 54 (70%) children were successfully seen by a local eye doctor. Documentation of these examinations included the ocular evaluation, eyeglasses prescription, and final assessment and plan. In review of these results, 9 (17%) students were identified as

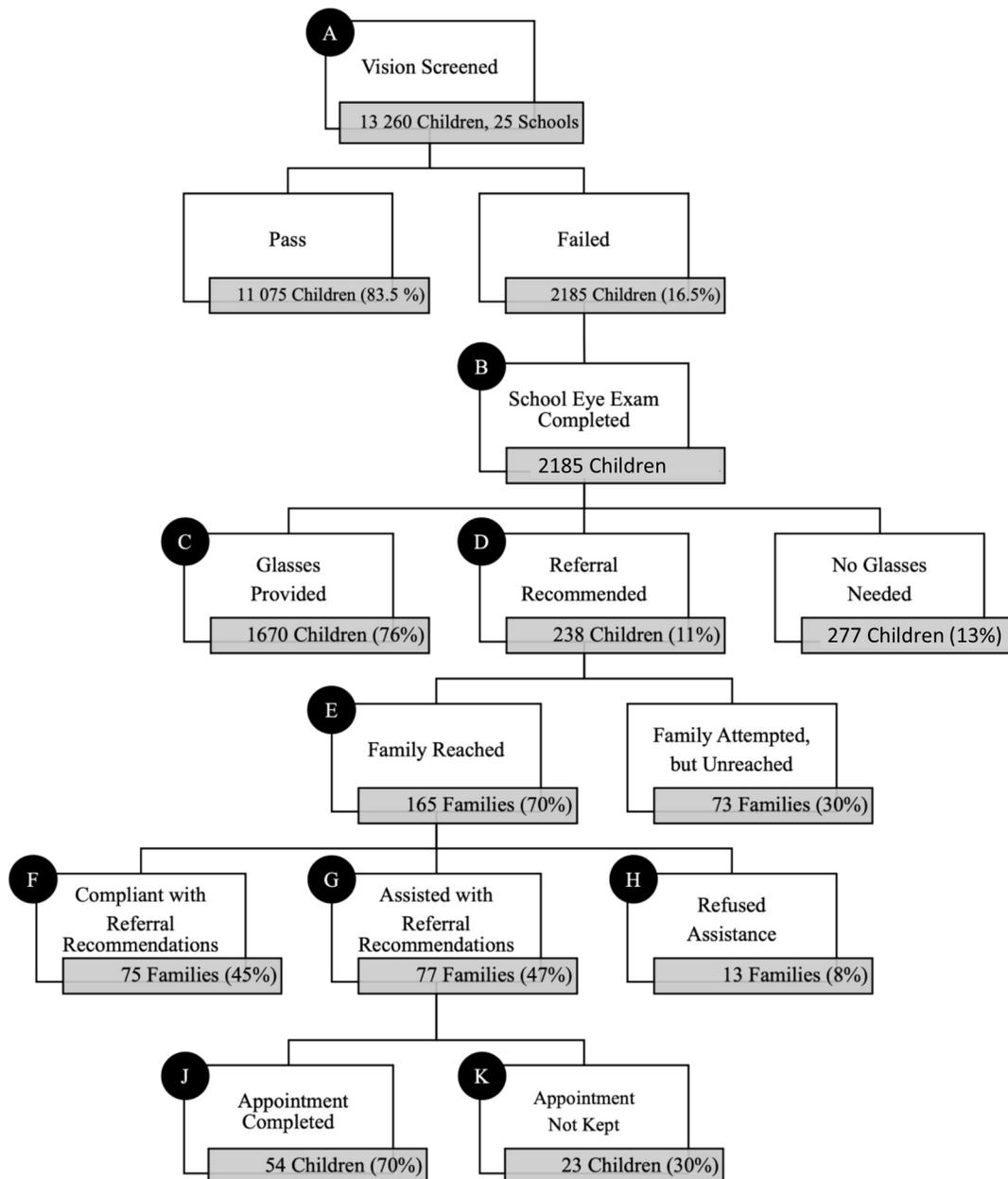


Figure 1. Referral Program Flowchart

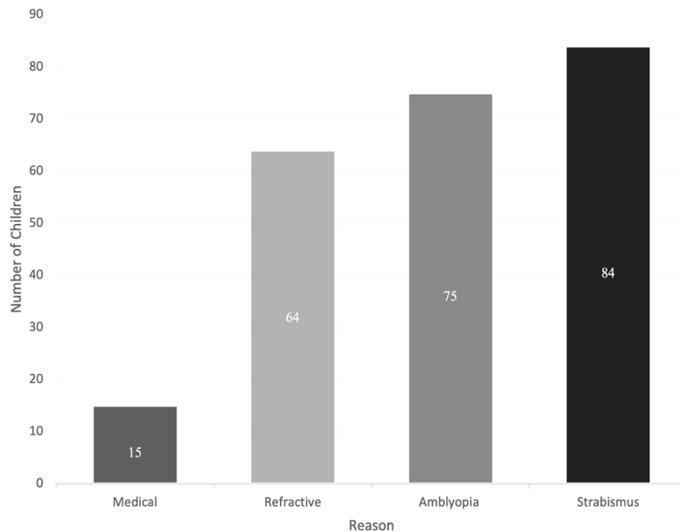


Figure 2. Reason for Referral

having strabismus, 17 (32%) students were identified as amblyopic, 18 (33%) students were given eyeglasses prescriptions which allowed them to be corrected to 20/20 in both eyes, and 3 (6%) students were seen for a medical condition. Of the 54 students receiving an eye examination, 7 (13%) students were completely healthy, and did not require eyeglasses.

Seventeen (31%) children required subsequent visits for continued care. Fourteen (26%) children required a 3-month follow-up for diagnoses such as amblyopia or strabismus. Three (6%) children received subspecialty referral for a more serious medical problem such as surgery for strabismus or cataracts. Thirty (56%) children required a yearly examination for continued monitoring of vision and refractive error.

Twenty-three (30%) families failed to bring their child to their scheduled appointments. These families received a reminder call and text before the appointment, coming from both our outreach assistant and the doctor's office. Attempts to reach the families for rescheduling the appointments were unsuccessful.

DISCUSSION

This program demonstrates the importance of additional intervention regarding recommended follow-up care after a failed school eye examination. Historical data demonstrate that nearly two-thirds of children are never seen by an eye doctor following a failed school screening.⁶ When this statistic is applied to our population of children, 1400 children would have been left without care. This unmet need for eye care can have a serious long-term impact on a child, including poor academic performance, ultimately leading to higher rates of unemployment and incarceration.⁹ The establishment of a mobile vision clinic has made great strides to remove this barrier by providing eye examinations and eyeglasses to children directly at the school. During the 2022-2023 school year, 2100 examinations took place on the vision van, and 1670 children received free eyeglasses. On-site examinations al-

low for immediate intervention following a failed vision screening and the on-site dispensing of free eyeglasses to any child in need produces improved test scores, and greater confidence and participation in the classroom.¹⁰

While in-school eye examinations create a tremendous impact on health equity for children, even with the mobile vision van more serious eye diseases are still being left untreated due to the continued lack of follow-up care after being seen on the van. This study is the first of its kind to provide insight into a parent's response to referral recommendations following in-school eye examinations. Many previous studies show the parent's response following a screening, but in our search there were no published studies looking at the parent response to a referral following an in-school eye examination.¹¹ Of the children screened and examined, 238 children were referred for further evaluation for more serious eye conditions such as strabismus, amblyopia, and medical problems. The outreach assistants were able to reach 165 of those families. After conversations with these families, our study demonstrated that only 45% of parents act on a school referral for additional care. In addition, 47% of parents either did not receive the referral letter or did not act on the referral letter after a problem was identified with their child's sight. This study confirms that a significant number of parents do not respond to recommended follow-up care following a screening or an in-school eye examination. The data of this study mirror previously published data regarding response to follow-up care following in-school vision screenings and further substantiate the need for outreach assistance to continue to stress the need for follow-up care.⁶

The statistics uncovered through this study are alarming because it leaves at-risk children with unmet vision needs. When needed medical care is not heeded, these children can develop lifelong debilitating vision and even a negative social impact.¹² Families reacted to the referral recommendation differently based on the presumed diagnosis from the mobile eye examination. Families scheduled an appointment at a higher rate when the presumed diagnosis had a noticeable visual appearance, such as strabismus, or a visual threatening effect, such as amblyopia. When the presumed diagnosis had no cosmetic effect or threat to vision, the chance of the family acting on the recommendation for follow-up care decreased (Figure 3). The data support previously published data by Yu et al regarding the prevalence of an eye examination for school-age children based on diagnosis showing strabismus and amblyopia had much higher rates of a previous eye examination, while hyperopia, anisometropia and astigmatism were at much lower rates¹³ (Figure 4).

Although we contacted 70% of families recommended for follow-up care, which is considered a significant improvement from baseline, 30% of the 238 families were still unreachable. Of these 73 families, 13 had phone numbers that were incorrect or not in service. In efforts to reach more children, it is important to evaluate issues with contacting parents such as wrong phone

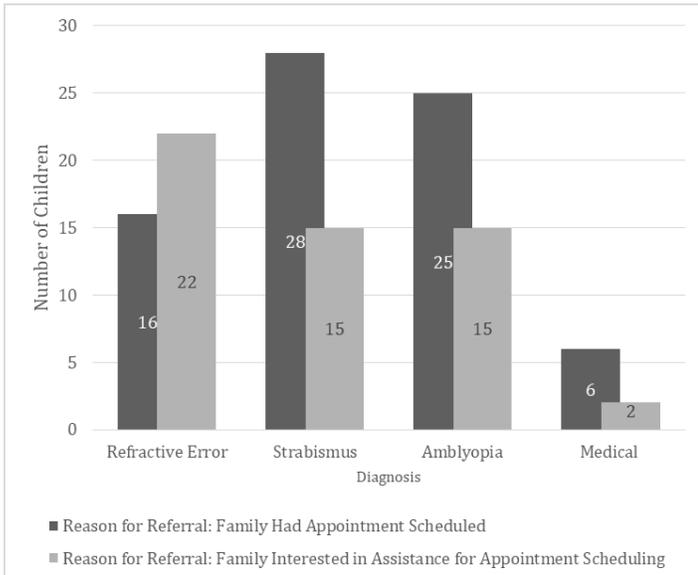


Figure 3. Comparison of Reason for Referral for Families Who Acted on Referral Recommendations Versus Families Who Did Not Act

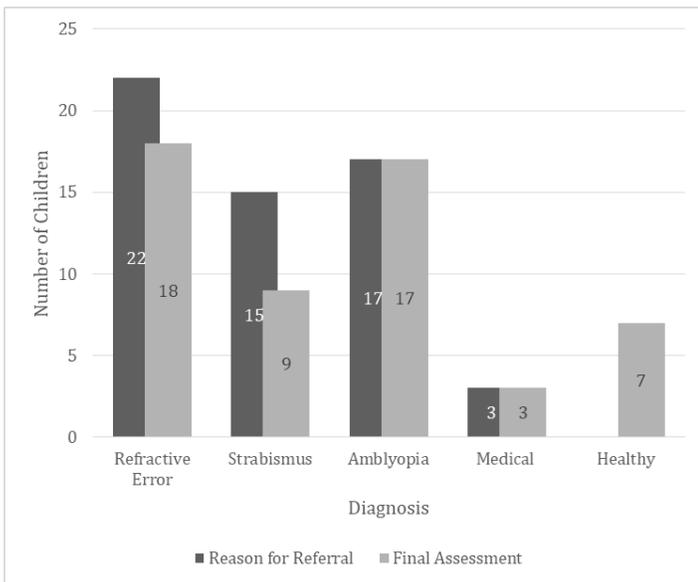


Figure 4. Comparison of Presumed Diagnosis Versus Final Assessment for Children Seen by Partnered Eye Doctors in the Community

numbers and language barriers. Home addresses, as a part of the data collection, would allow for letters to be sent to alleviate the complication that arises from incorrect/inactive phone numbers.

One of the major limitations we had when reviewing the data was the lack of demographic information. Outside of age and phone number, no other data was provided from the mobile vision van. Efforts to extract this information from the families, such as insurance status, race, primary language, education status, was challenging and often led to poor response. To increase our response rate, our team decided to forgo discussion of demographic information, but this information would be very valuable and improve the social implications of this study.

Another limitation this study has is the small geographic location that this project was able to impact. We believe that this model

could be replicated to other in-school eye examination programs across the state of Ohio, and even nationally, to ensure the next generation has adequate eye care.

PUBLIC HEALTH IMPLICATIONS

The outreach referral program had a positive impact on health equity for at-risk children in Northeast Ohio. This study shows how an in-school vision van program improves vision outcomes by addressing barriers such as scheduling and cost. When in-school examinations are paired with the outreach referral program, the impact of serious eye conditions on children’s vision is greatly reduced. When an outreach assistant educated the family concerning their presumed diagnosis, follow-up rates improved. This outreach referral program is the first of its kind to work directly with a mobile van and community eye doctors to close the gap for medical care. An outreach referral program augments the VHI by not just enhancing visual defect detection rates but by also increasing medical care and treatment, thus improving public health in a population. This can be seen through long-term health for these children by increasing parent understanding and improving doctor-patient relationships.

CONFLICTS OF INTEREST

The authors have none to report.

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Author Contribution

Tahir Kuraan: data acquisition. Kayla Tucker: data analysis, data interpretation, manuscript development. Sergul Ayse Erzurum: manuscript review, senior advisor.

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APPENDIX—Outreach Assistant Templates

A. Conversation template for the outreach assistant's initial call to the families of children in need of a referral examination.

- a. "Hello, my name is ____ (referral counselor's name) from Sight for All United once again reaching out in regards to ____ (child's name) eye examination. ____ (child's name) was seen on the vision van several weeks ago, and during that examination Dr. ____ (vision van doctor) noted that your child might have ____ (select from the list below that fits the child's reason for referral in layman terms). This means ____ (select explanation from below) which could mean ____ (select corresponding consequence.) Sight for All United is a non-profit organization helping families make follow-up eye examinations for kids. The follow-up eye examination is important because it could impact how well your child sees for the rest of their life. The follow-up examination could be with ____'s (child's name) previous eye doctor, or if you do not already have an eye doctor, we could help you schedule an appointment with one of our partner eye doctors. We have doctors near where you live and you would receive an eye examination at no cost. Please call our office back to let us know if ____ (child's name) already has an appointment scheduled or if you are interested in scheduling an appointment with our assistance."
- i. Lazy Eye (Layman Terms)
 1. Amblyopia (Medical Term on Referral)
 2. This means that one of your child's eyes is not as strong as the other eye
 3. This could lead to long term poor vision in that eye and risk of blindness if something were to happen to the good eye.
 - ii. Eye Turn (Layman Terms)
 1. Strabismus (Medical Term on Referral)
 2. Esotropia (Medical Term on Referral)
 3. Exotropia (Medical Term on Referral)
 4. Convergence Insufficiency (Medical Term on Referral)
 5. Nystagmus (Medical Term on Referral)
 6. This means that one of your child's eyes is not pointing in the same direction- either facing in or facing out
 7. This could cause your child to see poorly in that eye long term. It could also mean that your child could be more prone to headaches or eye strain and that could affect how well they do in school.
 - iii. Eyeglasses Prescription (Layman Terms)
 1. Hyperopia (Medical Term on Referral)
 2. Myopia (Medical Term on Referral)
 3. Astigmatism (Medical Term on Referral)
 4. Anisometropia (Medical Term on Referral)
 5. Cycloplegic Examination Needed (Medical Term on Referral)
 6. This means that because of the limited time on the vision van for examinations, Dr. ____ (vision van doctor) was not able to adequately assess your child's eyeglasses prescription and they believe a more in-depth eye examination would give better results.
 7. This is important because it could mean that your child is at-risk of a lazy eye or an eye turn if their eyeglasses prescription is not determined properly.
 - iv. Health of the Eye (Layman Terms)
 1. Pupillary Defect (Medical Term on Referral)
 2. Intraocular Pressure (Medical Term on Referral)
 3. Glaucoma (Medical Term on Referral)
 4. Cataract (Medical Term on Referral)
 5. Retina (Medical Term on Referral)
 6. This means that Dr. ____ (vision van doctor) is worried about something like glaucoma, high eye pressure, a cataract in the eye, or something wrong with the retina. All of these things are very serious and should be evaluated and monitored in an eye doctor's office regularly.
 7. This could lead to blindness as an adult if the medical condition is not managed properly now.

B. Text message template for the outreach assistant's initial call to the families of children in need a referral examination.

- a. "Hello, my name is ____ (referral counselor's name) from Sight for All United. Sight for All United is a non-profit organization helping families make follow-up eye examinations for kids. ____ (child's name) was seen on the vision van and Dr. ____ (vision van doctor) recommended a follow-up eye examination because of ____ (select from the list below that fits the child's reason for referral in layman terms). The follow-up eye examination is important because it could impact how well your child sees for the rest of their life. You should receive a letter in the mail soon with more information. Sight for All United would like to help you schedule an eye examination for your child. Please call or text our office at this number for more information or assistance with scheduling an appointment."
- i. Lazy Eye (Layman Terms)
 1. Amblyopia (Medical Term on Referral)
 - ii. Eye Turn (Layman Terms)
 1. Strabismus (Medical Term on Referral)
 2. Esotropia (Medical Term on Referral)
 3. Exotropia (Medical Term on Referral)
 4. Convergence Insufficiency (Medical Term on Referral)



APPENDIX—continued

5. Nystagmus (Medical Term on Referral)
- iii. Eyeglasses Prescription (Layman Terms)
 1. Hyperopia (Medical Term on Referral)
 2. Myopia (Medical Term on Referral)
 3. Astigmatism (Medical Term on Referral)
 4. Anisometropia (Medical Term on Referral)
 5. Cycloplegic Examination Needed (Medical Term on Referral)
- iv. Health of the Eye (Layman Terms)
 1. Pupillary Defect (Medical Term on Referral)
 2. Intraocular Pressure (Medical Term on Referral)
 3. Glaucoma (Medical Term on Referral)
 4. Cataract (Medical Term on Referral)
 5. Retina (Medical Term on Referral)