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## Practice Report

### Screening for Amblyogenic Factors in a Rural State: Implementing a Statewide Childhood Vision Project

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Wyoming is the least populated state in the United States, with approximately

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582,000 people living in a geographic area of 97,093 square miles. Wyoming's sparsely populated cities and towns struggle to support an optimal level of primary and specialist health care (Gantenbein, Robinson, Wolverton, & Earls, 2011). Limited availability of primary care for children presents a barrier to the provision of screening services for potentially correctable conditions such as amblyopia (Kemper & Clark, 2006). Amblyopia is the most common form of unilateral blindness in children, with an estimated prevalence of 1–5% (Holmes & Clarke, 2006).

To address the need for vision screening services in areas where primary care is limited, the Lions Clubs of Tennessee established a network of lay screeners who were trained to follow a standardized screening protocol (Donahue, Johnson, & Leonard-Martin, 2000). The success of the Tennessee program led the Lions Clubs International Foundation (LCIF) to incorporate vision screening into its Core Four sight preservation initiatives and provide matching funds for Lions Clubs in various states, including Wyoming, to initiate vision screening programs (see Donahue et al., 2006, for a review).

#### THE PROGRAM

The Wyoming Lions Early Childhood Vision Program (WLECV) provides children aged 6 months to 6 years with free annual vision screening, administered by

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trained lay persons from the community. In a state where vision screening is not mandated and where public schools do not begin vision screening until a child registers for kindergarten, WLECVP affords Wyoming children access to modern vision screening services well before they enter school. Similar to the Tennessee Lions Vision Screening Project, WLECVP utilizes trained Lions volunteers to set up and conduct screenings throughout the state, but WLECVP utilizes the services of Lions volunteers to a much lesser extent. What makes WLECVP unique is its use of 14 regional Child Development Centers and their staff members to conduct vision screenings in 46 sites. The Child Development Centers are state-supported entities that provide education and related services to children with developmental delays and disabilities from birth through 5 years of age. To meet children's needs, the centers work in conjunction with other early child care and education sites such as Head Start programs, developmental preschools, and private childcare settings.

Child Development Centers were chosen by WLECVP as primary screening sites for several reasons. First, they serve children with developmental delays—a population with higher rates of vision problems than the general population (Sandfeld-Nielsen, Skov, & Jensen, 2007). Second, their staff members have regular contact with the children being screened, which provides more consistent and secure lines of communication with the parents or guardians of a child who has failed a screening activity. Third, their staff members are specially trained to work with children and families and may be more adept in attaining the cooperation of

children who are difficult to screen, such as those with developmental delays. Finally, given their location in population centers throughout the state, they provide readily accessible developmental screening services for the entire population of children from birth to five years of age.

At the outset of the program in 2001, the WLECVP project coordinators assembled an advisory team made up of optometrists, ophthalmologists, teachers of visually impaired students, early childhood special education teachers, and specialists in early childhood education to develop a vision-screening protocol for that could be administered by lay screeners. At the time, no single tool had been developed that was capable of reliably identifying amblyopia risk factors. Therefore, the team decided on a battery of five different vision screening tools that took into consideration the particular strengths of each tool in detecting specific amblyopia risk factors. Screening activities were dependent on the age of the child being screened. Specifically, for children aged 6 to 35 months the screening procedure consisted of an external observation and a photograph using a Medical Technology and Innovations (MTI) photoscreener (Ottar, Scott, & Holgado, 1994), a vision screening camera system for the detection of amblyogenic vision disorders. For children aged 36 to 72 months, the screening procedure entailed the administration of an external observation, LEA Symbols (Near and Far Acuity) (Hyvarinen, Nasanen, & Laurinen, 1980), the Lang Stereotest (Lang, 1988), and the MTI photoscreener. Each lay screener completed eight hours of training that consisted of hands-on experience with

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each of the five screening tools as well as detailed information and practice on how to complete the paperwork for the project. Over time, screening technology changed radically and screening sites transitioned to newer, more objective technologies capable of detecting the presence of amblyogenic factors with a single digital screening instrument. The availability of digital vision screeners also reduced the need for intensive training. Consequently, the role of WLECVP shifted to tracking the progress of children in the follow-up process, communicating with families and vision professionals, and obtaining follow-up results. Without a follow-up evaluation after a failed screening, the program would have little impact on preventing serious vision conditions in early childhood.

WLECVP screened a total of 61,869 children over the span of 12 years. Most of the screenings were conducted by the Child Development Centers throughout the state (85%); the remainder of the screenings were conducted by Lions volunteers (15%). Approximately 62% of children screened were between the ages of 37 months and 6 years old, and 38% were between the ages of 6 and 36 months of age. Among the children screened, 5,888 children (9%) were found to be positive for one or more amblyopia risk factors, including anisometropia, astigmatism, hyperopia, myopia, strabismus, and media opacity. Comprehensive evaluations by eye care professionals confirmed diagnoses of amblyopia for 366 (0.6%) children.

The positive predictive value of screening positive for the presence of an amblyopic risk factor (Robinson, Bobier, Martin, & Bryant, 1999) steadily in-

creased over the 12-year project from 50% in 2000 to 92% in 2012. Consistent with research on the efficacy of newer screening instruments (such as digital vision screeners) in comparison to older, more subjective screening instruments (such as acuity testing and MTI photoscreeners) (Matta, Arnold, Singman, & Silbert, 2009), the positive predictive value for the program was significantly higher after WLECVP began transitioning to digital screeners in 2008. This finding demonstrates the importance and utility of the efforts made by the WLECVP project coordinators in evaluating emerging technologies in screening equipment, and in assisting screening sites in adopting newer screening technology. These efforts led to increased accuracy for WLECVP in identifying childhood amblyopia risk factors.

## EVOLUTION OF WLECVP

After establishing a statewide network and many years of sustained activity, the program began to change. Vision screening funds from the Wyoming Department of Health, Early Intervention & Education Program began to be funneled directly to the Child Development Center screening sites instead of funneling through the centralized oversight of WLECVP coordinators at the Wyoming Institute for Disabilities (WIND). This change in the appropriation of funds led to many of the 14 original screening regions leaving WLECVP to conduct vision screenings on their own. In some ways, this shift was possible because of the success of WLECVP in encouraging the adoption of state-of-the-art screening instruments. Initially, the screening sites relied on the MTI photoscreeners that required the

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sites to send their photos for each child to the WLECVP project coordinator in order to have the photos evaluated by certified individuals. Now that screening technology provides immediate results, parents or guardians receive a screening certificate that indicates pass or fail at the time of the screening. As a result, state funding sources recognized that with regard to the interpretation of screening measures, the program was becoming decentralized. It is unclear at this point how this natural change in the structure of the program might impact the long-term integrity and sustainability of WLECVP. It may be that particular screening sites are now able to stand on their own with less support from centralized leadership. However, it remains to be seen how sites will handle key programmatic issues such as procuring funds, remaining current with the latest research, and conducting follow-up services.

## DISCUSSION

The success of the WLECVP project can be attributed to the dedicated project staff members and the use of established Child Development Center sites throughout the state to conduct regular screenings. Most other screening programs initiated through the Lions Club International Foundation Core Four vision initiative have primarily used Lions volunteers to set up and conduct screenings; these programs are also typically affiliated with a medical school at which the comprehensive follow-up exams are conducted. Without a state medical school in Wyoming, WLECVP developed a unique plan for organizing screening sites and tracking follow-up results. Furthermore, the

program has remained viable through sustained funding from a variety of sources. The Wyoming Department of Health was instrumental in providing WLECVP with funds to purchase its original screening equipment. Annual supplemental funds for continued operations have come from a host of sources, including the Lions of Wyoming Foundation, the Wyoming Department of Health Division of Rural Health and Child and Adolescent Health, and the Rocky Mountain Lions Eye Bank. The WLECVP project coordinators and advisory committee worked as a team to use these funds to grow a vision screening program that was sensitive to best practice guidelines in the area of vision screening. Specifically, the team monitored relevant research and development of screening tools, and it drew upon this information to make informed changes in the screening protocol and screening equipment. In this way, WLECVP was able to provide leadership in screening practice throughout the state, and offer a statewide outreach program that effectively targeted unmet childhood vision screening needs.

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