Why Comprehensive Eye and Vision Examinations are Critical for School-aged Children

The prevalence of eye and vision disorders is substantial in children. Research indicates that early detection and intervention are particularly important in children because of the rapid development of the visual system in early childhood and its sensitivity to interference. When visual disorders such as amblyopia, strabismus, non-strabismic binocular vision disorders, and significant refractive error are undetected, the long-term consequences can lead to significant vision loss, decreased educational and occupational opportunities, and reduced quality of life. In addition, the cost of providing appropriate treatment for longstanding eye and vision disorders may be significantly higher than the cost of diagnosing and treating these problems early in life. A comprehensive pediatric eye and vision examination by a doctor of optometry is imperative for the timely diagnosis and treatment of eye and vision problems.

Eye and vision problems in children are a significant public health concern. An estimated one in five preschool children have vision problems.[1-7] In the United States school-age population, approximately one in four wear corrective lenses.[9] Since eye and vision problems can become worse over time, early diagnosis and treatment are essential to optimize children's eye health and vision and to prevent future vision loss.

Eye and vision disorders can lead to problems in a child's normal development,[9,10] school performance,[11-15] social interactions,[16] and self-esteem.[16-18] Vision disorders that occur in childhood may manifest as problems well into adulthood, affecting an individual's level of education, employment opportunities, and social interactions.[19]

Although comprehensive pediatric eye and vision examinations are essential for timely diagnosis and treatment of eye disease and maintenance of good vision, many children do not receive comprehensive eye care. The Centers for Disease Control and Prevention report that less than 15% of preschoolers receive an eye examination by an eye care professional and less than 22% receive some type of vision screening.[21]

A factor that may limit access to comprehensive eye and vision examinations and treatment services is the false sense of security that school screenings mistakenly give to parents (false negative results). Other factors that limit access include the absence of signs, symptoms, or a family history of eye and vision problems, [22] or the inability of parents/caregivers to afford needed services due to lack of insurance coverage or limited family income.[23] Limited access may now be partially resolved because comprehensive eye and vision examinations have received increased attention from the Affordable Care Act and other insurance programs reviewing essential health benefits necessary for children.

Eye and vision disorders can impose a significant burden on patients, parents, and the public. The total economic cost of vision loss and eye disorders among children younger than 18 years of age in 2012 was estimated to be $5.9 billion.[24] This includes the direct medical costs for eye examinations, eyeglasses and low vision aids. Also, the debilitating nature of vision loss results in major indirect and nonmedical costs including special education services, federal assistance programs, and decreased quality of life.

The above estimate does not include the costs of educational services for children with undiagnosed and untreated vision conditions. Learning-related vision problems have been reported to be significant contributors to reading difficulties and ultimately to the need for special education services.[14, 15, 25, 26, 27] Vision problems can increase educational costs in the form of Individualized Education Programs (IEPs) and special education services, which would otherwise not be necessary, if the vision problems were treated. A study of students (ages 6-16) with IEPs found that they have high rates of undiagnosed and untreated vision problems affecting reading speed and comprehension.[28]

In addition to the current costs of care, future costs for undiagnosed and untreated vision problems may include the loss of a child's full potential, and limitations on his or her occupational choices and future earnings. The cost of treating any visual impairment later in life could potentially be more expensive than treatment of the initial problem**.**

Many vision conditions are asymptomatic or not readily recognized, and will not prompt a patient, caregiver, or parent to seek a comprehensive eye and vision examination.[29] Undiagnosed or uncorrected refractive errors and other visual disorders in children can lead to developmental, academic, and social challenges and in some cases permanent vision loss, which has lifelong complications.[30] In the preschool population, the concern is for early diagnosis and treatment of significant refractive error, amblyopia, strabismus, and ocular disease. For the school-age population, the concern is the negative impact that untreated vision disorders (accommodation, binocular vision, ocular motility, and vision information processing) have on academic performance.

A comprehensive eye examination by a doctor of optometry or ophthalmologist is the reference standard of eye care.[30] Many children who fail a screening do not receive the necessary treatment of their conditions. A study of public school children reported only 38.7% who failed the vision screening received follow-up care after screenings.[31] Due to a lack of follow-through, screenings alone may not lead to the earlier diagnosis and treatment of eye and vision problems. While screenings may identify some children at risk for vision problems, a comprehensive eye exam is necessary for definitive diagnosis and appropriate treatment.[32]

Children's vision problems detected with a comprehensive eye examination:

• Refractive errors (Myopia, Hyperopia, Astigmatism, Anisometropia)	• Cataract
• Amblyopia	• Glaucoma
• Strabismus	• Retinitis pigmentosa
• Accommodative disorders	• Retinoblastoma

• Oculomotor conditions	• Diabetic Retinopathy
• Color vision deficiency	• Optic nerve hypoplasia
• Ocular inflammatory disease	• Cortical visual impairment and other neurodevelopmental disorders
• Conditions of prematurity	• Ocular signs of physical abuse

Children should receive periodic eye and vision examinations to diagnose and treat any eye disease in its early stages in order to prevent or minimize vision loss and maximize visual abilities. These examinations can also identify problems that may be affecting visual function and achievement at school, at home, and in sports or leisure activities. In addition, the early signs and symptoms of systemic medical conditions, such as diabetes, may be revealed during a comprehensive pediatric eye and vision examination.

Vision care in preschool children is very important because their visual system is still developing. They are at risk for the development of amblyopia, strabismus, and refractive error, which may lead to long term visual impairment. [33, 34, 35, 36-38]

Amblyopia is a treatable condition in children and adolescents[39] (Evidence Grade: A); however, amblyopia is more responsive to treatment among children younger than 7 years of age.[39-45] Significant uncorrected refractive errors are a risk factor for the development of amblyopia. In addition to its impact on vision, amblyopia can affect an individual's psychosocial functioning, warranting early diagnosis and treatment.[18]

Uncorrected vision problems can have a detrimental effect on vision development, learning, school success, and socialization. For preschoolers, eye and vision problems are mostly asymptomatic; therefore, it is important that preschool children receive a comprehensive eye examination. While the U.S. Preventive Services Task Force recommends that children have their vision screened at least once between the ages of 3 and 5 years,[46] gaps exist in the delivery of preschool vision screening. Rates of vision screening in preschool children are low, particularly in 3 year old children.[47]

Vision may change frequently during the school years. Children should receive an eye examination at the beginning of primary school to test for the presence of and, if diagnosed, they should have an examination at least annually or as frequently as their-doctor recommends because of rapid myopia progression.[48]

Hyperopia can also affect the development of literacy skills. Children with uncorrected hyperopia show reduced performance in the acquisition of emergent literacy skills.[49,50] Correction of hyperopia may, under specific conditions, lead to increased reading speed; therefore, eye examinations to diagnose uncorrected hyperopia are recommended.[51]

An accommodative or vergence dysfunction can have a negative effect on a child's school performance, especially after third grade when the child must read smaller print and reading demands increase. Due to the discomfort of these symptoms, a child may not be able to complete reading or homework assignments and may be easily distracted or inattentive.

Studies have reported an association between reading and eye movements.[52-54] Efficient reading requires accurate eye movements. Treatment of children with eye movement problems has been shown to improve reading comprehension.[54]

Children with Attention Deficit/Hyperactivity Disorder (AD/HD) have been reported to have a much greater incidence of eye convergence problems than those without AD/HD; [55] therefore, these children may benefit from comprehensive vision evaluation to assess the presence of convergence insufficiency.[56] Treatment of convergence insufficiency has been associated with reduction in the frequency of adverse academic behaviors.[57]

Comprehensive care that screenings miss:

Patient History
Accurate Monocular and Binocular Visual Acuity at near and far
Refraction
Binocular Vision, Ocular Motility, and Accommodation Abilities
Color vision testing
Ocular and Systemic Health Assessment

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