Should We Add Screening of Age-Related Macular Degeneration to Current Screening Programs for Diabetic Retinopathy?
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The report by Chan et al1 in the current issue details how screening for both diabetic retinopathy and age-related macular degeneration (AMD) can be conducted using fundus photographs obtained with nonmydriatic cameras. Exactly how cost-effective is such a screening? Could this be a recommendation for the future? Herein, we explore the potential for such a model for the management of 2 of the leading causes of blindness worldwide.

Criteria for effective screening for diseases include strategies that have good sensitivity and specificity. Ideally, the screening is effective if it results in detecting disease while the patient is asymptomatic and in initiation of an efficacious therapy that could prevent or retard progression of disease to reduce vision loss. Screening for diabetic retinopathy long has been demonstrated to be cost-effective.2,3 Persons with proliferative diabetic retinopathy may be asymptomatic, and timely delivery of scatter laser photocoagulation (panretinal photocoagulation) is 95% effective in reducing the risk of severe vision loss.4 The public health impact of screening for diabetic retinopathy indeed is enormous and may become even more effective in reducing vision loss in the era of anti–vascular endothelial growth factor (VEGF) therapy.

Are the reasons to recommend screening for AMD equally compelling? Persons with early and intermediate stages of AMD usually are asymptomatic and may be totally unaware of their diagnoses. For persons with intermediate AMD (i.e., bilateral large drusen), early detection is beneficial because of the availability of treatments that can decrease the progression of AMD to the late stages. The therapies for those at risk are the Age-Related Eye Disease Study (AREDS)5 and Age-Related Eye Disease Study 2 (AREDS2)6,7 supplements, which consist of antioxidant vitamins and minerals that are known to confer approximately 25% reduction in the risk of progression to late AMD in those who have supplemented for a duration of 5 years. The public health impact of this 25% treatment effect is considerable: if the 8 million persons in the United States with intermediate AMD were to take the supplements, approximately 300 000 would be saved from development of late AMD, particularly the neovascular form.5,6,8 Although no formal analyses of the cost-effectiveness of AREDS or AREDS2 supplements have been conducted after the approval of the anti-VEGF agents by the Food and Drug Administration for the treatment of neovascular AMD, a back-of-the-envelope calculation that uses estimates of the costs of treatment with anti-VEGF therapy9 and the costs of supplements suggests savings of billions of dollars if neovascular AMD can be avoided by AREDS or AREDS2 supplements. This estimate does not include the added stress and monetary burden stemming from the loss in productivity of affected patients, as well as the loss experienced by family members involved in the care of their loved ones with AMD, as evidenced in studies evaluating savings in quality-adjusted life years from supplements.10

Chan et al showed that it was cost-effective to screen simultaneously for intermediate AMD in patients already undergoing screening for diabetic retinopathy in a public health care system in a Chinese cohort residing in Hong Kong. The digital images from a nonmydriatic camera were graded by ophthalmologists and optometrists. The added cost of reviewing for AMD was considered low to negligible. The total cost per quality-adjusted life year gained from screening for AMD and the use of the AREDS or AREDS2 supplements for those at risk (persons with at least intermediate AMD bilaterally) was $12 712. Based on standards set by the World Health Organization at $29 000, this estimate would be considered highly cost effective. Previous studies looking at the cost per quality-adjusted life year in the era before anti-VEGF therapy found the supplements to be moderately cost effective.11,12

Are these results from a public health system in Asia generalizable to other parts of the world and to other ethnic groups? Although fewer population-based studies have been conducted in the Asian population, there are suggestions that the rates of incident cases of late AMD in both Chinese and Japanese populations may be lower than in the Western world.13,14 Interestingly, the large Multi-Ethnic Study of Atherosclerosis conducted in the United States reported the following prevalences of neovascular AMD: Chinese, 1.0%; white, 0.6%; Hispanic, 0.2%; and black, 0.3%.15 This study’s screening protocol used parameters from the AREDS classification of AMD severity, mainly size and area of drusen involvement. In this regard, such patients are similar to those screened in North America and elsewhere in the world, making these results applicable. Although it is well known that late AMD is less frequent

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in black persons, it is unknown if the natural course of AMD progression is similar in different ethnic groups. However, there is no reason to believe that they would be markedly different. The main difference in AMD between the North American cohort and the Asian cohort is the predominance of polypoidal lesions associated with AMD in the Asian populations, but this was not the focus of the screening using fundus photographs.

After intermediate AMD has been detected and the AREDS or AREDS2 supplements have been recommended, what is the next step? Those with intermediate AMD already have been identified as being at risk for late AMD. Therefore, further screening is not necessary because they will receive instructions for monitoring for late AMD development and should have regularly scheduled visits with their ophthalmologist. This screening process for diabetic retinopathy and AMD also potentially may detect other eye diseases with little or no extra cost, such as cataract and cup or disc anomalies. Although fundus photographic screening for glaucoma may be ineffective, other forms of imaging may help to facilitate the screening of another leading cause of blindness.

Photographic screening that focuses on one cause of blindness may be leveraged further to screen for common causes of vision loss. Adding other imaging technologies may make it possible to screen for all 4 of the leading causes of blindness: cataract, glaucoma, diabetic retinopathy, and AMD. Perhaps the most cost effective screening would include all persons with diabetes, blacks older than 40 years, and everyone older than 60 years of age and would screen for all of the leading causes of blindness.

Developing a successful screening program to evaluate 2 unrelated ocular diseases that are among the leading causes of blindness is innovative and, in this example, cost effective. It is estimated that by 2030, 552 million persons globally will have diabetes (and 50% of these eventually will demonstrate diabetic retinopathy), and the number of individuals with AMD globally will approach 196 million in 2020 and 288 million by 2040.10 With this epidemic of diabetic retinopathy and AMD looming, we should consider combined screening as suggested by Chan et al and perhaps using improved imaging to cast a wider net for all of the leading causes of blindness.

References


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