SPECIAL ARTICLE

Understanding the Value of Diabetic Retinopathy Screening

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Regular dilated eye examinations are an effective approach to detecting and treating vision-threatening diabetic retinopathy.[1] They can help prevent blindness, and they are cost-effective.[2,3] Guidelines for systematic screening have been developed because patients with retinopathy are often asymptomatic, and photocoagulation treatment is more effective at reducing visual loss when applied at specific, frequently asymptomatic, stages of retinopathy.[4,5] However, despite the recommendations for regular screening and the availability of effective treatment, many patients at risk of visual loss due to severe retinopathy are not receiving dilated eye examinations and needed photocoagulation treatments.[6,7]

Guidelines for the frequency of dilated eye examinations have been largely based on the severity of the retinopathy.[8,9] For patients with moderate to severe nonproliferative diabetic retinopathy, frequent eye examinations are often necessary to determine when to initiate treatment. However, for patients without retinopathy or with only microaneurysms, the need for annual dilated eye examinations is less clear. For these patients, the annual incidence of either proliferative retinopathy or macular edema is low, suggesting that a reduced frequency of screening would decrease costs without increasing the risk of visual loss.[10] Recently, Vijan et al[11] provided additional analyses suggesting that annual screening for some patients with type 2 diabetes mellitus without retinopathy may not be cost-effective and that consideration should be given to increasing the screening interval. Before accepting the recommendations of Vijan and colleagues, the following issues should be considered. First, is the model realistic and are the assumptions made in the model valid? Second, does the analysis adequately consider the implications of less frequent eye examinations? For example, would adoption of these less frequent screening intervals have indirect effects that could lead to more vision loss or other losses, and are these indirect effects considered in their model? Finally, does the analysis consider the patient's wishes and expectations?

A major assumption in the model adopted by Vijan et al is that legal blindness (best corrected visual acuity worse than 20/100 in the better eye) is the only level of visual loss with economic consequences. However, other visual function outcomes, such as visual acuity worse than 20/40, are clinically important, occur much more frequently, and have economic consequences. Using an end point of 20/200 will underestimate the benefit of any screening program. To fully understand the effect of increasing the screening interval, the authors should consider additional end points. It is not enough to state that there is limited information on the risks and utilities of these states. At the very least, some inclusion of rational assumptions in a sensitivity analysis seems reasonable.

Another assumption was the use of nonproliferative diabetic retinopathy progression figures from the United Kingdom Prospective Diabetes Study.[12] Although rates of progression stratified

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by hemoglobin A_{1c} levels were reported, this group only studied them among patients with newly diagnosed diabetes. A newly diagnosed patient is different from someone with the same level of retinopathy who has had diabetes longer. A person who has had diabetes longer would be more likely to progress during the next year of observation.[13] Use of newly diagnosed persons with diabetes would underestimate the rate of progression and the benefit of screening. In addition, these incidence rates were largely derived from diabetic persons of northern European origin. As Harris[14] and Haffner[15] and their colleagues point out, these rates are not applicable to other ethnic and racial groups, such as African and Hispanic Americans, who have higher rates of retinopathy progression.

With regard to the economic implications of less frequent eye examinations, Vijan and colleagues assume that the only value of an annual eye examination is for the detection of diabetic retinopathy. However, eye examinations may include other benefits. Older people often need eye examinations for increasing presbyopia and are at higher risk for cataract, glaucoma, age-related macular degeneration, and other potentially blinding disorders. As the authors point out, discovery of and treatment for any of these problems add value to the screening examination, although no value to such findings is given in the model. In addition, discussions with patients have value. For example, most primary care physicians tell their patients that it is important to control their blood glucose, blood pressure, and serum lipid levels. During the eye examination, these messages can be reinforced at a time when patients are particularly aware of the implications of vision loss. Patients can also be reminded that controlling these parameters also will reduce the risk of neuropathy and nephropathy. Increased patient compliance will reduce the risks of these secondary complications of diabetes. Prevention of multiple complications has important economic consequences. This value is difficult to measure, but there is no attempt by Vijan et al to incorporate it in the model.

The model also assumes that patient follow-up will occur whenever appointments are made. However, long intervals between follow-up visits may lead to difficulties in maintaining contact with patients. Also, patients may be unlikely to remember that they need an eye examination after several years have passed. Finally, a recommendation for follow-up visits at 2- or 3-year intervals may give a patient the impression that visual loss is unlikely and therefore not a concern. All these factors may result in longer than recommended intervals between examinations. Although automatic reminders from clinics can be helpful, they may be difficult to implement, especially when patients have relocated. As presented, the model assumes that there are never problems with patient follow-up at the prescribed intervals. Incorporating implications of such imprecise follow-up will reduce the economic value of deferring eye examinations.

Patients' expectations have only been partially included in the analysis. Blindness and visual impairment are a major fear of most patients with diabetes. Visual loss leads to emotional distress and reduces functioning in daily life. The magnitude of this fear, the effect of blindness on functioning, and the economic value of these factors are hard to quantify. One way to assess the worth of these factors is to determine the value of blindness in terms of quality-adjusted life years (QALYs). Vijan and coworkers assign a value of 0.69 QALY for 1 year of blindness. Other investigators[2,16] have suggested lower values (0.48-0.36). Vijan et al assign no QALY values to visual impairment less than blindness. Changes in QALY values significantly affect the cost-effectiveness of screening. The authors should include a sensitivity analysis for different values of QALYs before making generalized recommendations. This type of sensitivity analysis could be used for many of the assumptions listed herein. Given the range of possible reasonable estimates for the effects of the various factors listed, it is likely that the final range of cost-effectiveness assessed by a model for screening of persons without retinopathy would include cost-effective and "cost-ineffective" ranges.

In conclusion, we need a better understanding of the total value of screening eye examinations, the potential indirect effects of less frequent eye examinations, and patient preferences before a less frequent screening schedule should be generally recommended or adopted. Analyses, such as those of Vijan and coworkers, help put some relative values to the obvious fact that regular screening is less cost-effective in those groups of patients at lowest risk of a bad outcome, but many of the costs of infrequent screening have been left out of the model. Physicians may elect to individually reduce the frequency of follow-up for certain patients without retinopathy or nephropathy who are compliant and have good control of their blood glucose, blood pressure, and serum lipid levels. However, they should not assume that aggregate medical care costs can be reduced and efficiency increased by simply decreasing the frequency of screening examinations for entire groups of patients. Perhaps a major issue is the semantic difference between Vijan and colleagues' "universal standards" and most professional groups' "clinical practice guidelines." Until empirical data are available to show otherwise, the general recommendation that persons with diabetes should have a yearly eye examination seems conservative and reasonable. Deviations from this guideline are appropriate in certain low-risk groups, but with caveats. Even with the current guideline, too many persons with diabetes are needlessly losing vision because the opportunity to treat them in a timely fashion was missed. Relaxing the guidelines will not solve this problem. We agree with Vijan et al that understanding the needs of patients and treating them as individuals is appropriate. We differ in that we think the guideline for a regular dilated eye examination should

remain at 1 year rather than at 2 or 3 years. It is appropriate for the guideline to be conservative, and deviations from it should only be made after considering all the risks.

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From the Archives of the ARCHIVES

A look at the past . . .

The symptoms of accommodative insufficiency besides the blurring of vision are asthenopia, headache, eye pain, with smarting and burning of the eyelids, aprosexia, intolerance of light, sometimes also vertigo and nausea. The symptoms are usually well marked and sometimes exceedingly severe; in a small minority of cases they are slight or missing altogether. This is particularly the case in static insufficiency, in which the blurred vision, readily relieved by glasses, may be the only manifestation.

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