

# SINGLE-FIELD FUNDUS PHOTOGRAPHY FOR DIABETIC RETINOPATHY SCREENING: A REPORT BY THE AMERICAN ACADEMY OF OPHTHALMOLOGY

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**Original study reprint requests:**  
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## Research Objective

To evaluate whether single-field fundus photography can be used as a screening tool to identify diabetic retinopathy for referral for further ophthalmic care.

## Study Design

Consensus statement.

## Funding Source

None listed.

## Relevant Methodology

A MEDLINE search of the peer-reviewed literature was conducted in June 2001 for the years 1968 to 2001 and updated in September 2003, yielding 145 articles. The search was limited to articles published in English. The Cochrane Library of clinical trials was also investigated. The authors reviewed the abstracts of these articles and selected 63 of possible clinical relevance for review by the panel. Of these 63 articles, the panel selected 32 for the panel methodologist to review and rate according to the strength of evidence.

## Outcome Measures

Deletion of vision-threatening diabetic retinopathy.

## Results

Three of the 32 articles reviewed were classified as level I evidence, and 4 were classified as level II evidence. Evidence

*Williams GA, Scott IU, Haller JA, et al. Ophthalmology. 2004;111:1055-1062.*

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from level I studies demonstrates that as a tool to detect vision-threatening retinopathy, single-field fundus photography interpreted by trained readers has sensitivity ranging from 61% to 90% and specificity ranging from 85% to 97% when compared with the gold standard reference of stereophotography of 7 standard fields. When compared with dilated ophthalmoscopy by an ophthalmologist, single-field fundus photography has sensitivity ranging from 38% to 100% and specificity ranging from 75% to 100%.

## Conclusions

Single-field fundus photography is not a substitute for a comprehensive ophthalmic examination, but there is level I evidence that it can serve as a screening tool for diabetic retinopathy to identify patients with retinopathy for referral for ophthalmic evaluation and management. The advantages of single-field fundus photography interpreted by trained readers are ease of use (only 1 photograph is required), convenience, and ability to detect retinopathy. Further studies will be required to assess the implementation of single-field photography-based programs to confirm the clinical and cost-effectiveness of these techniques in improving population visual outcomes. Future research also should include establishing standardized protocols and satisfactory performance standards for diabetic retinopathy screening programs.

## Comment

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This consensus statement was prepared by the Retina Panel of the American Academy of Ophthalmology's Ophthalmic Technology Assessment Panel and systematically reviewed the English language peer-reviewed literature on this subject published between 1968 and September 2003. Thirty-two articles were deemed to be of sufficient clinical relevance and were selected for review. Only 3 of these met the criteria of the British Center for Evidence-Based Medicine for level I evidence.

*An extensive literature review demonstrated that, when compared with a dilated fundus examination by an ophthalmologist, single-field fundus photography has 38% to 100% sensitivity for detecting vision-threatening retinopathy.*

Diabetic retinopathy is the leading cause of blindness in working-age adults. It accounts for at least 8000 cases (12%) of new blindness each year in the United States and perhaps 10 times that number of cases of significant visual impairment.<sup>1</sup> There is clear and compelling evidence that much of this blindness and visual loss is preventable with appropriate identification and treatment. Treatment is most effective if it is begun prior to vision loss and efficacy falls sharply if started later.<sup>2,3</sup> Despite widespread effort by many and varied national and international bodies to disseminate screening recommendations and guidelines, an estimated 35%–50% of the diabetic population is not being appropriately screened. There are many potential barriers to patients not getting the appropriate evaluations.<sup>4</sup> In private health care systems such as the United States without universal health care coverage, financial constraints may in some part account for this disparity, but clearly does not tell the whole story. Even in the province of

Ontario, Canada, with government-sponsored universal health care coverage and with the less stringent Canadian Diabetes Association recommendation for, in the absence of any retinopathy, routine screening every 2 years as compared with the American Academy of Ophthalmology recommendation for annual screening, only about 50% of the diabetic population is being seen at the recommended interval.<sup>5</sup> Other issues such as lack of awareness, failure of primary care providers to communicate the benefits and importance of regular eye examinations, and a host of access issues such as difficulty finding an eye care provider, geographic isolation, and the lack of social support must also play a role.

The authors of this policy statement caution us that single-field fundus photography should not be considered as a substitute for comprehensive ophthalmologic examination. While this is certainly true, it is humbling to note that the sensitivity, when compared with the gold standard stereophotography of 7 standard fields, of single-field non-stereo, nonmydriatic fundus photography ranges from 61% to 90% as compared with a sensitivity as low as 38% to as high as 100% for a dilated examination by an ophthalmologist. The specificities are similar: 85% to 97% versus 75% to 100%, respectively.<sup>6</sup> If one adds simple mydriasis and stereo fundus photography to the typical screening regimen, sensitivity and specificity consistently and significantly improve.<sup>7,8</sup> As digital CCD photography continues to get better and less expensive, the situation can only get better and screening can become more accessible. In addition, if a more practical cutoff is chosen, so that only vision-threatening or referral-warranted retinopathy and all photographs deemed to be of poor quality or ungradable are referred for evaluation, the sensitivity will likely come even closer to 100%.<sup>8</sup>

The central issue is that there is a huge population of patients with diabetes with vision-threatening, referral-warranted retinopathy who are somehow, for some reason, not being seen or

treated by an ophthalmologist. As the prevalence of diabetes is expected to rise by 54% in the developed world by 2030,<sup>9</sup> this problem will only get worse. This is a potentially overwhelming burden of largely preventable blindness with staggering direct and indirect costs to the individual and society that needs to be acknowledged and addressed. Single-field or, better still, stereo fundus photography seems a reasonable tool to combat this growing problem. Widespread and accessible screening centers would have the additional advantage of increasing awareness of diabetic eye disease and creating a ready opportunity for diabetes education and counseling. Despite good evidence to the contrary,<sup>6</sup> it may not be as good as a comprehensive examination by an ophthalmologist, but it is considerably better than nothing and the evidence suggests that it is good enough. I believe that those tackling this important public health problem by pushing the boundaries of diabetic retinopathy screening and teleophthalmology forward should be applauded and encouraged. The American Academy of Ophthalmology, through its Ophthalmic Technology Assessment Panel, should give this effort a ringing endorsement rather than this kind of lukewarm and dated review.

## References

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