

# Using a Wide-View Digital Laser Ophthalmoscope to Increase Diabetic Retinopathy Screening Rates, Identify New Cases of Diabetic Retinopathy, Reduce No-Shows, and Create Opportunities for Research

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**D**iabetic retinopathy is the leading cause of blindness in the United States for people aged 20–74 years. After 20 years of diabetes, almost all type 1 diabetic and > 60% of type 2 diabetic patients have retinopathy.

Diabetic retinopathy progresses from mild nonproliferative abnormalities to proliferative diabetic retinopathy (PDR), which is characterized by new blood vessel growth on the retina and on the posterior surface of the vitreous. Macular edema can develop at any stage. Once PDR or macular edema begins to occur, diabetic eye disease can become vision-threatening.<sup>1</sup>

Among those at high risk, annual examination and laser photocoagulation reduce the risk by 50%.<sup>2</sup> However, it is estimated that, nationally, only ~ 20% of diabetic patients visit an ophthalmologist or other ophthalmological professional on a yearly basis as recommended by the American Diabetes Association (ADA). Screening rates are lower and retinopathy rates correspondingly higher among medically indigent, minority populations, or otherwise underserved groups.<sup>3,4</sup>

## Program Description and Results

The University of Virginia (UVA) Health System's largest primary care clinic, University Medical Associates, serves > 2,500 patients with diabetes.

Most have no health insurance or are of lower socioeconomic status. Although adherence to ADA retinal screening guidelines is a priority, actual screening rates have been low.

Patients with diabetes had high no-show rates for ophthalmology appointments for retinal examinations. From 2004 to 2005, this no-show rate was 24% in addition to a 7% appointment cancellation rate and a 19% rescheduling rate.

With a visit completion rate of only 50% for ophthalmology appointments, the best solution was to bring ophthalmology (virtually) to the primary care clinic via screening by retinal imaging. The clinic uses an Optomap retinal imaging machine (Optos, Inc., of North America; Marlborough, Mass.) providing an instantaneous, nonmydriatic, high-resolution, 200-degree view of the retina recorded as a digital image. The images are transferred to a UVA server and, accessed by an ophthalmologist at a remote location. Findings are transmitted to the attending physician, usually within a timeframe consistent with patients' ongoing consultations.

The UVA Medical Center initiated this program mid-way through 2006, and its initial use has resulted in a modest but significant increase in retinal screening exams (Table 1), and a reduction in the no-show rate for actual ophthalmology appoint-

ments (Table 2). The magnitude of the increase in the screening rate corresponds well to the actual number of patients screened by retinal photography during the study period. This number has gradually increased but has been limited by staff training and by technical issues.

Table 3 summarizes the results to date of retinal photography at UVA. Fewer than 10% of scans were deemed unacceptable or unreadable—a number that is expected to decline as experience increases. Of the 29 patients with evidence of diabetic retinopathy on their scan, 21 (72%) had no prior diagnosis of retinopathy. Ten (34%) kept subse-

**Table 1. Retinal Screening Rate for Clinic Patients With Diabetes\***

Year	Retinal Exam [n (%)]	No Retinal Exam [n (%)]
2005	968 (39.7)	1,470 (60.3)
2006	1,031 (42.3)	1,407 (57.7)
2007	1,079 (44.3)	1,359 (55.7)

\* $P = 0.005$  for change over time

**Table 2. Clinic Diabetic Patient No-Show Rates for Ophthalmology Appointments, 2005 versus 2007\***

Year	No-Shows [n (%)]	Total Appointments
2005	770 (23.6)	3,256
2007	664 (17.4)	3,807

\* $P < 0.0001$  for change over time

**Table 3. Initial Diabetes Retinal Photography Results**

Result	n (%)
Diabetic retinopathy detected	29 (15.6)
Other retinal pathology	7 (3.8)
Unacceptable quality scan	18 (9.7)
Total individuals	186

quent ophthalmology appointments, and 13 (45%) cancelled or failed to show for their appointment. Six more are pending. Additional efforts will need to be made to address barriers to seeking and receiving care for these high-risk patients.

### Discussion

The diabetes retinal imaging program addresses important barriers to care, especially among lower socioeconomic or uninsured patients at UVA. The program offers an opportunity to improve ophthalmic preventive care and may serve as a model of collaboration between two specialties, and we have demonstrated small but significant increases in retinal screenings and reductions in no-shows for ophthalmology appointments among our patients. Although digital retinal imaging has been considered an acceptable screening tool<sup>5</sup> with effectiveness demonstrated in other settings,<sup>6-8</sup> we believe that UVA is the first internal medicine training program in the country to use a nonmydriatic, ultra-wide-view digital ophthalmoscope (the Optomap).

Although our program provides a practical approach to improving diabetic retinal screening rates, the results thus far also illustrate the difficulty of initiating such a program with respect to training, technical issues, the task of introducing and championing a new process, and coordination between different specialties. Not least among the barriers is the operational cost and general

lack of reimbursement for services provided.

Because many of the patients at UVA are medically indigent and receive care under the state indigent care program, a virtual retinal screening program without the need for separate specialist visits can potentially yield total systems savings (as could be true with any monolithic health care reimbursement system). However, in our current predominantly piecemeal fee-for-service system, reimbursement mechanisms for virtual care still need to be worked out for most payers. Such issues, along with patient logistical barriers, contributed to the high no-show rate for actual ophthalmology appointments among patients who screened positive, another problem we are trying to address through a case-management approach and better interdisciplinary coordination.

In conclusion, with multidisciplinary collaboration, we have taken the initial steps to improving diabetes retinal screening rates using retinal imaging in a primary care setting, but we are cognizant that many barriers remain to its broader use. The total number of patients screened in the initial full year of operation represents just a small fraction of the pool of eligible patients. Nonetheless, the opportunity to have similar convenience for retinal screening exams as exists for monitoring other important diabetes parameters (e.g., A1C, cholesterol, renal function, and blood pressure) is certainly a goal worth pursuing. Combining such screening with usual care in a one-stop-shopping approach should ultimately be a positive approach with respect to patient, physician, and system issues.

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