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EyePACS: An Adaptable Telemedicine System for Diabetic Retinopathy Screening

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Abstract

Background:
Annual retinal screening of patients with diabetes is the standard clinical practice to prevent visual impairment and blindness from diabetic retinopathy. Telemedicine-based diabetic retinopathy screening (DRS) in primary care settings can effectively detect sight-threatening retinopathy and significantly increase compliance with annual retinal exams. EyePACS is a license-free Web-based DRS system designed to simplify the process of image capture, transmission, and review. The system provides a flexible platform for collaboration among clinicians about diabetic retinopathy.

Methods:
Primary clinic personnel (i.e., nursing, technical, or administrative staff) are trained and certified by the EyePACS program to acquire retinal images from standard digital retinal cameras. Relevant clinical data and eight high-resolution images per patient (two external and six retinal images) are encrypted and transmitted to a secure Internet server, using a standard computer and Web browser. Images are then interpreted by certified EyePACS reviewers or local eye care providers who are certified through the EyePACS Retinopathy Grading System. Reports indicating retinopathy level and referral recommendations are transmitted back to primary care providers through the EyePACS Web site or through interfaces between EyePACS and Health Level 7-compliant electronic medical records or chronic disease registries.

Results:
The pilot phase of the EyePACS DRS program in California (2005–2006) recorded 3562 encounters. Since 2006, EyePACS has been expanded to over 120 primary care sites throughout California and elsewhere recording over 34,000 DRSs. The overall rate of referral is 8.21% for sight-threatening retinopathy and 7.83% for other conditions (e.g., cataract and glaucoma).

Conclusion:
The use of license-free Web-based software, standard interfaces, and flexible protocols has allowed primary care providers to adopt retinopathy screening with minimal effort and resources.

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Abbreviations: (CHCF) California Health Care Foundation, (CSME) clinically significant macular edema, (DRS) diabetic retinopathy screening, (EMR) electronic medical record, (ERGS) EyePACS Retinopathy Grading System, (ETDRS) Early Treatment of Diabetic Retinopathy Study, (HE) hard exudates, (HMA) retinal hemorrhages with or without microaneurysms, (IRMA) intraretinal microvascular abnormalities, (NPDR) nonproliferative diabetic retinopathy, (PACS) picture archive and communication system, (PDR) proliferative diabetic retinopathy

Keywords: diabetes, Internet, ophthalmology, optometry, retinopathy, telemedicine

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