Remote diabetic retinopathy screening reaches those most at risk

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EARLY and regular screening for diabetic retinopathy can prevent or reduce ocular complications, saving both vision of patients and money for health systems. New screening initiatives that take advantage of digital imaging, non-mydriatic exams, and the internet, are helping to reach high-risk patients that otherwise would have been missed, in tiny villages in the remotest parts of the Earth as well as in the most crowded urban centres.

One important goal of remote screening is to identify at-risk patients and refer them for more detailed work-ups. Cathy Taylor DrPH, MSN, RN and colleagues at the Vanderbilt Eye Clinic in Tennessee, US, evaluated the utility of remote screening via digital photography in the primary care setting. The study included 495 diabetic patients aged 38 years and older seen at one community clinic.

Nearly half of the digitally screened patients displayed signs of retinopathy and were referred for urgent ophthalmological follow-up. The rate of significant retinopathy among higher risk non-whites (14.7 per cent) was more than double that observed for whites (5.9 per cent). The technical element of screening was reliable, with an imaging technical failure rate of less than one per cent.

The advantage of this approach is that it offers patients the chance for immediate screening rather than having to wait weeks for an appointment with an ophthalmologist. The study confirms that digital screening can improve retinopathy screening rates significantly compared with conventional methods; the researchers note. Moreover, the study suggests that this approach can increase referrals to retina specialists, and can help make sure that patients with the greatest needs receive appropriate care.

Researchers in Boston reached similar conclusions in another study. Paul Conlin MD and colleagues in the Department of Veterans Affairs Boston Healthcare System compared the rates of annual dilated eye exams in 223 patients assigned to undergo teleretinal imaging and 225 control patients who received usual care.

The Boston team used a system called the Joslin Vision Network system. This includes a digital retinal camera that captures stereoscopic single-frame images of three 45° retinal fields. The system also acquires a photograph of each eye for evaluating ocular media clarity, lids, lashes and orbital adnexa. The system transmits the images to retina specialists who grade them for diabetic retinopathy severity.

The researchers found that 87 per cent of patients in the teleretinal imaging group underwent a follow-up exam within 12 months of randomisation. This was significantly more than the rate seen in controls. Patients who had undergone screening were then ‘in the system’ and could be contacted with follow-up reminders when appropriate.

The Boston programme also includes an educational component. The screeners show patients their photographs and explain the ocular anatomy. They also emphasise the value of glucose and blood pressure control for minimising retinopathy risk.

The Joslin system effectively identified new cases of diabetic retinopathy as well as various other ocular disorders. The researchers attributed the success of the programme to the convenience and cost-efficiency of remote undilated imaging combined with patient counselling.

Putting the web to work

Another screening programme, in Los Angeles California, combines digital fundus photography and a web-based telemedicine system. Patients were screened at a public health centre in an economically deprived area with a high population of at-risk patients. The images were then relayed by a secure web system to the ophthalmology department of a large regional medical centre. In a four-month period the system acquired 1500 images of more than 650 patients.

The developers of that programme demonstrated the potential of using off-the-shelf, free or inexpensive software to facilitate the technical side of the system. The web-based system was built on Java Servlet and Java Server Pages technologies using the Apache Tomcat server platform. They used MySQL as the main database and Laboratory of Neuro Imaging (LONI) Image Storage Architecture. They used login/password, Secure Socket Layer (SSL) and HyperText Transfer Protocol over SSL (HTTPS) for security. The researchers plan to make the software publicly available through Open Source release.

Remote screening in remote locations

Innovative telemedicine systems are also proving very useful in screening patients in very remote locations. For example, Canadian ophthalmologists have created a long-distance system to screen and monitor aboriginal peoples in the northernmost extremes of the country, a population at high risk for retinopathy. Medical teams conduct the screening with specially equipped vans driven to the communities. When the roads are impassable, the teams are flown to the villages.

A pilot study revealed that more than one third of patients in the remote northern village of Fort Vermillion, Alberta showed some degree of diabetic retinopathy, of whom 10 per cent needed laser treatment. Patients requiring panretinal photocoagulation were then transported to medical centres. The remaining 90 per cent could be followed with ongoing remote screening. This represented a significant cost savings to government health care system. The successful pilot programme has since been expanded to include all 44 communities in Alberta’s far north. Patients now also undergo general assessments of their diabetes, not just for eye conditions.

Some of the communities participating in the project are more than 1,000km north of the city of Edmonton where the images are interpreted. Digital fundus photographs are sent to retina specialists via secure virtual private network on the internet.

UK aims for nationwide screening

Diabetic retinopathy is the single most common cause of blindness in the adult working population in the UK. The financially and operationally stressed National Health Service in the UK is anxious to reap the benefits of population wide retinopathy screening. A national committee recently recognised the potential benefits of establishing a nationwide protocol for such screening. It has established a National Standards Framework for its inception and subsequent operation.

The committee identified community-based digital retinal photography as the optimal and most cost-effective method of performing retinopathy screening. The committee recognised that a large-scale system would require training more people to conduct the screening. A national qualification for retinopathy screening personnel is now in a pilot phase.

A British company called Digital Healthcare has developed software to facilitate large-scale screening and information management. The OphoMize IP programme combines digital images of the retina with a centralised and fully automated patient administration system. It was used to transfer screening results of 12,000 diabetic patients seen at 17 screening locations across central Lancashire, England during a 12-month period.

The system connects primary care providers who do the screening with secondary care facilities that evaluate the images and follow-up with patients. The greater number of screening locations improves the overall screening rate and provides patients with more convenient options. This facilitates both regular screening and urgent referrals where necessary, the developers note.

“This is much more effective than conventional eye examinations with slit lamps and film-based retinal images, which can be less detailed and deteriorate over time. Before we were using a paper-based system, and opticians would grade the condition of the retina on paper and either refer the patient to the hospital for treatment or for screening the following year. There was no proper quality assurance programme,” said Ms Alison Johnson, head of priority clinical services development at Chorley & South Ribble Primary Care Trust, one of the regional organisations involved in the study.