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Short Report: Complications

Delay in diabetic retinopathy screening increases the rate of detection of referable diabetic retinopathy

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Abstract

Aims To assess whether there is a relationship between delay in retinopathy screening after diagnosis of Type 2 diabetes and level of retinopathy detected.

Methods Patients were referred from 88 primary care practices to an English National Health Service diabetic eye screening programme. Data for screened patients were extracted from the primary care databases using semi-automated data collection algorithms supplemented by validation processes. The programme uses two-field mydriatic digital photographs graded by a quality assured team.

Results Data were available for 8183 screened patients with diabetes newly diagnosed in 2005, 2006 or 2007. Only 163 with Type 1 diabetes were identified and were insufficient for analysis. Data were available for 8020 with newly diagnosed Type 2 diabetes. Of these, 3569 were screened within 6 months, 2361 between 6 and 11 months, 1058 between 12 and 17 months, 366 between 18 and 23 months, 428 between 24 and 35 months, and 238 at 3 years or more after diagnosis. There were 5416 (67.5%) graded with no retinopathy, 1629 (20.3%) with background retinopathy in one eye, 753 (9.4%) with background retinopathy in both eyes and 222 (2.8%) had referable diabetic retinopathy. There was a significant trend ($P = 0.0004$) relating time from diagnosis to screening detecting worsening retinopathy. Of those screened within 6 months of diagnosis, 2.3% had referable retinopathy and, 3 years or more after diagnosis, 4.2% had referable retinopathy.

Conclusions The rate of detection of referable diabetic retinopathy is elevated in those who were not screened promptly after diagnosis of Type 2 diabetes.

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Introduction

There is a strong correlation between incidence of diabetic retinopathy and duration of diabetes [1]. Detection of referable diabetic retinopathy at a patient's first screening appointment raises the following questions:

1. Could this relate to the time course of development of diabetes? Referable diabetic retinopathy around the time of diagnosis is recognized in Type 2 diabetes [2]. We know from closely monitored populations such as the Whitehall II study [3] that blood glucose rises above normal only around 18 months before diagnosis of diabetes. In populations like this who are regularly screened for diabetes, the prevalence of diabetic retinopathy is low [4]. In those who present symptomatically with diabetes, the onset of diabetes is estimated [5,6] to be 4–7 years before diagnosis and the prevalence of retinopathy is reported to be higher [2].
2. Is this attributable to the screening programme not being informed in a timely fashion of the diagnosis? Diabetic eye screening programmes are totally reliant on general practices informing them of all newly diagnosed patients and, as this is predominantly a manual process, errors and omissions are sometimes made.
3. Is this because of the person with diabetes not attending the screening appointment? Those on the screening register are invited within 3 months of being added to the register and then annually, but may choose not to take up the invitation, or may wait for two or more years before doing so.

In order to determine whether delay in screening for diabetic retinopathy as a result of any of the above factors

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What's new?

- This report is the first that has described a relationship between rate of detection of referable diabetic retinopathy and delay in screening for diabetic retinopathy after diagnosis of Type 2 diabetes.
- We would like to use this report as evidence to ask for a new quality standard in UK diabetic eye screening programmes. We suggest a target be set for proportion screened within 2 years of being added to the screening register.

might be clinically important, we determined the prevalence of referable diabetic retinopathy at the first screening episode by time after diagnosis in patients attending the Gloucestershire Diabetic Eye Screening Programme (GDESP).

Methods

Data for patients referred to the eye screening programme were extracted from the primary care databases with semi-automated data collection algorithms supplemented by validation processes using procedures developed under the General Practice to Diabetic Retinopathy Screening (GP2DRS) project, which was initiated as a joint initiative between the English National Health Service (NHS) Diabetic Eye Screening Programme (DESP) and Connecting for Health to automatically extract patient records from general practices. Patients were referred from 88 primary care practices and invited for screening at a local primary care practice with mobile cameras. Digital retinal images of both eyes were taken after pharmacological dilatation and graded by the quality-assured grading team. People with diabetes in this programme are routinely sent an invitation to phone to book an appointment with the screening service within 3 months of the service being informed by the general practice of the new person with diabetes and then once a year, with one reminder being sent if they do not take up the annual offer.

Data collected from the screening programme were analysed to examine the proportion with diabetic eye disease at intervals from diagnosis of diabetes. In the English NHS Diabetic Eye Screening Programme, all images are automatically allocated a retinopathy (R) grade and a maculopathy

Table 1 Comparison between the retinopathy grading classification of the English NHS DESP and the ETDRS

English retinopathy classification (R levels—R0, R1, R2 or R3) Outcome	English Screening Programme levels	ETDRS final retinopathy severity scale	ETDRS(final) grade	Risk of progression to proliferative diabetic retinopathy in 1 year
Re-screen in 12 months	R0 (no retinopathy)	No apparent retinopathy	10, 14, 15	
Re-screen in 12 months	R1 (background retinopathy), microaneurysm(s), retinal haemorrhage(s), any exudate	Mild non-proliferative retinopathy	20–35	6.2%
Routine referral to ophthalmologist	R2 (pre-proliferative retinopathy), venous beading, venous reduplication, intraretinal microvascular abnormality, multiple blot haemorrhages	Moderate non-proliferative retinopathy	43	11.3%
		Moderately severe non-proliferative retinopathy	47	20.7%
		Severe non-proliferative retinopathy	53	44.2–54.8%
Urgent referral to ophthalmologist	R3 (proliferative)	Proliferative diabetic retinopathy	61 and greater	Proliferative diabetic retinopathy has developed

English maculopathy classification (M levels—M0 or M1)* Outcome		
Re-screen in 12 months	M0	None of the features below
Routine referral to ophthalmologist	M1	Exudate within 1 disc diameter of the centre of the fovea
Routine referral to ophthalmologist	M1	Circinate or group of exudates within the macula
Routine referral to ophthalmologist	M1	Any microaneurysm or haemorrhage within 1 disc diameter of the centre of the fovea only if associated with a best visual acuity of ≤ 6/12 (if no stereo)
Routine referral to ophthalmologist	M1	Retinal thickening within 1 disc diameter of the centre of the fovea (if stereo available)

*Retinopathy R level must be at least R1 to classify any M1.
ETDRS, Early Treatment Diabetic Retinopathy Study;

(M) grade on the basis of the absence, presence and severity of features of diabetic retinopathy found during grading of the retinal images. The criteria used for grading and allocation of retinopathy and maculopathy levels in the Gloucestershire Diabetic Eye Screening Programme, which are those required by the English NHS Diabetic Eye Screening Programme [7], and the relationship to the Early Treatment Diabetic Retinopathy Study (ETDRS) severity scale [8,9] are shown in Table 1.

Any diabetic retinopathy was defined as having a grade other than R0M0 in at least one eye. Referable diabetic retinopathy was defined by the presence of any moderate to severe non-proliferative diabetic retinopathy (R2), proliferative diabetic retinopathy (R3) or maculopathy (M1) in either eye. Patients with unassessable images were excluded from the analyses here.

Results

Data were available for 8183 patients newly diagnosed with diabetes between 2005 and 2007.

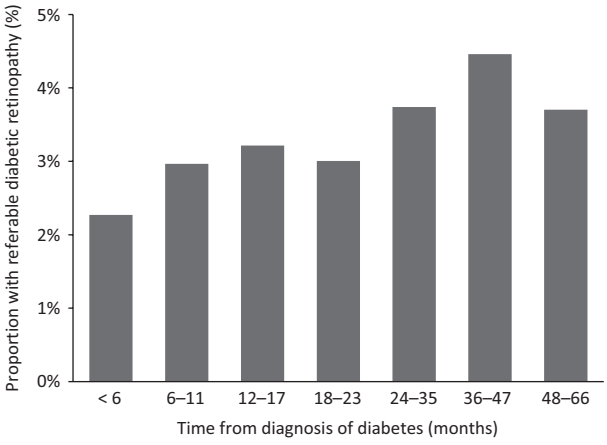

FIGURE 1 Proportion of subjects with referable diabetic retinopathy; χ^2 for trend, $P = 0.0004$.

Only 163 with Type 1 diabetes were available, which was an insufficient number to show any trends in the analysis, and hence these subjects were excluded.

Data were available for 8020 subjects with newly diagnosed Type 2 diabetes (see Fig. 1 and Table 2).

Of these, 3569 were screened within 6 months, 2361 were screened between 6 and 11 months, 1058 between 12 and 17 months, 366 between 18 and 23 months, 428 between 24 and 35 months and 238 at 3 years or more after diagnosis.

Overall, there were 5416 (67.5%) graded with no retinopathy (R0M0) in both eyes, 1629 (20.3%) with background non-referable retinopathy (R1M0) in one eye, 753 (9.4%) with background diabetic retinopathy (R1M0) in both eyes and 222 (2.8%) with referable diabetic retinopathy in one or both eyes.

There was a significant trend ($P = 0.0004$) relating time from diagnosis to screening, with worsening diabetic retinopathy.

Of those screened within 6 months of diagnosis, 2.3% had referable diabetic retinopathy. In those screened 3 years or more after diagnosis, 4.2% had referable diabetic retinopathy.

Discussion

Zoega *et al.* [10] described the relationship between non-attendance for diabetic retinopathy screening and blind registration in a small population of 22 people with diabetes registered blind in Iceland.

We recently published [11] an audit that we undertook in a large general practice in Gloucester, which demonstrated that attendance for diabetic eye screening was inversely associated with HbA_{1c} ($P < 0.0001$), systolic and diastolic blood pressure ($P = 0.005$), suggesting that those with the poorest control of their diabetes and blood pressure were least likely to attend.

Other factors that are known to affect attendance are:

1. Patient age—younger patients had a higher propensity for non-attendance at diabetic retinopathy screening [12,13].
2. Socio-economic deprivation [14].

Table 2 Relationship between time from diagnosis to screening and diabetic retinopathy severity

Time from diagnosis of diabetes to screening	No retinopathy (R0M0) in both eyes		Background retinopathy (R1M0) in one eye		Background retinopathy (R1M0) in both eyes		Referable diabetic retinopathy	
< 6 months	2449	68.6%	719	20.1%	320	9.0%	81	2.3%
6–11 months	1610	68.2%	463	19.6%	218	9.2%	70	3.0%
12–17 months	689	65.1%	231	21.8%	104	9.8%	34	3.2%
18–23 months	239	65.3%	80	21.9%	36	9.8%	11	3.0%
24–35 months	273	63.8%	93	21.7%	46	10.7%	16	3.7%
36–47 months	109	69.4%	28	17.8%	13	8.3%	7	4.5%
48–66 months	47	58.0%	15	18.5%	16	19.8%	3	3.7%

χ^2-test for trend, $P = 0.0004$.

3. Type of diabetes—attendance rates at diabetic retinopathy screening were found to be lower in patients with Type 1 diabetes [13].

This current study has demonstrated that the rate of detection of referable diabetic retinopathy is higher in those who were not screened promptly after diagnosis of Type 2 diabetes. This study does not differentiate between whether those who were screened later had more severe diabetic retinopathy at diagnosis or whether the lateness in being screened was related to the compliance issues that have previously been published. It also does not differentiate between people with diabetes who have good or poor control of blood glucose, because English NHS Diabetic Eye Screening Programmes do not routinely have access to HbA_{1c} data. It does, however, indicate that it would be beneficial to screen people within the current National Institute for Health and Clinical Excellence (NICE) [15] Quality Standard of within 3 months of diagnosis.

It also suggests that a new Quality Standard should be introduced in the English NHS Diabetic Eye Screening Programme to minimize the number of people who have a long delay in their first screening appointment and, in particular, the number of people who have not taken up their offer of screening within 3 years of diagnosis.

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Competing interests

None declared.

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