

Research article

Can Australian general practitioners effectively screen for diabetic retinopathy? A pilot study

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Abstract

Background: Diabetes has been identified as one of the national health priority areas in Australia. After 20 years of diabetes most patients can be expected to develop diabetic retinopathy which, if undetected, is likely to cause significant visual loss or blindness. This paper reports on a pilot study aimed to test the ability of Australian GPs to clinically recognise diabetic retinopathy following a brief training intervention.

Method: 17 GPs from a Brisbane Division of General Practice were recruited to participate in a clinical upskilling intervention pilot. Participant scores on clinical assessments were used to analyse GP sensitivity and specificity in screening for diabetic retinopathy. Results were compared with the NHMRC guidelines for acceptable screening accuracy.

Results: Ten of the 17 GPs (59%) achieved a screening sensitivity of 25% or less in the pre test, three (18%) a sensitivity of 50%, and four (23%) achieved a sensitivity of $\geq 75\%$. In the post-test, all seventeen GPs achieved between 50 and 100% sensitivity. In the pre-test, thirteen (76%) GPs achieved a screening specificity of less than or equal to 50%, and four (23%) a specificity of 75%. In the post test, four GPs (23%) rated a screening specificity of less than 50%, six (35%) achieved a specificity of 66%, and seven (41%) 100% specificity.

Conclusion: 24% of GPs met the NHMRC diabetic retinopathy screening criterion prior to the workshop, and 94% following this brief training intervention. Australian GPs are capable of a much more significant role in community screening for diabetic retinopathy.

Background

Diabetes mellitus constitutes a major Australian public health problem. It has been identified as one of our national health priority areas[1], and recent data suggests that up to 7.5% of the Australian adult population now suffers from this condition. After 20 years of diabetes most

patients can be expected to develop diabetic retinopathy[3] which, if undetected, is likely to cause significant visual loss or blindness. A recent Australian survey recorded almost 1/3 of patients with self-reported diabetes having diabetic retinopathy.[4] However, if detected early by appropriate retinal examination, followed and treated by

laser photocoagulation, most patients can be saved from major visual loss. [5-7]

Our National Health and Medical Research Council (NH-MRC) Guidelines on the management of diabetic retinopathy, recommend regular ocular review to detect, treat and minimize such visual morbidity. [8] Recent Australian studies, however, have documented only a relatively small proportion of Australians with diabetes receiving such sight-saving examinations. The Melbourne Visual Impairment Project, a large population-based epidemiological study of 4,744 Victorians with diabetes, found that only half the sample surveyed reported a retinal examination within the last 2 years. Worryingly, participants with diabetic retinopathy were no more likely to have had an examination than those without (52.9% v 49.3% p = 0.66)[3]. The National Divisions Diabetes Program, a survey of the treatment of diabetes in 4,359 patients across 7 Divisions of General Practice, recorded 49.6% of patients to have had an appropriate retinal examination over the 24 month reporting period. [9]

A number of strategies have been implemented to increase the number of Australians with diabetes accessing regular eye checks. Remote clinics with annual "fly-in" ophthalmologists operate in a number of Australian states. Mobile retinal cameras, operated by state health departments or Divisions of General Practice, have recently improved community access to screening,[10] but are expensive to purchase and operate. Australian optometrists are offering their services in the area of diabetic retinopathy screening. However, little attention to date has focused around the use of appropriately-trained general practitioners in offering effective and accessible screening for diabetic retinopathy. We aimed to determine whether general practitioners could be trained to identify the important features of diabetic retinopathy in a short training time and with an acceptable degree of sensitivity and specificity.

Method

Seventeen GPs from the Bayside Division of General Practice self-selected to participate in a Divisional Eye Upskilling Project, funded by the Department of Health and Human Services. As part of this program, the University of Queensland Departments of Ophthalmology and General Practice were asked to design a brief 'hands-on' educational intervention to assist GP skill development in the ocular assessment and management of diabetes mellitus and primary open angle glaucoma. The complete program and its evaluation has been documented in a previous paper [11] Details of the diabetic retinopathy training intervention are displayed in Table 1.

All sessions were highly interactive and used patients for skill demonstration wherever possible. These sessions were conducted within the Professorial Eye Unit, Princess Alexandra Hospital, using patients with good clinical signs. Doctors were urged to practice and refine skills in their own practices between workshops, and to comment on barriers and supports to the use of the skills in their clinical practice.

All GPs underwent a comprehensive practical assessment of their eye skills prior to undertaking the intervention, and completed an identical assessment at the conclusion (pre and post test). The pre and post evaluation relevant to the diabetes retinopathy skills component consisted of eight (8) two-minute patient fundal examinations conducted a month prior and a month following the skills program. Four (4) of the patients involved in this assessment suffered from diabetic retinopathy, and four (4) had normal fundi.. The gold standard used to determine the presence or absence of diabetic retinopathy was the agreed clinical assessment by two academic ophthalmologists. All four diabetic (4) patients had background diabetic retinopathy. Every attempt was made to make pre and post evaluation assessments for the diabetes patients identical. However, one of the four diabetic patients participating in the pre-test, was unable to return for the final evaluation session. He was replaced, as closely as possible, by a patient with similar fundal appearance. The four pa-

Table 1: Diabetes segment of the GP Eye Upskilling Program

Workshop 1		Workshop 2	
1. Overview diabetic eye disease	30 mins	1. Patient fundoscopy clinic	30 mins
2. Fundoscopy video	15 mins	2. Question and answer session	15 mins
3. Fundoscopy practice	30 mins	3. Use of skills in the general practice time frame	15 mins
4. Slide review session	15 mins	4. Slide review	15 mins
5. Patient fundoscopy clinic session	35 mins		

Table 2: Workshop Modules (National RACGP / RACO GP Eye Skills Workshop)

Module 1	Vision Testing And Ophthalmic Screening
Module 2	Concepts And Assessment For Glaucoma
Module 3	The Slit Lamp
Module 4	Ophthalmoscopy
Module 5	Incision Of Chalazion
Module 6	Removal Of Corneal Foreign Bodies
Module 7	Suture Repair Of Entropion
Module 8	Ocular First Aid
Module 9	The Six Point Eye Examination
Module 10	How Will This Change My Practice?
Module 11	Patient Assessment Clinic (Optional)

tients with normal fundi were recruited from the ward and outpatient departments on the day of assessment. One "normal" failed to attend the post-test. The post test was in all other respects conducted identically to the pre test. GPs were not informed of the retinopathy status of the patients used in the pre-evaluation testing and these patients were separated from clinical teaching sessions during the educational intervention.

All patients were unknown to participating GPs. The University of Queensland ophthalmology staff supervised all training sessions and both assessments. Ethical approval to conduct the study was sought and received from the Princess Alexandra Hospital Ethics Committee.

Statistical method

Participant performance on the patient fundal assessment, pre and post educational intervention, was used to determine sensitivity and specificity of screening for diabetic retinopathy. Sensitivity was calculated as the ratio of patient assessments correctly identified by the GPs as diabetic, to the total number of diabetic retinopathy positive cases (four subjects in total in both pre and post tests). Specificity was calculated as a ratio of the number of normal cases correctly identified over the total number of normals participating in both tests (four subjects in the pre-test, and three subjects in the post-test). [12]

For each GP, sensitivity pre and post educational intervention was classified 'not satisfactory' if sensitivity was less than 60% and classified 'satisfactory' if sensitivity was equal to or greater than 60%. For each GP, specificity pre and post educational intervention was classified 'not satisfactory' if specificity was less than 60% and classified 'satisfactory' if specificity was equal to or greater than 60%. McNemar's Test was then used to determine if there was an association between Sensitivity Classification and educational intervention. This test was used because it ac-

counts for the paired nature of the data. That is, the same GPs were evaluated Pre- and Post-workshop. Statistical significance is quoted at the conventional $p < 0.05$ level. All hypothesis testing was based on two-tailed hypotheses. Due to small sample sizes exact significance levels were used.

Results

Sensitivity

Pre and post intervention sensitivity results are displayed as percentages in Table 3. Ten GPs (59%) achieved a screening sensitivity of 25% or less in the pre test, three (18%) scored 50%, two (11.5%) scored 75%, and two (11.5%) recorded 100% sensitivity. In the post test, all seventeen GPs achieved between 50 and 100% sensitivity (1 GP achieved 50% sensitivity, 11 GPs (65%) achieved 75% sensitivity, and 5 GPs (29%) achieved 100% sensitivity).

The McNemar test (Table 4) was statistically significant and there was an association between sensitivity classification and educational intervention ($p = 0.001$). There was a significant increase in the number GPs with 'satisfactory' sensitivity from Pre- to Post-workshop.

Specificity

Specificity results, pre and post intervention, are displayed in Table 5. As one of our "normals" failed to appear in the post test, the number of subjects used in the post assessment dropped from four to three, hence the specificities are expressed in increments of 25% for the pre test compared with increments of 33% for the post test. In the pre test, nine GPs (54%) recorded a screening specificity of less than 50%, four (23%) a specificity of 50% and four (23%) a specificity of 75%. In the post test, only four GPs (23%) recorded a specificity of less than 50%, six (35%) a specificity of 66%, and seven (41%) 100% specificity. No GP recorded 100% specificity in the pre test, whilst 7 (41%) recorded 100% screening specificity following the intervention.

The McNemar test (Table 6) was statistically significant and there was an association between specificity classification and educational intervention ($p = 0.001$). There was a significant increase in the number GPs with 'satisfactory' specificity from Pre- to Post-workshop.

The NH&MRC publication "Management of Diabetic Retinopathy: a guide for general practitioners" [8] nominates that a "60% detection rate of early Diabetic Retinopathy (DR) may be sufficient for a successful screening campaign, so long as diabetic patients deemed to not have DR are screened at least every two years." In this study, 24% of GPs met this criterion prior to the workshop, and 94% met it following the intervention.

Table 3: Sensitivity of GP screening for Diabetic Retinopathy (n = 17)

Sensitivity (%)	Pre-workshop GPs (n)	Post-workshop GPs (n)
0	4	0
25	6	0
50	3	1
75	2	11
100	2	5

Table 4: Specificity of GP screening for Diabetic Retinopathy (n = 17)

Pre-workshop Specificity (%)	GPs (n)	Post-workshop Specificity (%)	GPs (n)
0	3	0	1
25	6		
50	4	33.3	3
75	4	66.6	6
100	0	100	7

Discussion

The early identification of diabetic retinopathy is crucial, as effective therapy is now available for the maintenance of vision in most patients. However, the absence of a systematic approach to such identification for Australians with diabetes limits our ability to provide optimal visual outcomes. The limited number of ophthalmologists available in the community restricts their role to the confirmation of diabetic retinopathy, grading, and eventual treatment. The use of a mobile fundus camera and central reading of all photos remains a potential method of identification of retinopathy, although as yet this has not been widely embraced in any single large community (outside remote areas).

GP screening is rarely suggested as an effective means of improving the early detection of diabetic retinopathy in Australia, yet it offers a number of clear benefits. General practitioners have almost universal access to Australian adults with diabetes, as GPs provide the bulk of adult diabetes diagnosis and care. As well as managing glucose control, medication, and lifestyle issues, GPs perform regular checks for peripheral neuropathy, nephropathy and macro vascular disease. An assessment for retinopathy could easily be included as part of the existing annual di-

abetes assessment (as nominated under the latest RACGP / DA Guidelines). This would negate the need to purchase and move expensive machinery, or arrange separate appointment times and assessments, and would be cost-effective for both the patient and community. A general practice screening model also offers the potential to opportunistically "catch" unscreened diabetics presenting to the general practitioner in a variety of other situations. General practitioners have a pre-established referral link with local ophthalmologists if early diabetic retinopathy is suspected. In most Australian states, this relationship has increasingly included an educational element via the RACGP / RACO National GP Eye Skills Program.

A GP screening model thus has the potential to provide a widely-available, holistic and extremely cost effective screening service on a population basis – providing general practitioner skills are adequate for the identification process.

Previous work with general practitioners in this area suggested to us that GP reluctance to undertake retinal screening was due to concerns about the time taken for the examination; a long-standing and unfounded fear of the consequences of pupillary dilatation; and a lack of confidence in undertaking funduscopy with a direct ophthalmoscope. McCarty et al (13) identify lack of dilating drops in the practice, lack of confidence in detecting changes, concern re time taken and the fear of precipitation of angle-closure glaucoma as major barriers to GPs performing dilated ophthalmoscopy with their patients. Strategies to address all of these issues and perceptions were addressed as part of the "_How will this change my practice?" module in our educational intervention (Table 2). Follow up of a separate group of GPs taking this intervention as part of the national RACGP / RACO GP Eye Skills Workshop has demonstrated a sustained change in reported practice in this area [14].

We piloted a brief interactive training intervention to address these issues. Our GP intervention group reviewed and accepted recent data on the rarity of acute glaucoma following pupillary dilation with short-acting mydriatics, and rapidly acquired effective skills in dilated diabetic fundal assessment. A focus of the training was the application of skills in each individual practitioner's work environment, and the practicing of skills between sessions in the general practice setting. This pilot aimed to assess the efficacy of this teaching program in raising the skills of those involved to the level of the current NHMRC guidelines for diabetic retinopathy screening. However, until patients are screened more regularly, the detection rate for diabetic retinopathy may need concomitantly to be higher than the 60% nominated in this guideline.

Table 5: Sensitivity Classification of GP screening for Diabetic Retinopathy by Pre-and Post-workshop

		Pre-workshop		Total
		not satisfactory	satisfactory	
Post-workshop	not satisfactory	1	0	1
	satisfactory	11	5	16
Total		12	5	17

Table 6: Specificity Classification of GP screening for Diabetic Retinopathy by Pre-and Post-workshop

		Pre-workshop		Total
		not satisfactory	satisfactory	
Post-workshop	not satisfactory	3	1	4
	satisfactory	10	3	13
Total		13	4	17

Following training, 94 % of the general practice study group reached this level within a two minute patient examination (both eyes). In addition, the specificity of the identification was such that it would not provide a gross referral overload to ophthalmologists for more accurate assessment and treatment. The time and effort required could be easily integrated into an annual review for patients with diabetes. The Royal Australian Colleges of General Practice and Ophthalmology have implemented this workshop across Queensland in 2000.

With appropriate training, motivation and support, GPs can make a major contribution in the area of effective screening for diabetic retinopathy. Clinicians, educators, bureaucrats and economists within our health system should be aware of this in framing future strategies in the area of diabetes.

Competing interests

None declared

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References

1. National Health Priorities and Quality Branch, Commonwealth Department of Health and Aged Care: **National Health Priority Areas 1999** [http://www.health.gov.au/hsdd/nhpq/3rdnhpa.htm]
2. Dunstan D, Zimmet P, Welborn T, et al: **Daibesity and associated disorders in Australia 2000. The acclerating epidemic. Australian diabetes, obesity and lifestyle report.** Melbourne; International Diabetes Institute 2000
3. Klein R, Klein BEK, Moss SE, et al: **The Beaver Dam Eye Study: retinopathy in adults with newly discovered and previously diagnosed diabetes mellitus.** *Ophthalmology* 1992, **99**:58-62
4. McKay R, McCarty CA, Taylor HR: **Diabetic retinopathy in Victoria, Australia: the Visual Impairment Project.** *Br J Ophthalmol* 2000, **84**:865-870
5. Ferris FL: **How effective are treatments for diabetic retinopathy?** *JAMA* 1993, **269**:1290-1
6. Early Treatment Diabetic Retinopathy Study Research Group: **Photocoagulation for diabetic macular edema. Early Treatment Diabetic Retinopathy Study report number 1.** *Arch Ophthalmol* 1965, **103**:1796-806
7. Early Treatment Diabetic Retinopathy Study Research Group: **Early photocoagulation for diabetic retinopathy: ETDRS report number 9.** *Ophthalmology* 1991, **98**(5 suppl):766-85
8. National Health and Medical Research Council: **Management of Diabetic Retinopathy: a guide for general practitioners.** Canberra: Australian Government Publishing Service, 1997
9. Carter S, Bonney M, Flack J, Burns J, Powell Davies PG, Harris MF: **National Divisions Diabetes Program Data Collation Project. Volume 5: Divisions of General Practice – Diabetes profiles.** Sydney: Centre for General Practice Integration Studies, School of Community Medicine, UNSW, 2000
10. Australian Diabetes Society Retinopathy Subcommittee: **Diabetes Eye Health Promotion Program. Visual Impairment Prevention Program,** 1999

11. Jackson C, Hirst L, Ambler J, Battistutta D: **GPs and eye skills – the heralding of a brave new world?** *Australian Family Physician* 1997, **26**:409-415
12. Hennekens CH, Burning JE: **Epidemiology in medicine: Boston: Little Brown and Company; 1987**
13. McCarty , et al: **Managemnt of diabetic retinopathy by general practitioners in Victoria"** *Clin Exper Ophthalmol* 1987, **29**:12-16
14. Jackson CL, de Jong I, Schlutter P: **Changing Clinical Practice: the RACGP/RACO National GP Eye Skills Workshop** *Australian Family Physician* 2001, **31**:285-91

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