

Factors Affecting Implementation of the National Retinal Screening Grading System and Referral Guidelines: A Multi-Centre Analysis.

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Abstract

Aim: To determine whether four main centre regional diabetic retinal screening services and retinopathy referral centres in New Zealand meet the national guidelines for referral and assessment of screen detected R3, M2B and M3 graded diabetic eye disease..

Method: The retinal screening pathways and data sets collected by four regional retinal screening services and their corresponding regional referral centres were described and compared with the standards recommended in the National Guidelines. A retrospective audit of screen detected R3, M2B and M3 graded diabetic eye disease during May to August 2008 was undertaken. Follow up of screen detected cases was examined and compared with the national recommendations.

Results: All four screening services used the national diabetes retinal screening guideline for grading. Three services had a dedicated electronic retinopathy screening database and two recorded screening results electronically. For the most part not all recommended data were collected and recorded, and not all recorded data were readily accessible. Grading practices varied between the centres. The retinal photos of 157 patients were graded as R3, M2B, M3 or a combination. This represented 1.2% of those screened in region A, 3.4% in region B, 3.2% in region C and 1.8% in region D. Overall, 75 (48%) were referred for review by an ophthalmologist of whom 45 (60% of referred) were seen within the recommended six months. Nine patients (15% of those with a documented review) were recorded as having been referred or received laser treatment during audit period or in the 12 months following the audit period.

Conclusion: Quality diabetic retinal screening data systems and quality assurance programmes are required to improve the monitoring and quality of retinal screening in New Zealand. Specific indicators are required for determining whether the rates of avoidable vision loss and blindness from diabetes are reducing.

INTRODUCTION

Diabetic retinopathy is a specific ocular complication of diabetes mellitus that when left undetected and untreated causes visual impairment and blindness.¹⁻³ Timely treatment with laser photocoagulation reduces both progression to and incidence of sudden vision loss secondary to proliferative diabetic retinopathy, and slows the progression of diabetic macular oedema.⁴ Organised retinal screening is the most cost effective means for early detection and timely treatment of diabetic retinopathy.⁵

The increase in diabetes prevalence worldwide has heightened awareness of the disease and its impact on affected individuals and populations. Preventing diabetes and limiting the impact of diabetes through better services is a key health target in New Zealand.⁶ Initiatives to achieve this goal have been implemented, for example, in 2001 the nationwide 'Get Checked' programme was introduced, part of which seeks to improve retinal screening rates, and the publication of both the National Diabetes Retinal Screening Grading System and Referral Guidelines 2006⁷ and the Diabetes and Cardiovascular Disease Quality Improvement Plan⁸ in 2008.

New Zealand has traditionally had separate regional approaches to diabetic retinal screening with considerable variation in structure, operation and results. Currently, the Ministry of Health contracts with 21 District Health Boards (DHBs) to provide retinal screening services. As part of contractual service specifications the Ministry of Health directs adoption of screening standards by DHBs and requests data relating to the service outcomes from DHBs. Service outcomes are based on interpretation of the number of patients screened, the number of screening events, and the number of patients receiving argon laser treatment reported by each DHB. The quality of grading of fundal photography and referral pathways are not monitored nationally. Fundal photographs are graded for both diabetic retinopathy disease (R0 to R5, RT) and diabetic macular disease (M0 to M5, MT).⁷ R3, M2B and M3 grades are important because an accurate assessment of disease is restricted – the need to exclude significant peripheral disease beyond the photographic fields in the case of R3, and the need to accurately assess retinal thickening in the case of M2B and M3. In these instances a first specialist assessment is recommended within 4-6 months.⁷

The aim of this project was to determine whether four regional diabetic retinal screening services and referral centres in New Zealand comply with the National Diabetes Retinal Screening Grading System and Referral Guidelines 2006 recommendations grades R3, M2B and M3.

The specific objectives were

- (i) to assess the uptake and use of the National Diabetes and Retinal Screening Grading System and Referral Guidelines in four regional diabetic retinal screening services.
- (ii) to undertake a retrospective audit of screen detected R3, M2B and M3 graded fundal photographs.

METHODS

This study was undertaken at four centres providing regional diabetic retinal screening services across New Zealand. The Multi-Regional Ethics Committee approved the study. A two stage approach to measuring guideline uptake was undertaken – a description of each service and a retrospective audit of R3, M2B and M3 graded fundal photographs during May to August 2008.

Description of Retinal Screening Services

The four retinal screening services and the dataset collected and recorded by each service and their corresponding regional referral centre were described. Each centre was visited and key screening staff interviewed. Information obtained about the screening service included retinal screening method, grading personnel, referral systems, data collection systems and data items that were collected and recorded. Information on where each data item, if collected, was recorded was also obtained. Information was also sought from the Ministry of Health. Data items collected by each centre were compared with the recommended national minimum dataset specified in the guidelines.

Retrospective Audit

A retrospective audit of screen detected R3, M2B and M3 was done. Screen detected grades R3, M2B or M3 were selected for this audit as they represent a significant precursor of preventable visual loss and appropriate timely referrals within 4-6 months, as specified in the national guidelines, is a measurable indicator of service function. M2B was included to reflect recent changes to the M3 description in the guidelines. The primary outcome was duration from screen detected R3, M2B or M3 until review of the patient by an ophthalmologist. In addition to retinal screen and referral details, demographic data were also collected.

Eligible patients were those with diabetes screened between 1 May and 31 August 2008 and the secondary grading was R3, M2B, or M3. The highest macular or peripheral grade in either eye was used. Where a record of the secondary grade was not found, the primary grading was used. Patients who were pregnant or did not have

guideline consistent grades in the screening database but graded as having few or no micro aneurysms were excluded.

The process for identifying eligible patients and obtaining audit data varied between the centres. Electronic appointment or paper records of the patients attending screening during the study period were checked to assess eligibility. If retinal screening results or other relevant data were missing from the screening database, paper records were accessed and reviewed to find the missing relevant data. The computerised retinal screening database was used to readily identify eligible patients and the audit data in one situation. In one centre clinic appointment lists which recorded follow-up details were examined, and those patients requiring non routine follow-up had their medical notes checked for eligibility. At another centre hand-written lists of patients screened at each screening clinic also recorded primary grading result and were manually checked for potential eligible patients, then the medical notes were checked for eligibility. At the fourth centre patients recorded as having few or no micro aneurysms on the screening database were excluded from a list of patients screened during the study period. The paper medical records were then examined to obtain the screening grade for the remaining patients.

For identified eligible patients, hospital patient booking management systems were used to source information pertaining to appointment and referral dates. In all centres, the medical notes (paper or electronic) had to be manually searched for relevant details pertaining to the ophthalmology review appointment. The data collected included: demographics, diabetes type, duration and treatment, date of abnormal retinal screen, date of referral, date of receipt of referral, date specialist appointment made and method of patient notification, whether appointment(s) was attended, co-morbid visual burden and outcome of the clinical review

Statistical Analysis

Totals were enumerated. Means and proportions were calculated where appropriate.

RESULTS

Participation in a regional retinal screening service was based on referral to the service, principally by general practitioners.

Structure of regional diabetic retinal screening services

Retinal screening services in the four regions were provided by District Health Boards (DHBs) – A, B, C and D. Two retinal screening services were provided by the hospital eye department, one by a dedicated hospital diabetes centre and one by a Primary Health Organisation (PHO) who contracted optometrists to undertake initial assessments and fundal photography. One service employed dedicated ophthalmologists to assess screen positive patients, whereas the other three services referred screen positive patients to the local hospital eye department for ophthalmology assessment.

Three services used a dedicated electronic screening database and two recorded the retinopathy grade electronically. Recorded electronic grades were readily accessible in only one centre.

All four centres used fundal photography to screen for diabetic retinopathy. Where adequate retinal images were not obtained using mydriatics, examination by dilated slit-lamp biomicroscopy was done. In B region this was performed at the same screening visit, whereas in the other three centres patients with inadequate photographs were recalled at a later date to be examined by an optometrist or ophthalmologist.

All four centres used the national guideline described grades for grading. The structure of the grading process varied between the centres. At both the A and D services, those taking the fundal photographs were the primary graders. In both centres the role of the primary grader was not restricted to grading R0, R1, M0 and M1 as specified in the guidelines. At service A the primary grader also graded R2, R3, M2, and M3 with photographs with graded R3 or M3 or higher being reviewed by the service ophthalmologists. At service D the primary grader graded all levels of retinopathy for the purposes of identifying those grades requiring prompt referral to

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clinic and triaging intermediate and lower grades for review by the secondary grader. All photographs were reviewed by the secondary grader. At service B the primary graders were optometrists and service C did not employ primary graders.

Secondary graders were employed by all centres, but the professional training differed between the regional programmes. Service A was the only service using a consultant ophthalmologist. Both service B and service D utilised optometrists, and service C employed training and non-training ophthalmology registrars who were supervised by the service ophthalmologist.

The recommended minimum dataset and those data items collected and recorded by each of the four regional services are shown in Tables 1 and 2. The pattern of recording information and what information was collected and recorded was inconsistent. No centre collected all recommended data items, and the data items recorded differed between the four centres. The data items collected by all four centres were demographic details and year of diabetes diagnosis. Only service B recorded ethnicity, using the codes as per the guideline recommendations.

Table 1. The recommended minimum dataset compared with those data items collected by each of the four centres, and where this information is recorded*.

Recommended Dataset		Screening Centre			
Field	Data	A	B	C	D
National Health Index number (NHI)		4	4	4	4
Gender	F, M, U	4	4	4	4
Surname		4	4	4	4
First Name		4	4	4	4
Middle name(s)		4	4	3	4
Date of Birth	ccyy-mm-dd	4	4	4	4
Residential address	Including suburb, city and post code	4	4	3	4
Contact phone(s)	Area code and phone number	4	4	3	3
Ethnic origin	Ethnicity – two digit code as specified in guideline	4	4	3	3
Domicile code	NNNNNNN	3	5	3	3
Type of Diabetes	1-Type 1 2-Type-2 3-Type unknown 4-Gestational 6-Other known type 7-IGT/IFG	4	4	1	0
Year of diabetes diagnosis	ccyy	4	4	4	4
Name of general practitioner		4	4	3	4
Practice ID		3	4	0	4
Name/address of GP practice		3	4	3	4
Diabetes “education and management” provider	GP team, specialist clinic, community diabetes clinic, other	0**	5	0	0
Year person enrolled for retinal screening service		5	5	1	4
Year person exited retinal screening		4	5	3	4

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service					
Reason for exiting retinal screening service	1. Grade R3 or worse 2. Grade M2 or worse 3. Referred for laser treatment 4. Dense lens opacities 5. Other pathology 6. Other	4	5	3	1
Year returned to retinal screening from clinical service		4	5	0	4
Reason returned to retinal screening from clinical service	1. Post cataract surgery, clear view 2. >2 years post laser – stable 3. Grading <R3, M2 4. Other pathology: OK to screen 5. Other	0	5	0	1

*Method of recording

0 – Not recorded

1 – Recorded in the patient eye department notes (includes grading sheets where not collated separately)

2 – Recorded in a hand written database (includes grading sheets where collated and stored separately)

3 – Recorded in computer database not specific to diabetes or retinopathy screening (includes PMS)

4 – Recorded in a dedicated computerised diabetes or retinopathy screening database

5 – Unknown

**While not recorded in the database, the service A database is maintained by the regional screening centre.

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Table 2. The recommended data to be collected at each retinal screening examination compared with those data items collected by each of the four centres, and where this information is recorded*.

Recommended Dataset		Screening Centre			
Field	Data	A	B	C	D
NHI		4	4	4	4
New Enrolment into screening	Yes/No	4	4	4	4
Date of last screening	ccyy-mm-dd	4	4	4	4
Date to screening	ccyy-mm-dd	4	4	4	4
Referrer	General practitioner, community diabetes clinic, diabetes physician, hospital diabetes clinic, other	4	4	1	1
ID of the person grading screening images		4	4	1	4
Location screening undertaken	(insert local pull down list)	2	4	0*	4
Screening Method	Digital photography, film photography, clinical (slit lamp biomicroscopy), other	0	4	0*	1
Mydriatic used	Yes/No	0	4	1*	1
Pregnant	0-No	4	5	1	4
Gestation	1-Yes Gestation:____/42	4	5	1	1
HbA1c		4	4	1	1
HbA1c date	ccyy-mm-dd	0	4	0	0
Compliance with screening over a 12-month period	Good, moderate (DNAx1), poor (DNAx2, or >)	0	5	0	0
Other Disease: hypertension	0-No 1-Yes	4	4	4	4
Renal Disease	0-No nephropathy 1-Confirmed microalbuminuria 2-Overt diabetic nephropathy 3-Non-diabetic nephropathy	4	4	1	4

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	9-Not established/not known (default)				
Is the patient a smoker?		3	3	3	3
Other		4	4	3	1
Retinopathy grade (worst eye) (or image clarity and field size)		2	4	4**	1
Maculopathy grade (worst eye)		2	4	4**	1
Other significant pathology		4	4	4	1
Referred to ophthalmologist		4	4	4	4
Recommended time to ophthalmologist clinic		3	4	4	4
Interval until next screening examination		3	4	4	4
Has the patient been given an eye referral today?		4	4	4	4
Visual acuity Left		4	4	4	1
Visual acuity Right		4	4	4	1

*Method of recording

0 – Not recorded

1 – Recorded in the patient eye department notes (includes grading sheets where not collated separately)

2 – Recorded in a hand written data base (includes grading sheets where collated and stored separately)

3 – Recorded in computer database not specific to diabetes or retinopathy screening (includes PMS)

4 – Recorded in a dedicated computerised diabetes or retinopathy screening database

5 – Unknown

** All screening at service C is conducted at the eye department by mydriatic photography. Grades recorded on the service C database correspond to, but are not in the format described by the guidelines

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R3 and M3 Referral Audit.

During the four month study period 2,135 resident patients were screened by service A, 1,438 by service B, 1,930 by service C and 1,139 by service D. Overall, the retinal photos of 157 patients were graded as M2B, M3, R3 or a combination – 25 (1.2%) in region A, 49 (3.4%) in region B, 62 (3.2%) in regions C and 21 (1.8%) in region D. Almost two-thirds (60%) were men and the mean age was 57 years. Two-thirds (66%) were European/Pakeha or Other European, while 4% were Maori, 10% were Pacific peoples and 11% Asian.

Diabetes type was poorly recorded with 36% having no diabetes type recorded. Mean duration of diabetes (all types) was 14.8 years. Mean duration of diabetes was longer for women (16.2 years) compared with men (13.9 years). Pacific Island peoples and Maori had a shorter duration of diabetes, 9.2 years and 10.7 years, respectively compared with other ethnic groups. Diabetes treatment information was incomplete with 15% having no diabetes treatment recorded or diabetes treatment was unknown. About half were treated with insulin and a third with oral hypoglycemic medications only. HbA1c was recorded for just under half (46%), but it was not known if this was the most recent result. Where HbA1c was recorded, the mean was 8.6%.

Slightly more than half (52%) had a best visual acuity in either eye of better than or equal to 6/6, while about one-quarter (29%) had a visual acuity greater than 6/6 but better than or equal to 6/10, and 19% less than 6/10. Table 3 shows the specific retinopathy grading groups. One-third were graded as R3 only, and 20% had both M3 (including M2B) and R3 grades. The proportion of photos with each grade or combination of grades varied between the centres. The R3 grade was used most frequently in both the service A and service C regions, and no patients were graded as R3 during the study period in region D.

Of the 157 patients identified with R3, M2B, M3, or a combination, less than half (75) were referred for review by an ophthalmologist of whom 45 (60%) were seen within the recommended six month time frame. Referral rates were considerably higher in regions A (80%) and D (90%) compared with regions B (22%) and C (40%). Of those referred the proportion reviewed by an ophthalmologist within the recommended 6 months ranged from 45% in region B to 70% in region A. Overall, 15 of the 75 referred patients had no record of being reviewed before 1 September 13 July 2010

2009, which was at least 12 months following the initial abnormal graded screen. Clinical notes were unable to be located for 5 patients to determine if a review had occurred, 4 of which had been referred for ophthalmology review in other regions or private providers.

Of the 60 patients reviewed by an ophthalmologist, eight received laser treatment before 1 September 2009. All eight patients were identified as having macular retinopathy at screening (two M2B, six M3), three of which were also identified with R3 peripheral retinopathy.

Overall patients with either an M3 grade or mixed grade had a higher referral rate compared with those with a R3 only or M2B only grade (Table 3). Referral rates for the different grades varied markedly between the four centres (Table 3). Of the 17 patients referred with a R3 grade, 10 (59%) were seen within the recommended six months. This was similar to the 43 patients referred for grades M2B or M3, of whom 27 (64%) were seen within the recommended six months. Of the 16 patients graded as both R3 and M2B/M3 referred for ophthalmology review, eight were seen within the recommended six month time frame, and five had not been reviewed more than 12 months from the time of referral.

Table 3. Demographic characteristics, grading and screening outcomes for R3, M2B, and M3 screen positive diabetic patients, May-August 2008. Data are number (%) unless otherwise stated.

	Total N=157	A N=25	B N=49	C N=62	D N=21
Male	95 (60.5)	12 (48.0)	28 (57.1)	42 (67.7)	13 (61.9)
Mean age (years)	57	61	58	55	60
European Pakeha	94 (59.9)	5 (24.0)	23 (46.9)	47 (75.8)	18 (85.7)
Other European	10 (6.4)	2 (8.0)	0 (0)	8 (12.9)	0 (0)
Maori	6 (3.8)	1 (4.0)	4 (8.2)	1 (1.6)	0 (0)
Samoan	13 (8.3)	4 (16.0)	6 (12.2)	3 (4.8)	0 (0)
Other Pacific	3 (1.9)	2 (8.0)	1 (2.0)	0 (0)	0 (0)
Asian	17 (10.8)	10 (40.0)	4 (8.2)	2 (3.2)	1 (4.8)
Other Ethnicity	13 (8.3)	0 (0)	11 (22.4)	0 (0)	2 (9.5)
R3	51 (32.2)	11 (44.0)	28 (57.1)	12 (19.4)	0 (0)
M2B	26 (16.6)	1 (4.0)	0 (0.0)	20 (32.3)	5 (23.8)
M3	56 (35.7)	8 (32.0)	12 (24.5)	21 (33.9)	15 (71.4)
Both R3 and M2B/M3	24 (15.3)	5 (20.0)	9 (18.4)	9 (14.5)	1 (4.8)
Referred	75 (47.8)	20 (80.0)	11 (22.4)	25 (40.3)	19 (90.4)
Reviewed within recommended 6 months*	45 (60.0)	14 (70.0)	5 (45.4)	15 (60.0)	11 (57.9)
Reviewed after 6 months*	15 (20.0)	3 (15.0)	1 (9.1)	7 (28.0)	4 (21.1)
No record of being seen before 1 September 2009	15 (20.0)	3 (15.0)	5 (45.4)	3 (12.0)	4 (21.1)
Documented laser treatment before 1 September 09**	8 (13.3)	0 (0.0)	0 (0.0)	5 (22.7)	3 (20.0)

* Denominator is those who were referred

** Denominator is those who had documented review

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Table 3. Referral rates for R3, M2B, M3 and mixed grading screen positive diabetic patients, May-August 2008 for each screening centre. Data are number (%).

Grading	Total N=157		A N=25		B N=49		C N=62		B N=21	
	Total No.	Referred No. (%)	Total No.	Referred No. (%)	Total No.	Referred No. (%)	Total No.	Referred No. (%)	Total No.	Referred No. (%)
R3	51	17 (33.3)	11	9 (81.8)	28	6 (21.4)	12	2 (16.7)	0	0/0
M2B	26	8 (30.0)	1	0 (0.0)	0	0	20	4 (20.0)	5	4 (80.0)
M3	56	35 (62.5)	9	6 (66.7)	12	1 (8.3)	21	13 (61.9)	15	15 (100.0)
Mixed R3, M2B, M3	24	16 (66.7)	5	5 (100.0)	9	4 (44.4)	9	6 (66.7)	1	1 (100.0)

DISCUSSION

The purpose of the National Diabetes Retinal Screening Grading System and Referral Guidelines⁷ in New Zealand has been to promote a nationally consistent, evidence based approach for retinal screening. Our study showed the four retinal screening services used the guidelines to some extent, most notably the recommended grading classification, but changes will be necessary to improve data collection systems to enable national monitoring and facilitate quality assurance activities. We identified that not all centres had a dedicated computerised retinal screening database and the complete recommended minimum dataset was not recorded by all four centres. Also, the details of each retinal screening examination and follow-up if required, were not readily accessible. In the case of this study, data items had to be manually searched for and checked in patient medical records and different databases.

During the study period the proportion of screening photographs graded as M2B, M3 or R3 varied between the four centres from 1.2% to 3.4%. This variation may reflect the relatively short duration of the study (4 months) or variation in grading practice. This study was not designed to determine reasons for any variation in grading practices but we established the grading process in each of the centres varied and different health professional groups with different levels of expertise and experience were grading fundal photographs. We also found that a lower than expected proportion (48%) of patients with screen detected M2B, M3 or R3 retinopathy were referred for ophthalmology assessment, and only 60% of these patients were seen within the recommended time frame of six months. The two centres with the lowest M2B, M3 or R3 screen detection rate had the highest referral rate. At least 15% of those seen required laser treatment.

Retinal Screening Programmes and Quality Assurance

Evidence for the effectiveness of diabetic retinopathy screening is well established. The objective of diabetic retinopathy screening programmes is to identify patients with sight threatening retinopathy and provide timely assessment and treatment to prevent loss of vision. Requirements of screening programmes are well established and well organised programmes with good information systems, monitoring and quality assurance activities are features of cost effective programmes. The UK has

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developed a national retinal screening programme with specified standards and monitoring systems, and a strong emphasis on quality assurance.⁹⁻¹⁰ The programme has not been fully implemented, but good progress has been made and monitoring and evaluation has identified areas requiring improvements.¹¹ In New Zealand regional screening programmes have been established in a fragmented fashion since the 1980s, and the National Diabetes Retinal Screening Grading System and Referral Guidelines⁷ were an initial step to develop a high quality nationally consistent retinal screening programme. The 2008 Diabetes and Cardiovascular Disease Quality Improvement Plan⁸ highlighted the importance of retinal screening and the need to develop systems to deliver an equitable high quality programme in New Zealand.

Fundal Photograph Grading

A high standard of grading is critical for an effective retinal screening programme. Under-reporting can lead to an unacceptable level of false negative screening photographs and over-reporting can lead to false positive screens, and thus unnecessary referrals to already busy ophthalmology clinics. An expected referral level has not been established, but a recent audit of a regional programme in England found the screen positive rate for all grades diabetic eye disease was 3.2%.¹² Our study was not able to determine whether under or over reporting was an issue, but variation in grading practices between the centres was described. Given the lack of national standards and training for graders in New Zealand, this is not a surprising finding, and is in contrast to England where 84% of primary graders are trained retinal screener graders.¹³ Our findings support intentions 'to define and develop suitable national accreditation and qualifications for primary and secondary graders as part of the ongoing quality assurance work'⁷ and to implement intergrader quality assurance initiatives to assess the quality and accuracy of primary grading.^{9 14} Intergrader consistency is considered a critical feature of effective retinal screening,^{9 15} and relative grading experience does contribute to differences in grading.¹⁶

Diabetic Eye Disease Grading Classification

The grading classification for diabetic eye disease screening is not internationally universal. Classifications vary slightly from country to country.^{7 9} In New Zealand the grades R3, M2B and M3 are the threshold for referral to an ophthalmologic care.⁷

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While the guidelines recommend referral, our study found this was not universal practice with only half being referred. Determining reasons for variation in referral patterns was not part of the study design. Possible reasons for non-referral are insufficient clinical capacity to assess these patients, and disagreement with the current guideline recommendation as these patients are considered to not have significant disease. Limited clinical capacity was identified as a significant factor contributing to an inability of services to meet targets in a recent survey of the current state of retinal screening services in the England.¹³ About half of retinal screening programmes reported waiting lists for screen positive patients who needed further assessment and treatment for retinopathy. Moreover about two-thirds of programmes reported having inadequate resources to provide a high quality service. With any screening programme, suitable assessment and treatment facilities are necessary requirements so that the goals of the programme can be achieved. The impact of retinal screening on ophthalmology services should not be underestimated.¹⁷⁻¹⁸

Strengths and Limitations

The participation, support and co-operation of the four study sites was a strength of the study. However, we only included fairly large main centres and our results may not reflect the situation at other sites, particularly smaller centres. Ideally a formal national audit would include all retinal screening services in New Zealand, and indeed if linked national data systems were in place, this would be readily possible. The main limitation of the study was the difficulty obtaining data. While every effort was made to obtain complete data, some data may have been missed simply because it was recorded in multiple places. Although the study period was 4 months, this represented a large number of screening events (6,642). Other grades of diabetic eye disease were not examined.

Conclusions

Retinal screening in New Zealand requires further development to attain a high quality equitable programme in order to achieve the goal of reduced visual loss and blindness from diabetes. This study provides evidence to support the four recommendations made in the Diabetes and Cardiovascular Disease Quality Improvement Plan.⁸ We found that follow-up for retinal screening needs to be

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improved, specifically screen detected R3, M2B and M3. The difficulty with obtaining relevant data for the audit supports the two recommendations that information technology systems are required for good clinical communication and clinical audit. Although we did not specifically examine quality of fundal photographs or quality of grading, our results suggested grading practices varied between the study sites, and therefore support the recommendation for implementation of a national quality assurance programme based on the guidelines and includes appropriate standards for training, competency assurance, technical quality and follow-up. In addition to the recommendations in the Diabetes and Cardiovascular Disease Quality Improvement Plan,⁸ we recommend:

1. A central umbrella group with appropriate expertise be established and maintained to oversee the future development, monitoring and quality assurance of retinal screening in New Zealand.
2. Appropriate levels of resourcing are required to fund, develop and maintain all aspects of a quality retinal screening programme, in particular information systems, assessment and treatment services, and independent monitoring.

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Appendix 1. The Audit Dataset.

Patients Graded during the study period with M2B, M3, R3 retinopathy	NHI / Study Number
Date of Screening	
VA at screening	
HbA1c at Screening	
Treatment (Diet only, metformin only, other oral medication, Insulin)	
Diabetes Type (Type I, Type II)	
Year of diagnosis	
Date of Primary grading	
Grade of primary grading	
Date of Secondary Grading	
Grade of Secondary Grading	
Action from Grading	
Date Grading actioned	
Date Referral sent by screening service	
Referral vector	
Date Referral received by referral centre	
Date Referral actioned	
Action from referral	
Date Appointment booked for	
Clinic type (General / Dedicated diabetic / consultant / registrar)	
Date reviewed by ophthalmology service	
Number of clinic non attendances prior to being seen	
Grade of retinopathy at review	
Reviewed by (consultant / training registrar non / training registrar)	
Management outcome from review (if laser include number burns and distribution)	
Sex	
Ethnicity	
DOB	
Rural / Urban residence	

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Region of origin	
Region of screening	
Place of referral	
Socioeconomic status / NZ Deprivation score	
Suburb	

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