Diabetes affects more than 200,000 New Zealanders, and is one of the fastest growing health epidemics in the country. Diabetic retinopathy (DR) is a serious complication of diabetes, and is the leading cause of preventable blindness and vision impairment in New Zealand.

The aim of retinal screening programs is to detect diabetic retinopathy so that timely interventions can be made. Screening is undertaken by the district health boards (DHBs), and referrals are made to specialist eye clinic/s in accordance with the National Diabetes Retinal Screening Grading System and Referral Guidelines.

In 2014, there were a total of 257,776 patients diagnosed with diabetes in New Zealand, of which 11,000 patients were from the Northland district. Northland consists of 3.6% of the New Zealand population, and has a total of 151,692 people residing in an area which spans 13,789 km. The main ethnic groups are European (75.7%), Māori (32.4%), Pacific islander (3.2%) and Asian (2.8%).

Northland also has a high level of deprivation with large inequalities in health care outcomes. Approximately 30% of people with diabetes have DR, with 10% presenting with sight-threatening retinopathy. In Northland, the rate of avoidable hospitalisation from

**Discharge outcomes of patients referred to specialist eye clinic from diabetic retinopathy screening in Northland (2014–15)**

Pragnya Jagadish, David Dalziel

**ABSTRACT**

**AIMS:** To determine the discharge outcomes of patients seen in specialist eye clinic after referral from diabetic retinopathy screening (DRS).

**METHODS:** Retrospective analysis of outcomes of a sample of 98 patients referred from DRS to specialist eye clinic.

**RESULTS:** A sample of 98 patients were analysed following referral by DRS to specialist eye clinic from 16/4/14 to 16/4/15. Age at screening ranged from 13–88 years, with the main ethnic groups being Māori (57.1%), European (39.79%) and Indian (3.06%). A majority of the patients were referred to specialist eye clinic for diabetic retinopathy (60%) or cataracts (35%). After being seen in specialist eye clinic, 45% of the patients were enrolled back into DRS and 49.1% stayed under care of ophthalmology service for further treatment, and a further 5.9% were discharged to care of GP or optometrist without re-enrolment back to DRS. Of those referred back to DRS, 30% were re-enrolled after further imaging with optical coherence tomography (OCT), and 24% of patients were referred back to DRS due to non-attendance. Non-attendance at clinic appointments was high among the Māori population.

**CONCLUSION:** Our study identified that 94% of patients referred to specialist eye clinic were either referred back to DRS or kept under care with only five patients not re-enrolled back into DRS. Despite good service delivery, Northland remains a high-risk population for diabetes, where non-attendance at clinic appointments remained an issue with the Māori patient population. In addition, a significant proportion of patients were re-referred back to DRS after OCT, and a consideration is to include OCT in the screening pathway.
diabetic complications is nearly twice the national average, and the mortality rates for diabetes-related conditions is up to eight times higher for the Māori population. In 2006, a strategy called STAND (Successfully Taking Action for Northland Diabetes) was undertaken by the Northland DHB with the aim to prevent diabetes through advocacy of lifestyle changes, early detection and intervention in order to reduce the risks of diabetic complications.

The DRS in Northland was launched in 1994 and includes 22 screening sites. It comprises a mobile retinal screening van, which is attended by a qualified medical photographer. Mobile retinal screening takes place in a range of settings—hospital outpatient clinics, medical centres and community centres, and covers areas from Te Kao, south of Cape Reinga to Mangawhai near Northland’s southern border. Patients from DRS were referred to specialist eye clinic in Whangarei in accordance with the National Diabetes Retinal Screening Grading System and Referral Guidelines 2006.

This study aims to examine the outcomes of a sample of 98 patients who were referred from DRS in Northland and seen in specialist eye clinic between April 2014–April 2015. It also aims to examine whether patients are re-enrolled back into DRS after being reviewed in the specialist eye clinic.

Methods

This study was a retrospective audit of a sample of 98 patients referred from DRS to specialist eye clinic at Whangarei hospital over a 12-month period. Since this was a retrospective audit, we did not require ethics approval.

Research design—The study accessed data from the Optimise database, which stores the diabetic retinal screening photographs. This database recorded demographics, disease data and digital retinal photographs. Screening data of 98 patients consecutively referred to eye clinic was acquired from April 2014 to April 2015, and retrospectively assessed.

Screening centres—Screening took place in 22 clinics, with a mobile screening van attending outpatient clinics, GP surgeries and community centres in Northland. After pre-assessment and mydriatic administration, a Zeiss ProNM camera was used to take three digital photographs, each with a 45 degree field of view, in accordance with National Guidelines.

Grading criteria was applied to patients in accordance with the National Diabetes Retinal Screening grading system. All patients with M3 R4 or other significant pathology, including cataracts, were referred to specialist eye clinic. The primary grader was a qualified medical photographer, and the secondary grader was the designated ophthalmologist at Whangarei Base Hospital. Each of the retinal photographs were screened into low, medium and high urgency (marked green, orange and red respectively) by the primary grader, and referred to the secondary grader.

Low urgency (marked green) included mostly patients who required OCT assessment; medium urgency (marked orange) included patients with significant maculopathy or impaired fundal view from cataracts; and high urgency (marked red) included patients with evidence of proliferative DR or vitreous haemorrhage. The secondary grader assessed the referrals from the primary grader, and patient appointments were made according to National Guideline Screening Intervals. Patients referred with cataracts did not meet requirements for referral reporting, and hence screening was unable to be completed.

To address the issue of concordance between graders, 10% of the primary grader’s images were reviewed by the secondary grader in a random fashion, and a high concordance rate was reported.

Results

Patient demographics

Diagnosis on referral—A majority of the patients (60.7%) were referred for Diabetic retinopathy (non-proliferative and proliferative with complications eg vitreous haemorrhage), followed by (35.7%) for cataract or complication from cataract (eg YAG capsulotomy). There were singular cases of exotropia (1.1%), intracranial hypertension (1.1%) and keratoconus (1.1%) referred by DRS to eye clinic.
Outcomes of patients referred to specialist eye clinic—Around 45% of the patients were enrolled back into DRS, and 49.1% stayed under care of ophthalmology service for further treatment. A small proportion (5.9%) were discharged to care of GP or optometrist.

Reasons why patients were referred back to DRS—Around 37% of patients were referred back to DRS after retinal laser, 29% had further imaging, eg optical coherence tomography (OCT), and returned to DRS since no active treatment was necessary, and a further 10% were referred back while awaiting cataract surgery. Around 24% of patients were referred back to DRS due to non-attendance (DNA). Ninety percent of DNA patients were of Māori ethnicity. All DNA patients had a recall notice sent.

Outcomes of patients not re-enrolled into DRS—Five patients were not re-enrolled back into DRS from specialist eye clinic. Four of five were discharged to GP, out of these, three were discharged following non-attendance after more than two recall appointments. One patient was discharged to GP to optimise HbA1C pre-cataract surgery, and one was referred to optometrist post-cataract surgery.

Discussion
The Northland population remains a high-risk population for diabetes, with 11,000 patients diagnosed with the condition over the last year. Diabetic retinopathy is an avoidable complication of diabetes, and can be reliably detected by regular retinal screening. It is known that between

Table 1:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Study population n=98</th>
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<tbody>
<tr>
<td>Gender, n (%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>45, (46%)</td>
</tr>
<tr>
<td>Female</td>
<td>52, (54%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
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<tr>
<td>Māori</td>
<td>56, (57.1%)</td>
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<tr>
<td>Caucasian</td>
<td>39, (39.79%)</td>
</tr>
<tr>
<td>Indian</td>
<td>3, (3.06%)</td>
</tr>
<tr>
<td>Age (mean, range)</td>
<td>Mean 61, (13–88)</td>
</tr>
</tbody>
</table>

Figure 1: Reasons why patients were referred back to DRS.
6% and 39% of people with type 2 diabetes have retinopathy at diagnosis, with 4% to 8% having sight-threatening disease. In the next 20 years, it is projected that the prevalence of diabetes in New Zealand will, if left unchecked, increase by 90% in Māori, 109% in Pacific peoples and 39% in Europeans. Prevalence of retinopathy is higher in Northland (20% total across all ethnicities) than other district health boards (Waikato 9–10%, Lower Hutt 11–12%). Northland also has a higher proportion of Māori (7.7 percent of New Zealand's Māori population), with 43,527 people residing in Northland Region. The STAND (Successfully Taking Action for Northland Diabetes) was a program taken up in 2006 by the Northland DHB, which aims to prevent diabetes through lifestyle advocacy, address inequalities in healthcare and reduce the impact on quality-of-life from diabetic complications.

This study aims to examine the outcomes of patients referred to specialist eye clinic from DRS. Of a total of 98 patients who were referred to DRS, 46% were male and 54% female. A majority of the population referred were of Māori ethnicity (57.1%) despite comprising only 30% of the total Northland population. Of the patients seen in the eye clinic, around 49.1% stayed under care of ophthalmology service for further treatment and 45% of the patients were enrolled back into DRS after assessment. Around 30% were re-enrolled after optical coherence tomography (OCT) and 24% of patients were referred back to DRS due to non-attendance. There were only five patients not referred back to DRS, and three of these were discharged to GP after multiple non-attendances. Interestingly, around 90% of the patients who did not attend were of Māori ethnicity, which remains a challenge in addressing the health inequalities in the region.

One of the goals of the STAND strategy is to improve the health among Māori populations and continually identify and address barriers to people accessing programmes and services in Northland. A majority of the referrals to specialists were of Māori origin (57.1%), which correlates with existing data that Māori are three times as likely to have type 2 diabetes as non-Māori, and are more likely to develop complications. However, the rate of non-attendance is high among the Māori population, which resulted in three patients discharged to care of GP rather than DRS. The STAND strategy investigated the barriers to access in Māori populations for attendance at diabetic retinal screening through patient satisfaction survey and addressed issues with measures, such as flexibility in changing appointments, new referral forms and having a telephone confirmation of attendance prior to appointment. To address the non-attendance rates at specialist eye clinic from DRS referral, further research is being undertaken through patient surveys and focus groups on what can be done to improve the experience of referral and attendance for patients.

In those referred back to DRS, around 30% were re-enrolled after imaging of the fundus and retina with OCT. The OCT is the gold standard for evaluating the layered structure of the retina, and is useful in determining macular oedema or intraretinal fluid. Despite investment in new retinal camera, which affords good views without pupil dilation, some of the referrals to the eye clinic were due to poor views from camera and requirement of further imaging. The Ophthalmic Photographic Diabetic Review (OPDR) in the UK comprehensively combines digital photography and OCT for patients who require more frequent reviews than the usual annual screening service. In centres such as the Birmingham Diabetes Centre, the OCT has already been incorporated into the DRS service. The use of OCT helps monitoring for the high-risk patient population, eg pregnant diabetic women, patients with early maculopathy virtually and avoids the burden of specialist appointments in hospitals. Similarly in New Zealand, the Wellington region has trialled incorporating optometry services into DRS pathway for patients. It targets for moderate non-proliferative DR and quiescent (previously treated) proliferative DR. This involves monitoring by optometrist with OCT in either the primary or secondary health care setting. Although the cost of having an OCT in DRS needs to be accounted for, it is a worthy measure to consider, given that 30% of patients were referred back after OCT in the specialist eye clinic.

The study supports the efficiency of the current process of referrals and re-referrals.
back to DRS. Out of 84 patients, only five patients were not re-enrolled back to DRS. Of these, three were due to non-attendance, and were discharged to care of GP. One patient was discharged to GP to optimise blood sugar levels prior to cataract surgery, and one was discharged to the optometrist post-cataract operation. Although it is likely all five patients would be referred back to DRS from the GP or optometrist, it flags the need to improve the identification of patients who are referrals from DRS. Currently, the referral letters from DRS are not linked into *Concerto*, which is a program used for letter dictations, and hence there is no easy identification of patients as being from DRS. Suggestions to improve identification include alerts on *Concerto*, which flags that the patient is from DRS, and creation of links between applications, eg *Optimise* and *Concerto*, in a way that data from DRS is easily accessible to clinicians, GPs and optometrists who are involved in patient care.

Recently, the National Diabetes Retinal Screening grading system and Referral Guidelines were updated in March 2016.\(^7\) The new guidelines involve measures to monitor DR by revising the screening interval to three-yearly for those without clinical modifiers, and involves monitoring by optometrist with an ophthalmologist who oversees the region’s program. However, in Northland, we have not introduced the increased recall periods due to high incidence of retinopathy in the high-risk population with a significant DNA rate. Improvement of the service should involve collaboration with GPs and optometrists in order to streamline a process of referral and communication for patients seen in the specialist eye clinic.

In conclusion, Northland remains a high-risk population for diabetes, and measures to identify and prevent complications from diabetes that have been initiated with the STAND strategy. Our study identified that a majority of patients referred to eye clinic were referred back to DRS after being seen at specialist eye clinic. A large proportion of our referrals from DRS were of Māori ethnicity and non-attendance at clinic appointments remained an issue in this patient population.

**REFERENCES:**


**Competing interests:** Nil.

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