Investigating the Effectiveness of an Orthoptist-Led Diabetic Retinopathy Screening Clinic

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ABSTRACT

Aim: To determine the effectiveness of the orthoptist-led diabetic retinopathy screening clinic at Northern Health by investigating the diagnostic agreement between orthoptists and ophthalmologists.

Method: This study was a retrospective audit of 1,097 patients booked at the Northern Health orthoptist-led screening clinic. The demographic data and clinical assessment findings were recorded for the 101 included patients (192 eyes). The orthoptists' diabetic retinopathy diagnoses were compared with those made by the ophthalmologists using a kappa analysis.

Results: Substantial agreement was observed between the orthoptists and ophthalmologists in relation to the diagnosis and detection of diabetic retinopathy ($k = 0.660$, $p < 0.001$).

Conclusions: Strong agreement was found between the orthoptists and ophthalmologists when detecting and diagnosing diabetic retinopathy for patients attending the Northern Health orthoptist-led clinic. This suggests that orthoptists are able to effectively detect and diagnose patients with diabetic retinopathy in a hospital outpatient setting and provide a high level of care.

Keywords: diabetic retinopathy, screening, orthoptist

INTRODUCTION

Diabetic retinopathy (DR) occurs as a complication of diabetes. It is characterised by the presence and development of retinal vascular lesions that can leak fluid and cause clinically significant macular oedema (CSMO), which is the leading cause of vision loss in those with diabetes.[1-4] Diabetic retinopathy is currently the leading cause of blindness in working-age adults with a strong association between the severity of retinopathy and the duration of diabetes.[1,2,4-6] Duration of diabetes is the strongest risk factor in those with non-insulin-dependent diabetes. They are also at a slightly higher risk of developing diabetic retinopathy than insulin-dependent patients due to recent improvements in metabolic control.[4] Ophthalmic screening, with the appropriate treatment and management, has shown to prevent vision loss in up to 95% of cases.[7,8] According to the National Health and Medical Research Council,[4] all people with diabetes should have a dilated fundus examination at the time of diagnosis and then at least every two years thereon. Indigenous Australians, people from non-English speaking backgrounds and those living in rural and remote areas should undergo annual screening. More frequent screening is indicated in these populations due to a higher prevalence and earlier onset of non-insulin-dependent diabetes as well as poor access and low utilisation of services.[4,9] Unfortunately, patient compliance is poor, with up to 50% of Australians not undergoing screening within the recommended time frame.[1,6,8]

In order to meet the increasing demand placed on the current healthcare system, we need to look towards workforce reform and to develop allied health professionals to extend their practice. This is particularly evident in the eye healthcare system and more recently for orthoptists.[10,11] Extending orthoptists' scope of practice has many advantages and has the potential to inspire a variety of innovative models of care. In Australia, orthoptists are well placed within the public health system to address the increased demand for eye care services. An extension of orthoptic roles to monitor and manage stable ophthalmic disease has the potential to improve service delivery whereby patients are seen in a more timely manner with a reduction in waiting times and ophthalmologists are able to concentrate their higher level skills on more complex and surgical cases.

Northern Health has been active in expanding orthoptic services in response to increasing demand and has specifically introduced orthoptist-led clinics targeting diabetic retinopathy. This clinic was designed as a screening and assessment clinic whereby the orthoptists would independently examine each patient and determine the appropriate review and management in accordance

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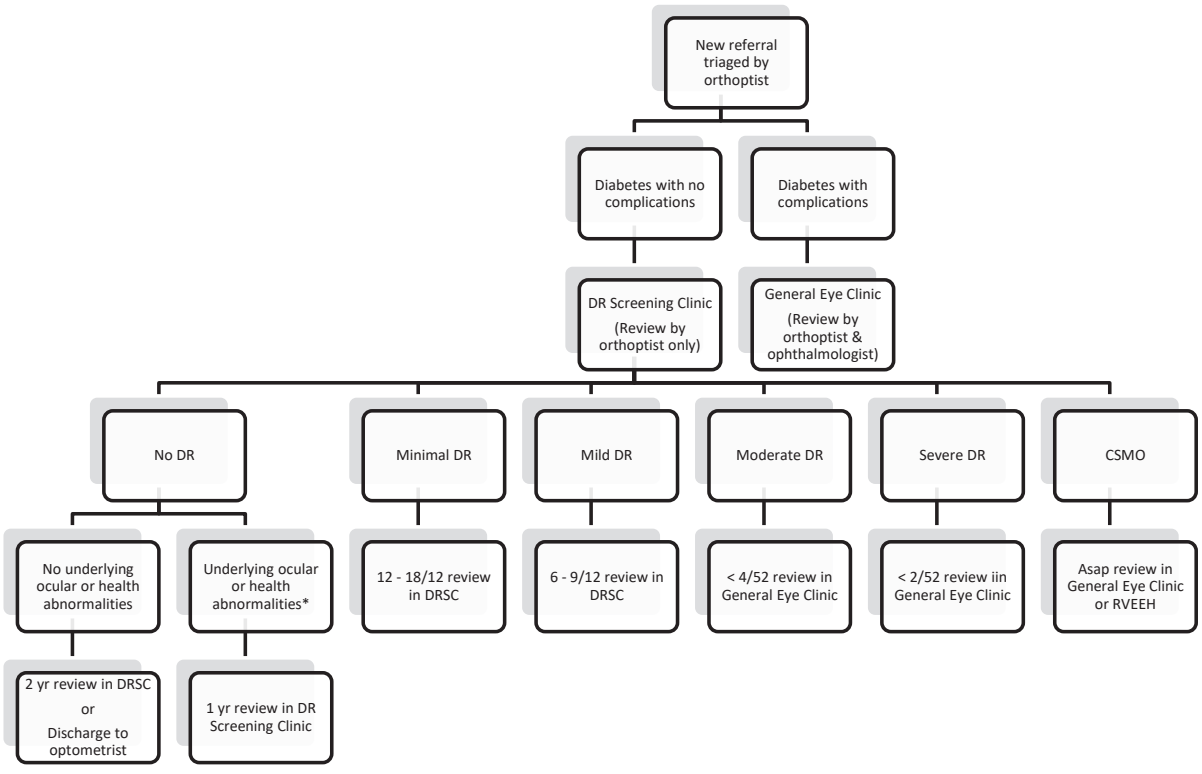
with the National Health and Medical Research Council (NHMRC) guidelines for the management of diabetic retinopathy.[4] The DR screening clinic has been running for approximately 12 years at Northern Health consisting of three orthoptists, three ophthalmologists and one registrar. The driving force to commence this clinic was the demand for services, with an increasing number of people diagnosed and living with diabetes.

Figure 1 illustrates the clinical pathway for patients referred for a diabetic eye check. In the initial triage process, patients are classified as either having 'diabetes with complications' such as increased blood sugar levels, high blood pressure or cholesterol, or any known retinopathy; or as having 'diabetes with no underlying complications'. Patients with complications are to be seen in the general eye clinic by both an orthoptist and ophthalmologist. Patients with no underlying complications are seen in the orthoptist-led DR screening clinic. In this screening clinic, the patient's condition is diagnosed and assigned a classification according to the NHMRC guidelines. A patient with no retinopathy is either reviewed in two years, or discharged to their local optometrist if they have no underlying ocular or health conditions. A patient is considered for earlier review (within 12 months) if they are Indigenous Australians; from non-English speaking backgrounds; have a long duration of diabetes, poor glycaemic control, hypertension or blood lipid control; or have renal disease. If the patient is diagnosed with minimal DR they are reviewed in 12 to 18 months in the screening clinic. If mild retinopathy is detected the patient is reviewed in 6 to 9 months in the screening clinic. When moderate DR is detected, the patient is then reviewed in the general eye clinic within four weeks. If severe retinopathy is diagnosed the patient is seen in the eye clinic as soon as possible or within two weeks. If CSMO is identified and confirmed on ocular coherence tomography (OCT) in any patient, they are seen in the eye clinic or referred to the Royal Victorian Eye and Ear Hospital, depending on the day and time, as soon as possible for appropriate treatment and management.

METHODOLOGY

Participants

From January 2012 to July 2013, a total of 1,097 patients were booked into the DR screening clinic. From these, 996 patients were excluded from this analysis. Four-hundred-and-sixteen patients (41.7%) failed to attend their appointment with either health professional, 84 patients (8.7%) were discharged from the clinic to their general practitioner or optometrist and 316 patients (31.7%) were



*Indigenous Australians, those of non-English speaking backgrounds, those with longer duration of diabetes, poor glycaemic control, hypertension, poor blood lipid control or renal disease

Figure 1. Patient pathways for diabetic retinopathy screening at Northern Health.

to have a review appointment with the orthoptists only. For 103 patients (10.3%), there was no DR diagnosis data available from one or both health professionals and 77 patients (7.7%) did not meet the clinic criteria. This resulted in a total of 101 patients (192 eyes) included in the study.

Procedures

Data was retrospectively collected from the medical histories and referrals of patients who had attended the DR screening clinic. A list of the unit record numbers of patients was obtained and used to de-identify the patient for their confidentiality. The project was approved by the Northern Health Low Risk Ethics Committee and the La Trobe University Faculty of Health Sciences Human Ethics Committee (Project No. FHEC12/103). The medical histories of these patients were reviewed in date order and data was recorded including demographic details of age and gender; and clinical information of visual acuity and diagnosis by the orthoptist and ophthalmologist.

A standard clinical assessment was performed by the orthoptists for each patient in the orthoptist-led DR screening clinic. The assessment included taking a clinical history (including HbA1c, blood sugar level and type of diabetes), visual acuity, subjective refraction, and anterior and posterior segment examination. Non-mydriatic and mydriatic fundus photos and an OCT were also performed on each patient.

For the diagnosis of diabetic retinopathy, the NHMRC modified Airlie House classification (Wisconsin system) was used.[4] Diabetic retinopathy is categorised as non-proliferate (NPDR) or proliferative (PDR). Non-proliferative disease is further classified into: none, minimal, mild, moderate and severe retinopathy, which can further develop into PDR (Table 1). CSMO can occur in either type of retinopathy.

Table 1. Classifications for the diagnosis of non-proliferative diabetic retinopathy[4]
None
No signs of diabetic retinopathy
Minimal
Microaneurysms only
Mild
Microaneurysms and one or more of; retinal haemorrhages, hard exudates or cotton wool spots
Moderate
Microaneurysms in at least one retinal quadrant and one or more of; cotton wool spots, venous beading or intraretinal microaneurysms
Severe
Any of; microaneurysms in all four quadrants, intraretinal microaneurysms in one or more quadrants, or venous beading in two or more quadrants
Clinically significant macular oedema
Retinal thickening of the macular centre or hard exutdates near the centre of the macula with adjacent thickening

The classification system grades the severity of retinopathy based on the presence or absence of specific retinal lesions such as haemorrhages, microaneurysms, hard exudates, venous beading, intraretinal microvascular abnormalities, soft exudes or cotton wool spots, neovascularisation involving the optic disc or elsewhere in the retina. The severity scale is indicated for use at every assessment in order to determine the need for follow up, referral or treatment.[4] Only NPDR and CSMO were assessed and classified in this study. Patients with proliferative PDR were reviewed, treated and managed in the general clinic by the ophthalmologists.

Data Analysis

All data was recorded on data collection forms, entered into an excel spreadsheet for statistical analysis using IBM Statistical Package for Social Sciences (SPSS) software, Version 21.0. Statistical significance was set at $p \leq 0.05$. Descriptive statistics were utilised to present the characteristics of the study population. A kappa analysis was used to review agreement between the orthoptists and ophthalmologists. To evaluate the agreement between these professionals, the orthoptists' clinical outcomes and decisions were compared to that of the ophthalmologists.

RESULTS

Of the 101 participants, 55 (54.5%) were females and 46 (46.5%) were males. At the initial appointment with the orthoptist, the mean age of participants was 66.4 years (SD ± 14.7), ranging from 26.7 to 91.1 years. Visual acuity of the participants ranged from Snellen acuity 6/5 to counting fingers at 1 metre. Table 2 presents the classification agreement data for the orthoptists and ophthalmologists. The kappa analysis for the agreement between the orthoptists and ophthalmologists when detecting and diagnosing diabetic retinopathy revealed substantial agreement between the two professionals ($k = 0.660$, $p < 0.001$). In addition to diabetic retinopathy, two eyes were found to have an epiretinal membrane and one eye to have drusen, each of which was diagnosed by both professionals.

DISCUSSION

When looking at the agreement between the orthoptists and ophthalmologists for the diagnosis of diabetic retinopathy, this study showed statistically significant substantial agreement with only 42 disagreements out of a total of 192. Thirty of these differences were due to the orthoptists under-diagnosing the severity of retinopathy, and 12 were due to over-diagnosis compared with the ophthalmologists. This rate of under-diagnosis could have been affected by the time delay between the patients' appointments. It is known that the duration of diabetes strongly predicts the

Table 2. Classification and agreement by orthoptists and ophthalmologists for non-proliferative diabetic retinopathy

		Ophthalmologist classification						
Orthoptist classification		No DR	Minimal	Mild	Moderate	Severe	CSMO	**Total**
	No DR	**87**	6	6	0	0	0	**99**
	Minimal	3	**10**	7	1	0	0	**21**
	Mild	3	4	**19**	8	0	0	**34**
	Moderate	0	0	1	**27**	2	0	**30**
	Severe	0	0	0	1	**2**	0	**3**
	CSMO	0	0	0	0	0	**5**	**5**
	Total	**93**	**20**	**33**	**37**	**4**	**5**	**192**

severity of retinopathy,[1,4,5,12] and therefore it would be of benefit to record and analyse this when conducting future research.

The factor of inter-rater reliability and experience requires consideration, as there were three orthoptists in the DR screening clinic and three ophthalmologists, including one registrar, in the general clinic. This has the potential to increase disagreements between graders due to varying competencies and experience with screening. Inter-rater reliability should be taken into consideration when conducting further research, including factors such as workplace experience, duration of employment, skill level and any training or education received.

The accuracy and agreement for classifying moderate and severe retinopathy and CSMO are the most clinically important diagnoses in this study. When looking at the diagnosis of moderate retinopathy, there were 10 discrepancies in a total of 37 participants. Orthoptists under-diagnosed eight eyes as having mild, and one eye as having minimal retinopathy, which meant that nine eyes (7 patients) were not referred for ophthalmic assessment by the ophthalmologist, but were booked for review in six to nine months time with the orthoptists. Overall, the orthoptists' results concurred with the ophthalmologists when diagnosing moderate retinopathy. In a study by Klein et al,[13] patients who had moderate retinopathy at their baseline exam were found to progress to proliferative retinopathy in at least one eye within six years. In a later study, Henricsson et al[12] reported that patients with moderate retinopathy showed a 50% risk of vision loss resulting from progression to proliferative retinopathy or CSMO within three years. The earlier detection of moderate retinopathy by orthoptists may help with timely treatment and to slow progression if detected early and monitored frequently.

The diagnosis of severe retinopathy proved to be the most difficult, with an equal number of agreements and disagreements between the professionals. There were however, only four eyes diagnosed with severe retinopathy, with the orthoptists under-diagnosing two eyes as having moderate rather than severe retinopathy. The outcome for under-diagnosis in these cases however, was not of clinical concern as the patients were still referred and reviewed in the general eye clinic by an ophthalmologist within four weeks of screening. Henricsson et al[12] reported that 50% of those with severe retinopathy progressed within one year to the proliferative stage and/or CSMO, which highlights the need for accurate and timely diagnosis of severe retinopathy. Further research with a larger sample of patients with severe retinopathy would clarify the accuracy of orthoptists with this classification level.

There was complete concordance between orthoptists and ophthalmologists in this study for the detection of CSMO, with a 100% agreement rate. CSMO is the most common cause of vision loss in diabetic retinopathy, which makes its clinical detection particularly important.[1,4] Prompt diagnosis of CSMO is imperative as urgent treatment is indicated in these patients to prevent any further retinal damage and vision loss.[1,4] One-third of untreated patients with CSMO will have a significant loss of central vision within three years.[1]

A number of studies have investigated the use of trained non-physicians, including retinal photographers, ophthalmic nurses, primary graders, general practitioners, optometrists and orthoptists as graders for diabetic retinopathy screening.[3,7,14-20] It is however, difficult to directly compare these studies to this one as various grading and classification systems were used as well as different screening and assessment tools. A number of health professionals in these studies appeared to under-diagnose

diabetic retinopathy more often than over-diagnose, which is similar to the orthoptists' trends in this study.[14,15,17]

In this study, the orthoptists appear to have the required skill-set necessary to accurately diagnose the majority of diabetic retinopathy classifications. Additional training and guidance in detecting cases of minimal and severe retinopathy would further strengthen the orthoptists' skills in DR screening. As Georgievski et al[16] stated, minimal training for orthoptists has the potential to uniformly prepare them to participate and run DR screening clinics. This has been demonstrated in various other studies where general practitioners, optometrists and non-physicians received specific training to meet screening standards.[7,15,20,21]

CONCLUSION

This study suggested that orthoptists at Northern Health have the necessary skill-set to effectively diagnose and detect diabetic retinopathy in a diabetic retinopathy screening clinic. There was significant agreement between orthoptists and ophthalmologists when diagnosing absent, mild and moderate diabetic retinopathy as well as clinically significant macular oedema. Further training in the diagnosis of minimal and severe retinopathy is recommended to increase the effectiveness of the screening clinic. Future research needs to be conducted surrounding the role of orthoptists in leading DR screening clinics in order to support and lead healthcare reform in the development of new and improved models of eye service delivery. The demand for effective and efficient diabetic retinopathy screening clinics is constantly increasing and orthoptists are the ideal healthcare professional to be used in these screening models to help combat this growing public health issue.

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