Ophthalmic nurse practitioner led diabetic retinopathy screening. Results of a 3-month trial

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Abstract

Purpose

To describe the design and implementation of a nurse led diabetic retinopathy screening clinic. To present the results of a 3-month trial period assessing the concordance of retinopathy grading between a nurse practitioner and an ophthalmologist.

Method

Patients attending for annual diabetic eye review during an initial 3-month trial period were assessed in a dedicated diabetic eye clinic by an ophthalmic nurse practitioner and an ophthalmologist, with both grading the degree of diabetic retinopathy using to the Wisconsin grading system. Each was masked as to the other's findings. The concordance of retinopathy grading between ophthalmic nurse practitioner and ophthalmologist was assessed.

Results

A total of 95 patients (189 eyes) were assessed during the study period. A 92% concordance was achieved between the ophthalmologist and the ophthalmic nurse practitioner. In total, 72 eyes were graded as having some degree of retinopathy by the ophthalmologist. The sensitivity of the nurse practitioner for diagnosing the presence of diabetic retinopathy was 93%, and the specificity 91%. Nine eyes with severe nonproliferative diabetic retinopathy or worse, and four with clinically significant macular oedema were seen. All were correctly identified by the nurse practitioner.

Conclusions

The structure and management protocols of the clinic are described. An excellent concordance between ophthalmologist and nurse practitioner was achieved in this group of patients with relatively less advanced retinopathy.

Keywords

diabetic retinopathy, nurse practitioner, Wisconsin grading system, screening, public health

Introduction

The prevalence of diabetes mellitus is increasing, with 2.9% of the population known to be affected in Australia in 2001.1 There is a similar prevalence in the UK, and it is possibly higher in the USA.2, 3 The disease is more prevalent among selected racial groups,4, 5 and a
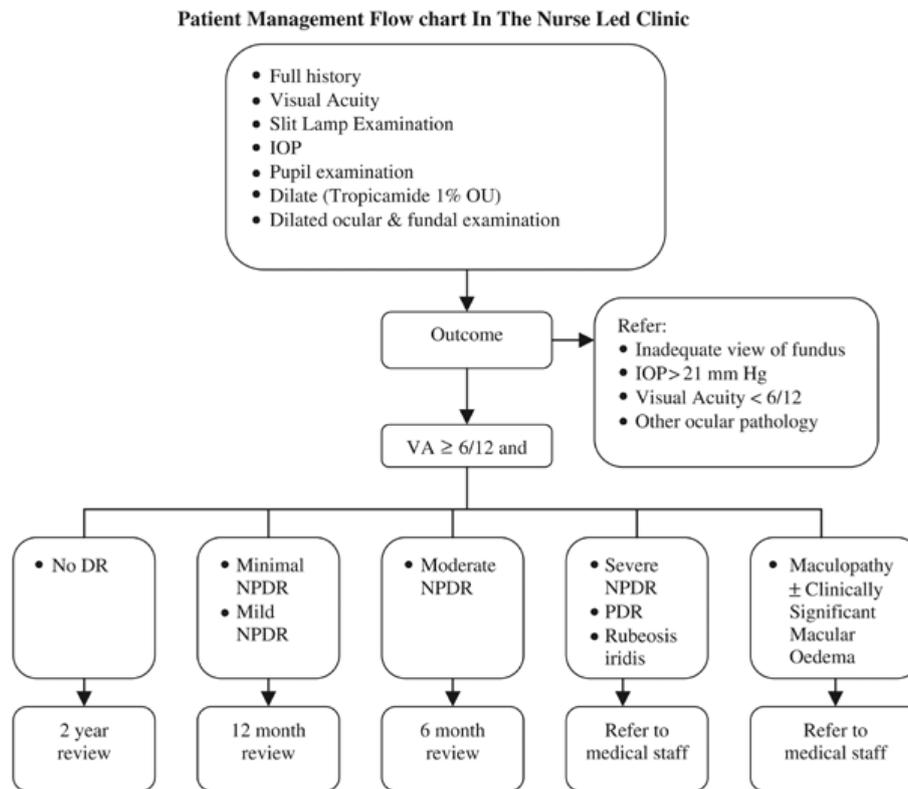
significant proportion of the diabetic population remains undiagnosed.2, 3 This large and increasing number of diabetics directly impacts on the workload of ophthalmologists as all require regular eye review. Clinical classification of diabetic retinopathy is well described, making it suited to assessment by a trained observer.6 Ophthalmic nurse practitioners and other health care providers may be increasingly utilised in the screening of diabetic patients. Quality assurance is an essential requirement of any such screening program. The present study describes the design of an ophthalmic nurse practitioner led diabetic retinopathy screening clinic including provision for ongoing quality assurance, and presents the results of an initial 3-month evaluation period involving assessment of all patients by both an ophthalmologist and an ophthalmic nurse practitioner.

Materials and methods

Clinic structure and protocols

A management protocol for a nurse led diabetic retinopathy screening clinic was established in conjunction with the retinal service at Flinders Medical Centre (Figure 1). Patients who had already been seen in an eye clinic previously, and who were due for annual diabetic eye review were eligible for review in the nurse-led clinic, which was held weekly. Exclusion criteria were age less than 18 years, any previous retinal laser photocoagulation and known ocular comorbidity. When patients attended the clinic, a full ophthalmic history was taken. Visual acuity and intraocular pressure were measured and the pupils were examined. The anterior segment was examined with the aid of the slit-lamp for signs of pathology, particularly iris rubeosis, then the pupils were dilated with 1% tropicamide. Dilated fundal examination was next performed using the slit lamp biomicroscope and a 78 diopter lens. Patients were examined in nine directions of gaze. The presence and severity of any diabetic retinopathy was recorded using the simplified Wisconsin grading, and any diabetic maculopathy was specifically noted.7, 8 For all patients, the importance of blood sugar control and regular follow-up was emphasised. The results of the assessment determined subsequent patient management. In all cases, follow-up was determined by the more severely affected eye. Patients with no diabetic retinopathy were booked in for review in the nurse led clinic in 2 years. Patients with minimal or mild nonproliferative diabetic retinopathy (NPDR) were booked in for review in the nurse led clinic in 1 year. Patients with moderate NPDR were booked in for review in the nurse led clinic in 6 months. All patients with severe NPDR, or any signs of proliferative diabetic retinopathy (PDR), as well as any suspicion of macular oedema (whether clinically significant or not) were promptly referred back to an ophthalmologist led clinic within 2 weeks for further assessment and management. These thresholds for referral were set to allow a margin of safety between the need for referral and need for therapeutic intervention. Patients were also referred back into an ophthalmologist run clinic if any of the following were present: inability to assess diabetic retinopathy for any reason, visual acuity less than 6/12 corrected in either eye, intraocular pressure greater than 21 in either eye, or other significant ocular comorbidity. Standards were set for correspondence with other health professionals, and protocols were established for patients who failed to attend appointments. The nurse practitioner was free to exercise judgement and to review patients sooner (but not later), or to refer any other patients to the ophthalmologist clinic.

Figure 1. Diagrammatic representation of patient management in the ophthalmic nurse practitioner led clinic. DR=diabetic retinopathy; NPDR=nonproliferative diabetic retinopathy; PDR= proliferative diabetic retinopathy.

Patient Management Flow chart In The Nurse Led Clinic

- Full history
- Visual Acuity
- Slit Lamp Examination
- IOP
- Pupil examination
- Dilate (Tropicamide 1% OU)
- Dilated ocular & fundal examination

Outcome

Refer:
- Inadequate view of fundus
- IOP>21 mm Hg
- Visual Acuity < 6/12
- Other ocular pathology

VA ≥ 6/12 and

• No DR	• Minimal NPDR • Mild NPDR	• Moderate NPDR	• Severe NPDR • PDR • Rubeosis iridis	• Maculopathy ± Clinically Significant Macular Oedema
2 year review	12 month review	6 month review	Refer to medical staff	Refer to medical staff

Study design

Having established this model for the clinic, its introduction was planned in two phases. The first phase involved a 3-month trial period, which was initiated to evaluate the safety aspects of an ophthalmic nurse practitioner led clinic. This trial period is the subject of the present paper. During this period all patients were seen by the ophthalmic nurse practitioner (BK) and a consultant ophthalmologist from the retinal service (RE). Each clinician assessed the degree of retinopathy in each eye, and graded it in a masked fashion. These results were recorded prospectively, and later collated and analysed. During this first phase it became evident that there were very few patients with anything worse than mild diabetic retinopathy, and also very few with maculopathy. It was decided that the ophthalmic nurse practitioner would also attend the ophthalmologist run clinic and assess a number of patients with sight-threatening retinopathy, again in a masked fashion. These eyes are included in the results presented.

If a good degree of correlation was achieved, the clinic was to be continued under the leadership of the ophthalmic nurse practitioner (Phase 2). At least 80% concordance between ophthalmologist and ophthalmic nurse practitioner in Phase 1 was prospectively decided as necessary to allow this to happen. In this second phase, ongoing quality assurance and education is planned. For any patient referred out of the nurse led clinic for ophthalmic assessment, the findings of the nurse practitioner and the ophthalmologist will be recorded

and correlated in an ongoing manner, with periodic review by the department of ophthalmology. The nurse led clinic is run concurrently with the retinal clinic, and most consultant referrals are performed on the same day. Any such same day referrals are used as an opportunity for ongoing clinician education.

Results

In total, 95 five patients (189 eyes) were examined during the initial 3-month study period (Table 1). One patient had a blind eye with an opaque cornea as the result of a previous penetrating eye injury and no view of the retina was possible on that side. Of these patients, 82 were seen in the nurse led clinic, and 13 in the consultant clinic at a time when the nurse practitioner was present. There was an exact concordance in 173 eyes (91.5%), while 12 (6.3%) were within one grade of diabetic retinopathy and four (2.1%) were within two grades of diabetic retinopathy. The sensitivity of the ophthalmic nurse practitioner for diagnosing any diabetic retinopathy was 93% (67/72), and the specificity was 91% (67/74). Macular oedema was assessed independently to other changes of retinopathy. Four eyes (2.1%) were assessed as having clinically significant macular oedema (CSME) by the ophthalmologist. All were identified by the nurse practitioner. One additional eye was assessed as having CSME by the nurse practitioner. The sensitivity of the ophthalmic nurse practitioner in detecting CSME was therefore 100%, and the specificity was 80%. Very few eyes with sight-threatening retinopathy were seen in the nurse led clinic. Of the four eyes with CSME and the nine eyes with severe NPDR or worse, all but one eye with CSME and two eyes (one patient) with severe NPDR were seen primarily in the consultant clinic at a time when the nurse practitioner was also attending for educational purposes. All those with severe NPDR or PDR were correctly identified by the nurse practitioner.

A total of 82 patients were seen in the nurse led clinic. In total, 19 (23%) were referred out due to comorbidity, two were referred on due to severity of diabetic retinopathy, and 61 (74%) were booked for review in the nurse led clinic.

As a result of the high concordance of diabetic retinopathy assessment between ophthalmologist and ophthalmic nurse practitioner, the clinic has been continued as planned ('Phase 2').

Table 1 - Results of diabetic retinopathy grading by ophthalmologist and ophthalmic nurse practitioner.

Results of assessment by ophthalmologist		Result of assessment by nurse practitioner of corresponding patients	
Degree of retinopathy	n	*Degree of retinopathy*	n
No DR	117	No DR	110
		Minimal NPDR	3
		Mild NPDR	4
Minimal NPDR	26	Minimal NPDR	20
		No DR	5
		Mild NPDR	1
Mild NPDR	24	Mild NPDR	23
		Minimal NPDR	1
Moderate NPDR	13	Moderate NPDR	11
		Mild NPDR	2
Severe NPDR	6	Severe NPDR	6
Low-risk PDR	1	Low-risk PDR	1
High-risk PDR	1	High-risk PDR	1
Advanced PDR	1	Advanced PDR	1
Any DR	72	Any DR	67
		No DR	5
No CSME	185	No CSME	184
		CSME	1
CSME	4	CSME	4

 DR=diabetic retinopathy; NPDR=nonproliferative diabetic retinopathy; PDR=proliferative diabetic retinopathy; CSME=clinically significant macular oedema.

Discussion

An ophthalmic nurse practitioner is a nurse who has received additional training and experience in the management of patients with ophthalmic disease. In Australia this training must be recognised by the state nursing authorities and the place of employment before the title ophthalmic nurse practitioner can be used. A nurse practitioner has the right to refer

patients to other health care providers, order investigations, and administer a range of medications.

A very high concordance between the findings of the ophthalmologist and ophthalmic nurse practitioner was achieved in the current study. This was in a group of patients who had previously been assessed by an ophthalmologist, and had been booked in for annual review due to their relatively less advanced retinopathy. Nearly two-thirds of all patients were assessed by the ophthalmologist as having no diabetic retinopathy at all. This relative paucity of retinopathy would have increased the degree of concordance between ophthalmologist and nurse. The concordance was still very good (63/72, 88%) in eyes judged to have some degree of retinopathy by the ophthalmologist.

There was complete concordance between ophthalmologist and ophthalmic nurse practitioner for eyes with severe NPDR or any PDR. In addition, there was complete concordance for eyes judged to have CSME by the ophthalmologist. The number of eyes with this degree of sight-threatening retinopathy was however very small, and it is not possible to accurately assess the diagnostic sensitivity of the ophthalmic nurse practitioner for such eyes.

The clinic structure was such that patients with any sight-threatening retinopathy were promptly referred back to an ophthalmologist. The threshold for referral was deliberately set lower than the accepted thresholds for intervention to give the clinic a margin for diagnostic error. Sight-threatening retinopathy was very rare in the nurse led clinic. This also lent a degree of safety to the clinic design. There is however the risk that a clinician working solely in such a clinic may lose familiarity with the appearance of more severe retinopathy. It is planned therefore that the second phase of clinic implementation be modified to include ongoing periodic attendance of the nurse practitioner in the consultant clinic.

The present standard of care for diabetic retinopathy screening is dilated fundal examination by an ophthalmologist, preferably with an interest in retinal disease, and using indirect slit-lamp biomicroscopy. The 'gold standard' used in several larger trials of diabetic retinopathy is seven field stereo photography, which is highly reproducible and sensitive.[6, 9, 10, 11] The correlation between ophthalmologist assessment and seven field photography was 86% in one study, although 26% of proliferative diabetic retinopathy was missed.[12] For eyes with microaneurysms only, ophthalmoscopy may miss as many as 50% of cases.[13] The present study has not endeavoured to compare a nurse practitioner with the gold standard but rather to the present standard of care.

The concordance between ophthalmologists and other health professionals has been investigated in other studies. Concordances of between 48 and 77% have been reported for optometrists detecting any retinopathy.[14, 15, 16] In a large series by Prasad et al[17] using a simplified retinal grading system, only 1.16% of patients with sight-threatening retinopathy were missed by optometrists. Nonconsultant physicians were found to be 'correct' in their assessment in 30% of cases, improving to 67% with training in one study.[18] General practitioners have been reported to detect diabetic retinopathy in 65% of cases, and to correctly diagnose and refer sight-threatening retinopathy in 37%.[14, 19] It is difficult to compare these results directly with those of the present study due to differences in the retinopathy grading systems used. The system used in the present study was more sensitive to small differences in severity of retinopathy, and if anything would tend to have decreased the interobserver concordance. Despite this, the concordance achieved was excellent.

Screening for diabetic retinopathy using photographic techniques is also used. The sensitivity for detecting diabetic retinopathy is good using mydriatic cameras,[20] however the results with nonmydriatic cameras are more variable.[21] Patient satisfaction is likely to be better when diabetic retinopathy screening is performed by a clinician rather than photographically. Compliance with established screening recommendations is perhaps the biggest barrier to minimisation of diabetes related blindness.[22, 23] Photo-screening at the point of primary care (eg the local doctor or the pharmacist) has the potential to significantly improve compliance. The design of the nurse led clinic in the current study is unlikely to significantly improve compliance with screening, except that it makes more screening appointments available.

The design of the present study was such that the financial implications of nurse led diabetic retinopathy screening were not assessed. It is probable that it is less expensive than an ophthalmologist led primary screening program. It is likely to be cost competitive with photo-screening, since the staff cost is similar and there is not the need for an expensive retinal photographic system, nor the associated cost of reading the photographs. In the present model there is no additional visit required when significant retinopathy is detected, as the ophthalmologist clinic is run concurrently and patients can be 'walked round' for further assessment and treatment on the same day. This could equally be the case for photo-screening, although not if provided at the point of primary care.

A very high concordance was achieved between the grading of diabetic retinopathy by an ophthalmic nurse practitioner and by an ophthalmologist. This has validated the safety of independent diabetic retinopathy screening by an ophthalmic nurse practitioner, and allowed an ongoing assessment clinic to be established. The design of the clinic is described in detail to allow other groups to use this model, with quality assurance and education integral to the ongoing clinic.

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