

A preliminary evaluation of optometric management and referral protocols for patients with diabetic retinopathy

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Abstract

Aim: The purpose of this pilot study was to investigate the assessment, management and referral practices of South African optometrists in the care of patients with diabetic retinopathy (DR) and to recommend strategies to improve and standardize patient management as required.

Methods: The study design incorporated quantitative, qualitative and clinical measures that were administered to fourteen experienced optometrists from the Durban area. The quantitative measure, the questionnaire in appendix I, evaluated the optometrists' management protocols of patients with diabetes mellitus (DM). These included the optometrists' referral and co-management practices, their awareness and usage of appropriate guidelines in the management and referral of these patients, their perceived levels of competence and confidence in their education, levels of service offered to the patients and finally the role of Continuous Professional Development (CPD). This self-report information was supplemented by a set of clinical measures where the study sample graded levels of DR, chose appropriate management options and indicated prognosis for disease

progression based on a set of slides presented to them. Finally the fourteen optometrists, as well as two ophthalmologists, were interviewed using tailored, semi-structured interview schedules. These interviews were used to elaborate and corroborate information obtained from the other two research approaches.

Results: Descriptive analysis was used to analyse the data from the quantitative and clinical measures, whilst the interviews were analysed thematically. Although 86% of the sample routinely screened for ocular manifestations of DM, there was no standardization in the criteria used by the fourteen optometrists. Only 15% of the sample reportedly assessed their patients using dilated fundus examinations (DFE), which is the internationally recommended standard of care. The results of the clinical measures indicated that there was a lack of standardization in the management and referral of patients with DR by the study sample, contrary to their own levels of confidence in their educational competencies regarding DR and their perception of the level of service that they offered to their patients. The interviews with the optometrists provided crucial insights into this lack of standardised care of patients with DR, with the ophthalmologists confirming

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the urgent need for CPD aimed at enhancing clinical skills and ensuring standardization in the management and referral of patients with DR. This finding was particularly relevant for co-management models.

Conclusion: This pilot study indicates that the performance of the optometrists (albeit a relatively small group) in the assessment, management and referral of patients with DR was inconsistent and not in keeping with internationally recommended guidelines. It is recommended that CPD programmes focus on the improvement of clinical skills and on the implementation of existing standardised management protocols for patients with DR. This should result in improved patient care, patient confidence and loyalty with regard to care received, efficient and effective models of management and co-management and decreased costs to patients and the health care system.

Introduction

Diabetes Mellitus is recognized as a significant public health problem due to it being a major cause of morbidity and mortality¹. Public health focuses on the health of the overall population rather than on the treatment of individuals² and it attempts to find cost effective ways to deliver health services². DM and diabetic retinopathy (DR) have been on the public health agenda worldwide¹⁻⁴. The estimated worldwide prevalence of people with DM in 2000 was 171 million or approximately 3% of the population^{5,6}. What is of greater concern is that about half of these people are unaware that they have the disease⁶. Further, the greatest increase in the prevalence rate is expected to be in developing countries^{7,8}. The incidence of DM is increasing globally (the 1994 prevalence will have doubled by 2010)⁹ and the current prevalence is expected to double by the year 2030.¹⁰ This increase in DM has burdened health care services with staggering costs^{1,3}.

Strategies such as the National Service Framework (NSF) in Britain⁴ and the National Diabetes Strategy Implementation Plan in Australia^{2,3} have officially recognized the role of optometrists in screening and management

of patients with diabetes as part of a healthcare team. This envisaged role of optometrists as primary health care providers is premised on the extensive training that they receive in managing the ocular effects of DM (they are more competent than general medical practitioners in recognizing the ocular effects of DM¹¹). Optometrists also offer easy accessibility and cost effective management to patients¹². The guidelines, backed by continuous professional development available to optometrists in Britain and Australia, as well as evidence from support groups and health care teams, have resulted in positive feedback on the effectiveness of optometric intervention in the management of patients with DM and DR^{13,14}.

Whilst in South Africa there are currently no official guidelines or service frameworks regarding optometrists' role in the management of patients with DM and DR, there has been a significant emphasis in recent years at South African higher educational institutions on educating optometrists to provide more comprehensive health care services by examining, diagnosing and managing diseases and disorders of the visual system and associated structures, as well as diagnosing related systemic conditions based on ocular findings. Being primary eye care providers, optometrists are often the first to examine patients with undiagnosed systemic conditions, especially those with associated ocular manifestations such as DR.

Although the main categories of DM are clinically and genetically heterogeneous, they share hyperglycaemia as a common clinical feature⁹. Ultimately, this disease alters the metabolism of carbohydrates, fats and proteins causing wide spread damage throughout the body¹⁵. DM causes end organ disease with a multitude of complications including heart disease, pulmonary infections particularly tuberculosis, renal failure due to complications such as albuminuria, hypertension and nephretic changes, nephropathies such as peripheral neuritis and other autonomic nervous system involvement producing impotence, gastro-intestinal symptoms and postural hypotension¹. Also, it is important to note that some degree of DR is present in about one third of all diabetic patients and is sight-threatening in about 10-15%^{6,16}. More importantly, DR is the leading cause of

blindness in people^{1, 6, 10} under the age of 65.

The current classification of diabetes is based on recommendations of the American Diabetes Association (ADA) and a World Health Organization (WHO) consultation group. In this classification¹⁵, diabetes is divided into Type 1 and Type 2. These two main clinical patterns are distinct in terms of aetiology (both genetic and environmental factors), pathogenesis, clinical presentation and treatment^{14, 15}. Whilst DM is not contagious, certain factors amongst others, lifestyle and population and ethnic origins¹⁷ can increase the risk of developing diabetes.

Type 1 DM, is less common and accounts for approximately 10% of the total diabetic population whilst Type 2 DM is more common, accounting for 90% of the total diabetic population¹⁵. About 98% of patients with Type 1 DM and about 60% of those with Type 2 DM will develop DR after 20 years⁹. (A study in Britain found that about 39% of men and 35% of women who were newly diagnosed with Type 2 DM had retinopathy at the time of diagnosis⁹.)

In South Africa the prevalence of types 1 and 2 DM is approximately 3-5%, that is, 30 000 – 50 000 diabetics per million population¹⁸. The prevalence of Type 2 DM in South Africa varies among the different population and age groups. For instance, the prevalence of DM in South Africa amongst Indians is 11% - 13% and amongst Africans is 5% and increasing¹⁹. Socio-economic factors, urbanization and changes in nutrition are some of the key factors contributing to the increase in DM and other diseases amongst African adults²⁰. Further it has been found that DR accounts for 8% of blindness in South Africa¹⁹ and, more importantly, this figure is on the increase²⁰.

Visual and ocular ramifications

Diabetic eye disease is an end organ response to the generalized medical condition. All structures of the eye and many aspects of visual function are susceptible to the deleterious effects of DM²¹ (Table 1). The incidence of ocular complications increases with age and duration of the disease. Some studies have shown that there is a higher prevalence of glaucoma in known groups at risk for DM^{6, 22}. Cataracts are two to four times more prevalent, occur at

younger ages, and progress more rapidly in patients with DM²³. The duration of diabetes is the most important factor for the development of DR^{9, 16} with the cumulative risk rising to approximately 98% in those with Type 1 compared to 60% in those with Type 2 after 20 years⁹. Other risk factors include pregnancy, hypertension, poor glycaemic control, renal disease and hyperlipidaemia¹⁵.

Increased levels of blood glucose are thought to have a structural and physiologic effect on retinal capillaries causing them to be both functionally and anatomically incompetent^{1, 16}. Micro aneurysms are amongst the earliest detectable signs of DR⁹. With ruptured micro aneurysms (MA) resulting in retinal haemorrhages, either superficially (flame-shaped haemorrhages) or in deeper layers of the retina (blot and dot haemorrhages)⁹. As the disease progresses, eventual closure of retinal capillaries occur, leading to hypoxia. Infarction of the nerve fibre layer leads to the formation of cotton-wool spots (CWS) with associated stasis in axoplasmic flow²³. More extensive retinal hypoxia triggers compensatory mechanisms within the eye to provide enough oxygen to tissues. Atherosclerotic abnormalities cause change in venous diameter such as venous beading, loops, and dilation, increasing hypoxia and risk for progression to proliferative retinopathy²¹.

Increased permeability of these vessels results in leakage of fluid and proteinaceous material, which clinically appears as retinal thickening and exudates. If the swelling and exudation happens to involve the macula, a decrease in central vision may be experienced. Macular oedema is the most common cause of vision loss in patients with non-proliferative DR (NPDR). While it is not exclusively seen in patients with NPDR, it also may complicate cases of proliferative DR (PDR)²³. In addition, patients with DM might be at risk for developing neuro-ophthalmological complications affecting vision and ocular health significantly¹⁰.

Management and clinical issues

As primary eye care providers, optometrists should be familiar with the ocular complications of DM. Due to the severity of ocular complications, the management of patients presenting with DM and associated DR should begin with

Table 1: Ocular and visual complications of Diabetes Mellitus ²¹

Source of complication	Ocular/Visual Complications
Functional	<ul style="list-style-type: none"> • Tritan colour vision deficiencies • Refractive error changes • Accommodative dysfunction • Visual field defects
Extraocular Muscle Anomalies	<ul style="list-style-type: none"> • Mononeuropathies involving third, fourth, or sixth cranial nerves
Pupillary Reflexes	<ul style="list-style-type: none"> • Sluggish pupillary reflexes
Conjunctiva	<ul style="list-style-type: none"> • Bulbar conjunctival micro aneurysms
Tear Film	<ul style="list-style-type: none"> • Tear film deficiencies resulting in dry eye syndrome
Cornea	<ul style="list-style-type: none"> • Reduced corneal sensitivity • Reduced corneal wound healing ability • Basement membrane abnormalities resulting in increased frequency of abrasions or recurrent erosion syndrome • Descemet's membrane wrinkling • Endothelial cell morphology changes, often resulting in increased corneal thickness
Iris	<ul style="list-style-type: none"> • Depigmentation • Rubeosis iridis, possibly with associated ectropian uvea and peripheral anterior synechiae • Neovascular glaucoma
Lens	<ul style="list-style-type: none"> • Higher prevalence of cataracts • Reversible opacities and snowflake cataracts
Vitreous	<ul style="list-style-type: none"> • Haemorrhage in proliferative retinopathy
Retina	<ul style="list-style-type: none"> • Nonproliferative retinopathy • Proliferative retinopathy • Macular oedema
Optic Nerve	<ul style="list-style-type: none"> • Papillopathy • Ischemic optic neuropathy • Higher incidence of open angle glaucoma

a detailed history. Common ocular symptoms of undiagnosed DM include recent onset of blurred or fluctuating vision, or recent onset diplopia⁶. Knowledge of the ocular effects of DM as well as the clinical features of DR would enable optometrists to structure the ocular examination to include all relevant tests (Table 1) to rule out any changes to the visual system due to the effects of the diabetic disease process.

Within the context of the holistic management of patients with DM, optometrists have a significant role in ensuring that patients have minimal visual complications. Since 2001, the scope of the practice of optometry in South Africa has been broadened to offer more comprehensive patient management. Accordingly, the training of optometrists now includes the diagnosis and management of systemic diseases

that present with ocular manifestations such as those associated with DM. However, there is a lack of information on the practice of the broadened scope of the profession especially with respect to management of patients with DM and DR. Anecdotal information (telephonic communication with two ophthalmologists) suggests possible concerns with a lack of standardised management and referral practices by South African optometrists with regard to patients presenting with ocular manifestations of chronic systemic diseases such as DM.

Appropriate patient management, particularly across the community of eye care professionals, must be informed by a set of commonly accepted guidelines. In the absence of any officially recommended guidelines for the profession in South Africa, for the purposes of this study the guidelines for the clinical features, natural history and management of DR (Table 2) recommended by the Community of Eye Health – Planning and Implementation of Vision 2020 Programme, were used²⁴.

The aim of this pilot study was to investigate the assessment, management and referral practices of South African optometrists in the care of patients with DR and to recommend standardized clinical protocols. The objectives of the study were:

- To determine whether optometrists follow standard guidelines across the profession in the assessment, management and referral of patients presenting with DR
- If applicable, to investigate reasons why

optometrists do not use standardized assessment, management and referral protocols for patients with DR

- To suggest appropriate standardized assessment, management and referral protocols for optometrists.

Methodology

Participants

The study design incorporated quantitative, qualitative and clinical measures. Fourteen optometrists from the Durban area with at least a Bachelor of Optometry degree were involved. Seven of them had more than five years of clinical experience.

Quantitative measure: the questionnaire

The data from the study sample was collected with a questionnaire of twenty-six questions (Appendix I). Of these, twenty were fixed response questions (close-ended) with the other six being open-ended. The questionnaire focused on the diagnostic methods, management and referral protocols commonly used by the optometrists in managing patients with DR. Specific variables that were investigated included:

- Management protocols for patients presenting with DM, including methods and frequency of screening
- Usage and views regarding the use of standardised protocols for the diagnosis, management and referral of patients with DR
- Perceptions regarding appropriateness of educational training, competence and qual-

Table 2: Clinical features, natural history and management of DR²⁴.

Level of Retinopathy	Clinical Features	Natural History (Rate of progression to PDR at 1yr)	Management
Mild Non Proliferative	• More than 1 microaneurysms	5%	Review at 12 months
Moderate Non Proliferative	• Haemorrhages	25%	Review at 6 months
Severe Non Proliferative	• Haemorrhages and microaneurysms in all quadrants • Or venous beading in more than 2 quadrants; • Or IRMA in 1 quadrant	50%	Review at 3 months Pan retinal photocoagulation
Proliferative	• Neovascularisation		Pan retinal photocoagulation Clinically Significant
Clinically Significant Maculopathy	• Macular oedema with visual acuity deterioration		Grid laser to macula

- ity of service provided to patients with DM
- Viewpoints on the role of continuous professional development (CPD)

Clinical Measure

For the purposes of clinical assessment, the optometrists completed another questionnaire based on a set of seven slides showing various stages of DR²⁵. The aim was to determine the levels of accuracy and consensus amongst the optometrists in the diagnosis, management and referral of patients presenting at various stages of progression of DR, as measured against the appropriate actions suggested by ophthalmologists and internationally recommended guidelines. The research team used the recommended international guidelines to compile the printed questionnaire (13 questions), based on the slide presentations. Of these questions:

- Three questions assessed the optometrists' ability to correctly identify the stage of DR presented in the slide,
- Five questions assessed the optometrists level of understanding of the disease process as well as the causes of visual loss,
- A further two questions were aimed specifically at the ability to differentially diagnose the different stages and,
- The final three questions were directed at ascertaining whether appropriate management and referral would be practiced.

The information obtained from this clinical measure was used to compliment the self-report results yielded via the questionnaire (quantitative measure), especially with respect to the samples perceived adequacy of their clinical training as well as their levels of satisfaction and confidence with regard to their management and referral practices.

Qualitative measure - Interviews

Upon completion of the quantitative and clinical measures questionnaires, the optometrists were interviewed individually (Appendix II). The interviews were used to obtain further clarification on their role in the diagnosis, management and referral of patients with DR, their use of specific guidelines and the role of continuous professional development (CPD).

In order to ensure uniform and appropriate standards of care to patients presenting with DR,

optometrists and ophthalmologists should follow the same guidelines. The research team interviewed two ophthalmologists within the Durban area, on the basis of convenience and availability. Open-ended questions were used to explore the nature and accuracy of referrals made by optometrists of patients presenting with DR, personal judgements of the accuracy and consistency of the diagnosis, management and referral of these patients, based on the referral letters received from various optometrists and their own examination of patients referred (Appendix II).

Ethical considerations:

Ethical clearance for undertaking this study was obtained from the Ethics Committee of the University of KwaZulu-Natal and written informed consent to participate in this study was obtained from each member of the study sample.

Data Analysis

Given that the relatively small sample size precluded the use of multivariate statistical analysis, quantitative data was analysed descriptively. The results were grouped categorically as described in the measures section for ease of analysis and presentation of results.

Interviews were recorded on audiotape and a verbatim transcript of these tapes was rendered for the purposes of data analysis. The transcriptions were analysed thematically in order to identify commonalties and variances among the responses of participants.

Results

Quantitative results: the questionnaire

With regard to patient management, 86% or most of the fourteen optometrists indicated that their patients were routinely screened for ocular manifestations of systemic diseases, and 79% indicated that they screened their patients at every visit. 57% used the direct ophthalmoscope when assessing the fundus for ocular manifestations of systemic diseases while only 15% performed a full dilated fundus examination.

A staggering 64% were unaware of national or international guidelines for the management of DR, and only 21% of the sample indicated that they co-managed their patients with ophthalmologists. 72% believed that they

had an adequate level of education and clinical training with regard to managing ocular manifestations of systemic diseases like DR whilst 64% believed that they offered adequate levels of management to their patients. All the optometrists in the study sample were unanimous in recognizing the need for regular educational training. Most (93%) believed that standardized management protocols for DR are necessary and that increased levels of co-management would be advantageous to patients.

Analysis of clinical measures

The results of the slide evaluation showed that only 15% of the study sample, on average, correctly identified the different stages of DR. Only 55% correctly identified the

stage of the disease process and causes of visual loss whilst only 25% were correct in their differential diagnosis. Finally, 61% of the sample identified appropriate management and referral options for the cases in the slide questionnaire.

Table 3 reflects the aggregate opinions of optometrists based on criteria being investigated. A significant percentage of the patients presenting to these optometrists with DM had some degree of DR. However there was no consistency in the referral patterns with respect to standardised guidelines.

The results in Table 4 of the interviews with the ophthalmologists support the need for standardisation of referral and management of patients with DR by optometrists in order to facilitate co-management of patients.

Table 3: Thematic Analysis of Interviews with the Optometrists

Emergent themes	Aggregated Responses
Percentage of patients presenting with DM	<ul style="list-style-type: none"> 30%
Views on diagnosis, management and referrals of patients with DM	<ul style="list-style-type: none"> 100% of optometrists in the study sample monitored blood glucose levels 25% of these optometrists performed dilated fundus examination
Percentage of patients presenting with DR	<ul style="list-style-type: none"> 40%
Areas of concern with respect to the diagnosis, management and referral of patients with DR	<ul style="list-style-type: none"> 100% of these optometrists believed that patient education is important
Suggestions regarding co-management between optometrist and ophthalmologist	<ul style="list-style-type: none"> 25% of the sample referred patients at the appropriate stage (using the international guidelines as the gold standard) 75% of these optometrists referred patients irrespective of the stage of DR

Table 4: Thematic Analysis of Interviews with the Ophthalmologists

Questions probed	Responses
Number of referrals from optometrists of patients presenting with DR	<ul style="list-style-type: none"> 30%
Consistency in the diagnosis, management and referral of these patients by optometrists to ophthalmologists	<ul style="list-style-type: none"> All patients referred at varying and inconsistent stages of DR
Ophthalmologists' views on co-management	<ul style="list-style-type: none"> Lack of co-management on the part of optometrists
Awareness and use of specific international guidelines by ophthalmologists	<ul style="list-style-type: none"> Yes
Suggestions regarding co-management of patients with DR between optometrist and ophthalmologist	<ul style="list-style-type: none"> Optometrists should refer patients at any stage if a dilated fundus examination is not performed Optometrists should refer patients at the appropriate stage if the patient is monitored with a dilated fundus examination

Discussion and conclusions

The percentage of patients presenting with DM, as reported by optometrists in this study, was higher (30%) than reported in a similar study which assessed the proficiency of Australian optometrists at detecting retinal changes caused by DM¹³ (2% to 20 %). This was possibly due to an elevated prevalence of DM in the Indian South African population group which comprised the primary patient base of the sample of optometrists in this study. The internationally recommended guidelines for minimal care of DR require that patients be examined using dilated fundus examinations (DFE) as the appropriate standard of care at every visit^{10, 12, 22}. These visits need to be at appropriate time intervals based on the presenting levels of DR^{1, 10}. In this regard, most of the Australian optometrists performed fundus examinations through dilated pupils whereas this was not the case for the local optometrists involved in our study.

The questionnaire data indicated that 86% of the optometrists assessed all their patients at the initial visit for ocular manifestation of disease whilst only approximately 80% assessed their patients at every visit. However, the instrumentation used for fundoscopy was a direct ophthalmoscope without dilation and only fifteen percent of the study sample performed DFE routinely on these patients. This is of concern since the suggested minimal care required for patients with DR includes a DFE.

A significant 64% of the study sample was unaware of any standardised national or international guidelines for the management of patients with DR. In comparison, approximately 74% of the Australian study sample routinely used their NHMRC guidelines for the classification of DR as these guidelines were easy to use and helped keep their grading consistent¹³. This could possibly explain the relatively low percentage of optometrists in this study (21%) who were reportedly engaged in co-management of their patients with ophthalmologists. On the other hand, a significant 72% of the study sample believed that they had adequate levels of education and clinical training and offered adequate levels of service to patients with DR. This is in contradiction to their actual management and referral protocols practised as evidenced in the

results of their performance on the clinical measure involving slide diagnosis.

The study sample was unanimous in recognising the value and the need for regular educational and clinical training to ensure optimal care for their patients. This can be achieved by CPD courses aimed at ensuring that the community of optometrists follow standardised national and international guidelines so that we may engage in increased levels of co-management of these patients with ophthalmologists and the health care team. This would not only benefit the patient directly but could have positive financial implications for both the public and private health care systems.

There was limited consistency in the results obtained from the study sample with respect to their performance on the clinical cases presented with slides. Whilst just over half the sample demonstrated appropriate theoretical understanding of the disease process, only a quarter were able to return an appropriate differential diagnosis and a very small percentage was competent in the management of patients with DR.

These results compared unfavourably with those of the Australian study where the detection of DR was correct approximately 94% of the time and even though the classification of the severity was found to be more difficult, these cases were successfully managed by approximately 67% of the sample¹³. This evaluation clearly indicates the need for regular clinical and educational training aimed at standardising the identification of the disease process and prognosis, improving competencies for making differential diagnoses and utilising appropriate management and referral criteria.

The key reasons advanced by participants for their lack of consensus in the management of DR related to a lack of specialized equipment (e.g. 90D/78D lenses, indirect ophthalmoscopes) and a paucity of on-going clinical training. They showed deep concern for the lack of sufficient co-management and they all indicated that CPD could play a vital role in the enhancement of their skills. From the various results it was clear that, contrary to their own views, the performances of the sample in the assessment, management and referral of patients with DR was unsatisfactory and at odds with internationally recommended guidelines. It was highly

commendable that the study sample recognized their limitations and the need to be proactive in offering optimal care to their patients. When comparing the results for this sample to those of similar studies in Australia, United States and Britain^{10, 13, 26-28}, it was clear that standardized guidelines and regular clinical updates would dramatically improve the quality of (South African) optometric care in managing patients with DM and DR. It is therefore crucial that CPD service providers take up this call as a matter of urgency and further that educational institutions review their educational and clinical training programs with regard to systemic diseases such as DM. The benefit of improved and standardised levels of care would include better patient care, patient confidence and loyalty with regard to care received, efficient and effective models of management and co-management and decreased costs to both patients as well as the health care system.

The two ophthalmologists interviewed indicated that co-management would be more possible once there is standardisation in the management and referral of patients with DR by optometrists, using internationally recommended guidelines, which the ophthalmologists currently follow. They have noted this as an area of weakness when receiving referrals of patients with DR from optometrists. As noted in the Australian study, standardized guidelines improved consistency of grading of the severity of the condition¹³ and this would improve reporting and referral within the health care team.

The results of this study must be considered within the context of certain limitations. For example, a major limitation of this study was the small non-probability sample which precluded the use of higher order statistical analysis and therefore restricted the generalisability of the findings. A further probably minor limitation was that for the clinical measures only a slide questionnaire was used instead of actual patients with the different stages of DR. In comparison, the Australian study had a study sample of nineteen optometrists who assessed both slide presentations as well as actual patients¹³. This allowed for a more comprehensive assessment of their performance. While patients were included in the original conceptualisation of this study design, this was precluded due to

logistical difficulties such as a lack of time and finances, as well as patients' and optometrists' unavailability to participate in this aspect of the study. Assessment of clinical performance was thus effected using only the slide questionnaire, which, while normatively sound, must fall short of an exact match to real patient assessment.

A larger scale study is recommended, where the study sample of optometrists satisfies statistical power and probability sampling requirements so as to ensure generalisability. Further, it is important to include the clinical assessment of patients presenting with various and representative stages of DR, in addition to other assessments like clinical slides. Notwithstanding the above limitations, the findings of this study point to the urgent need for relevant educational service providers to take up the challenge of ensuring that optometrists are able to receive urgent and regular clinical training with respect to DR as part of CPD, as a means of improving efficacy, effectiveness and costs involved in treating patients with systemic diseases such as DR.

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APPENDICES

Appendix I: Participating Optometrist Questionnaire

The enclosed questionnaire has been designed to evaluate the management and referral protocols of diabetic retinopathy patients by optometrists. There are no personal adverse ramifications in completing this questionnaire. Your participation will remain anonymous. The results will be used to assist in the development of uniform guidelines for the management of patients presenting with this condition as well as identifying any areas that need to be improved by means of education and or practitioner guidance. Please complete the questionnaire as honestly as possible and feel free to make any suggestions that you might feel would be of assistance in the space provided.

SECTION A: Biographical Information

1. Educational Qualifications: (list all undergraduate and post-graduate qualifications, date and year)

2. Site of practice: (tick one option only):

Urban
Peri-urban
Rural

3. No. of years of clinical experience:
_____ years

SECTION B: Clinical Practice: Diagnosis, Management & Referral Of Diabetic Retinopathy

4. Patients presenting to your practice are screened for ocular manifestations of systemic diseases: (Tick one option only)

Only if they have a history of systemic diseases	
Routinely, regardless of history or lack thereof of systemic diseases	
Never	

5. If your answer to question 4 above was 'Never', please indicate state possible reasons. (You may tick more than one response).

Lack of skills in disease management
Lack of instrumentation
Other – Specify

6. How often are your patients screened for ocular manifestations of systemic diseases? (You may tick more than one response).

At initial visit
At every visit
Depends on the level of disease progression
Other

7. If you do screen for ocular manifestations of systemic diseases, percentage of your patients, on average, present with diabetic retinopathy to your practice annually?

% with DR	Patients are not screened for systemic diseases
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8. Of those patients presenting with Diabetic Retinopathy, estimate the percentage, if any,

that were unaware that they had Diabetes?
9. Indicate the frequency at which you examine the ocular posterior segment (You may tick more than one response). Dilated at:

At initial visit
At every visit
Depends on the level of disease progression
Never

10. Indicate the frequency at which you examine the ocular posterior segment (You may tick more than one response). Undilated at:

At initial visit
At every visit
Depends on the level of disease progression
Never

11. Instruments used to conduct the posterior and anterior segment ocular examinations: (You may tick more than one response)

Ophthalmoscope – Direct / Indirect
90D
Slit Lamp
Other

12. Are you aware of any national guidelines that might be available for use in the diagnosis, management and referral of patients with Diabetic Retinopathy either in South Africa or elsewhere in the world?

YES	NO
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13. In evaluating patients presenting with Diabetic Retinopathy, please indicate whether you use any specific criteria and guidelines by ticking the table below.

EVALUATION	SPECIFIC CRITERIA USED?		GUIDELINES USED?	
	Yes	No	Yes	No
Diagnosis				
Management				
Referral				

14. If you use specific criteria to assess, manage

and refer patients presenting with Diabetic Retinopathy, as indicated in question 13 above, please explain.

.....

.....

15. If you use specific guidelines to assess, manage and refer patients presenting with Diabetic Retinopathy, as indicated in question 13 above, please explain.

.....

.....

16. List any other tests that you normally request when patients present with Diabetic Retinopathy e.g. fasting lipid level.

.....

.....

17. Patients presenting with ocular manifestations are referred to: (Please respond to all options below)

General Practitioner	Always	Sometimes	Never
Ophthalmologist	Always	Sometimes	Never
Hospital eye clinic	Always	Sometimes	Never
Other (specify)	Always	Sometimes	Never
Co-managed with:	General Practitioner	Ophthalmologist	No other professional

18. What percentage of patients whom you refer to other practitioners are co-managed?

.....

.....

19. Rate your level of educational and clinical training in the care of patients with diabetic retinopathy. (Tick the most appropriate answer only transpose.)

Very adequate trained
Adequate trained
Inadequate trained

20. Rate the level of management you offer patients presenting with diabetic retinopathy. (Tick the most appropriate answer only transpose.)

Very adequate management
Adequate management
Inadequate management

21. Please justify your response to question 20.

.....

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SECTION C: Recommendations

22. In your opinion, is there a need for regular educational and clinical updates in the care of patients with Diabetic Retinopathy?

YES	NO	UNSURE
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23. Would the standardization of assessment, management and referral protocols for patients with Diabetic Retinopathy be of benefit to the Optometrist, patient and health care system?

YES	NO	UNSURE
-----	----	--------

24. Would you the Optometrist prefer to be more integrally involved in the management and co-management of patients with Diabetic Retinopathy than you currently are?

YES	NO	UNSURE
-----	----	--------

25. Should Continuous Professional Development (CPD) play a more important role in facilitating this process?

YES	NO	UNSURE
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26. Any additional comments would be most valuable.

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Thank you for your time and effort in participating in this research project.

Appendix II: Qualitative Measure 1 - Interviews with Optometrists

Interview Schedule

1. Do you see many patients presenting with DM in your practice? (Elaborate)
2. What are your views regarding the diagnosis, management and referrals of patients presenting with DM?

3. Of those patients presenting with DM, how many present with ocular manifestations? (Elaborate)
4. Are there any areas of concern you have with respect to the diagnosis, management and referrals of patients presenting with DR?
5. Do you have any suggestions with respect to how Optometrists should diagnose, manage and refer patients with DR in collaboration with other eye care professionals, especially Ophthalmologists?

Qualitative Measure 2 – Interviews with Ophthalmologists

Interview Schedule

1. Do you receive many referrals from Optometrists of patients presenting with DR? (Elaborate)
2. Is there consistency, in your opinion, in the diagnosis, management and referral of these patients by Optometrists, judging from their referral forms and/or other communications?
3. What are your views regarding co-management of patients with DR?
4. Do you grade your patients with respect to any specific guidelines for DR? (Elaborate)
5. Are you aware of any international guidelines for DR? (Elaborate)
6. Do you have any suggestions as to how Optometrists and Ophthalmologists may together improve the care provided to patients with DR?