Received: 26 November 2024 | Accepted: 5 March 2025 | Published online: 20 March 2025

DOI: 10.1111/opo.13491

OPO THE COLLEGE OF OPTOMETRISTS

ORIGINAL ARTICLE

Analysing diagnostic practices and referral pathways for glaucoma in Australian primary eye care

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Funding information
NHMRC Investigator, Grant/Award Number: APP1175405; Research Training Scholarship from the Australian Commonwealth Government; Medical Research Future Fund, Grant/Award Number: MRFAI00035; Global STEM Professorship Scheme, Grant/Award Number: P0046113; National Critical Research Infrastructure Initiative

Abstract

Background: Glaucoma is the leading cause of irreversible blindness globally, posing a significant public health challenge in Australia, particularly among individuals aged 55 years and older. As primary health care providers, optometrists play a crucial role in the early diagnosis and management of glaucoma, making them central to efforts aimed at reducing the burden of this sight-threatening condition. This study investigates the practice patterns of Australian optometrists in diagnosing and managing glaucoma, focusing on test utilisation, diagnostic confidence, referral practices and intra- and inter-observer variabilities in grading glaucomatous optic neuropathy (GON).

Methods: A mixed-method cross-sectional design was conducted, involving 50 Australian optometrists who graded 120 colour digital retinal photographs for GON and completed an online survey regarding their diagnostic methods and confidence levels. Statistical analyses assessed inter- and intra-observer agreement in GON grading.

Results: The results showed that 82% of optometrists surveyed possessed optical coherence tomography (OCT) instruments and 96% had visual field analysers. Despite a majority expressing confidence in glaucoma detection, only 8% felt capable of independently diagnosing the disease and initiating treatment. Inter-observer agreement for glaucoma detection from retinal photographs was moderate (kappa = 0.53, 95% CI 0.50–0.54), while intra-observer agreement was substantial (kappa = 0.73, 95% CI 0.70–0.77). Inter-observer agreement of optometrists was similar to that of ophthalmologists.

Conclusion: Most optometrists have access to advanced diagnostic tools, know how to appropriately diagnose and manage glaucoma and have similar inter-observer variability when assessing fundus photographs to that of glaucoma sub-specialists, but few feel confident in independently diagnosing and managing glaucoma.

KEYWORDS
Australia, diagnostic confidence, glaucoma, primary care, referral practices

INTRODUCTION

Glaucoma is a significant public health issue and is the leading cause of irreversible blindness worldwide.[1,2] Glaucoma is the second leading cause of blindness among people aged 55 years and over in Australia.[3] Early detection and treatment are crucial to prevent vision loss. In many western countries such as Australia, Canada, the USA, New Zealand and the UK, optometrists play an important role in detecting and managing glaucoma, as they are often the first point of contact for patients seeking eye care services. They function as the primary eye care providers, conducting the majority of glaucoma examinations.[4,5]

In Australia, the number of glaucoma sub-specialists is well below the number needed to manage all glaucoma. In 2020, there were around 1000 full-time equivalent ophthalmologists and 6043 optometrists registered in Australia.[6] Among these optometrists, 3801 or 65% have scheduled medicines endorsement, which allows them to detect and manage glaucoma by prescribing anti-glaucoma eye medications.[6] This group of practitioners has completed training specific for this purpose. Before 2014, anti-glaucoma drugs required shared-care plans between general medical practitioners (GPs), ophthalmologists and optometrists that aligned with the Optometry Board of Australia guidelines, which reflect a sensible and safe mode of practice transitioning to unrestricted management. Following the 2014 issuing of revised Guidelines for Use of Scheduled Medicines, pharmaceutical benefits scheme (PBS) shared-care requirements for glaucoma prescriptions were removed, allowing optometrists to diagnose and manage glaucoma independently.[5]

Despite the importance of optometrists in the detection and management of glaucoma, there is limited research on their practice patterns[7] and evidence is lacking in relation to diagnostic confidence and levels of agreement in assessing glaucoma across the profession. A population study found that undiagnosed glaucoma was as high as 63% in Australia.[8] Of the undiagnosed cases, 51% had seen an optometrist in the past year, 46% did not have a visual field (VF) test performed and 32% had cup-to-disc (CDR) ratios consistent with glaucoma (>0.7), but were not recorded as such.[8] Importantly, there is no study on the frequency and type of tests performed by active optometrists, the referral patterns of optometrists or the variability of glaucoma grading among optometrists.

Understanding these key elements in the glaucoma practice patterns of optometrists is crucial to reduce the amount of undiagnosed glaucoma. It is unknown whether targeted educational and training programmes undertaken by optometrists in Australia to become therapeutically active have led to an acceptable intra- and inter-observer performance that is comparable with ophthalmologists. Optometrists need to be confident in their ability to diagnose and manage glaucoma and to be familiar with the latest evidence-based guidelines for the detection and management of the disease.

Key points

- This paper presents evidence for glaucoma practice patterns and variability in assessing glaucomatous optic nerves by Australian optometrists.
- While many optometrists are confident in their diagnostic abilities, most refer patients to glaucoma specialists for management.
- Inter-observer agreement in assessing glaucoma likelihood from monoscopic photographs was comparable between optometrists, general ophthalmologists and ophthalmology trainees.

Moreover, understanding optometrists' referral pathways is important to ameliorate this public health crisis of undiagnosed glaucoma. Referral patterns should be based on evidence-based guidelines. Optometrists need to be familiar with the referral pathways and communicate effectively with ophthalmologists to ensure that patients receive timely and appropriate care. Optometrists also need to be confident in their decision-making and might need refresher educational programmes to reinforce the issues involved. This might particularly be the case when a clinician does not encounter glaucoma cases frequently, so their level of skill and confidence could decline over time.

Therefore, this study aims to investigate several key factors related to optometrists and their practice patterns in diagnosing and managing glaucoma. Specifically, the study aimed to examine the nature of tests utilised by optometrists in diagnosing glaucoma, the proportion of optometrists who diagnose glaucoma independently, the proportion of optometrists who initiate treatment for glaucoma, the level of confidence that optometrists have in their ability to diagnose glaucoma accurately, technology usage in glaucoma care and variability in grading the optic disc and retinal nerve fibre layer (RNFL) for glaucoma detection among Australian optometrists. Understanding these factors is crucial for improving the diagnosis and management of glaucoma, as well as identifying areas for targeted education and training programmes to improve the delivery of eye care services.

METHOD

Ethics approval was granted by the Human Research Ethics Committees of St Vincent's Hospital, Melbourne, and the study was conducted in accordance with the Declaration of Helsinki. Implied consent was obtained electronically from participating optometrists.

A prospective mixed-method cross-sectional observational study was used to investigate the practice patterns of glaucoma detection by optometrists. Fifty optometrists practising in Australia were recruited. The project was predominantly advertised by Optometry Australia (optometry.org.au/) and Mivision (mivision.com.au/) by emailing their members. However, other avenues were also utilised, including the media channels of Optometry Australia and the Centre for Eye Research Australia (CERA), newsletters, websites and Facebook.

Fifty optometrists completed the study, which included an online survey and a short grading exercise of coloured fundus photographs. The survey questions included demographic information, such as their education and training background, and tests they use to carry out glaucoma diagnoses, as well as characteristics of their place of practice, such as if it is corporate or independent, practice volume and available equipment. Urban/rural regions were determined by the postcode of their practice location provided by the optometrists and searched using agriculture.gov.au/biosecurity-trade/import/online-services/delivery-postcode-classifications.

The same 50 optometrists also graded 120 images on an online grading platform hosted by electronic data capture tools (Research Electronic Data Capture [REDCap], project-redcap.org) and controlled and managed by the CERA (cera.org.au/) data management and information technology (IT) teams. Each participating optometrist was given a unique code at the end of the online survey that took them to the REDCap grading platform. The participating optometrists assessed optic discs and RNFL using monoscopic fundus photographs presented to them. The optometrists were asked to classify the image into 'certain', 'suspect' or 'unlikely' for glaucoma after viewing the image. Previous literature has demonstrated that for expert observers evaluating optic disc photographs to assess the likelihood of glaucoma, monocular (monoscopic) optic disc photographs did not appear to represent a significant disadvantage compared to stereoscopic photographs.[9]

Grading results were also collected from two ophthalmologists (glaucoma sub-specialists) certified by the Royal Australian and New Zealand College of Ophthalmologists (RANZCO) to volunteer in this project. Each of them also graded the same 120 colour fundus photographs for glaucoma using the same classifications as the optometrists.

The fundus images were randomly selected from the UK Biobank, which recruited half a million people aged 40–69 years from 2006 to 2010 in the UK.[10] A subset of 68,544 participants underwent retinal fundus imaging. Images were non-mydriatic, single-field colour fundus photographs (45° field of view, centred to include both the optic disc and the macula) captured using a digital Topcon-1000-integrated ophthalmic camera (Topcon 3D OCT1000 Mark II, topconhealthcare.com). Images were stored in PNG format with dimensions of 2048 × 1536 pixels.[10] The UK Biobank obtained approval for data collection from the Northwest Region National Health Service (NHS) research ethics committee. Approval for access to the UK Biobank data for the purpose of this study was granted under an agreement between the UK Biobank and the CERA. Images did not contain any identifiable information. No identifiable information was obtained from the participating optometrists or ophthalmologists by the grading platform.

All study data were manually entered and managed using REDCap, which was hosted at the CERA. De-identified data were downloaded from REDCap and imported into Stata/IC Version 17 (stata.com) for statistical analysis.

Eligibility criteria

Australian Health Practitioner Regulation Agency (AHPRA)-registered optometrists were included in this study.

Sample size calculation

To determine the number of unique images that needed to be assessed, the *CI3Cats* function from the *kappaSize* package[11] in R (r-project.org) was used. As this function only allows computations up to six raters, the required number of images was first computed for two to six raters, assuming an expected Fleiss's κ of 0.40, with a target 95% lower bound of 0.35 and equal proportions for the three rating categories. The *lm* function was then applied to the relationship between the number of images N and the number of raters R, according to the following formula:

$$\frac{1}{N} = a \log(R) + b + \in$$

where a and b are regression coefficients and ϵ is an error term.

The resulting curve was then extrapolated to 50 raters, giving a required number of samples of 86. This number was rounded up to 90 images.

To determine the required number of images to be repeated per optometrist, the *N2.cohen.kappa* function from the *irr* package[12] was used. Assuming equal probabilities of the rating categories and a minimum Cohen's κ of 0.35, with a null κ of 0.40 and a target statistical power of 0.80, the required number of images was computed to be 1346 (27 per optometrist). This final number was rounded up to 30 repeated images per optometrist.

Statistical analysis

Descriptive analysis was used to describe the practice patterns. The *t*-tests were used to compare continuous variables, while Pearson's Chi-squared or Fisher's exact tests were used for the comparison of categorical data. Descriptive analysis was used for the characteristics of participants. Statistical significance was set at $p < 0.05$. Kappa statistics were used for intra-observer and inter-observer variability. The agreement can be described as slight if kappa is 0–0.20, fair if kappa is 0.21–0.40, moderate if kappa is 0.41–0.60, substantial if kappa is 0.61–0.80 and very good if kappa is 0.81–1.00. Intra-observer agreement was computed by comparing the responses of each observer. Inter-observer agreement was calculated by comparing participants' responses with each other (i.e., 50 raters for optometrists and two raters for ophthalmologists). Analyses were conducted in Stata/IC Version 17.

RESULTS

Characteristics of optometrist participants

Among the 50 optometrist participants, 17 (34%) were male, 32 (64%) were female and 1 (2%) self-identified as 'other'. Most (29, 58%) optometrist participants were between 30 and 39 years of age. A total of 14 (28%), 5 (10%) and 2 (4%) were between 20 and 29, 40 and 49, and 50 and 59 years of age, respectively. The mean duration of practising optometry in Australia was 9.64 years (SD = 7.33 years; median = 8.5 years). All had undergone an optometry programme that was either 4 or 5 years in duration. Forty-seven (94%) were therapeutically qualified and trained in glaucoma detection and management, 43 (86%) worked in private sector optometric practices and the remainder worked in the public sector. Twenty-two (44%) worked in a corporate setting (excluding franchises), 13 (26%) in a franchise practice, 12 (24%) were in independent practices and 3 (6%) worked in community health care. Forty-two (84%) practised in metropolitan settings, 7 (14%) in rural settings and 1 (2%) as a locum optometrist (working in both urban and rural settings). Forty-one (82%) worked full time (practising ≥16 h per week) and nine (18%) part time (practising <16 h per week).

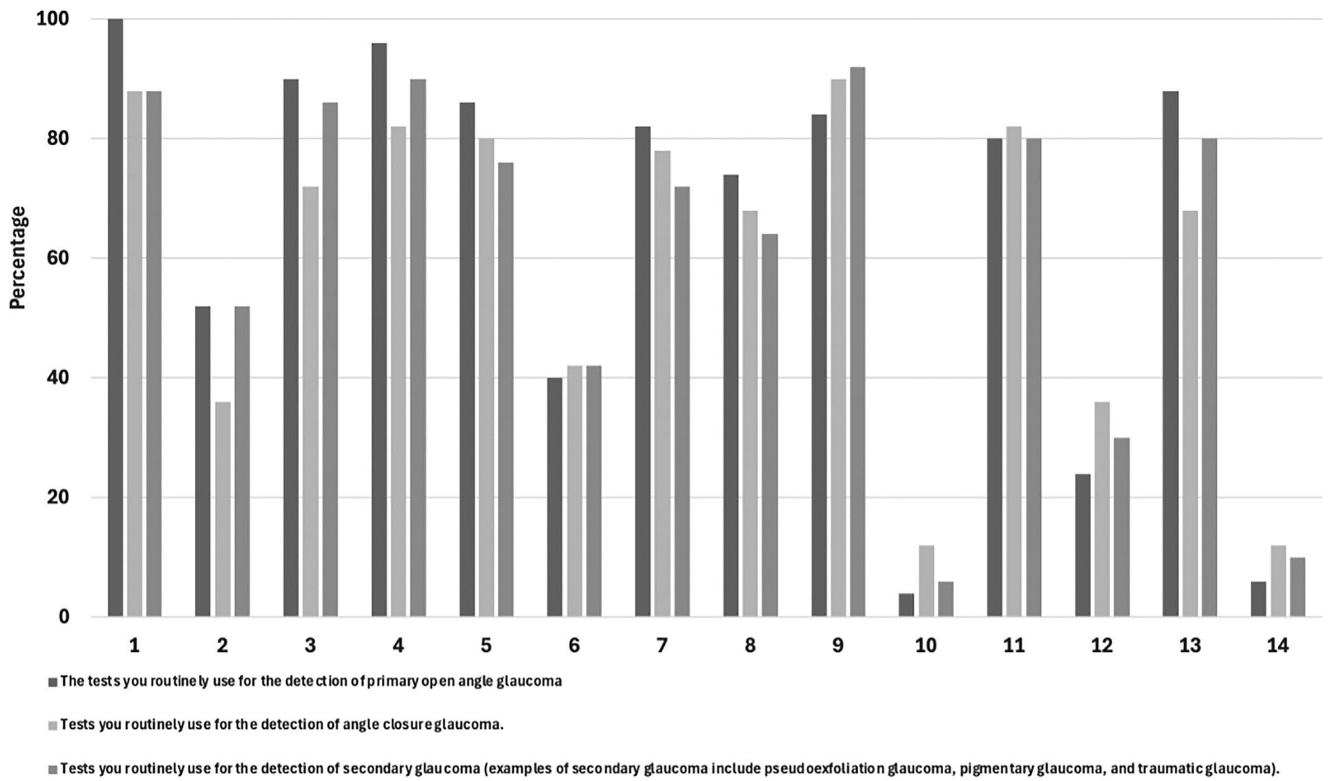

FIGURE 1 Routine tests that optometrists use for the detection of primary open-angle glaucoma, angle-closure glaucoma and secondary glaucoma: (1) optic nerve head evaluation, (2) presence of peripapillary atrophy (PPA) in non-myopic eyes, (3) retinal nerve fibre layer (RNFL) evaluation, (4) family history, (5) medical history, (6) applanation tonometry, (7) non-contact tonometry, (8) central corneal thickness for high intraocular pressure, (9) slit lamp examination of the anterior chamber, (10) shadow test, (11) Van Herick Shaer Schwartz test, (12) gonioscopy, (13) threshold visual field test and (14) other tests.

Glaucoma detection

Figure 1 shows the routine tests used by optometrists for the detection of primary open-angle glaucoma, angle-closure glaucoma and secondary glaucoma, in accordance with the Clinical Practice Guide for the Diagnosis and Management of Open-Angle Glaucoma.[13] Figure 2 shows fundus photograph features that may be used for glaucoma detection. Figure 2 indicates that most optometrists use all key fundus photograph features for glaucoma detection.

Forty-one (82%) of the optometrists surveyed had an optical coherence tomography (OCT) device in their practice. Forty-eight (96%) optometrists had a VF analyser in their practice for the purpose of detecting glaucoma and other causes of vision loss. All (100%) optometrists used a slit lamp and fundus lens (e.g., 90 D) for the detection of GON during the initial comprehensive eye examination. Forty-five (90%) optometrists took fundus photographs during the initial comprehensive eye examination. Thirty-three (66%) optometrists took fundus photographs for every patient. For those who did not take fundus photographs routinely for every patient, the main reasons were difficulty integrating photograph taking into the practice routine (6, 35%), cost of the fundus camera (2, 11%) or cost barrier for the patient (9, 52%). Optometrists took the fundus photographs themselves in 31 (62%) of the practices, while an optical assistant/dispenser took the fundus photograph in 27 (54%) of the practices, with the overlap being where both the optometrist and the optical dispenser took fundus photographs. Sixteen (66%) optometrists charged a fee for fundus photography.

Forty-two (84%) optometrists thought that assistance from artificial intelligence (AI) interrogation of fundus photographs would be helpful for glaucoma detection. Of these 42 optometrists who thought that AI could be helpful, the main reasons were increased accuracy for glaucoma diagnosis (23, 54.8%), improved confidence in glaucoma diagnosis (11, 26.2%), time-saving (5, 11.9%), increased perceived value for patients (1, 2.4%) and other reasons (2, 4.8%) such as increased consistency in assessing all factors and features that could lead to a diagnosis. For the eight optometrists who thought that AI would not be helpful for glaucoma detection from fundus photographs in their practice, the main reasons were lack of confidence in AI (1, 12.5%), lack of understanding about AI (2, 25%), no need for AI (2, 25%) and other reasons (3, 37%), such as concern that AI grading may be affected by other factors such as the quality of the photographs and that a reliance by AI on fundus photographs alone may result in diagnostic error.

Confidence in glaucoma detection

Figure 3 shows the confidence level of optometrists in GON detection. A little over half of the optometrists were confident or very confident in detecting GON and assessing the optic disc and RNFL, while about 30% were somewhat confident or not very confident. Just under half of the optometrists surveyed were confident or very confident at detecting GON by only looking at the fundus photographs, while the minority were somewhat confident or not very confident.

Inter-observer agreement and intra-observer agreement for detecting referable GON using colour fundus photographs

The level of inter-observer agreement (between practitioners) was moderate (kappa = 0.53, 95% CI 0.50–0.54) amongst optometrists. The level of intra-observer agreement (within a practitioner) was substantial (kappa = 0.73, 95% CI 0.70–0.77) for optometrists. The level of inter-observer agreement between the two glaucoma specialists was fair (kappa = 0.39, 95% CI 0.33–0.44) and less than that for optometrists. Perhaps this difference reflects the fact that optometrists are more familiar with decisions made in the primary eye care setting.

Glaucoma management

If the optometrist suspects that a patient has glaucoma, 46 (92%) would routinely refer the patient for specialist assessment and 4 (8%) would feel confident to make the diagnosis themselves and initiate treatment. Regarding their preference for glaucoma management, 7 (14%) chose initiating management of the glaucoma with subsequent referral to an ophthalmologist, 25 (50%) chose initial referral to an ophthalmologist for co-management and 18 (36%) chose referral for comprehensive management by the ophthalmologist with no involvement in further therapeutic management. When encountering a routine patient with suspected primary open angle glaucoma with logMAR 0.00 (6/6) vision, 3 (6%) would recall in 1 month, 10 (20%) in 3 months, 22 (44%) in 6 months, 10 (20%) in 1 year and 5 (10%) at other timings such as between 3 and 6 months.

DISCUSSION

Overview of glaucoma detection and management

This study provides a comprehensive evaluation of glaucoma care practices among Australian optometrists. The findings underline both the strengths and limitations within the current model of glaucoma detection and management in primary eye care settings. Glaucoma remains a pressing public health concern due to its role as the leading cause

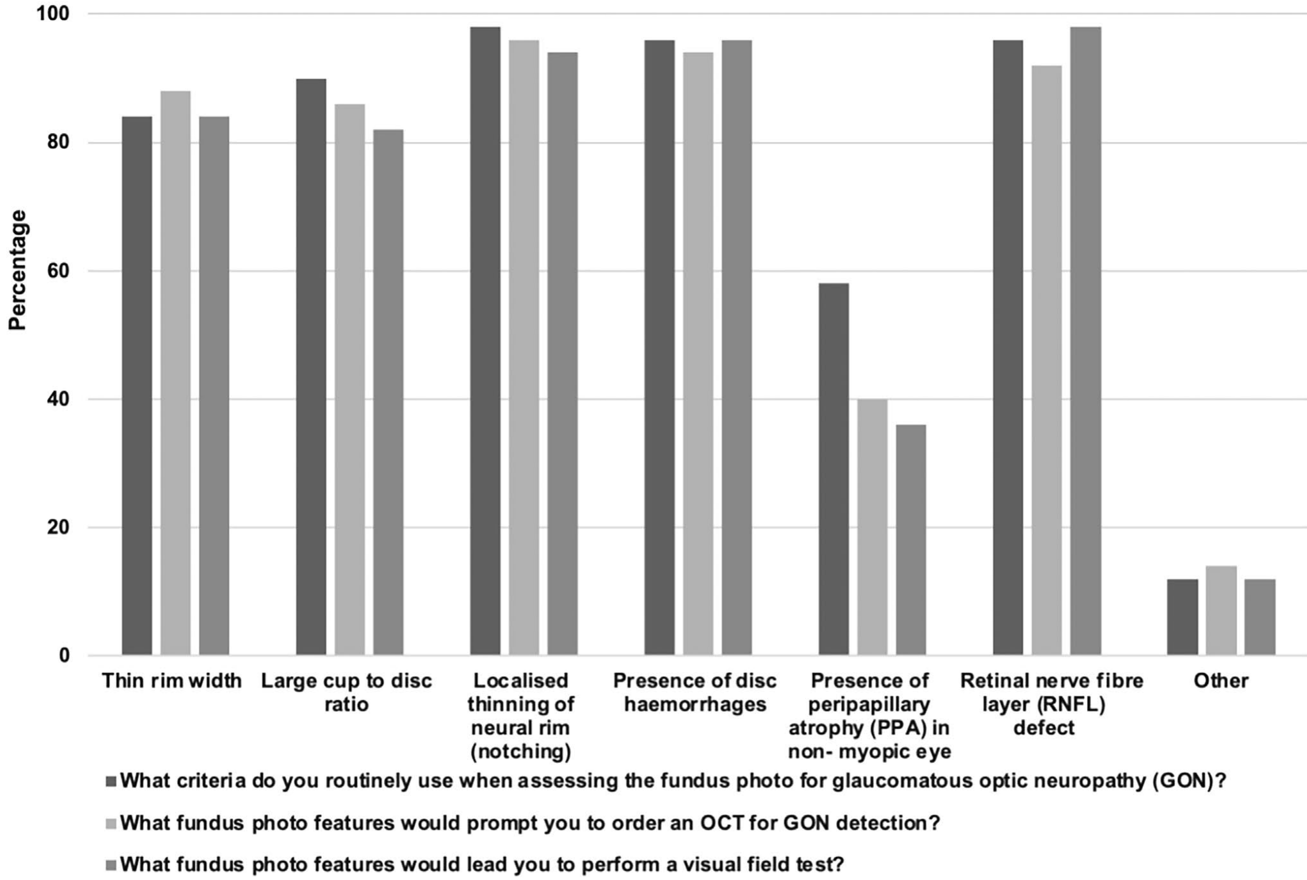

FIGURE 2 Fundus photograph features used for glaucomatous optic neuropathy (GON) detection. OCT, optical coherence tomography.

of irreversible blindness. Given the significant proportion of undiagnosed glaucoma cases, including those who have recently visited an optometrist, there is an evident need to address gaps in glaucoma care practices.

Optometrist practice patterns

The results reveal that while optometrists are pivotal in the early detection and management of glaucoma, there is variability in their practice patterns. A majority of optometrists consider a wide range of fundus photographic features in GON assessment. These features include thin rim width, large CDR, localised thinning of the neural rim or notching, the presence of disc haemorrhages, peripapillary atrophy and RNFL defects. In addition, most optometrists complement the above with clinical procedures including VF testing, tonometry, family history, medical history, slit lamp examination of the anterior segment, central corneal thickness measurement in cases of high intra-ocular pressure and the Van Herick Shaffer Schwartz test. This multifaceted approach underscores the complex nature of the diagnosis of GON. These findings align with previous literature that finds appropriate care is delivered by most optometrists.[7]

Most optometrists utilise a range of diagnostic tests, including OCT and VF analysers, indicating a robust use of available technology. This reflects the consensus view that these tools are important for accurate glaucoma detection.[4,8] However, despite having access to this equipment, not all optometrists routinely perform certain diagnostic tests such as fundus photography and OCT, primarily due to logistical and financial constraints. This inconsistency in the use of diagnostic tests could be driven by business models and might contribute to the high rate of undiagnosed glaucoma in the community.

Interestingly, the study highlights that a significant proportion of optometrists (84%) believe that AI could enhance glaucoma detection. This suggests a forward-looking approach to integrating advanced technologies into clinical practice. The potential of AI to improve diagnostic accuracy and efficiency could address some of the current challenges faced by optometrists. However, scepticism regarding AI—cited by a smaller group of optometrists—may indicate that this group of clinicians is well versed in the task and finds little benefit from AI and suggests a need for further education and validation of AI tools, especially in their clinical application to gain broader acceptance in clinical settings. Given the intra-observer agreement found in this study (0.73), one potential benefit of AI would be to

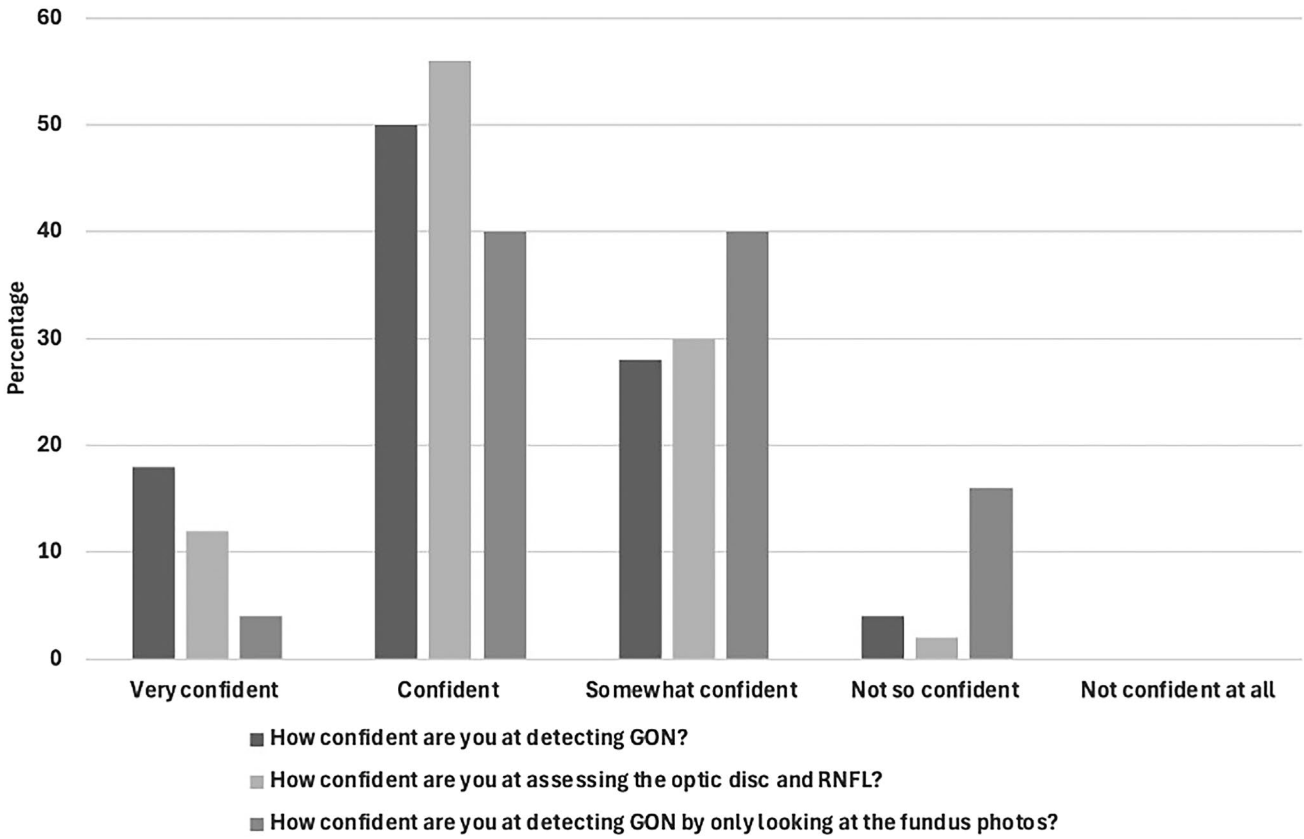

FIGURE 3 Confidence level of optometrists in glaucomatous optic neuropathy (GON) detection. RNFL, retinal nerve fibre layer.

provide more repeatable outcomes, thereby improving this level of agreement.

Confidence in diagnosing glaucoma

Confidence levels among optometrists in detecting glaucoma varied with the level of training in the Australian profession, with a minority (~32%) feeling only 'somewhat confident' or 'not confident' in their ability to diagnose glaucoma accurately. This variability in confidence could impact the reliability of glaucoma diagnoses and highlights the need for enhanced training and ongoing professional development.

Agreement among optometrists

In the present study, the moderate inter-observer agreement (kappa = 0.53 [0.50–0.54]) and substantial intra-observer agreement (kappa = 0.73 [0.70–0.77]) indicate that while there is a reasonable level of consistency among optometrists, there is still room for improvement in achieving uniform diagnostic standards. The inter-observer agreement observed here is similar to expert-level performance by glaucoma specialists (kappa = 0.51) from a European study and superior to non-expert ophthalmologist performance (kappa = 0.20) from the same investigation.[14] More importantly, it was similar to that of UK optometrists (kappa = 0.57) in the Moorfields Optic Disc Assessment Study (MODAS)[15] and better than that of another group of UK optometrists (kappa ranges from 0.31 to 0.39 for various fundus features).[16] The intra-observer agreement is similar to that reported in the MODAS (0.71 [0.59–0.86]) and falls within the ranges found in previous literature (kappa ranges from 0.58 to 0.92 for various fundus features), although instead of using overall glaucoma likelihood as the outcome, these studies considered individual fundus features indicative of glaucoma and thus are not as holistic as the current trial.[16,17]

The fair level of inter-observer agreement between the two glaucoma sub-specialists (kappa = 0.34) suggests that any discrepancy in diagnosis is not limited to primary care clinicians. A previous study based on a sample of 197 ophthalmologists from our institute also found moderate inter-observer agreement on glaucoma likelihood determined from colour fundus photographs: kappa = 0.63 among 37 glaucoma sub-specialists, kappa = 0.51 among 51 general ophthalmologists, kappa = 0.50 among 41 ophthalmology trainees with ≥3-year experience and kappa = 0.48 among 68 ophthalmology trainees with <3-year experience.[18] Overall, the current findings suggest that the level of inter-observer agreement is similar between optometrists and general ophthalmologists or ophthalmology trainees in identifying glaucoma likelihood from monoscopic photographs. This information can help optometrists recognise that they have the skills to identify and manage a condition that causes consternation because the diagnosis is often unclear. These findings also underscore the difficulty of reaching this diagnosis based on optic nerve and RNFL evaluation and the need for other technology (such as AI)[19] and standardised diagnostic protocols to improve consistency in glaucoma detection.

Referral patterns and management approaches

The study also sheds light on referral practices and management strategies. A majority of optometrists (92%) prefer to refer patients to specialists for the management of suspected glaucoma, which aligns with collaborative care models. This was the recommended mode of practice before 2014, and the current findings might reflect this past mode of practice. Alternatively, it might also be influenced by business models that dampen the management of chronic eye care due to limited income from the Medicare Benefits Schedule (MBS, the universal health insurance system for all Australian citizens and eligible residents) for such undertakings by optometrists. Nevertheless, 8% of optometrists are willing to initiate management independently, which in part will be dependent on the patient as much as the practitioner. Given the current MBS schedules, it is likely that undertaking glaucoma management is not financially viable for optometrists, and charges will need to be levied outside the MBS.

Optometrists are restricted in the number of VF tests and review consultations that they can claim through Medicare (Australia's Universal Health Care Insurance System) within a year,[20] which can limit their capacity to manage complex diseases like glaucoma effectively. Similarly, ophthalmologists also face such restrictions, which can also impact the management of chronic conditions such as glaucoma. Optometrists or ophthalmologists who wanted to order beyond the limited number (two to three per year) will need to charge the patient privately. This restriction highlights a significant challenge in glaucoma care, as optometrists must navigate these constraints while providing comprehensive patient management. This directly affects optometrists' ability to manage glaucoma and might contribute to their preference for specialist referral and co-management models. As the number of glaucoma cases increases due to the ageing Australian population, it is likely that Australian optometrists will have to become more actively involved in managing these cases, and the MBS needs to be structured to promote such activity.

Implications for education and training

The observed variability in diagnostic practices and confidence levels of some practitioners underscores the importance of further targeted educational initiatives. Training programmes should focus on standardising diagnostic criteria, enhancing confidence in using diagnostic tools and integrating evidence-based guidelines into practice. Such initiatives could help reduce the prevalence of undiagnosed glaucoma and improve overall patient outcomes. In the long term, the goal would be to yield optimal community eye care and should empower optometrists to manage glaucoma independently. By fostering this capacity, optometrists can contribute to more effective primary glaucoma care, helping alleviate the growing pressure on glaucoma specialists and ensuring that patients receive timely and appropriate treatments in their local district.

Strengths and limitations

We utilised a sample that encompasse optometrists working in a broad spectrum of optometry practices across Australia, with varying years of experience and representation from both rural and urban settings, as well as full-time and part-time practitioners. The age and gender distribution of the sample reflects the national statistics of all optometrists.[6] While the study offers valuable insights, it is important to acknowledge certain limitations. First, the reliance on self-reported data and the use of a single set of fundus images may affect the generalisability of the findings. In particular, those who detect and manage glaucoma regularly are more likely to have responded to the advertisements concerning participation, which could introduce bias. However, measures were taken to ensure the anonymity of the data to encourage honest and accurate responses. Second, glaucoma is a multifactorial disease that requires a complex diagnostic process. While interpreting the optic nerve head and RNFL is important for glaucoma detection, there are other important elements that must be mentioned, such as OCT interpretation, VFs, intra-ocular pressure, family history and other risk factors important for glaucoma assessment. These aspects would make an excellent avenue for future research aimed at assessing the diagnostic accuracy of optometrists in detecting and managing glaucoma.

In conclusion, this study highlights areas for improvement in glaucoma care and funding to support the involvement of Australian optometrists in glaucoma management. By addressing gaps in diagnostic practices, enhancing training and embracing technological advancements, the primary eye care sector can better meet the challenges posed by the increasing numbers of glaucoma cases and improve patient outcomes across the country.

AUTHOR CONTRIBUTIONS

Catherine L. Jan: Conceptualization (lead); data curation (lead); formal analysis (lead); investigation (lead); methodology (lead); project administration (equal); resources (supporting); software (lead); validation (equal); visualization (lead); writing – original draft (lead); writing – review and editing (lead). **Randall S. Stafford:** Supervision (equal); writing – review and editing (supporting). **Xianwen Shang:** Formal analysis (supporting); writing – review and editing (supporting). **Jacqueline Henwood:** Investigation (supporting); project administration (equal); writing – review and editing (supporting). **Christian Davey:** Methodology (supporting); writing – review and editing (supporting). **Jiahao Liu:** Writing – review and editing (supporting). **Peter van Wijngaarden:** Project administration (supporting); writing – review and editing (supporting). **George Y. X. Kong:** Writing – review and editing (supporting). **Jennifer C. Fan Gaskin:** Writing – review and editing (supporting). **Mingguang He:** Conceptualization (supporting); funding acquisition (lead); supervision (equal); writing – review and editing (supporting). **Algis Vingrys:** Conceptualization (supporting); supervision (equal); validation (equal); writing – review and editing (supporting).

ACKNOWLEDGEMENTS

We would like to thank Nicole Tindill and Kiki Elms for their critical assistance in data management; Prof Graham Hepworth for his statistical advice; Meng Wei, Sam Dodgshun and Kemu Qoroya for IT support; Rowan Neilson for legal support and Carly Parfett and Rebecca Singleton for their valuable assistance in ethics application. We are grateful to our clinician participants. Open access publishing facilitated by The University of Melbourne, as part of the Wiley - The University of Melbourne agreement via the Council of Australian University Librarians.

FUNDING INFORMATION

This project received grant funding from the Australian Government: National Critical Research Infrastructure Initiative, Medical Research Future Fund (MRFAI00035) and the NHMRC Investigator Grant (APP1175405). It also received funding from the Global STEM Professorship Scheme (P0046113). The CERA receives Operational Infrastructure Support from the Victorian State Government. Catherine L. Jan is supported by a research training scholarship from the Australian Commonwealth Government. The funding source had no role in the design and conduct of the study; collection, management, analysis and interpretation of the data; preparation, review or approval of the manuscript and decision to submit the manuscript for publication.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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How to cite this article: Jan CL, Stafford RS, Shang X, Henwood J, Davey C, Liu J, et al. Analysing diagnostic practices and referral pathways for glaucoma in Australian primary eye care. *Ophthalmic Physiol Opt*. 2025;45:1211–1220. https://doi.org/10.1111/opo.13491