
Model of interprofessional collaboration in the care of glaucoma patients and glaucoma suspects

Canadian Glaucoma Society Committee on Interprofessional Collaboration in Glaucoma Care

Patients with glaucoma and glaucoma suspects encompass a large group of individuals—up to 5% of the population over the age of 40 years, and an even higher prevalence in older age groups. With aging of the Canadian population, the number of affected individuals with glaucoma or glaucoma suspects is expected to increase dramatically, placing significant stresses on the resources devoted to eye care.

Patients with glaucoma and glaucoma suspects seek eye care from 2 distinct types of trained professionals—ophthalmologists and optometrists. Frequently, the communication between these professionals is less than ideal, potentially leading to duplication of services and tests.

Ophthalmologists are medical doctors (MDs) who, after completing 4 years of medical school obtain further specialized training in eye diseases and eye surgery (ophthalmology residency). This specialized training takes 5 years to complete. Some ophthalmologists, after their residency program, will take a further subspecialty training (fellowship) in glaucoma, which can be a 1- or 2-year program. These ophthalmologists become glaucoma subspecialists. Comprehensive ophthalmologists are, however, fully trained to manage glaucoma both medically and surgically. For this reason, we do not differentiate between comprehensive ophthalmologists and ophthalmologists with glaucoma subspecialty training in this document.

Optometrists take a 4-year program (optometrist school) during which they are trained to carry out routine eye examinations, refractions, and recognition of eye problems, such as glaucoma. Because optometrists are not medical doctors, they are not trained to carry out surgery or any laser procedures. Some optometrists choose to take an additional 6–12 months of training after completing optometry school and, at the end of this additional training, they become “advanced optometrists.”

In some Canadian provinces, optometrists are not permitted to prescribe glaucoma medications and in the provinces where they are permitted to prescribe glaucoma medications, different rules and regulations apply. In this document, we decided not to consider whether optometrists are permitted to prescribe medications, but rather opted to describe a model that would be in the best interest of patients.

Currently there are no national models or recommendations concerning interprofessional collaboration between

ophthalmologists and optometrists as it pertains to glaucoma care. Even though scopes of practice are provincially mandated, the existence of a national, patient-centred set of recommendations can only be beneficial. Recognizing the importance of this issue, the membership of the Canadian Glaucoma Society (CGS) created a committee in 2008 to evaluate the nature of the appropriate collaboration in glaucoma care and to propose a model to be discussed by the bodies governing ophthalmologists and optometrists (for a list of the members in this GGS Committee see Appendix A). After several face-to-face meetings and suggestions from members of the CGS, and further amendments by the Canadian Ophthalmological Society (COS) Board of Directors and Council on Provincial Affairs members, the following document has emerged. It must be noted that it remains a work in progress and further input from interested parties might be solicited. It is our goal that this document will provide the framework for provincial cooperation between optometrists and ophthalmologists in glaucoma care.

SCOPE OF THE DOCUMENT AND DISCLAIMER

This document was developed to better define models of care for patients with glaucoma and glaucoma suspects, with the ultimate goal of increasing accessibility and improving quality of care provided to these patients.

There is great variability in the severity and presentation of patients with glaucoma. It is difficult to generalize models of care applicable to all possible clinical presentations. Nevertheless, it is important to categorize patients with glaucoma. Models of interprofessional collaboration are necessarily, but not exclusively, linked to disease severity and type of glaucoma.

This model was developed considering the best available evidence and is not meant or intended to restrict innovation. Adherence to this model will not produce successful outcomes in every case. This model is not intended to restrict scopes of practice or serve as a standard of medical care. Standards of medical care are specific to all the facts or circumstances in an individualized case, and can be subject to change as scientific knowledge and technology advance and as practice patterns evolve.

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Accepted June 15, 2011 Available online November 2, 2011

Can J Ophthalmol 2011;46:S1–S10

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doi:10.1016/j.jco.2011.09.001

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It should be recognized that in a model of interprofessional care, every member of the team is accountable for the care he or she provides and may also be held accountable for his or her role in the outcomes. (Readers are directed to the CMPA article entitled “The New Reality: Expanding Scopes of Practice” originally published March 2006/Revised August 2008, March 2009 [IS0661-E].) It is beyond the scope of this document to discuss medico-legal implications of collaboration between health care professionals in the management of glaucoma. Consultations should take place with the appropriate medico-legal insurance providers to determine these implications of cooperative care for each professional group involved.

PRINCIPLES OF INTERPROFESSIONAL COLLABORATION

In the discussions leading to the development of this document, several key principles of interprofessional collaboration in glaucoma care were identified. This document was developed with these principles in mind.

The key principles of interprofessional collaboration in glaucoma care are:

- Patient-centred approach;
- Timely access to appropriate eye care professional;
- Ongoing commitment to high-quality standards of care;
- Evidence-based approach to care;
- Collegial relationships;
- Effective, clear, and timely communication;
- Optimal use of professional competencies and finite resources; and
- Duplication of tests and services kept to a minimum.

PREREQUISITES FOR MANAGING GLAUCOMA SUSPECTS AND GLAUCOMA PATIENTS

Professionals involved in the management of patients with glaucoma and glaucoma suspects must have appropriate knowledge of the disease, clinical skills, access to specialized tests, and the ability to meaningfully interpret test results. It is beyond the scope of this document to determine methods for assessment of competency of all professionals managing patients with glaucoma. It is also beyond the scope of this document to identify methods of teaching new skills to professionals who are currently not proficient. A change in the current model of delivery of care to glaucoma patients will need to be combined with teaching, acquisition, and maintenance of the appropriate skills.

Any professional managing these patients should take an appropriate ocular, medical, and family history, with particular emphasis on identifying possible risk factors for glaucoma (see Appendix B).

It is expected that these professionals be proficient in the following skills. It should be noted that the recommended tests and procedures are related to the best evidence cur-

rently available and may change in the future as evidence-based practice evolves.

- (1) Applanation tonometry with regularly calibrated tonometers. The gold standard is the Goldmann-type Applanation Tonometer (GAT), but other tonometers might be used in special circumstances in which GAT is not technically possible, such as patients with cornea irregularities. Air-puff tonometry and Tono-Pen are not considered reliable enough to follow patients with glaucoma.
- (2) Gonioscopy to detect angle abnormalities, such as risks for angle closure or secondary glaucoma, repeated whenever clinically necessary. For example, gonioscopy should be repeated if there is a significant increase in intraocular pressure (IOP) or in the presence of other evidence suggesting a change in angle configuration (such as a change in the anterior chamber depth or presence of iris neovascularization).
- (3) Stereo slit-lamp biomicroscopy, either with contact or noncontact lenses, with attention to specific findings such as optic disc hemorrhages, focal disc changes, etc. A reproducible method of documenting the optic nerve status is required to determine changes over time. Baseline and sequential optic disc status documentation should be carried out with optic disc photography and/or with optic nerve head and retinal nerve fibre layer (RNFL) analyzers. Fundus photography or imaging alone should not replace visual inspection of the optic nerve and RNFL. If automated imaging tests are available, appropriate interpretation of test results is essential, with particular emphasis to imaging quality and clinical integration of the findings (both for diagnosis and progression).
- (4) Visual field evaluation, with standard automated perimetry and threshold-testing instruments (the Humphrey Visual Field Analyzer or the Octopus Perimeter are examples of preferred instruments). Careful evaluation of the visual field and its progression is critical. Assessment of reliability and integration of relevant findings are of equal importance for perimetry as for optic disc examination.
- (5) In-depth knowledge of the effectiveness, side effect profile, and contraindications of all medications used in the treatment of glaucoma, as well the indications and possible complications of incisional and laser surgeries for glaucoma.

A prerequisite for cost-effective interprofessional collaboration between optometrists and ophthalmologists in the management of glaucoma patients and glaucoma suspects is effective, clear, and timely communication. This includes sharing results of pertinent findings and testing (such as IOP measurements, medications used, optic disc photos or other imaging, and visual field tests), to allow for proper assessment and continuity of care, without unne-

essary test duplication. The use of similar diagnostic testing equipment in each office involved will facilitate meaningful sharing of results, particularly for visual field assessment. An example of an appropriate referral letter for glaucoma patients is presented in Appendix C.

Because glaucoma is a chronic disease, continuity of clinical care is of paramount importance. It should be clearly evident to the patient which eye care professional is responsible for his/her care at every stage of disease management. Excellent communication between the eye care professionals will also guarantee that transfer of care is clearly understood.

DEFINITION OF PATIENT GROUPS

To better categorize patients based on clinical presentation, disease severity, and need for ocular hypotensive treatment, certain groups of patients were identified. This grouping of patients is not meant to be a comprehensive classification of glaucoma, but rather an attempt to provide an adequate framework to develop appropriate management recommendations.

Glaucoma suspect with low/moderate risk

This group will involve one of the following clinical scenarios:

- (1) Presence of elevated applanation IOP not >27 mm Hg, with normal visual fields (normal glaucoma hemifield test or equivalent tests) and normal optic discs;
- (2) Positive family history of glaucoma with normal visual fields and optic discs;
- (3) Suspicious optic disc(s) in patients with normal IOP (<22 mm Hg) and normal visual fields;
- (4) Suspicious visual field tests not yet confirmed on a second test; or
- (5) Presence of other conditions commonly associated with glaucoma but without elevated IOP (such as pigment dispersion, pseudoexfoliation).

Glaucoma suspect with high risk (or already on topical treatment)

This group will involve one of the following clinical scenarios:

- (1) Presence of elevated IOP >27 mm Hg (or >24 mm Hg associated with relatively thin central corneal thickness <550 μm);
- (2) Presence of very suspicious optic disc findings, such as rim notches, disc hemorrhages, localized RNFL defects, but with normal visual fields;
- (3) Elevated IOP associated with other causes of secondary glaucoma such as pseudoexfoliation, pigment dispersion, uveitis, iris or angle neovascularization, but without clear signs of optic disc damage or visual field loss;

- (4) Glaucoma suspect patients who are already being treated with IOP-lowering therapy; or
- (5) Patient with an angle deemed at high risk for closure (typically 180° or more of iridotrabecular contact).

Early glaucoma patient—stable

Early glaucoma is defined according to criteria outlined in the Canadian Ophthalmological Society glaucoma clinical practice guidelines (see Appendix D). Stability is defined as IOP within target pressure range and no visual field or optic disc deterioration in the last 3 years. Note that any patient with glaucoma identified recently would be considered unstable until stability is proven over long-term follow-up.

Moderate/advanced glaucoma patient—stable

Moderate and advanced glaucoma are defined according to criteria outlined in the COS glaucoma guidelines (see Appendix D). Stability is defined as above.

Unstable glaucoma patient

Unstable patients are those with IOP above target or with proven optic disc or visual field deterioration in the recent past.

Acute glaucoma (or patients with any chronic form of glaucoma presenting with a very high IOP)

This group includes patients presenting with very high IOP (usually >40 mm Hg), being either of acute onset (usually characterized by symptoms such as nausea, pain, reduced visual acuity, halos) or a more chronic presentation.

RECOMMENDATIONS

Recommendations are presented related to the groups defined previously. These are recommendations only and need to be adapted to the individual circumstances of the clinical presentation, availability of eye care professionals and resources (see Appendix E for summary of the recommendations). A general principle inherent in this model is that the ophthalmologist most likely to be involved in the future care of a given patient should be able to evaluate the patient early in the course of the disease.

Glaucoma suspect with low/moderate risk

Glaucoma suspects initially assessed by the attending optometrist and judged to be of low to moderate risk do not require a referral to an ophthalmologist. If, however, the patient has a combination of more than one of the clinical scenarios described above (for example, elevated IOP and suspicious optic disc), then the patient should be considered a high-risk suspect (see above).

After completion of the initial assessment, the frequency of follow-up examinations will be left to the discretion of the attending eye care professional. The recommended intervals are provided in Appendix F. At each follow-up visit,

stability of the disease should be assessed (i.e., are the IOP, optic disc, and visual field stable?). In cases where a change in optic disc or visual field from the initial evaluation is suspected, a second confirmatory exam should be carried out within 4-6 months (second visual field test or another IOP measurement, for instance). If change is confirmed, then the patient should be managed as a glaucoma suspect with high risk or as a patient with early glaucoma, depending on the clinical scenario, and the recommendations for the appropriate category should be followed.

Glaucoma suspect—high risk

A high-risk glaucoma suspect might already be on IOP-lowering therapy. On therapy or not, they require more frequent evaluations and/or testing. Patients in this group will need good baseline tests, preferably at least baseline images of the optic disc and 2 visual fields within the first 6 months. In addition, these patients will require periodic visual field and imaging evaluations to ensure stability of the clinical picture. The suggested frequency of tests is presented in Appendix F. Patients should be made aware of their risk factors for developing glaucoma and the decision to initiate or augment ocular hypotensive therapy must be discussed with the patient.

In general, high-risk glaucoma suspects can be followed and monitored by the optometrist with periodic consultation to the ophthalmologist. The interval for these periodic consultations will depend on the clinical scenario, but consultations shall be undertaken early after the initial assessment by the optometrist and thereafter at least every 3–4 years, or if any of the following situations listed below occur. If the decision to start ocular hypotensive therapy is contemplated, the patient shall first be referred to an ophthalmologist for an evaluation. A clearly outlined treatment plan and IOP targets must be communicated back to the optometrist.

Clinical situations requiring further referral to the ophthalmologist include:

- (1) If initiation or augmentation of ocular hypotensive therapy is contemplated;
- (2) If progression is suspected in disc and/or visual field; and
- (3) If there is uncertainty in the clinical findings.

Stable early glaucoma patient

When the optometrist detects early glaucoma, the patient shall be referred to an ophthalmologist in a timely fashion. All recently diagnosed patients are deemed to be potentially unstable until stability is demonstrated during the course of follow-up. Decisions regarding treatment, appropriate target IOP and frequency of testing must be clearly communicated by the ophthalmologist back to the optometrist. (For recommended target IOPs, please see Appendix G) Once stable, the patient can be returned to the optometrist for monitoring and management as needed. These patients shall be reassessed by an ophthalmologist at regular intervals, at least every 2-3 years. The

ophthalmologist thus continues to have clinical contact with the patient, which can be particularly valuable if the patient requires more aggressive laser surgery or incisional surgery in the future. As glaucoma is a lifelong and potentially blinding disorder, it is essential that optometrists and ophthalmologists communicate all pertinent clinical information and test results in a timely and efficient manner. This will prevent duplication, thereby controlling cost and inconvenience both to the patient and the medical system.

Stability of the disease shall be confirmed through periodic examinations (see Appendix F), ensuring that IOP is within the previously determined IOP target range and that visual fields/optic discs do not show signs of deterioration. Visual field deterioration should be analyzed with appropriate software, such as the Guided Progression Analysis (GPA) of the Humphrey Field Analyzer, PROGRESSOR, PeriData, or other similarly validated strategies. Optic disc deterioration shall be determined by careful examination of optic disc photographs and/or by appropriate interpretation of the progression software available with the current imaging (optic disc and/or RNFL) automated devices.

Stable moderate/advanced patient

Moderate and advanced disease stages are determined according to criteria outlined in Appendix D. Patients with more severe disease are at high risk of visual disability and blindness and should generally be treated more aggressively and followed at more frequent intervals than those with earlier disease (see Appendix F).

Patients with stable moderate or advanced disease should primarily be managed by an ophthalmologist, unless transportation barriers or nonavailability of an ophthalmologist are significant issues. These patients are at considerable risk for progression even with stable IOP. Particular attention should be placed on monitoring the status of the visual field and optic disc. Recommended follow-up intervals for testing are presented in Appendix E.

The clinical management of these patients should focus on ensuring stability of the IOP, visual field and optic nerve, adherence to treatment, and tolerance to medications.

Unstable glaucoma patient

Patients should be considered unstable if they have shown signs of progressive glaucomatous damage, or if they are not meeting the previously specified target IOP. Additionally, as mentioned previously, recently diagnosed patients are considered unstable until stability is proven during follow-up. Progression in glaucoma is difficult to define and varies depending on the stage of the disease and the methodology used to monitor the optic discs and visual fields. The COS glaucoma guidelines define “progression” as follows: “A patient’s glaucoma is deemed to have progressed if structural and (or) functional changes, associated with the disease, are verifiably detected on clinical examination and (or) testing.”

Instability of the disease can be manifested as uncontrolled IOP, progression of the visual field and/or progression of the optic disc. The following are clinical scenarios of unstable glaucoma patients:

- (1) **IOP instability:** If a patient on glaucoma treatment is being managed by an optometrist and the IOP is greater than the established target IOP, the optometrist should refer the patient back to an ophthalmologist. The optometrist shall communicate the medications used and the resulting IOP, as well as sending all pertinent ancillary tests.
- (2) **Visual field criterion:** If a patient being managed by an optometrist and there is repeatable, clinically significant change in the visual field, the patient must be referred back to an ophthalmologist. The optometrist shall communicate all pertinent clinical findings and send all available visual field tests and optic disc imaging (printouts or in an electronic format).
- (3) **Optic nerve criterion:** If a patient being managed by an optometrist and there is a repeatable, clinically significant change in the appearance of the RNFL or the optic nerve, the optometrist must refer the patient back to an ophthalmologist. If imaging technology is being used, the change should be demonstrated as being repeatable. The optometrist shall communicate the imaging results to the attending ophthalmologist, preferably by transmitting a good copy (colour photographs or image testing) or an electronic format of the all tests, as well as all available visual field tests to the ophthalmologist.

The COS glaucoma guidelines recommend that a correlation between structural and functional changes be sought in suspected progression, even though it is more common for a change to be detected with one or the other independently. At all times, the variability of test results, both for structural and functional assessments should be kept in mind, along with the existence of both false positive and false negative results.

Once the ophthalmologist assesses the patient and makes the appropriate management changes, he or she should monitor the patient for a period of time to ensure stability of the disease. If stability is achieved, the patient (particularly those with early disease) can be referred back to the optometrist for further follow-up. However, patients with moderate or severe disease should be maintained under the care of the ophthalmologist. It is important for the ophthalmologist to clearly communicate to the optometrist treatment changes and therapeutic goals to be achieved.

Acute glaucoma (or patients with chronic glaucoma presenting with extremely elevated IOP)

Acute glaucoma is used in this document as a term (not a diagnosis) that describes the onset and symptomatology of many glaucoma types or even glaucoma suspects. These include acute angle closure events (primary or secondary

angle closure) as well as sudden IOP elevations due to pigment dispersion syndrome, pseudoexfoliation syndrome, postoperative syndromes, acute iritis, hyphema, ocular trauma, and others.

The symptoms are mainly, but not exclusively, caused by extreme elevation of IOP. They include the acute onset of blurred vision with or without haloes/rainbows around lights, dull aching pain often centred around the affected eye, nausea, and even vomiting. Patients might lack any symptoms if the extreme elevated IOP was not of acute onset, but more chronic in nature.

When presented with such a patient, immediate lowering of IOP remains the priority. Equally important is the need to identify the primary cause of the elevated IOP. To accomplish this, a full history and complete examination of both the affected and the unaffected eyes are required.

Assessment of the patient demands full knowledge of all possible causes of extreme IOP elevation, and the attending health care professional should not automatically assume that it is caused by primary angle closure glaucoma. A good gonioscopic examination of the affected and the contralateral eye is usually mandatory to arrive at the proper diagnosis in these patients.

In the event of acute glaucoma seen initially by an optometrist, referral to an ophthalmologist is to be arranged immediately. Patients with acute glaucoma can present a significant challenge and delayed treatment can result in irreversible visual loss. Topical treatment can be initiated while transfer of the patient to the ophthalmologist is arranged. Oral and intravenous glaucoma therapy must be prescribed only by an ophthalmologist as these medications carry significant systemic risk that must be managed by a medical doctor. Resolution of the acute IOP elevation often involves the use of laser or incisional surgical interventions.

When immediate transfer of the patient is not possible for a variety of circumstances, treatment may be conducted by the optometrist after contacting an ophthalmologist. The patient should be observed for reduction of IOP, alleviation of symptoms and occurrence of adverse events related to the treatment as well as the disease. If oral or intravenous medications are required, a medical practitioner should be involved to administer these medications and monitor potential side effects. Constant dialogue with the ophthalmologist is essential to allow for modifications of treatment according to the evolving clinical scenario and transfer of care to the ophthalmologist should be arranged at the next available opportunity.

Some of the more common causes of acute glaucoma are outlined below. This list is not exhaustive, but it illustrates the large number of possibilities that are encompassed by “acute glaucoma” (raised IOP, sometimes associated with other symptoms) outside of the more common primary angle closure glaucoma:

- (1) **Primary angle closure:** This classic situation can often be identified by history and physical findings.

As mentioned, the fellow eye may reveal the native state for the patient before the acute event. Pupil block is the usual mechanism and so the attack must be broken first, followed by an iridotomy. Providing the angle is found to open post iridotomy, the chance of recurrence of acute attacks is relatively small. However, as chronic or recurrent glaucoma can develop in these patients, they should be continuously monitored.

- (2) **Pigment dispersion and pseudoexfoliation syndromes:** Both of these conditions can show wide swings in IOP and can present with very elevated IOP associated with acute symptoms. Particularly in pigment dispersion, significant IOP rises can occur following activities such as sports.
- (3) **Iritis:** Acute IOP elevation in this case may be associated with an open or closed angle. Closure may be by direct angle closure (peripheral anterior synechiae) or pupil block (posterior synechiae) or, more commonly, an open angle is found in which debris or trabeculitis are responsible for the IOP elevation. Treatment with steroids and ocular hypotensive therapy are almost always recommended. Pilocarpine and other miotics should be avoided in this condition. Awareness of the differential diagnosis for hypertensive iritis is imperative, because other agents may be integral in the treatment, such as antivirals in herpetic keratouveitis. In some circumstances, steroids are not recommended, such as in Fuch heterochromic iridocyclitis. When optometrists with prescribing privileges initiate treatment for iritis, they must routinely check the patient's IOP during the treatment phase, as steroid-induced elevation of IOP is relatively common in these patients.
- (4) **Neovascular glaucoma:** These patients can present with severe and relatively acute IOP elevation. This condition is typically secondary to ischemic retinal conditions, most commonly diabetic retinopathy, central retinal vein occlusion, or carotid occlusive disease. Treatment of the underlying retinal condition and ocular hypotensive therapy are recommended. Pilocarpine should be avoided in this condition.

CONCLUSIONS

Care of the glaucoma suspect and glaucoma patient can be shared between ophthalmologists and optometrists. A patient-centred strategy, with particular attention to the patient's needs, coupled with frequent and clear communication will result in optimum outcomes for patients. Optometrists, who are the most frequent

entry point for eye care in Canada, are well positioned to identify glaucoma suspects and glaucoma patients. They can safely and effectively provide care for the less advanced forms of glaucoma, respecting the recommendations contained in this document. Ophthalmologists must be entrusted to manage advanced or unstable cases as befits their extra training and experience.

A patient-centred model of care should take into account both the complementary and contrasting differences in expertise that exist between eye care professionals, the accessibility of patients to these professionals and the unique and idiosyncratic nature of glaucoma.

The goal of the proposed model of interprofessional collaboration in glaucoma care is to maximize the accessibility, quality and safety of care for the patient in our health care environment, providing them with world-class glaucoma care. At the same time, the recommendations in this document are meant to minimize duplication of efforts and to use the available resources appropriately, with a view of achieving a cost-effective model of care for these patients.

Disclosure: The authors have no proprietary or commercial interest in any materials discussed in this article.

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APPENDIX A: MEMBERS OF THE CANADIAN GLAUCOMA SOCIETY COMMITTEE ON INTERPROFESSIONAL COLLABORATION IN GLAUCOMA CARE

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APPENDIX B: RISK FACTORS FOR PRESENCE OF OPEN ANGLE GLAUCOMA AND CONVERSION FROM OCULAR HYPERTENSION TO GLAUCOMA (TABLES 1 AND 2)

Table 1—Risk factors and signs for presence of open-angle glaucoma with level 1 evidence
<p>Ocular risk factors and signs</p> <ul style="list-style-type: none"> ■ IOP <ul style="list-style-type: none"> – Elevated baseline IOP ■ Optic disc <ul style="list-style-type: none"> – Deviation from the ISNT rule (inferior ≥ superior ≥ nasal ≥ temporal) – Increased optic disc diameter – Parapapillary atrophy – Disc hemorrhage ■ Pseudoexfoliation ■ Thinner CCT ■ Pigment dispersion ■ Myopia ■ Decreased ocular perfusion pressure <p>Nonocular risk factors</p> <ul style="list-style-type: none"> ■ Increasing age ■ African ancestry ■ Hispanic ancestry ■ Family history ■ Genetics <ul style="list-style-type: none"> – Myocillin – Optineurin – Apolipoprotein ■ Migraine ■ Corticosteroids
<p>Note: CCT, central corneal thickness; IOP, intraocular pressure; PSD, pattern standard deviation. Source: Canadian Ophthalmological Society evidence-based clinical practice guidelines for the management of glaucoma in the adult eye. <i>Can J Ophthalmol.</i> 2009;44(Suppl 1):S1–S54.</p>

Table 2—Risk factors and signs for conversion of ocular hypertension to glaucoma with level 1 evidence
<p>Ocular risk factors and signs</p> <ul style="list-style-type: none"> ■ IOP <ul style="list-style-type: none"> – Higher baseline IOP ■ Optic disc <ul style="list-style-type: none"> – Large cup-to-disc ratio – Disc hemorrhage ■ Thinner CCT ■ Myopia ■ Increased PSD <p>Nonocular risk factors</p> <ul style="list-style-type: none"> ■ Increasing age ■ African descent ■ Family history
<p>Note: CCT, central corneal thickness; IOP, intraocular pressure; PSD, pattern standard deviation. Source: Adapted from the Canadian Ophthalmological Society evidence-based clinical practice guidelines for the management of glaucoma in the adult eye. <i>Can J Ophthalmol.</i> 2009;44(Suppl 1):S1–S54.</p>

APPENDIX C: EXAMPLE OF REFERRAL LETTER FOR GLAUCOMA PATIENTS

Date: mm ____/dd ____/yyyy _____

Please see _____ (DOB mm ____/dd____/yyyy____)

For the following reason: _____

Glaucoma originally diagnosed: mm ____/yyyy _____

Maximum untreated IOP (*if known*): OD __ OS __

Current glaucoma medical therapy:	
Eye	Medication (name and frequency)
<input type="checkbox"/> OD <input type="checkbox"/> OS	
<input type="checkbox"/> OD <input type="checkbox"/> OS	
<input type="checkbox"/> OD <input type="checkbox"/> OS	

Previous glaucoma medical therapy used and response:	
Previous Medication	Response (including side effects/allergy)

Previous glaucoma interventions and response (laser or surgery):		
Type	Eye	Date
	<input type="checkbox"/> OD <input type="checkbox"/> OS	
	<input type="checkbox"/> OD <input type="checkbox"/> OS	

Other ocular procedures:		
Type	Eye	Date
	<input type="checkbox"/> OD <input type="checkbox"/> OS	
	<input type="checkbox"/> OD <input type="checkbox"/> OS	

Enclosed are copies of:

θ Recent visual field (*in cases of documented progression please include several reliable VFs*).

θ Disc photos and imaging (*if possible include colour printout*).

Source: Adapted from the Canadian Ophthalmological Society evidence-based clinical practice guidelines for the management of glaucoma in the adult eye. *Can J Ophthalmol.* 2009;44(Suppl 1):S1–S54.

APPENDIX D: STAGING OF THE GLAUCOMA SUSPECT AND PATIENTS WITH GLAUCOMA

Suspect	1 or 2 of the following: <ul style="list-style-type: none"> ● IOP >21 mm Hg ● suspicious disc or cup to disc (C/D) asymmetry of >0.2 ● suspicious 24-2 (or similar) VF defect
Early	Early glaucomatous disc features (e.g., C/D* <0.65) and/or mild VF defect not within 10° of fixation (e.g., MD >−6 dB on HVF 24-2)
Moderate	Moderate glaucomatous disc features (e.g., vertical C/D* 0.7–0.85) and/or moderate visual field defect not within 10° of fixation (e.g., MD from −6 to −12 dB on HVF 24-2)
Advanced	Advanced glaucomatous disc features (e.g., C/D* >0.9) and/or VF defect within 10° of fixation† (e.g., MD worse than −12 dB on HVF 24-2)

Note: HVF, Humphrey Visual Field Analyzer; MD, mean deviation.
 Source: Adapted from the Canadian Ophthalmological Society evidence-based clinical practice guidelines for the management of glaucoma in the adult eye. Can J Ophthalmol. 2009;44(Suppl 1):S1–S54.
 *Refers to vertical C/D ratio in an average size nerve. If the nerve is small, then a smaller C/D ratio may still be significant; conversely, a large nerve may have a large vertical C/D ratio and still be within normal limits.
 †Also consider baseline 10-2 visual field (or similar).

APPENDIX E: SUMMARY OF RECOMMENDATIONS FOR THE IDENTIFIED GROUPS OF PATIENTS

Group of patients	Description	Recommendations
Glaucoma suspect—low/moderate risk	Ocular hypertension (IOP <27 mm Hg) Positive family history of glaucoma Suspicious optic disc(s) First suspicious visual field defect Presence of conditions such as pseudoexfoliation, pigment dispersion	Managed primarily by the optometrists, or ophthalmologists (based on availability) If patient has several risk factors or change occurred, please follow recommendations for high-risk suspect and early glaucoma, respectively
Glaucoma suspect—high risk	Ocular hypertension (IOP >27 mm Hg) Very suspicious optic disc(s) (notching, optic disc hemorrhages) Elevated IOP caused by secondary causes (pseudoexfoliation, pigment dispersion, uveitis, iris or angle neovascularization) Glaucoma suspects on treatment High risk for angle closure	Shall be initially sent to ophthalmologist; then when agreed on by both parties, may be monitored by optometrist, with periodic consultation by ophthalmologist (at least every 3–4 years) Patient shall be referred to ophthalmologist before initiating IOP-lowering therapy or if progression is suspected
Stable early glaucoma patients	Early glaucoma recently diagnosed Stable disease (IOP within target, no visual field or disc progression in the last 3 years)	Initial referral to ophthalmologist is required—initiation of therapy and goals recommended by the ophthalmologist Once stable, many patients can be managed by optometrist with periodic consultation by ophthalmologist (at least every 2 years)
Stable moderate/advanced patients	Moderate or advanced patients known to be stable for the last 3 years	Managed primarily by ophthalmologists, unless transportation barriers or nonavailability of an ophthalmologist are significant issues
Any unstable glaucoma	Patient not achieving target IOP Evidence of visual field or optic disc deterioration in the recent past	Shall be referred to and managed by ophthalmologist If stability is achieved, can be referred back to the optometrist for further follow-up; however, patients with moderate or severe disease should be maintained under the care of the ophthalmologist
Acute glaucoma symptomatic or very high IOP	Primary acute glaucoma Other causes of very high IOP such as pigmentary, pseudoexfoliation, uveitic, or neovascular glaucoma	Acute treatment can be started by optometrist after phone consultation with the ophthalmologist, but immediate contact and transfer to ophthalmologist shall be arranged

APPENDIX F: CLINICAL ASSESSMENT INTERVALS* FOR GLAUCOMA SUSPECTS AND GLAUCOMA PATIENTS

Glaucoma suspect	1–2 years
Early glaucoma	At least every 12 months
Moderate glaucoma	At least every 6 months
Advanced glaucoma†	At least every 4 months

*More frequent evaluations may be necessary.
 Source: Adapted from the Canadian Ophthalmological Society evidence-based clinical practice guidelines for the management of glaucoma in the adult eye. Can J Ophthalmol. 2009;44(Suppl 1):S1–S54.
 †It may be necessary to see patients with advanced glaucoma very frequently (weeks or days) if their IOP is poorly controlled, progression appears rapid or fixation is threatened.

APPENDIX G: TARGET INTRAOCULAR PRESSURES

Suggested upper limit of initial target IOP for each eye

Stage	Suggested upper limit of target IOP (modify based on longevity, QOL, and risk factors for progression)	Evidence
Suspect in whom a clinical decision is made to treat	24 mm Hg with at least 20% reduction from baseline	OHTS ¹ EGPS ²
Early	20 mm Hg with at least 25% reduction from baseline	EMGTS ³ CIGTS ⁴
Moderate	17 mm Hg with at least 30% reduction from baseline	CNTGS ⁵ AGIS ⁶
Advanced	14 mm Hg with at least 30% reduction from baseline	AGIS ⁶ Odberg ⁷

Note: CIGTS, Collaborative Initial Glaucoma Treatment Study; CNTGS, Collaborative Normal-Tension Glaucoma Study; EGPS, European Glaucoma Prevention Study; IOP, intraocular pressure; OHTS, Ocular Hypertension Treatment Study; QOL, quality of life.
 Target IOP may need to be adjusted during the course of follow-up. Extremes of CCT may be helpful in the setting of target IOP. For example, if the cornea is very thin, this may encourage a more aggressive approach with more frequent follow-up. Similarly, a thick CCT would imply overestimation of the IOP.⁸
 Source: Adapted from Damji et al.⁹ and the Canadian Ophthalmological Society evidence-based clinical practice guidelines for the management of glaucoma in the adult eye. Can J Ophthalmol. 2009;44(Suppl 1):S1–S54.