



GLAUCOMA SUMMARY BENCHMARKS FOR PREFERRED PRACTICE PATTERN® GUIDELINES

Introduction

These are summary benchmarks for the Academy's Preferred Practice Pattern® (PPP) guidelines. The Preferred Practice Pattern series of guidelines has been written on the basis of three principles.

- Each Preferred Practice Pattern should be clinically relevant and specific enough to provide useful information to practitioners.
- Each recommendation that is made should be given an explicit rating that shows its importance to the care process.
- Each recommendation should also be given an explicit rating that shows the strength of evidence that supports the recommendation and reflects the best evidence available.

Preferred Practice Patterns provide guidance for the pattern of practice, not for the care of a particular individual. While they should generally meet the needs of most patients, they cannot possibly best meet the needs of all patients. Adherence to these Preferred Practice Patterns will not ensure a successful outcome in every situation. These practice patterns should not be deemed inclusive of all proper methods of care or exclusive of other methods of care reasonably directed at obtaining the best results. It may be necessary to approach different patients' needs in different ways. The physician must make the ultimate judgment about the propriety of the care of a particular patient in light of all of the circumstances presented by that patient. The American Academy of Ophthalmology is available to assist members in resolving ethical dilemmas that arise in the course of ophthalmic practice.

The Preferred Practice Pattern® guidelines are not medical standards to be adhered to in all individual situations. The Academy specifically disclaims any and all liability for injury or other damages of any kind, from negligence or otherwise, for any and all claims that may arise out of the use of any recommendations or other information contained herein.

For each major disease condition, recommendations for the process of care, including the history, physical exam and ancillary tests, are summarized, along with major recommendations for the care management, follow-up, and education of the patient. For each PPP, a detailed literature search of PubMed and the

Cochrane Library for articles in the English language is conducted. The results are reviewed by an expert panel and used to prepare the recommendations, which are then given a rating that shows the strength of evidence when sufficient evidence exists.

To rate individual studies, a scale based on the Scottish Intercollegiate Guideline Network (SIGN) is used. The definitions and levels of evidence to rate individual studies are as follows:

- I++: High-quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias
- I+: Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
- I-: Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
- II++: High-quality systematic reviews of case-control or cohort studies; high-quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
- II+: Well-conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
- II-: Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
- III: Nonanalytic studies (e.g., case reports, case series)

Recommendations for care are formed based on the body of the evidence. The body of evidence quality ratings are defined by Grading of Recommendations Assessment, Development and Evaluation (GRADE) as follows:

- Good quality (GQ): Further research is very unlikely to change our confidence in the estimate of effect
- Moderate quality (MQ): Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate
- Insufficient quality (IQ): Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate; any estimate of effect is very uncertain



GLAUCOMA SUMMARY BENCHMARKS FOR PREFERRED PRACTICE PATTERN® GUIDELINES

Introduction *(continued)*

Key recommendations for care are defined by GRADE as follows:

- Strong recommendation (SR): Used when the desirable effects of an intervention clearly outweigh the undesirable effects or clearly do not
- Discretionary recommendation (DR): Used when the trade-offs are less certain—either because of low-quality evidence or because evidence suggests that desirable and undesirable effects are closely balanced

In PPPs prior to 2011, the panel rated recommendations according to its importance to the care process. This “importance to the care process” rating represents care that the panel thought would improve the quality of the patient’s care in a meaningful way. The ratings of importance are divided into three levels.

- Level A, defined as most important
- Level B, defined as moderately important
- Level C, defined as relevant but not critical

The panel also rated each recommendation on the strength of evidence in the available literature to support the recommendation made. The “ratings of strength of evidence” also are divided into three levels.

- Level I includes evidence obtained from at least one properly conducted, well-designed randomized controlled trial. It could include meta-analyses of randomized controlled trials.
- Level II includes evidence obtained from the following:
 - Well-designed controlled trials without randomization
 - Well-designed cohort or case-control analytic studies, preferably from more than one center
 - Multiple-time series with or without the intervention
- Level III includes evidence obtained from one of the following:
 - Descriptive studies
 - Case reports
 - Reports of expert committees/organizations (e.g., PPP panel consensus with external peer review)

This former approach, however, will eventually be phased out as the AAO adopted the SIGN and GRADE rating and grading systems.

The PPPs are intended to serve as guides in patient care, with greatest emphasis on technical aspects. In applying this knowledge, it is essential to recognize that true medical excellence is achieved only when skills are applied in a such a manner that the patients’ needs are the foremost consideration. The AAO is available to assist members in resolving ethical dilemmas that arise in the course of practice. (AAO Code of Ethics)

Primary Open-Angle Glaucoma (Initial Evaluation)

Initial Exam History (Key elements)

- Ocular history
- Race/ethnicity
- Family history
- Systemic history
- Review of pertinent records
- Current medications
- Ocular surgery

Initial Physical Exam (Key elements)

- Visual acuity measurement
- Pupil examination
- Slit-lamp biomicroscopy of anterior segment
- Measurement of IOP
- Central corneal thickness
- Gonioscopy
- Evaluation of optic nerve head and retinal nerve fiber layer using magnified stereoscopic visualization with slit-lamp biomicroscope and through a dilated pupil (*I+, MQ, SR*)
- Examination of optic nerve head appearance by color stereophotography or computer-based image analysis should be serially documented (*I+, MQ, SR*)
- Evaluation of the fundus (through a dilated pupil whenever feasible)
- Visual field evaluation, preferably by automated static threshold perimetry
- Evaluation of the optic disc
- Thinning of the inferior and/or superior neuroretinal rim

Management Plan for Patients in Whom Therapy is Indicated

- Set an initial target pressure of at least 25% lower than pretreatment IOP. Choosing a lower target IOP can be justified if there is more severe optic nerve damage.
- Target pressure is an estimate and must be individualized and/or adjusted during the course of the disease (*III, IQ, DR*)
- The goal of treatment is to maintain the IOP in a range at which visual field loss is unlikely to significantly reduce a patient's health-related quality of life over his/her lifetime (*II+, MQ, DR*)
- Medical therapy is presently the most common initial intervention to lower IOP; consider balance between side effects and effectiveness in choosing a regimen of maximal effectiveness and tolerance to achieve the desired IOP reduction for each patient
- If progression occurs at the target pressure, undetected IOP fluctuations and adherence to therapy should be re-evaluated before adjusting target IOP downward
- Assess the patient who is being treated with glaucoma medication for local ocular and systemic side effects and toxicity

- Laser trabeculoplasty can be considered as initial therapy in selected patients or an alternative for patients at high risk for nonadherence to medical therapy who cannot or will not use medications reliably due to cost, memory problems, difficulty with instillation, or intolerance to medication (*I+, GQ, DR*)
- Trabeculectomy is effective in lowering IOP; it is generally indicated when medications and appropriate laser therapy are insufficient to control disease and can be considered in selected cases as initial therapy (*I+, GQ, SR*)

Surgery and Postoperative Care for Laser Trabeculoplasty Patients

- The ophthalmologist who performs surgery has the following responsibilities:
 - Obtain informed consent
 - Ensure that the preoperative evaluation confirms the need for surgery
 - At least one IOP check within 30 minutes to 2 hours of surgery
 - Follow-up examination within 6 weeks of surgery or sooner if concern about IOP-related optic nerve damage

Surgery and Postoperative Care for Incisional Glaucoma Surgery Patients

- The ophthalmologist who performs surgery has the following responsibilities:
 - Obtain informed consent
 - Ensure that the preoperative evaluation accurately documents findings and indications for surgery
 - Prescribe topical corticosteroids in the postoperative period
 - Follow-up evaluation on the first postoperative day (12 to 36 hours after surgery) and at least once during the first 1 to 2 weeks
 - In the absence of complications, perform additional postoperative visits during a 6-week period
 - Schedule more frequent visits, as necessary, for patients with postoperative complications
 - Additional treatments as necessary to maximize the chances for a successful long-term result

Patient Education for Patients with Medical Therapy

- Discuss diagnosis, severity of the disease, prognosis and management plan, and likelihood of lifelong therapy
- Educate about eyelid closure or nasolacrimal occlusion when applying topical medications to reduce systemic absorption
- Encourage patients to alert their ophthalmologist to physical or emotional changes that occur when taking glaucoma medications

Primary Open-Angle Glaucoma (Follow-up Evaluation)

Exam History

- Interval ocular history
- Interval systemic medical history
- Side effects of ocular medications
- Frequency and time of last IOP-lowering medications, and review of medication use

Physical Exam

- Visual acuity measurement
- Slit-lamp biomicroscopy
- Measurement of IOP
- Evaluation of optic nerve head and visual fields (see table below)
- Measurement of central corneal thickness should be repeated after any event that may alter it (e.g., refractive surgery)

Management Plan For Patients On Medical Therapy

- At each exam, record dosage and frequency of use, discuss adherence to the therapeutic regimen and patient's response to recommendations for therapeutic alternatives or diagnostic procedures
- Perform gonioscopy if there is a suspicion of angle closure, anterior-chamber shallowing or anterior-chamber angle abnormalities or if there is an unexplained change in IOP. Perform gonioscopy periodically.

- Reassess treatment regimen if target IOP is not achieved and benefits of a change in therapy outweigh the risk
- Adjust target pressure downward if optic disc, retinal nerve fiber layer, or visual field change is progressive
- Within each of the recommended intervals, factors that determine frequency of evaluation include the severity of damage, the rate of progression, the extent to which the IOP exceeds the target pressure and the number and significance of other risk factors for damage to the optic nerve

Patient Education

- Educate about the disease process, rationale and goals of intervention, status of their condition, and relative benefits and risks of alternative interventions so that patients can participate meaningfully in developing an appropriate plan of action
- Refer for or encourage patients with significant visual impairment or blindness to use appropriate vision rehabilitation and social services
- Patients considering keratorefractive surgery should be informed about the possible impact laser vision correction has on reducing contrast sensitivity and decreasing the accuracy of IOP measurements

Follow-Up:

Consensus-based Guidelines for Follow-up Glaucoma Status Evaluations with Optic Nerve and Visual Field Assessment*

Target IOP Achieved	Progression of Damage	Duration of Control (months)	Approximate Follow-up Interval (months)**
Yes	No	≤6	6
Yes	No	>6	12
Yes	Yes	NA	1-2
No	Yes	NA	1-2
No	No	NA	3-6

IOP = intraocular pressure; NA = not applicable

*Evaluations consist of clinical examination of the patient, including optic nerve head assessment (with periodic color stereophotography or computerized imaging of the optic nerve and retinal nerve fiber layer structure) and visual field assessment.

**Patients with more advanced damage or greater lifetime risk from POAG may require more frequent evaluations. These intervals are the maximum recommended time between evaluations.

Primary Open-Angle Glaucoma Suspect (Initial and Follow-up Evaluation)

Initial Exam History (Key elements)

- Ocular history
- Family history
- Systemic history
- Review of pertinent records
- Current medications
- Ocular surgery

Initial Physical Exam (Key elements)

- Visual acuity measurement
- Pupil examination
- Slit-lamp biomicroscopy of anterior segment
- Measurement of IOP
- Central corneal thickness
- Gonioscopy
- Evaluation of optic nerve head and retinal nerve fiber layer using magnified stereoscopic visualization with slit-lamp biomicroscope and through a dilated pupil
- Appearance of the optic nerve head and, if possible, the RNFL should be documented (*II++*, *GQ*, *SR*)
- Evaluation of the fundus (through a dilated pupil whenever feasible)
- Visual field evaluation, preferably by automated static threshold perimetry
- Excavation of the optic cup
- Thinning of the inferior and/or superior neuroretinal rim

Management Plan for Patients in Whom Therapy is Indicated

- A reasonable initial goal is to set a target pressure 20% less than mean of several baseline IOP measurements based on criteria from the Ocular Hypertension Study (*I+*, *MQ*, *DR*)
- The goal of treatment is to maintain the IOP in a range at which visual field loss is unlikely to significantly affect a patient's health related quality of life over his/her lifetime (*II+*, *MQ*, *DR*)
- If visual field glaucomatous damage is newly detected in a glaucoma suspect patient, it is best to repeat testing (*II++*, *GQ*, *SR*)
- Clinicians should include all perimetric and other structural information in addition to digital imaging technology when formulating patient management decisions (*III*, *IQ*, *SR*)

Follow-up Exam History

- Interval ocular history
- Interval systemic medical history and any change of systemic medications
- Side effects of ocular medications if patient is being treated
- Frequency and time of last glaucoma medications, and review of use, if patient is being treated

Follow-up Physical Exam

- Visual acuity
- Slit-lamp biomicroscopy
- Measurement of IOP
- Gonioscopy is indicated when there is a suspicion of an angle-closure component, anterior chamber shallowing or unexplained change in IOP

Follow-up Intervals

- Visit intervals depend on the interaction between patient and disease, which is unique for every patient
- Frequency of periodic optic nerve head and visual field evaluation is based on risk assessment. Patients with thinner corneas, higher IOPs, disc hemorrhage, larger cup-to-disc, larger mean pattern standard deviation, or family history of glaucoma may warrant closer follow-up.

Patient Education for Patients with Medical Therapy

- Discuss diagnosis, number and severity of risk factors, prognosis, management plan and likelihood that therapy, once started, will be long term
- Educate about disease process, rationale and goals of intervention, status of their condition, and relative benefits and risks of alternative interventions
- Educate about eyelid closure and nasolacrimal occlusion when applying topical medications to reduce systemic absorption
- Encourage patients to alert their ophthalmologist to physical or emotional changes that occur when taking glaucoma medications

Primary Angle Closure (Initial Evaluation and Therapy)

Initial Exam History (Key elements)

- Ocular history (symptoms suggestive of intermittent angle-closure attacks)
- Family history of acute angle-closure glaucoma
- Systemic history (e.g., use of topical or systemic medications)

Initial Physical Exam (Key elements)

- Refractive status
- Pupil
- Slit-lamp biomicroscopy
 - Conjunctival hyperemia (in acute cases)
 - Central and peripheral anterior chamber depth narrowing
 - Anterior chamber inflammation suggestive of a recent or current attack
 - Corneal swelling. (Microcystic edema and stromal edema are common in acute cases.)
 - Iris abnormalities, including diffuse or focal atrophy, posterior synechiae, abnormal pupillary function, irregular pupil shape, and a mid-dilated pupil (suggestive of a recent or current attack)
 - Lens changes, including cataract and glaukomflecken
 - Corneal endothelial cell loss
- Measurement of IOP
- Gonioscopy and/or anterior segment imaging of both eyes
- Evaluation of fundus and optic nerve head using direct ophthalmoscope or slit-lamp biomicroscope with an indirect lens

Management Plan for Patients in Whom Iridotomy is Indicated

- Iridotomy is indicated for eyes with PAC or primary angle-closure glaucoma (*I++*, *GQ*, *SR*)
- Laser iridotomy is the preferred surgical treatment for acute angle-closure crisis (AACC) because it has a favorable risk-benefit ratio (*II+*, *MQ*, *SR*)
- In AACC, use medical therapy first to lower the IOP to reduce pain and clear corneal edema. Iridotomy should then be performed as soon as possible. (*III*, *GQ*, *SR*)
- Perform prophylactic iridotomy in fellow eye if chamber angle is anatomically narrow, as nearly half of fellow eyes can develop AACC within 5 years (*II++*, *GQ*, *SR*)

Surgery and Postoperative Care for Iridotomy Patients

- The ophthalmologist who performs surgery has the following responsibilities:
 - Obtain informed consent
 - Ensure that preoperative evaluation confirms the need for surgery
 - Perform at least one IOP check immediately prior to surgery and within 30 minutes to 2 hours following surgery
 - Prescribe topical corticosteroids in the postoperative period
 - Ensure that the patient receives adequate postoperative care
- Follow-up evaluations include:
 - Evaluation of patency of iridotomy by visualizing the anterior lens capsule
 - Measurement of IOP
 - Gonioscopy with compression/indentation, if not performed immediately after iridotomy
 - Pupil dilation to reduce risk of posterior synechiae formation
 - Fundus examination as clinically indicated
- Prescribe medications perioperatively to avert sudden IOP elevation, particularly in patients with severe disease

Follow-up of Patients with Iridotomy

- After iridotomy, follow patients with glaucomatous optic neuropathy as specified in the Primary Open-Angle Glaucoma PPP
- After iridotomy, patients with a residual open angle or a combination of open angle and some PAS with or without glaucomatous optic neuropathy should be followed at least annually, with special attention to repeat gonioscopy

Education For Patients if Iridotomy is Not Performed

- Patients with primary angle-closure suspect who have not had an iridotomy should be warned that they are at risk for AACC and that certain medications cause pupil dilation and include AACC (*III*, *MQ*, *DR*)
- Patients should be informed about the symptoms of AACC and instructed to notify their ophthalmologist immediately if symptoms occur (*III*, *MQ*, *SR*)