



Complete Summary

GUIDELINE TITLE

Glaucoma.

BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Glaucoma. Singapore: Singapore Ministry of Health; 2005 Oct. 43 p. [108 references]

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
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BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
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SCOPE

DISEASE/CONDITION(S)

Glaucoma

GUIDELINE CATEGORY

Diagnosis
Evaluation
Treatment

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Ophthalmology

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

To provide enough evidence-based information to guide the physician or ophthalmologist in:

- Diagnosing the various forms of the disease, with the main focus on primary glaucomas
- Ordering the appropriate investigations
- Instituting safe, evidence-based treatment where possible
- Educating and counselling the patient on the nature of the disease and the risks and benefits of treatment

TARGET POPULATION

Patients with glaucoma

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnosis/Evaluation

1. Assessment of signs and symptoms
2. Intraocular pressure (IOP) measurement by Goldmann Applanation Tonometry
3. Disc documentation, preferably by photography
4. Perimetry
5. Ancillary tests
6. Follow-up testing
7. Case detection programmes, in specific populations

Note: Routine population screening was considered, but not recommended.

Treatment

1. Pharmacologic treatment to reduce IOP
 - Beta-blockers
 - Prostaglandins and prostamides
 - Adrenergic agonists
 - Carbonic anhydrase
 - Parasympathetic (cholinergic) agonists
2. Laser iridotomy for primary angle closure glaucoma
3. Additional systematic drugs (osmotic diuretics, oral/parenteral carbonic anhydrase inhibitors) in emergency setting of acute angle closure glaucoma
4. Laser trabeculoplasty as adjunct to medical therapy in open angle glaucoma
5. Surgery, including trabeculectomy

MAJOR OUTCOMES CONSIDERED

- Sensitivity and specificity of diagnostic tests
- Intraocular pressure (IOP)

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level Ia: Evidence obtained from meta-analysis of randomised controlled trials

Level Ib: Evidence obtained from at least one randomised controlled trial

Level IIa: Evidence obtained from at least one well-designed controlled study without randomisation

Level IIb: Evidence obtained from at least one other type of well-designed quasi-experimental study

Level III: Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies, and case studies

Level IV: Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The guidelines were developed by an expert workgroup nominated by the National Committee on Ophthalmology. The workgroup, comprising ophthalmologists from both the public and private sectors, as well as a general practitioner, conducted a systematic review of the current medical literature and, taking into account our local context, have summarized their findings.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Grades of Recommendation

Grade A (evidence levels Ia, Ib): Requires at least one randomized controlled trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation.

Grade B (evidence levels IIa, IIb, III): Requires availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation.

Grade C (evidence level IV): Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.

Good Practice Points: Recommended best practice based on the clinical experience of the guideline development group.

COST ANALYSIS

Acute primary angle closure glaucoma produces a substantial financial burden on both the society and individuals. It was reported that each annual cohort of acute primary angle closure glaucoma in Singapore would need to pay about US\$261,700 (S\$444,900) for treatment over 5 years. The costs for treating chronic open and closed angle glaucoma, the most prevalent forms of glaucoma in Singapore, are likely to be far higher.

Total disease costs, including treatment costs, has been shown to rise with disease progression in glaucoma. In addition, non-compliance with a prescribed drug regimen not only decreases the efficacy of the therapy, but also increases treatment costs. Evidence suggests that early identification of appropriate therapeutic options can have beneficial effects on expenditures, and high frequency of treatment changes is associated with higher costs.

There is currently no evidence for population screening for glaucoma. Screening in high-risk patients would yield more favourable cost-effective ratios. For instance, it was reported that the cost-effectiveness ratio of screening patients aged 65 to 79 every 3 years ranged from Can\$36,000 to Can\$42,000 (S\$52,600 to

S\$61,300) per year of blindness avoided. In contrast, a similar screening programme which includes screening of patients as young as 40 years would cost Can\$74,000 to Can\$100,000 (S\$108,000 to S\$146,000) per year of blindness avoided.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Each recommendation is rated based on the level of the evidence and the grades of recommendation. Definitions of the level of evidence (**Ia-IV**) and the grades of recommendations (**A, B, C, and GPP**) are defined at the end of the Major Recommendations field.

Introduction

C - Steroid eye drops are a frequently unrecognised cause of glaucoma. They should only be used as short-term therapy and intraocular pressure (IOP) monitoring is vital in such patients. (**Grade C, Level IV**)

This is especially so in those who have been applying them for more than 1 week, and includes steroid eye drops produced in combination with an antibiotic. Doctors must also ascertain that the patient has not already received similar therapy recently, before initiating a course of steroid eye drops. (Kersey & Broadway, 2005; Palmberg et al., 1975; Ng et al., 2000; Baratz & Hattenhauer, 1999)

Diagnosis of Glaucoma

The clinical features of the primary glaucomas are summarised in the table below. Please note that this list of signs and symptoms highlights key features and is not exhaustive. Please also refer to the photographs displayed in the original guideline document.

Table. Clinical Features of the Primary Glaucomas

	Acute Angle Closure Glaucoma	Primary Open Angle Glaucoma (POAG) & Chronic Angle Closure Glaucoma (CACG)
SYMPTOMS		
	<ul style="list-style-type: none"> • Painful red eye • Blurring of vision, haloes • Severe headache, nausea, and 	<ul style="list-style-type: none"> • Usually asymptomatic until advanced stages of

	Acute Angle Closure Glaucoma	Primary Open Angle Glaucoma (POAG) & Chronic Angle Closure Glaucoma (CACG)
	vomiting <ul style="list-style-type: none"> History of similar episodes in the past, which were aborted spontaneously with sleep The patient is frequently an elderly Chinese lady. 	the diseases
SIGNS		
Visual Acuity	Decreased	Normal / decreased in advanced stages
Conjunctiva	Injected	Normal
Cornea	Hazy in symptomatic eye	Clear
Anterior Chamber	Shallow in both eyes Positive "eclipse sign" (nasal iris not illuminated by light shone from the temporal side, see Figure 1 on page 12 in the original guideline document)	Deep in both eyes
Gonioscopy	Closed angles	POAG - open angles CACG - closed angles
IOP	Much higher than 21 mmHg and the eye may feel harder than fellow eye on digital palpation	Usually higher than 21 mmHg
Pupil	Mid-dilated in symptomatic eye	Relative Afferent Pupillary Defect (RAPD) if asymmetrical involvement
Optic disc	<ul style="list-style-type: none"> May be difficult to examine due to hazy cornea Can be normal, hyperemic or cupped if there have been previous neglected attacks 	<ul style="list-style-type: none"> Vertical cup disc ratio ≥ 0.7 in a normal-sized disc Increase in cup disc ratio over time Asymmetry in cup disc ratio ≥ 0.2 between the 2 eyes Flame-shaped haemorrhages that extend across the disc margin (splinter haemorrhages) Focal loss of neuroretinal rim (notching)
Visual Field	If glaucomatous nerve damage has been sustained, perimetry shows defects that are consistent with nerve fibre layer loss and these include: <ul style="list-style-type: none"> Temporal island Central island in advanced glaucoma Nasal step 	

	Acute Angle Closure Glaucoma	Primary Open Angle Glaucoma (POAG) & Chronic Angle Closure Glaucoma (CACG)
	<ul style="list-style-type: none"> • Paracentral or arcuate scotomas 	

Diagnostic Evaluation and Monitoring of Glaucoma

Baseline Tests

C - Patients suspected of having glaucoma should undergo the following three baseline tests (South-East Asian Glaucoma Interest Group [SEAGIG], 2004):

- IOP measurement by Goldmann Applanation Tonometry
- Disc documentation, preferably by photography
- Perimetry

(Grade C, Level IV)

B - The visual acuity and IOP are neither specific nor sensitive enough in themselves to be effective diagnostic or screening tools (Tielsch et al., 1991; Sommer et al., 1991). **(Grade B, Level IIa)**

GPP - IOP measurements should be combined with disc and visual field examination for greater sensitivity and specificity. **(GPP)**

Follow-Up

C - IOP measurement, disc appearance, and perimetry should be monitored during follow-up (SEAGIG, 2004). **(Grade C, Level IV)**

Treatment of Glaucoma

Goals of Therapy

A - IOP lowering is the only clinically effective approach in the management of glaucoma ("Comparison of glaucomatous progression," 1998; AGIS, 2000; Lichter et al., 2001; Heijl et al., 2002; Kass et al., 2002). **(Grade A, Level Ia)**

C - The target IOP is an estimate of the mean IOP achieved with treatment that is expected to prevent further optic nerve damage. An individualised target IOP range should be set for every glaucoma patient (SEAGIG, 2004). **(Grade C, Level IV)**

Pharmacological Treatment of Glaucoma

C - The first line of treatment in primary open angle glaucoma (POAG) is medical therapy and the choice of the drug depends on the target IOP, the safety profile of the drug, patient acceptance, and cost. **(Grade C, Level IV)**

A - The first line of treatment in primary angle closure glaucoma (PACG) is a laser iridotomy. A laser iridotomy is also required for the fellow eye. Supplemental medical therapy may also be required (Fleck, Wright, & Fairley, 1997; Lam et al., 2002). **(Grade A, Level Ib)**

C - In the emergency setting of **acute angle closure glaucoma**, additional systemic drugs like osmotic diuretics and oral/parenteral carbonic anhydrase inhibitors may be employed to rapidly reduce the IOP to avoid permanent, devastating nerve damage (SEAGIG, 2004). **(Grade C, Level IV)**

Laser Therapy for Glaucoma

A - In open angle glaucoma, laser trabeculoplasty may be used as an adjunct to medical therapy (The Advanced Glaucoma Intervention Study [AGIS], 1998; The Glaucoma Laser Trial [GLT], 1990). **(Grade A, Level Ia)**

Surgery for Glaucoma

C - Surgery is indicated in patients who fail or are unable to comply with medical therapy and may be combined with cataract removal for enhanced visual rehabilitation (SEAGIG, 2004). **(Grade C, Level IV)**

C - Trabeculectomy is the primary surgery of choice in medically uncontrolled glaucoma (Wilson, 1977; Watson & Barnett, 1975; Sherwood et al., 1993). **(Grade C, Level IV)**

GPP - Patients who have undergone glaucoma surgery should be advised that there is a lifelong need to be aware of symptoms of infection, which include blurring of vision, pain, redness, discharge, and swelling. **(GPP)**

Screening for Glaucoma

B - Routine population screening for glaucoma is **not** recommended at this stage. However, high-risk individuals such as first degree relatives of a glaucoma patient, age >65 years and elderly Chinese females (who are at risk of angle closure glaucoma) may be considered as target populations for case detection programmes (Tielsch et al., 1994; Rosenthal & Perkins, 1985; Foster, 2002; The U.S. Preventive Services Task Force [USPSTF] Recommendations for Glaucoma Screening, 2005). **(Grade B, Level IIa, IIb)**

Definitions:

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GPP (good practice points): Recommended best practice based on the clinical experience of the guideline development group.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for most recommendations (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Accurate diagnosis and appropriate treatment of glaucoma in order to maintain useful visual function and the quality of life

POTENTIAL HARMS

Beta-blockers

Timolol and Timolol Suspension

- Irritation/stinging on instillation, pain, allergic reaction, decreased vision, corneal surface problems. May aggravate existing lung problems such as asthma and emphysema. Heart problems include lowered blood pressure, and heart failure may be worsened. Fatigue, giddiness, depression, impotence, insomnia, and hair loss.

Levobunolol

- Similar to timolol. May additionally cause inflammation of the eyes, transient decreased vision.

Betaxolol and Betaxolol Suspension

- May be safer for patients with asthma and emphysema compared to timolol. Other side effects are similar to timolol.

Adrenergic Agonists

Adrenaline

- Redness, eyelid inflammation, itching, and pigment deposits in the conjunctiva frequent. May increase failure rate of filtration surgery. May cause tachycardia, nervousness, headache, pupillary dilation and can exacerbate angina.

Dipivefrine

- Reduced incidence of side effects compared to adrenaline.

Apraclonidine

- May cause redness, irritation/stinging, allergic reaction, pupil enlargement. Long-term use occasionally associated with loss of effectiveness.

Brimonidine

- Irritation, stinging, redness. Generally avoided in patients using some antidepressants, and in patients with increased blood pressure associated with severe circulatory disease.

Parasympathetic Agonists

Pilocarpine & Pilocarpine gel

- Eye or brow ache common when first applying eyedrops; improves with time. Blurred vision, dim vision, small pupil. Induced near-sightedness may occur in younger patients.

Carbonic Anhydrase Inhibitors

Acetazolamide

- Tingling sensation in fingers and toes. May have increased frequency of passing urine, kidney stones, and electrolyte abnormalities. Abdominal upset, metallic taste with carbonated drinks, depression, fatigue, weight loss and impotence have been reported. Rarely, aplastic anaemia and severe allergic reactions occur.

Dorzolamide & Brinzolamide

- Occasional stinging, allergic reaction, itch, bitter taste.

Prostaglandin Analogues

Latanoprost, Travoprost, & Bimatoprost

- Local stinging, irritation, allergic reaction, and conjunctival hyperemia. may cause brownish colouration of the iris. May stimulate abnormal eyelash growth. Anecdotal reports of macular edema and re-activation of herpes simplex virus (HSV) keratitis.

Hyperosmotic Agents

Mannitol & Glycerol

- Nausea, vomiting, increased blood glucose levels in diabetics. Dehydration, headache, disorientation. Care in elderly patients with kidney disease, heart disease, or diabetes. Acute retention of urine may occur.

Trabeculectomy

- Trabeculectomy does not always succeed and even if it does in the short term, it may still fail over time.
- Augmentation with anti-metabolites is associated with a slightly higher risk of complications such as hypotony and infection.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These guidelines are not intended to serve as a standard of medical care. Standards of medical care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge advances and patterns of care evolve.

- The contents of this publication are guidelines to clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care. Each physician is ultimately responsible for the management of his/her unique patient in the light of the clinical data presented by the patient and the diagnostic and treatment options available.
- Evidence-based clinical practice guidelines are only as current as the evidence that supports them. Users must keep in mind that new evidence could supersede recommendations in these guidelines.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Clinical Quality Indicators

The following parameters may be used in clinical quality monitoring in the management of patients with glaucoma:

- Documentation of the optic nerve appearance, visual field, and intraocular pressure (IOP) in diagnosing glaucoma
- Documentation of target intraocular pressure range
- Reduction in intraocular pressure to the individualised target level range with treatment of glaucoma
- Achieving and maintaining visual field stability during the course of treatment and monitoring

IMPLEMENTATION TOOLS

Audit Criteria/Indicators
 Personal Digital Assistant (PDA) Downloads
 Staff Training/Competency Material

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
 Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Glaucoma. Singapore: Singapore Ministry of Health; 2005 Oct. 43 p. [108 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2005 Oct

GUIDELINE DEVELOPER(S)

Singapore Ministry of Health - National Government Agency [Non-U.S.]

SOURCE(S) OF FUNDING

Singapore Ministry of Health

GUIDELINE COMMITTEE

Workgroup on Glaucoma

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the [Singapore Ministry of Health Web site](#).

Print copies: Available from the Singapore Ministry of Health, College of Medicine Building, Mezzanine Floor 16 College Rd, Singapore 169854.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Audit criteria and a continuing medical education (CME) self assessment are available in the [original guideline document](#).
- The full text guideline and summary card are available for PDA download in ISilo and MSReader formats from the [Singapore Ministry of Health Web site](#).

PATIENT RESOURCES

None available

NGC STATUS

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