

Glaucoma: diagnosis and management

Clinical guideline

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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

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This guideline is the basis of QS7.

Introduction

Chronic open angle glaucoma (COAG) is a common and potentially blinding condition. It is usually asymptomatic until advanced and many people will be unaware there is a problem with their eyes until severe visual damage has occurred. Ocular hypertension (OHT) is a major risk factor for developing COAG, although COAG can occur with or without raised eye pressure.

Approximately 10% of UK blindness registrations are attributed to glaucoma. Around 2% of people older than 40 years have COAG, rising to almost 10% in people older than 75 years in white Europeans. The prevalence may be higher in people of black African or black Caribbean descent or who have a family history of glaucoma. With changes in population demographics the number of individuals affected is expected to rise. Based on these estimates 480,000 people are currently affected by COAG in England. There are over a million glaucoma-related outpatient visits in the hospital eye service annually.

Once diagnosed, people with COAG need lifelong monitoring so that any progression of visual damage can be detected. Once lost, sight cannot be restored, and controlling the condition, together with prevention, or at least minimisation of ongoing damage, is crucial to maintaining a sighted lifetime.

Because uncertainty and variation exist in clinical practice this guideline seeks to give clear recommendations on testing for and diagnosing COAG and OHT, and on effective monitoring and treatment to prevent these conditions progressing. By implementing this guideline more people will be prevented from going blind.

The guideline will assume that prescribers will use a drug's summary of product characteristics to inform their decisions for individual patients.

Person-centred care

This guideline offers best practice advice on the diagnosis and management of COAG and OHT.

Treatment and care should take into account people's needs and preferences. People with OHT or COAG should have the opportunity to make informed decisions about their care and treatment, in partnership with their healthcare professionals. If people do not have the capacity to make decisions, healthcare professionals should follow the [Department of Health's advice on consent](#) and the [code of practice that accompanies the Mental Capacity Act](#). In Wales, healthcare professionals should follow [advice on consent from the Welsh Government](#).

Good communication between healthcare professionals and people is essential. It should be supported by evidence-based written information tailored to the person's needs. Treatment and care, and the information people are given about it, should be culturally appropriate. It should also be accessible to people with additional needs such as physical, sensory or learning disabilities, and to people who do not speak or read English.

If the person agrees, families and carers should have the opportunity to be involved in decisions about treatment and care.

Families and carers should also be given the information and support they need.

Terms used in this guideline

Acceptable IOP Intraocular pressure (IOP) at or below the target level considered by the healthcare professional treating the person to be sufficiently low to minimise or arrest disease progression. See 'Target IOP'.

Adherence The extent to which the person's behaviour matches the prescriber's recommendations. Adherence emphasises the need for agreement and that the person is free to decide whether or not to adhere to the doctor's recommendation.

Blindness 1. Inability to see. 2. Absence or loss of sight severe enough for someone to be unable to perform any work for which eyesight is essential.

Conversion Worsening of suspected COAG or OHT with the development of visual field loss in keeping with optic nerve head appearance. To make this judgement the healthcare professional must know the eye's earlier clinical state.

Glaucoma A disease of the optic nerve with characteristic changes in the optic nerve head (optic disc) and typical defects in the visual field with or without raised IOP. See also types of glaucoma listed below.

Glaucoma, chronic open angle glaucoma (COAG) Glaucoma without evident secondary cause, which follows a chronic time course and occurs in the presence of an open anterior chamber angle (the trabecular meshwork is visible on gonioscopy). In this guideline the term COAG is used regardless of the level of IOP and has been extended to include COAG associated with pseudoexfoliation and pigment dispersion.

Glaucoma (COAG); early, moderate and advanced The definitions are based on the Hodapp classification of visual field loss for the stages of glaucoma (see section 1.8.6 of the full guideline). These can be summarised approximately in terms of mean defect (MD) as follows: early, MD greater than -6 dB; moderate, MD -6 dB to greater than -12 dB; advanced, MD -12 dB to greater than -20 dB. Severe visual impairment (blindness) is defined as MD -20 dB or worse.

Glaucoma, suspected When, regardless of the level of the IOP, the optic nerve head (optic disc) and/or visual field show changes that suggest possible glaucomatous damage.

Gonioscope Mirrored contact lens (goniolens), used with slit lamp biomicroscopy, or a contact prism lens (gonioprism) which enables observation of the anterior chamber angle.

Gonioscopy Examination of the anterior chamber angle using a gonioscope to observe angle structures and estimate depth of angle.

Healthcare professional For the purposes of this guideline the term 'healthcare professional' refers to a trained individual involved in glaucoma-related care including: ophthalmologists, optometrists, orthoptists, pharmacists, nurses and GPs.

Intraocular pressure (IOP) The internal pressure of the fluid contained within the eye.

Laser trabeculoplasty A surgical procedure to deliver a series of laser burns to the trabecular meshwork to improve the outflow of aqueous humour in open angle glaucoma.

Ocular hypertension (OHT) Consistently or recurrently elevated IOP (greater than 21 mmHg) in the absence of clinical evidence of optic nerve damage or visual field defect.

Perimetry The systematic measurement of visual field function using different types and intensities of stimuli.

Progression The worsening of COAG as clinically judged by the healthcare professional caring for the person on the basis of the assessment of visual field loss and optic nerve head appearance. To make this judgement the healthcare professional must know the eye's earlier clinical state.

Target IOP A dynamic, clinical judgement about what level of IOP is considered by the healthcare professional treating the person to be sufficiently low to minimise or arrest disease progression or onset and avoid disability from sight loss within a person's expected lifetime.

Tonometry A test to measure IOP using an instrument called a tonometer.

Trabeculectomy A surgical procedure that lowers IOP by creating a fistula, which allows aqueous outflow from the anterior chamber of the eye to the subtenon space.

Van Herick's peripheral anterior chamber depth assessment A slit lamp estimation of the depth of the peripheral anterior chamber of the eye; it is used as a proxy measure for judging whether the anterior chamber angle is open.

Visual field The area which can be seen when the eye is directed forward, including both central and peripheral vision.

Key priorities for implementation

Diagnosis

- At diagnosis offer all people who have COAG, who are suspected of having COAG or who have OHT all of the following tests:
 - intraocular pressure (IOP) measurement using Goldmann applanation tonometry (slit lamp mounted)
 - central corneal thickness (CCT) measurement
 - peripheral anterior chamber configuration and depth assessments using gonioscopy
 - visual field measurement using standard automated perimetry (central thresholding test)
 - optic nerve assessment, with dilatation, using stereoscopic slit lamp biomicroscopy with fundus examination.
- Ensure that all of the following are made available at each clinical episode to all healthcare professionals involved in a person's care:
 - records of all previous tests and images relevant to COAG and OHT assessment
 - records of past medical history which could affect drug choice
 - current systemic and topical medication
 - glaucoma medication record
 - drug allergies and intolerances.

Monitoring

- Monitor at regular intervals people with OHT or suspected COAG recommended to receive medication (see 'Treatment for people with OHT or suspected COAG'), according to their risk of conversion to COAG (see table 1).

Table 1 Monitoring intervals for people with OHT or suspected COAG who are recommended to receive medication

Clinical assessment			Monitoring intervals (months)	
IOP at target ^a	Risk of conversion to COAG ^b	Outcome ^c	IOP alone ^d	IOP, optic nerve head and visual field
Yes	Low	No change in treatment plan	Not applicable	12 to 24
Yes	High	No change in treatment plan	Not applicable	6 to 12
No	Low	Review target IOP or change treatment plan	1 to 4	6 to 12
No	High	Review target IOP or change treatment plan	1 to 4	4 to 6

^a Person is treated and IOP is at or below target. If IOP cannot be adequately controlled medically, refer to consultant ophthalmologist.

^b To be clinically judged in terms of age, IOP, CCT, appearance and size of optic nerve head.

^c For change of treatment plan refer to treatment recommendations.

^d For people started on treatment for the first time check IOP 1 to 4 months after start of medication.

- Monitor at regular intervals people with COAG according to their risk of progression to sight loss (see table 2).

Table 2 Monitoring intervals for people with COAG

Clinical assessment			Monitoring intervals (months)	
IOP at target ^a	Progression ^b	Outcome ^c	IOP alone ^d	IOP, optic nerve head and visual field
Yes	No ^e	No change in treatment plan	Not applicable	6 to 12
Yes	Yes	Review target IOP and change treatment plan	1 to 4	2 to 6
Yes	Uncertain	No change in treatment plan	Not applicable	2 to 6

No	No ^e	Review target IOP or change treatment plan	1 to 4	6 to 12
No	Yes/ uncertain	Change treatment plan	1 to 2	2 to 6
<p>^a IOP at or below target.</p> <p>^b Progression = increased optic nerve damage and/or visual field change confirmed by repeated test where clinically appropriate.</p> <p>^c For change of treatment plan refer to treatment recommendations.</p> <p>^d For people started on treatment for the first time check IOP 1 to 4 months after start of medication.</p> <p>^e No = not detected or not assessed if IOP check only following treatment change.</p>				

Treatment for people with OHT or suspected COAG

- Offer people with OHT or suspected COAG with high IOP treatment based on estimated risk of conversion to COAG using IOP, CCT and age (see table 3).

Table 3 Treatment for people with OHT or suspected COAG

CCT	More than 590 micrometres				555–590 micrometres		Less than 555 micrometres		Any
	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	
Untreated IOP (mmHg)	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	> 32
Age (years) ^a	Any	Any	Any	Treat until 60	Treat until 65	Treat until 65	Treat until 80	Treat until 80	Any
Treatment	No treatment	No treatment	No treatment	BB ^b	PGA	PGA	PGA	PGA	PGA

^a Treatment should not be routinely offered to people over the age threshold unless there are likely to be benefits from the treatment over an appropriate timescale. Once a person being treated for OHT reaches the age threshold for stopping treatment but has not developed COAG, healthcare professionals should discuss the option of stopping treatment.

The use of age thresholds is considered appropriate only where vision is currently normal (OHT with or without suspicion of COAG) and the treatment is purely preventative. Under such circumstances the threat to a person's sighted lifetime is considered negligible. In the event of COAG developing in such a person then treatment is recommended.

^b If beta-blockers (BB) are contraindicated offer a prostaglandin analogue (PGA).

Treatment for people with COAG

- Offer people newly diagnosed with early or moderate COAG, and at risk of significant visual loss in their lifetime, treatment with a prostaglandin analogue.
- Offer surgery with pharmacological augmentation (mitomycin C [MMC] or 5-fluorouracil [5-FU])⁽ⁱ⁾ as indicated to people with COAG who are at risk of progressing to sight loss despite treatment. Offer them information on the risks and benefits associated with surgery.

Organisation of care

- Refer people with suspected optic nerve damage or repeatable visual field defect, or both, to a consultant ophthalmologist for consideration of a definitive diagnosis and formulation of a management plan.
- People with a diagnosis of OHT, suspected COAG or COAG should be monitored and treated by a trained healthcare professional who has all of the following:
 - a specialist qualification (when not working under the supervision of a consultant ophthalmologist)
 - relevant experience
 - ability to detect a change in clinical status.

Provision of information

- Offer people the opportunity to discuss their diagnosis, prognosis and treatment, and provide them with relevant information in an accessible format at initial and subsequent visits. This may include information on the following:

- their specific condition (OHT, suspected COAG and COAG), its life-long implications and their prognosis for retention of sight
- that COAG in the early stages and OHT and suspected COAG are symptomless
- that most people treated for COAG will not go blind
- that once lost, sight cannot be recovered
- that glaucoma can run in families and that family members may wish to be tested for the disease
- the importance of the person's role in their own treatment – for example, the ongoing regular application of eye drops to preserve sight
- the different types of treatment options, including mode of action, frequency and severity of side effects, and risks and benefits of treatment, so that people are able to be active in the decision-making process
- how to apply eye drops, including technique (punctal occlusion and devices) and hygiene (storage)
- the need for regular monitoring as specified by the healthcare professional
- methods of investigation during assessment
- how long each appointment is likely to take and whether the person will need any help to attend (or example, driving soon after pupil dilatation would be inadvisable)
- support groups
- compliance aids (such as dispensers) available from their GP or community pharmacist
- Letter of Vision Impairment (LVI), Referral of Vision Impairment (RVI) and Certificate of Vision Impairment (CVI) registration
- Driver and Vehicle Licensing Agency (DVLA) regulations.

^[1] At the time of publication (April 2009), MMC and 5-FU did not have UK marketing authorisation for this indication. Informed consent should be obtained and documented. Both drugs should be handled with caution and in accordance with guidance issued by the Health and Safety Executive.

1 Guidance

The following guidance is based on the best available evidence. The [full guideline](#) ('Glaucoma: diagnosis and management of chronic open angle glaucoma and ocular hypertension') gives details of the methods and the evidence used to develop the guidance.

1.1 *Diagnosis*

1.1.1 At diagnosis offer all people who have COAG, who are suspected of having COAG or who have OHT all of the following tests:

- IOP measurement using Goldmann applanation tonometry (slit lamp mounted)
- central corneal thickness (CCT) measurement
- peripheral anterior chamber configuration and depth assessments using gonioscopy
- visual field measurement using standard automated perimetry (central thresholding test)
- optic nerve assessment, with dilatation, using stereoscopic slit lamp biomicroscopy with fundus examination.

1.1.2 Adopt professional^[2]/Department of Health^[3] guidance to reduce the risk of transmitting infective agents via contact tonometry or gonioscopy.

1.1.3 Use Van Herick's peripheral anterior chamber depth assessment as an alternative to gonioscopy if clinical circumstances rule out gonioscopy (for example, when people with physical or learning disabilities are unable to participate in the examination).

1.1.4 Obtain an optic nerve head image at diagnosis for baseline documentation.

1.1.5 Ensure that all of the following are made available at each clinical episode to all healthcare professionals involved in a person's care:

- records of all previous tests and images relevant to COAG and OHT assessment
- records of past medical history which could affect drug choice
- current systemic and topical medication

- glaucoma medication record
- drug allergies and intolerances.

1.1.6 Use alternative methods of assessment if clinical circumstances rule out the use of standard methods of assessment (for example, when people with physical or learning disabilities are unable to participate in the examination).

1.1.7 Ensure that all machines and measurement instruments are calibrated regularly according to the manufacturer's instructions.

1.2 *Monitoring*

1.2.1 Offer Goldmann applanation tonometry (slit lamp mounted) to all people with COAG, who are suspected of having COAG or who have OHT at each monitoring assessment.

1.2.2 Repeat CCT measurement as necessary (for example, following laser refractive surgery or at onset or progression of corneal pathology).

1.2.3 Offer Van Herick's peripheral anterior chamber depth assessment to all people with COAG, who are suspected of having COAG or who have OHT at each monitoring assessment.

1.2.4 Repeat gonioscopy when clinically indicated (for example, where a previous examination has been inconclusive or where there is suspicion of a change in clinical status of the anterior chamber angle).

1.2.5 Offer standard automated perimetry (central thresholding test) to all people who have established COAG and those suspected of having visual field defects who are being investigated for possible COAG. People with diagnosed OHT and those suspected of having COAG whose visual fields have previously been documented by standard automated perimetry as being normal may be monitored using supra-threshold perimetry (see tables 4 and 5 for recommended monitoring intervals).

1.2.6 Where a defect has previously been detected use the same visual field measurement strategy for each visual field test.

- 1.2.7 Offer stereoscopic slit lamp biomicroscopic examination of the optic nerve head to all people with COAG, who are suspected of having COAG or who have OHT at monitoring assessments (see tables 4 and 5 for recommended monitoring intervals).
- 1.2.8 When a change in optic nerve head status is detected by stereoscopic slit lamp biomicroscopic examination, obtain a new optic nerve head image for the person's records to provide a fresh benchmark for future assessments.
- 1.2.9 When an adequate view of the optic nerve head and surrounding area is unavailable at a monitoring visit, people undergoing stereoscopic slit lamp biomicroscopy should have their pupils dilated before the assessment.
- 1.2.10 Monitor at regular intervals people with OHT or suspected COAG recommended to receive medication (see recommendation 1.3.1), according to their risk of conversion to COAG (see table 4).

Table 4 Monitoring intervals for people with OHT or suspected COAG who are recommended to receive medication

Clinical assessment			Monitoring intervals (months)	
IOP at target ^a	Risk of conversion to COAG ^b	Outcome ^c	IOP alone ^d	IOP, optic nerve head and visual field
Yes	Low	No change in treatment plan	Not applicable	12 to 24
Yes	High	No change in treatment plan	Not applicable	6 to 12
No	Low	Review target IOP or change treatment plan	1 to 4	6 to 12
No	High	Review target IOP or change treatment plan	1 to 4	4 to 6

^a Person is treated and IOP is at or below target. If IOP cannot be adequately controlled medically, refer to consultant ophthalmologist.

^b To be clinically judged in terms of age, IOP, CCT, appearance and size of optic nerve head.

^c For change of treatment plan refer to treatment recommendations.

^d For people started on treatment for the first time check IOP 1 to 4 months after start of medication.

1.2.11 Discuss the benefits and risks of stopping treatment with people with OHT or suspected COAG who have both:

- a low risk of ever developing visual impairment within their lifetime
- an acceptable IOP.

If a person decides to stop treatment following discussion of the perceived risks of future conversion to COAG and sight loss, offer to assess their IOP in 1 to 4 months' time with further monitoring if considered clinically necessary.

1.2.12 In people with OHT or suspected COAG who are not recommended to receive medication, assess IOP, optic nerve head and visual field at the following intervals:

- between 12 and 24 months if there is a low risk of conversion to COAG
- between 6 and 12 months if there is a high risk of conversion to COAG.

If no change in the parameters has been detected after 3 to 5 years (depending on perceived risk of conversion), or before if confirmed normal, the person should be discharged from active glaucoma care to community optometric care.

1.2.13 At discharge advise people who are not recommended for treatment and whose condition is considered stable to visit their primary care optometrist annually so that any future changes in their condition can be detected.

1.2.14 Monitor at regular intervals people with COAG according to their risk of progression to sight loss (see table 5).

Table 5 Monitoring intervals for people with COAG

Clinical assessment			Monitoring intervals (months)	
IOP at target ^a	Progression ^b	Outcome ^c	IOP alone ^d	IOP, optic nerve head and visual field
Yes	No ^e	No change in treatment plan	Not applicable	6 to 12
Yes	Yes	Review target IOP and change treatment plan	1 to 4	2 to 6
Yes	Uncertain	No change in treatment plan	Not applicable	2 to 6
No	No ^e	Review target IOP or change treatment plan	1 to 4	6 to 12
No	Yes/ uncertain	Change treatment plan	1 to 2	2 to 6

^a IOP at or below target.

^b Progression = increased optic nerve damage and/or visual field change confirmed by repeated test where clinically appropriate.

^c For change of treatment plan refer to treatment recommendations.

^d For people started on treatment for the first time check IOP 1 to 4 months after start of medication.

^e No = not detected or not assessed if IOP check only following treatment change.

1.2.15 Following full recovery from surgery or laser trabeculoplasty, restart monitoring according to IOP, optic nerve head appearance and visual field (see table 5).

1.3 Treatment for people with OHT and suspected COAG

1.3.1 Offer people with OHT or suspected COAG with high IOP treatment based on estimated risk of conversion to COAG using IOP, CCT and age (see table 6).

Table 6 Treatment for people with OHT or suspected COAG

CCT	More than 590 micrometres	555–590 micrometres	Less than 555 micrometres	Any

Untreated IOP (mmHg)	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	> 21 to 25	> 25 to 32	> 32
Age (years) ^a	Any	Any	Any	Treat until 60	Treat until 65	Treat until 80	Any
Treatment	No treatment	No treatment	No treatment	BB ^b	PGA	PGA	PGA

^a Treatment should not be routinely offered to people over the age threshold unless there are likely to be benefits from the treatment over an appropriate timescale. Once a person being treated for OHT reaches the age threshold for stopping treatment but has not developed COAG, healthcare professionals should discuss the option of stopping treatment.

The use of age thresholds is considered appropriate only where vision is currently normal (OHT with or without suspicion of COAG) and the treatment is purely preventative. Under such circumstances the threat to a person's sighted lifetime is considered negligible. In the event of COAG developing in such a person then treatment is recommended.

^b If beta-blockers (BB) are contraindicated offer a prostaglandin analogue (PGA).

- 1.3.2 Do not treat people with suspected COAG and normal IOP.
- 1.3.3 Check that there are no relevant comorbidities or potential drug interactions before offering medication.
- 1.3.4 Offer alternative pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic) to people with OHT or suspected COAG and high IOP who are intolerant of the current medication.
- 1.3.5 Offer alternative pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic) to treated people with OHT or suspected COAG whose IOP cannot be reduced sufficiently to prevent the risk of progression to sight loss. More than one agent may be needed concurrently to achieve target IOP.
- 1.3.6 Refer treated people with OHT or suspected COAG whose IOP cannot be reduced sufficiently to prevent the risk of progression to sight loss to a consultant ophthalmologist to discuss other options.

- 1.3.7 Offer a preservative-free preparation to people with OHT or suspected COAG and an allergy to preservatives only if they are at high risk of conversion to COAG (IOP more than 25 and up to 32 mmHg and CCT less than 555 micrometres, or IOP more than 32 mmHg).

1.4 *Treatment for people with COAG*

- 1.4.1 Check that there are no relevant comorbidities or potential drug interactions before offering medication.
- 1.4.2 Offer people newly diagnosed with early or moderate COAG, and at risk of significant visual loss in their lifetime, treatment with a prostaglandin analogue.
- 1.4.3 Offer people with advanced COAG surgery with pharmacological augmentation (MMC or 5-FU)^[4] as indicated. Offer them information on the risks and benefits associated with surgery.
- 1.4.4 Offer people who present with advanced COAG and who are listed for surgery interim treatment with a prostaglandin analogue.
- 1.4.5 Encourage people using the prescribed pharmacological treatment to continue with the same treatment unless:
- their IOP cannot be reduced sufficiently to prevent the risk of progression to sight loss
 - there is progression of optic nerve head damage
 - there is progression of visual field defect
 - they are intolerant to the drug.
- 1.4.6 Check the person's adherence to their treatment and eye drop instillation technique in people with COAG whose IOP has not been reduced sufficiently to prevent the risk of progression to sight loss despite pharmacological treatment. If adherence and eye drop instillation technique are satisfactory offer one of the following:
- alternative pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic); more than one agent may be needed concurrently to achieve target IOP

- laser trabeculoplasty
- surgery with pharmacological augmentation (MMC or 5-FU^[4]) as indicated.

If the pharmacological treatment option is chosen, after trying two alternative pharmacological treatments consider offering surgery with pharmacological augmentation (MMC or 5-FU^[4]) as indicated or laser trabeculoplasty.

1.4.7 Offer surgery with pharmacological augmentation (MMC or 5-FU^[4]) as indicated to people with COAG who are at risk of progressing to sight loss despite treatment. Offer them information on the risks and benefits associated with surgery.

1.4.8 Consider offering people with COAG who are intolerant to a prescribed medication:

- alternative pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic) or
- a preservative-free preparation if there is evidence that the person is allergic to the preservative.

After trying two alternative pharmacological treatments consider offering surgery with pharmacological augmentation (MMC or 5-FU^[4]) as indicated or laser trabeculoplasty.

1.4.9 After surgery offer people with COAG whose IOP has not been reduced sufficiently to prevent the risk of progression to sight loss one of the following:

- pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic); more than one agent may be needed concurrently to achieve target IOP
- further surgery
- laser trabeculoplasty or cyclodiode laser treatment.

1.4.10 Offer people with COAG who prefer not to have surgery or who are not suitable for surgery:

- pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic); more than one agent may be needed concurrently to achieve target IOP
- laser trabeculoplasty or cyclodiode laser treatment.

1.5 *Organisation of care*

- 1.5.1 Refer people with suspected optic nerve damage or repeatable visual field defect, or both, to a consultant ophthalmologist for consideration of a definitive diagnosis and formulation of a management plan.
- 1.5.2 Diagnosis of OHT and suspected COAG and formulation of a management plan should be made by a suitably trained healthcare professional with:
- a specialist qualification (when not working under the supervision of a consultant ophthalmologist) and
 - relevant experience.
- 1.5.3 Healthcare professionals involved in the diagnosis of OHT and COAG suspect status and preliminary identification of COAG should be trained in case detection and referral refinement and be able to identify abnormalities based on relevant clinical tests and assessments. They should understand the principles of diagnosis of OHT and COAG and be able to perform and interpret all of the following:
- medical and ocular history
 - differential diagnosis
 - Goldmann applanation tonometry (slit lamp mounted)
 - standard automated perimetry (central thresholding test)
 - central supra-threshold perimetry
 - stereoscopic slit lamp biomicroscopic examination of anterior segment
 - examination of the posterior segment using a slit lamp binocular indirect ophthalmoscopy

- gonioscopy
- Van Herick's peripheral anterior chamber depth assessment
- CCT measurement.

1.5.4 People with a diagnosis of OHT, suspected COAG or COAG should be monitored and treated by a trained healthcare professional who has all of the following:

- a specialist qualification (when not working under the supervision of a consultant ophthalmologist)
- relevant experience
- ability to detect a change in clinical status.

1.5.5 Healthcare professionals involved in the monitoring and treatment of people with OHT, suspected COAG and established COAG should be trained to make management decisions on all of the following:

- risk factors for conversion to COAG
- coexisting pathology
- risk of sight loss
- monitoring and clinical status change detection (for example, visual field changes, stereoscopic slit lamp biomicroscopic examination of anterior segment and posterior segment)
- pharmacology of IOP-lowering medications
- treatment changes for COAG, COAG suspect status and OHT (with consideration given to relevant contraindications and interactions).

1.5.6 People with a confirmed diagnosis of OHT or suspected COAG and who have an established management plan may be monitored (but not treated) by a suitably trained healthcare professional with knowledge of OHT and COAG, relevant experience and ability to detect a change in clinical status. The healthcare professional should be able to perform and interpret all of the following:

- Goldmann applanation tonometry (slit lamp mounted)
- standard automated perimetry (central thresholding test)
- central supra-threshold perimetry (this visual field strategy may be used to monitor people with OHT or COAG suspect status when they have normal visual field)
- stereoscopic slit lamp biomicroscopic examination of the anterior segment
- Van Herick's peripheral anterior chamber depth assessment
- examination of the posterior segment using slit lamp binocular indirect ophthalmoscopy.

1.5.7 Healthcare professionals who diagnose, treat or monitor people independently of consultant ophthalmologist supervision should take full responsibility for the care they provide.

1.6 *Provision of information*

1.6.1 Offer people the opportunity to discuss their diagnosis, prognosis and treatment, and provide them with relevant information in an accessible format at initial and subsequent visits. This may include information on the following:

- their specific condition (OHT, suspected COAG and COAG), its life-long implications and their prognosis for retention of sight
- that COAG in the early stages and OHT and suspected COAG are symptomless
- that most people treated for COAG will not go blind
- that once lost, sight cannot be recovered
- that glaucoma can run in families and that family members may wish to be tested for the disease
- the importance of the person's role in their own treatment – for example, the ongoing regular application of eye drops to preserve sight
- the different types of treatment options, including mode of action, frequency and severity of side effects, and risks and benefits of treatment, so that people are able to be active in the decision-making process

- how to apply eye drops, including technique (punctal occlusion and devices) and hygiene (storage)
- the need for regular monitoring as specified by the healthcare professional
- methods of investigation during assessment
- how long each appointment is likely to take and whether the person will need any help to attend (for example, driving soon after pupil dilatation would be inadvisable)
- support groups
- compliance aids (such as dispensers) available from their GP or community pharmacist
- Letter of Vision Impairment (LVI), Referral of Vision Impairment (RVI) and Certificate of Vision Impairment (CVI) registration
- Driver and Vehicle Licensing Agency (DVLA) regulations.

^[2] [Royal College of Ophthalmologists and the Medicines and Healthcare products Regulatory Agency.](#)

^[3] See [Department of Health Advisory Bodies](#)

^[4] At the time of publication (April 2009), MMC and 5-FU did not have UK marketing authorisation for this indication. Informed consent should be obtained and documented. Both drugs should be handled with caution and in accordance with guidance issued by the Health and Safety Executive.

2 Notes on the scope of the guidance

NICE guidelines are developed in accordance with a [scope](#) that defines what the guideline will and will not cover.

How this guideline was developed

NICE commissioned the National Collaborating Centre for Acute Care to develop this guideline. The Centre established a Guideline Development Group (see appendix A), which reviewed the evidence and developed the recommendations. An independent Guideline Review Panel oversaw the development of the guideline (see appendix B).

There is more information about [how NICE clinical guidelines are developed](#) on the NICE website. A booklet, 'How NICE clinical guidelines are developed: an overview for stakeholders, the public and the NHS' is [available](#).

3 Implementation

NICE has developed [tools](#) to help organisations implement this guidance (listed below).

- Slides highlighting key messages for local discussion.
- Costing tools:
 - costing report to estimate the national savings and costs associated with implementation
 - costing template to estimate the local costs and savings involved.
- Audit support to monitor local practice.

4 Research recommendations

The Guideline Development Group has made the following recommendations for research, based on its review of evidence, to improve NICE guidance and patient care in the future.

4.1 *Monitoring people with OHT, suspected COAG and COAG*

What is the clinical effectiveness and cost effectiveness of using different monitoring intervals to detect disease progression in people with COAG who are at risk of progression?

Why this is important

The answer to this question is key to the recommendations on chronic disease monitoring intervals in this guideline. There is currently no identifiable evidence from randomised controlled trials (RCTs) in this area. Once diagnosed, people with COAG face lifelong treatment and monitoring. Monitoring based on risk-guided intervals would allow people who have a high risk of progression to sight loss to have more intensive monitoring and would stop people with slowly progressing disease having to attend unnecessary appointments. It would also focus resources on the people at greatest risk, making early detection of progression more likely and allowing damage to vision over time to be minimised. A randomised comparative trial of three perceived risk strata for progression to blindness randomised to different monitoring intervals is suggested. The outcome would be the progression events detected.

4.2 *Update of the National Survey of Trabeculectomy*

What are the current NHS national benchmarks for surgical success and complications in people with COAG undergoing trabeculectomy drainage surgery with and without pharmacological augmentation?

Why this is important

The answer to this question would provide more accurate and up-to-date evidence for surgical treatment in COAG. Surgical success and complication rates could then be used to update benchmarks for clinical audit and assist in planning service provision. It would also then be possible to inform people having surgery of the chances of success and complications. The current evidence base is the National Survey of Trabeculectomy. However, this is now 10 years old and techniques have changed. The benchmarks created from the new survey would set a standard against which newer techniques could be evaluated. The study design would be similar to the audit of 10 years

ago, to allow comparison of outcomes now in the light of changes in technique and the recommendations made by that audit.

4.3 *Laser treatment*

What is the clinical effectiveness and cost effectiveness of initial argon, diode or selective laser trabeculoplasty compared with prostaglandin analogues alone or laser trabeculoplasty plus prostaglandin analogues in combination in people with COAG?

Why this is important

The answer to this question would provide data on the comparative clinical effectiveness and cost effectiveness of laser treatment versus modern ocular hypotensive agents, particularly prostaglandin analogues. Laser treatment may control IOP in some people for a time without the need for topical medications, and in others it may offer additional benefit to topical medications. In either case there may be cost savings and improved prevention of progression. Existing trials of laser trabeculoplasty compared with pharmacological treatment use outdated pharmacological agents. Because of the lack of evidence, the role of laser trabeculoplasty in COAG management cannot be clearly defined. An RCT should be used to answer this research question, and sham laser treatment would be needed to enable double masking or at least single masking.

4.4 *Service provision*

In people identified on primary examination as exhibiting possible COAG, OHT or suspected COAG, what is the comparative effectiveness of diagnosis by different healthcare professions?

Why this is important

The answer to this question has the potential to improve access to care by increasing the number of available healthcare professionals and locations. The current available evidence is weak. There is one RCT, but it is of limited general use because of its design. There has not been any large-scale research on service provision in this area in the past 10 years. However, the Department of Health did pilot alternative COAG care pathways, which shows that central government is interested in this area. Primary research and several RCTs would be needed to answer the questions in this research recommendation.

4.5 *Provision of information to people with COAG*

What is the clinical effectiveness and cost effectiveness of providing people with COAG with a 'glaucoma card' or individual record of care compared with standard treatment?

Why this is important

The answer to this question would provide evidence of better care in terms of treatment outcome and the experience that people with COAG have. Involving them and helping them understand how to manage their COAG could reduce stress and uncertainty and potentially improve adherence to medical treatment, allowing them to remain sighted for longer. No RCTs or systematic reviews on the subject were identified. The study design for the proposed research should be an RCT. A qualitative research component would be needed to develop an appropriate intervention and patient-focused outcome measure to assess the experience of people with COAG. A standard visual function (field of vision) test would be appropriate for evaluating visual outcome. A large sample size and long study period – probably at least 5 years – would be needed to determine visual outcome, with the associated cost implications.

5 Other versions of this guideline

5.1 *Full guideline*

The full guideline, [Glaucoma: diagnosis and management of chronic open angle glaucoma and ocular hypertension](#) contains details of the methods and evidence used to develop the guideline. It is published by the National Collaborating Centre for Acute Care.

5.2 *Information for the public*

NICE has produced [information for the public](#) explaining this guideline.

We encourage NHS and voluntary sector organisations to use text from this information in their own materials.

6 Related NICE guidance

Published

Canaloplasty for primary open-angle glaucoma. [NICE interventional procedure guidance 260](#) (2008).

7 Updating the guideline

NICE clinical guidelines are updated so that recommendations take into account new information. New evidence is checked 3 years after publication, and healthcare professionals and patients are asked for their views; we use this information to decide whether all or part of a guideline needs updating. If important new evidence is published at other times, we may decide to do a more rapid update of some recommendations.

Appendix A: The Guideline Development Group

Mr John Sparrow (Chair)

Consultant Ophthalmologist, Bristol Eye Hospital

Ms Cecilia Fenerty

Consultant Ophthalmologist, Manchester Royal Eye Hospital

Ms Wendy Franks

Consultant Ophthalmologist, Moorfields Eye Hospital, London

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Mr Dennis Keight

Patient Representative

Ms Susana Ramirez-Florez

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Mr Paul Spry

Consultant Hospital Optometrist, Bristol Eye Hospital

Mr Chris Steele

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Mr Richard Wormald

Consultant Ophthalmologist, Moorfields Eye Hospital, London

Mr David Wright

Patient Representative and Chief Executive of the International Glaucoma Association

NCC-AC staff on the Guideline Development Group

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Ms Hanna Lewin

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Senior Information Specialist/Research Associate

Appendix B: The Guideline Review Panel

The Guideline Review Panel is an independent panel that oversees the development of the guideline and takes responsibility for monitoring concordance to NICE guideline development processes. In particular, the panel ensures that stakeholder comments have been adequately considered and responded to. The panel includes members from the following perspectives: primary care, secondary care, lay, public health and industry.

Mr Peter Robb (Chair)

Consultant ENT Surgeon, Epsom and St Helier University Hospitals and The Royal Surrey County Hospital NHS Trusts

Mr John Seddon

Lay member

Mr Mike Baldwin

Head of Health Technology Appraisals, Sanofi-Aventis

Dr Christine Hine

Consultant in Public Health (Acute Commissioning), Bristol and South Gloucestershire PCTs

Appendix C: The algorithms

Pathways on diagnosis, monitoring and treatment are in the [full guideline](#).

About this guideline

NICE clinical guidelines are recommendations about the treatment and care of people with specific diseases and conditions in the NHS in England and Wales.

The guideline was developed by the National Collaborating Centre for Acute Care. The Collaborating Centre worked with a group of healthcare professionals (including consultants, GPs and nurses), patients and carers, and technical staff, who reviewed the evidence and drafted the recommendations. The recommendations were finalised after public consultation.

The methods and processes for developing NICE clinical guidelines are described in [The guidelines manual](#).

The recommendations from this guideline have been incorporated into a [NICE Pathway](#). We have produced [information for the public](#) explaining this guideline. Tools to help you put the guideline into practice and information about the evidence it is based on are also [available](#).

Changes after publication

January 2012: minor maintenance

August 2013: minor maintenance

April 2015: minor maintenance

Your responsibility

This guidance represents the view of NICE, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summary of product characteristics of any drugs they are considering.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have

regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

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