# Glaucoma: diagnosis and management (large print version)

1 November 2017

## Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in your care.

Making decisions using NICE guidelines explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

### *1.1 Case-finding*

The recommendations on case-finding are for primary eye care professionals before referral for diagnosis of chronic open angle glaucoma (COAG) and related conditions, and are separate from a sight test.

1.1.1 Before referral for further investigation and diagnosis of COAG and related conditions, offer all of the following tests:

- central visual field assessment using standard automated perimetry (full threshold or supra-threshold)
- optic nerve assessment and fundus examination using stereoscopic slit lamp biomicroscopy (with pupil dilatation if necessary), and optical coherence tomography (OCT) or optic nerve head image if available
- intraocular pressure (IOP) measurement using Goldmann-type applanation tonometry
- peripheral anterior chamber configuration and depth assessments using gonioscopy or, if not available or the patient prefers, the van Herick test or OCT. **[2017]**

1.1.2 Do not base a decision to refer solely on IOP measurement using non-contact tonometry. **[2017]**

1.1.3 Do not refer people who have previously been discharged from hospital eye services after assessment for COAG and related conditions unless clinical circumstances have changed and a new referral is needed. **[2017]**

1.1.4 Before deciding to refer, consider repeating visual field assessment and IOP measurement on another occasion to confirm a visual field defect or IOP of

24 mmHg or more, unless clinical circumstances indicate urgent or emergency referral is needed. **[2017]**

1.1.5 Refer for further investigation and diagnosis of COAG and related conditions, after considering repeat measures as in recommendation 1.1.4, if:

- there is optic nerve head damage on stereoscopic slit lamp biomicroscopy **or**
- there is a visual field defect consistent with glaucoma **or**
- IOP is 24 mmHg or more using Goldmann-type applanation tonometry. **[2017]**

1.1.6 Provide results of all examinations and tests with the referral. **[2017]**

1.1.7 Advise people with IOP below 24 mmHg to continue regular visits to their primary eye care professional. **[2017]**

**These recommendations are for people planning and providing eye care services before referral**

1.1.8 People planning and providing eye care services should use a service model that includes Goldmann-type applanation tonometry before referral for diagnosis of COAG and related conditions. **[2017]**

1.1.9 People planning eye care services should consider commissioning referral filtering services (for example, repeat measures, enhanced case-finding, or referral refinement) for COAG and related conditions. **[2017]**

## *1.2 Diagnosis*

1.2.1 To diagnose COAG and related conditions, offer all of the following tests:

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

**[2017]**

1.2.2 Adopt professional[1]/Department of Health[2] guidance to reduce the risk of transmitting infective agents via contact tonometry or gonioscopy. **[2009]**

1.2.3 Use the van Herick peripheral anterior chamber depth assessment if clinical circumstances rule out gonioscopy (for example, when people with physical or learning disabilities are unable to participate in the examination). **[2009]**

1.2.4 Obtain an optic nerve head image at diagnosis for baseline documentation (for example, a stereoscopic optic nerve head image or OCT). **[2009, amended 2017]**

1.2.5 After referral, consider an early assessment appointment when there is clinical concern based on the information provided. **[2017]**

1.2.6 At the time of diagnosis of ocular hypertension (OHT), assess risk of future visual impairment, taking account of risk factors such as:

- level of IOP
- CCT
- family history

[1] See Royal College of Ophthalmologists' Ophthalmic Services Guidance.
[2] See Minimise transmission risk of CJD and vCJD in healthcare settings.

- life expectancy. **[2017]**

## *1.3 Standard practice for all assessments*

1.3.1 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. **[2009]**

1.3.2 Use alternative methods of assessment if clinical circumstances rule out standard methods (for example, when people with physical or learning disabilities are unable to participate in the examination). **[2009]**

1.3.3 Ensure that all machines and measurement instruments are calibrated regularly according to the manufacturers' instructions. **[2009]**

## *1.4 Reassessment*

### Reassessment tests

1.4.1 At each assessment, offer the following tests to people with COAG, people suspected of having COAG and people with OHT:

- Goldmann applanation tonometry (slit lamp mounted)
- anterior segment slit lamp examination with van Herick peripheral anterior chamber depth assessment when clinically indicated. **[2017]**

1.4.2 When clinically indicated, repeat gonioscopy, 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. **[2017]**

1.4.3 When clinically indicated, repeat visual field testing using standard automated perimetry (central thresholding test) for people with COAG and those suspected of having visual field defects who are being investigated for possible COAG (see tables 2 and 3 for recommended reassessment intervals). **[2009, amended 2017]**

1.4.4 When clinically indicated, repeat visual field testing using either a central thresholding test or a supra-threshold test for people with OHT and those

suspected of having COAG whose visual fields have previously been documented by standard threshold automated perimetry (central thresholding test) as being normal (see tables 1 and 2 for recommended reassessment intervals). **[2009, amended 2017]**

1.4.5 When a visual field defect has previously been detected, use the same measurement strategy for each visual field assessment. **[2009]**

1.4.6 When clinically indicated, repeat assessment of the optic nerve head (for example, stereoscopic slit lamp biomicroscopy or imaging). **[2017]**

1.4.7 When a change in optic nerve head status is detected by stereoscopic slit lamp biomicroscopy, obtain a new optic nerve head image for the person's records to provide a fresh benchmark for future assessments. **[2009]**

1.4.8 When an adequate view of the optic nerve head and surrounding area is unavailable at reassessment, people should have their pupils dilated before stereoscopic slit lamp biomicroscopy or optic nerve head imaging is repeated. **[2009]**

### When to reassess

#### *People with COAG, suspected COAG and OHT*

1.4.9 At each assessment, re-evaluate risk of conversion to COAG and risk of sight loss to set time to next assessment. **[2017]**

1.4.10 At each assessment, ask about general health and, if appropriate, factors affecting adherence to treatment, including cognitive impairment and any treatment side effects. **[2017]**

#### *People with treated OHT (baseline IOP 24 mmHg or more) and a normal optic nerve head and visual field at most recent assessment*

1.4.11 For people with treated OHT (baseline IOP of 24 mmHg or more) and a normal optic head and visual field at the most recent assessment:

- use clinical judgement to assess control of IOP and risk of conversion to COAG, and
- reassess according to table 1. **[2017]**

**Table 1 Time to next assessment for people being treated for OHT**

| Conversion from OHT to COAG | Control of IOP | Time to next assessment[1] |
|---|---|---|
| Not detected or uncertain conversion[2] | No | Review management plan and reassess between 1 and 4 months |
| Uncertain conversion[2] | Yes | Reassess between 6 and 12 months |
| No conversion detected | Yes | Reassess between 18 and 24 months |
| Conversion | No or yes | See recommendations on the diagnosis and reassessment of COAG |

[1] Use clinical judgement to decide when the next appointment should take place within the recommended interval.

[2] Uncertain conversion includes having insufficient accurate information (perhaps because the person was unable to participate in the assessment).

### *People with suspected COAG*

1.4.12 For people with suspected COAG:

- use clinical judgement to assess control of IOP and risk of conversion to COAG (optic nerve head damage and visual field defect), and
- reassess according to table 2. **[2017]**

**Table 2 Time to next assessment for people with suspected COAG**

| Conversion to COAG | Control of IOP | Time to next assessment[1] |
|---|---|---|
| Not detected or uncertain conversion[2] | No | Review management plan and reassess between 1 and 4 months |
| Uncertain conversion[2] | Yes | Reassess between 6 and 12 months |
| No conversion detected | Yes | Reassess between 12 and 18 months |
| Conversion | No or yes | See recommendations on the diagnosis and reassessment of COAG |

[1] Use clinical judgement to decide when the next appointment should take place within the recommended interval.

[2] Uncertain conversion includes having insufficient accurate information (perhaps because the person was unable to participate in the assessment).

### *People with COAG*

1.4.13 For people with COAG:

- use clinical judgement to assess risk of COAG progression to sight loss, and
- reassess according to table 3. **[2017]**

**Table 3 Time to next assessment for people with COAG**

| Progression of COAG | Control of IOP | Time to next assessment[1] |
|---|---|---|
| Not detected | No | Review treatment plan and reassess between 1 and 4 months |
| Uncertain progression[2] or progression | No | Review treatment plan and reassess between 1 and 2 months |
| No progression detected and low clinical risk | Yes | Reassess between 12 and 18 months |
| No progression detected and high clinical risk | Yes | Reassess between 6 and 12 months |
| Uncertain progression[2] or progression | Yes | Review treatment plan and reassess between 2 and 6 months |

[1] Use clinical judgement to decide when the next appointment should take place within the recommended interval.

[2] Uncertain progression includes having insufficient accurate information (perhaps because the person was unable to participate in the assessment).

## Discharge back to primary care

1.4.14 Discharge people back to primary eye care services if:

- they were referred for OHT but do not need treatment
- they were referred for suspected COAG but this is no longer suspected.

Advise people that they should continue with regular visits to their primary eye care professional, at clinically appropriate intervals. **[2017]**

1.4.15 Give a discharge summary to people who have been assessed and discharged to primary care. Send a copy to their GP and, with patient consent, copy the relevant information to the primary eye care professional nominated by the patient. Advise people to take their discharge summary with them when attending future sight tests. **[2017]**

## *1.5 Treatment*

1.5.1 Take into account any cognitive and physical impairments when making decisions about management and treatment. **[2017]**

1.5.2 Check that there are no relevant comorbidities or potential drug interactions before offering pharmacological treatment. **[2009]**

### Treatment for people with OHT

1.5.3 Offer a generic prostaglandin analogue (PGA)[3] to people with IOP of 24 mmHg or more (OHT) if they are at risk of visual impairment within their lifetime (see recommendation 1.2.6). **[2017]**

[3] At the time of publication (November 2017), not all generic PGAs had a UK marketing authorisation for first-line treatment. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information.

1.5.4 Do not offer treatment to people with OHT who are not at risk of visual impairment in their lifetime. Advise people to continue regular visits to their primary eye care professional, at clinically appropriate intervals. **[2017]**

1.5.5 Offer another pharmacological treatment to people with an IOP of 24 mmHg or more who cannot tolerate their current treatment. The first choice should be an alternative generic PGA, if available, and if this is not tolerated, offer a beta-blocker. If none of these options are tolerated, offer non-generic PGA, carbonic anhydrase inhibitors, sympathomimetics, miotics or a combination of treatments. **[2017]**

1.5.6 Offer a drug from another therapeutic class (beta-blocker, carbonic anhydrase inhibitor[4] or sympathomimetic) to people with an IOP of 24 mmHg or more whose current treatment is not reducing IOP sufficiently to prevent the risk of progression to sight loss. Topical drugs from different therapeutic classes

[4] At the time of publication (November 2017), some carbonic anhydrase inhibitors were licensed for use only when beta-blockers were not tolerated or were contraindicated. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information.

may be needed at the same time to control IOP. **[2009, amended 2017]**

1.5.7 Refer people whose IOP cannot be reduced sufficiently with pharmacological treatment to prevent the risk of progression to sight loss to a consultant ophthalmologist to discuss other options. **[2009]**

1.5.8 Offer preservative-free eye drops to people who have an allergy to preservatives or people with clinically significant and symptomatic ocular surface disease, but only if they are at high risk of conversion to COAG. **[2009, amended 2017]**

### Treatment for people with suspected COAG

1.5.9 Do not offer treatment to people with suspected COAG and IOP less than 24 mmHg. Advise people to continue regular visits to their primary eye care professional, at clinically appropriate intervals. **[2017]**

1.5.10 Offer a generic PGA[3] to people with suspected COAG and IOP of 24 mmHg or more, in line with the recommendations on treatment for people with OHT. **[2017]**

### Stopping treatment for people with OHT or suspected COAG

1.5.11 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 after this discussion, offer to assess their IOP in 1 to 4 months with further reassessment if clinically indicated. **[2009]**

### Treatment for people with COAG

1.5.12 Offer a generic PGA[3] to people with COAG. **[2017]**

1.5.13 Offer people with advanced COAG, surgery with pharmacological augmentation (MMC[5]) as indicated. Offer them information on the risks and benefits associated with surgery. **[2009, amended 2017]**

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[5] At the time of publication (November 2017), MMC did not have a UK marketing authorisation for this indication. The prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's Prescribing guidance: prescribing unlicensed medicines for further information.

1.5.14 Offer people who present with advanced COAG and who are listed for surgery, interim treatment with a generic PGA[3]. **[2009, amended 2017]**

1.5.15 Encourage people to continue with the same pharmacological 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 cannot tolerate the drug. **[2009]**

1.5.16 Ask about adherence to treatment and check the 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 1 of the following:

- a drug from another therapeutic class (a beta-blocker, carbonic anhydrase inhibitor[4] or sympathomimetic); topical drugs from different therapeutic classes may be needed at the same time to control IOP
- laser trabeculoplasty

- surgery with pharmacological augmentation (MMC[5]) as indicated.

  If the drug treatment option is chosen, after trying drugs from 2 therapeutic classes, consider offering surgery with pharmacological augmentation (MMC[5]) as indicated or laser trabeculoplasty. **[2009, amended 2017]**

1.5.17 Offer surgery with pharmacological augmentation (MMC[5]) 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. **[2009, amended 2017]**

1.5.18 Consider offering people with COAG who cannot tolerate a treatment:

- a drug from another therapeutic class (a beta-blocker, carbonic anhydrase inhibitor[4] or sympathomimetic) **or**
- preservative-free eye drops if there is evidence that the person is allergic to the preservative or has clinically significant and symptomatic ocular surface disease.

  After trying drugs from 2 therapeutic classes,

consider offering surgery with pharmacological augmentation (MMC[5]) as indicated or laser trabeculoplasty. **[2009, amended 2017]**

1.5.19 After surgery offer people with COAG whose IOP has not been reduced sufficiently to prevent the risk of progression to sight loss 1 of the following:

- pharmacological treatment; topical drugs from different therapeutic classes may be needed at the same time to control IOP
- further surgery
- laser trabeculoplasty or cyclodiode laser treatment. **[2009, amended 2017]**

1.5.20 Offer people with COAG who prefer not to have surgery or for whom surgery is not suitable:

- pharmacological treatment; topical drugs from different therapeutic classes may be needed at the same time to control IOP
- laser trabeculoplasty or cyclodiode laser treatment. **[2009, amended 2017]**

## *1.6 Organisation of care*

1.6.1 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. **[2009]**

1.6.2 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 and
- relevant experience. **[2009, amended 2017]**

1.6.3 Be aware that holding an independent or non-medical prescribing qualification alone (without a specialist qualification relevant to the case complexity of glaucoma being managed) is insufficient for managing glaucoma and related conditions. **[2017]**

1.6.4 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 peripheral anterior chamber depth assessment
- CCT measurement. **[2009]**

1.6.5 People with OHT, suspected COAG or COAG should have monitoring and treatment from a trained healthcare professional who has all of the following:

- a specialist qualification
- relevant experience
- ability to detect a change in clinical status. **[2009, amended 2017]**

1.6.6 Healthcare professionals involved in the monitoring and treatment of 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 detecting a change in clinical status (for example, visual field changes, stereoscopic slit lamp biomicroscopic examination of anterior segment and posterior segment)
- pharmacology of IOP-lowering drugs
- treatment changes for COAG, suspected COAG and OHT (with consideration given to relevant contraindications and interactions). **[2009]**

1.6.7 People with a confirmed diagnosis of OHT or suspected COAG and who have an established management plan may have monitoring (but not treatment) from 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 for monitoring OHT or suspected COAG when the visual field is normal)
- stereoscopic slit lamp biomicroscopic examination of the anterior segment
- van Herick peripheral anterior chamber depth assessment
- examination of the posterior segment using slit lamp binocular indirect ophthalmoscopy. **[2009]**

1.6.8 Healthcare professionals who diagnose, treat or monitor independently of consultant ophthalmologist supervision should take full responsibility for the care they provide. **[2009]**

## *1.7 Providing information*

1.7.1 Offer people the opportunity to discuss their diagnosis, referral, prognosis, treatment and discharge, 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 having treatment for COAG will have good quality of life and 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 condition
- 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 take an active part in decision-making (see NICE's guideline on medicines optimisation)
- 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)

- the eye clinic liaison officer (ECLO)
- support organisations and 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. **[2009, amended 2017]**

## *Terms used in this guideline*

### COAG and related conditions

These include COAG, OHT and suspected COAG.

### Enhanced case-finding

Enhanced community case-finding services use slit lamp mounted Goldmann-type applanation tonometry, dilated slit lamp indirect biomicroscopy and other tests deemed necessary by the healthcare professional.

### Hospital-based triage

A hospital-based risk assessment shortly after referral. Initial tests are performed to determine what happens next. For example, people at a low risk following initial testing by a nurse or technician may be discharged whereas those at higher risk

may be directed to a more senior member of the assessment and diagnostic team, such as a consultant ophthalmologist.

**Primary eye care professionals**

These include optometrists, GPs with a special interest in ophthalmology and community orthoptists.

**Referral filtering**

A general term for any type of accuracy checking before referral to hospital eye services. Referral filtering may take the form of ‘repeat measures’, ‘enhanced case-finding’, ‘referral refinement’, ‘hospital-based triage’ or ‘administrative paper-based triage’.

**Referral refinement**

A 2-tier assessment in which initial evidence of abnormality found during case-finding or screening is validated by an enhanced assessment, which adds value beyond that achieved through a simple 'repeat measures' scheme. A referral refinement service performs tests to diagnose OHT and suspected COAG and interprets the results in the light of clinical findings. Specialist practitioners who deliver this service independently have the qualifications and experience set out in the recommendations on organisation of care. Practitioners providing a referral refinement service should be qualified to

make a diagnosis of OHT and suspected glaucoma, and to carry out gonioscopy to exclude angle-closure glaucoma.

**Repeat measures**

The repeated measurement of parameters related to the diagnosis of glaucoma. A simple repeat measures scheme may involve repeat measurement of IOP only. Other repeat measures schemes may also include repeated measurement of visual fields and other relevant ocular parameters when clinically necessary.

**Sight loss**

Sight loss in glaucoma is visual damage that manifests as blind spots in the field of vision. Early on these are mostly asymptomatic with many people being unware of a problem. Sight loss may progress to visual impairment and eventually become symptomatic.

**Sight test**

A sight test determines whether or not a person has a sight defect, and if so what is needed to correct, remedy or relieve it. An optometrist performing a sight test has to conduct the examinations specified in the Sight Testing (Examination and Prescription) (No 2) Regulations 1989. These include an internal and external examination of the eyes and any other

examinations needed to detect signs of injury, disease or abnormality in the eye or elsewhere.

**Visual impairment**

A severe reduction in vision, which cannot be corrected with standard glasses or contact lenses and reduces a person's ability to function in a visual environment.

## Putting this guideline into practice

NICE has produced tools and resources to help you put this guideline into practice.

Putting recommendations into practice can take time. How long may vary from guideline to guideline, and depends on how much change in practice or services is needed. Implementing change is most effective when aligned with local priorities.

Changes recommended for clinical practice that can be done quickly – like changes in prescribing practice – should be shared quickly. This is because healthcare professionals should use guidelines to guide their work – as is required by professional regulating bodies such as the General Medical and Nursing and Midwifery Councils.

Changes should be implemented as soon as possible, unless there is a good reason for not doing so (for example, if it would

be better value for money if a package of recommendations were all implemented at once).

Different organisations may need different approaches to implementation, depending on their size and function. Sometimes individual practitioners may be able to respond to recommendations to improve their practice more quickly than large organisations.

Here are some pointers to help organisations put NICE guidelines into practice:

1. **Raise awareness** through routine communication channels, such as email or newsletters, regular meetings, internal staff briefings and other communications with all relevant partner organisations. Identify things staff can include in their own practice straight away.

2. **Identify a lead** with an interest in the topic to champion the guideline and motivate others to support its use and make service changes, and to find out any significant issues locally.

3. **Carry out a baseline assessment** against the recommendations to find out whether there are gaps in current service provision.

4. **Think about what data you need to measure improvement** and plan how you will collect it. You may want to work with other health and social care organisations and

specialist groups to compare current practice with the recommendations. This may also help identify local issues that will slow or prevent implementation.

5. **Develop an action plan**, with the steps needed to put the guideline into practice, and make sure it is ready as soon as possible. Big, complex changes may take longer to implement, but some may be quick and easy to do. An action plan will help in both cases.

6. **For very big changes** include milestones and a business case, which will set out additional costs, savings and possible areas for disinvestment. A small project group could develop the action plan. The group might include the guideline champion, a senior organisational sponsor, staff involved in the associated services, finance and information professionals.

7. **Implement the action plan** with oversight from the lead and the project group. Big projects may also need project management support.

8. **Review and monitor** how well the guideline is being implemented through the project group. Share progress with those involved in making improvements, as well as relevant boards and local partners.

NICE provides a comprehensive programme of support and resources to maximise uptake and use of evidence and guidance. See our into practice pages for more information.

Also see Leng G, Moore V, Abraham S, editors (2014) Achieving high quality care – practical experience from NICE. Chichester: Wiley.

## Context

The scope of this NICE guideline on diagnosing and managing chronic open angle glaucoma has been extended to cover referral. This includes the most effective service models for referral filtering schemes (repeat measures, enhanced case-finding and referral refinement), the tests to be used for finding people with chronic open angle glaucoma, suspected chronic open angle glaucoma and ocular hypertension (OHT), and thresholds for onward referral. We have also updated the guidance on tests for diagnosis and reassessment, pharmacological treatments for lowering intraocular pressure and preserving visual field, and reassessment intervals which depend on prognosis.

The update has provided an opportunity to re-evaluate the clinical effectiveness, cost effectiveness and indications for treating OHT. Knowledge of corneal thickness is no longer needed to decide whether or not to treat OHT and a single

threshold of 24 mmHg is now recommended for both onward referral and treatment. Changes in the costs of pharmacological treatments, acknowledgement of short- and long-term variations in intraocular pressure and the uneven relationship between rising pressure and increased risk have allowed a simplification of the indications for OHT treatment.

Control of intraocular pressure remains critical to the therapeutic approach, with intensity of treatment and ongoing management being guided by disease severity and progression as shown by visual field change, morphological change in the optic disc, and the likelihood of progressive sight loss. Reassessment at each visit is emphasised, encouraging flexible clinical judgement about the frequency of visits and options for treatment, including stopping treatment when the perceived risk to a sighted lifetime is low.

Where fresh evidence was not found the guideline has not been updated, that is, accuracy of visual field tests, surgical interventions, laser procedures and information, education and support needed for adherence to treatment.

## *More information*

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| You can also see this guideline in the NICE pathway on glaucoma. |

To find out what NICE has said on topics related to this guideline, see our web page on eye conditions.

See also the guideline committee's discussion and the evidence reviews (in the full guideline), and information about how the guideline was developed, including details of the committee.

# Recommendations for research

The guideline committee has made the following recommendations for research.

## *1 Risk tools to identify risk of developing COAG and risk of sight loss*

What is the predictive value of risk tools for identifying people in the community who are at increased risk of developing chronic open angle glaucoma (COAG) and identifying people with COAG who are at increased risk of sight loss?

### Why this is important

Most cases of COAG are first detected by case-finding in community optometry after a sight test (with or without repeat measures, enhanced case-finding, or referral refinement). Identifying at case-finding which people are at high risk of conversion to COAG is important for guiding decisions about

monitoring, treatment and referral. However, current evidence on the sensitivity and specificity of risk tools for developing COAG is of moderate-to-low quality, with all studies having a high or very high risk of bias. There was no evidence on cost effectiveness.

Similarly, a risk tool that identifies people with COAG who are at risk of progression to sight loss would be useful for both patients and healthcare professionals. People at higher risk of sight loss could have more frequent testing and perhaps more intensive treatment, whereas people at lower risk could have less frequent assessments and potentially less intensive treatment.

## *2 Treatment for people with an IOP of 22 or 23 mmHg*

What is the clinical and cost effectiveness of treating an intraocular pressure (IOP) of 22 or 23 mmHg in people with normal optic discs and visual fields?

**Why this is important**

The only proven intervention for preventing and controlling glaucoma is lowering IOP. It has been widely accepted that the upper limit of statistically normal IOP is 21 mmHg. This was also accepted as the threshold for treatment, and most treatment studies aimed to achieve this target or a reduction in

IOP of between 25% and 35% from baseline. However, more recently the Ocular Hypertension Treatment Study (OHTS) enrolled people with an IOP between 24 mmHg and 32 mmHg, but without glaucomatous optic nerve damage, to receive treatment or no treatment. The results showed a reduction in 5-year incidence of very early glaucoma (either optic disc or visual field changes) from 9.5% in people not receiving treatment to 4.4% in those having treatment. This leaves an area of uncertainty about treatment for people with an IOP above 21 mmHg but below 24 mmHg. There are about 1.8 million people in the UK with an IOP of 22 or 23 mmHg. The costs associated with management in these people are sufficient to make this question of national importance.

## *3 An instrument to measure quality of life in people with glaucoma*

What instrument should be used to measure health related quality of life in people with glaucoma?

**Why this is important**

Quality of life is the most important overall measure of treatment effect for patients as it measures their life experience and how their life experience is affected by interventions. Patient-reported outcome measures (PROM) are used for informing patients of the value of interventions and may affect their treatment choices. They also offer a tool for audit or

service evaluation of glaucoma services, and for designing glaucoma trials.

However, uncertainty exists as to which PROM instrument should be used to measure outcomes of glaucoma interventions. A suitable instrument would be helpful to inform patients, healthcare professionals and policy makers about the effectiveness of glaucoma interventions. Identifying a valid and responsive PROM for measuring glaucoma outcomes would allow this instrument to be adopted in future clinical trials and glaucoma audits and would ensure meaningful comparisons between different interventions.

## *4 Optical coherence tomography for glaucoma*

What is the effectiveness and cost effectiveness of optical coherence tomography (OCT) for diagnosing and monitoring glaucoma?

### Why this is important

Glaucoma is an age-related chronic condition and the second leading cause of blindness in the UK. Once detected, glaucoma care usually takes place in hospital eye services, where patients are monitored for the rest of their life. There are over 1 million visits per year for glaucoma care in the NHS in England. This is predicted to increase substantially as a result of an ageing population and better detection in the community.

For diagnosis and monitoring, patients have an examination of the optic nerve and a review of visual field test results. Visual field testing has potential limitations: there is a learning effect and variability, it involves considerable patient effort, it is influenced by comorbidities, and in some people results are not reliable. Automated imaging with OCT overcomes many of these limitations.

OCT is an imaging technology that has evolved over the past 2 decades and is currently used in all NHS departments for the diagnosis and management of retinal diseases. However, current use of OCT and imaging technologies in glaucoma is highly variable.

It is possible the addition of OCT for diagnosing and monitoring glaucoma may enable earlier detection of disease and progression than when visual field testing is used alone. This could lead to escalation of treatment with less visual loss and blindness. However, it is possible that OCT may detect structural changes that will not be translated into functional loss, and may lead to unnecessary treatment. Overtreatment is likely to be associated with side effects and increased healthcare costs.

## *5 Referral filtering*

What is the effectiveness and cost effectiveness of the different models for glaucoma filtering (pathways from case-finding to

assessment in secondary ophthalmic care) for detecting glaucoma and glaucoma-related conditions (ocular hypertension and suspected glaucoma)?

**Why this is important**

Routine optometric sight testing has poor sensitivity and specificity for detecting glaucoma and glaucoma-related conditions, resulting in a high percentage of false positive referrals to secondary care. These are costly for commissioners, cause unnecessary anxiety for patients and are a burden for secondary care. A variety of referral filtering models have been developed to improve the accuracy of referrals. These include ‘repeat measures’ schemes in which IOP measurement or visual field assessments, or both, are repeated at a separate visit; ‘enhanced case-finding’ referral enhancement schemes in which IOP measurements are repeated, detailed disc assessment is carried out and visual fields are performed with automated perimetry; ‘referral refinement’ schemes, which require tests sufficient for the diagnosis of ocular hypertension and suspected COAG, including gonioscopy, and the interpretation of these clinical findings.

Each scheme requires different levels of healthcare training and qualifications. Investment in equipment may also be

needed to set up these services, and professionals would expect remuneration for providing these models of care.

It is unclear which of these models is the most accurate (sensitive and specific) and which is most cost effective. Evidence is therefore needed so that commissioners can commission the best services that allow accurate referral to secondary care for glaucoma assessment.

# Update information

**November 2017:** This guideline is an update of NICE guideline CG85 (published April 2009) and will replace it.

New recommendations have been added for case-finding, diagnosis, reassessment and treatment.

These are marked as: **[2017]**.

## *Recommendations that have been changed*

### Amended recommendation wording (change to meaning)

| Recommendation in 2009 guideline | Recommendation in current guideline | Reason for change |
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| Obtain an optic nerve head image at diagnosis for baseline documentation. (1.1.4) | Obtain an optic nerve head image at diagnosis for baseline documentation (for example, a stereoscopic optic | Clarification added that this image may be acquired by a stereoscopic optic nerve head image (leaving it open to either biomicroscopy slit |

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| | nerve head image or OCT). (1.2.4) | lamp examination or stereo photography) or OCT, whichever is more readily available at the time of diagnosis. |
| 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). (1.2.5) | When clinically indicated, repeat visual field testing using standard automated perimetry (central thresholding test) for people with COAG and those suspected of having visual field defects who are being investigated for possible COAG (see tables 2 and 3 for recommended reassessment intervals). (1.4.3) | The original recommendation contained 2 separate instructions (1 for people with established COAG and those having initial investigation for possible COAG, and 1 for follow-up of people with an established diagnosis of suspected COAG or OHT). These 2 instructions have now been separated into 2 recommendations to improve clarity. |
| Offer standard automated perimetry (central thresholding test) to all people who have established COAG and those | When clinically indicated, repeat visual field testing using either a central thresholding test or a supra-threshold test | As above, the original recommendation contained 2 separate instructions (1 for |

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| 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). (1.2.5) | for people with OHT and those suspected of having COAG whose visual fields have previously been documented by standard automated perimetry as being normal (see tables 1 and 2 for recommended reassessment intervals). (1.4.4) | people with established COAG and those having initial investigation for possible COAG, and 1 for follow-up of people with an established diagnosis of suspected COAG or OHT). These 2 instructions have now been separated into 2 recommendations to improve clarity.<br>The original recommendation was suggesting that for people with OHT and COAG suspects with normal visual fields, it would be acceptable to use the supra-threshold test as opposed to the superior central thresholding test (CTT) recommended for those with established COAG. However the committee wished to clarify that the CTT is also an option for this population if |

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| | | it is clinically available. |
| 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. (1.3.5) | Offer a drug from another therapeutic class (beta-blocker, carbonic anhydrase inhibitor or sympathomimetic) to people with an IOP of 24 mmHg or more whose current treatment is not reducing IOP sufficiently to prevent the risk of progression to sight loss. Topical drugs from different therapeutic classes may be needed at the same time to control IOP. (1.5.6) | Clarification that the drug should be from another therapeutic class when switching to another monotherapy and when adding another drug. This clarification was considered important because committee members were aware of inappropriate switching through multiple examples of drugs from the same class (for example, multiple PGA switches). |
| 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). (1.3.7) | Offer preservative-free eye drops to people who have an allergy to preservatives or people with clinically significant and symptomatic ocular surface disease, but only if they are at high risk of conversion to COAG. (1.5.8) | High risk of conversion is no longer defined in the guideline by IOP and CCT so these parameters have been removed from the recommendation. Treatment adherence may be significantly affected by both allergic and non-allergic reactions |

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| | | (preservative toxicity). Preservative toxicity is a particular problem for people with ocular surface diseases so this group was added to the recommendation. |
| Offer people with advanced COAG surgery with pharmacological augmentation (MMC or 5-FU) as indicated. Offer them information on the risks and benefits associated with surgery. (1.4.3) | Offer people with advanced COAG, surgery with pharmacological augmentation (MMC) as indicated. Offer them information on the risks and benefits associated with surgery. (1.5.13) | 5FU is no longer used as standard practice during surgical treatment and postoperative care. |
| Offer people who present with advanced COAG and who are listed for surgery interim treatment with a prostaglandin analogue. (1.4.4) | Offer people who present with advanced COAG and who are listed for surgery, interim treatment with a PGA prescribed generically. (1.5.14) | Generic PGAs are now recommended in the guideline for first-line treatment. |
| 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 | Ask about adherence to treatment and check the eye drop instillation technique in people with COAG whose IOP has not been reduced sufficiently to prevent the risk of progression to sight | Clarification that the drug should be from another therapeutic class when switching to another monotherapy and when adding another drug. 5FU is no longer |

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| loss despite pharmacological treatment. If adherence and eye drop instillation technique are satisfactory offer one of the following:<br>• 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<br>• laser trabeculoplasty<br>• surgery with pharmacological augmentation (MMC or 5-FU) as indicated.<br>If the pharmacological treatment option is chosen, after trying two alternative pharmacological treatments consider offering surgery with pharmacological augmentation (MMC or 5-FU) as indicated | loss despite pharmacological treatment. If adherence and eye drop instillation technique are satisfactory offer 1 of the following:<br>• a drug from another therapeutic class (a beta-blocker, carbonic anhydrase inhibitor or sympathomimetic); topical drugs from different therapeutic classes may be needed at the same time to control IOP<br>• laser trabeculoplasty<br>• surgery with pharmacological augmentation (MMC) as indicated.<br>If the drug treatment option is chosen, after trying drugs from 2 therapeutic classes, consider offering surgery with pharmacological augmentation (MMC) as indicated or laser | used as standard practice during surgical treatment and postoperative care. |

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| or laser trabeculoplasty. (1.4.6) | trabeculoplasty. (1.5.16) | |
| Offer surgery with pharmacological augmentation (MMC or 5-FU) 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. (1.4.7) | Offer surgery with pharmacological augmentation (MMC) 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. (1.5.17) | 5FU is no longer used as standard practice during surgical treatment and postoperative care. |
| Consider offering people with COAG who are intolerant to a prescribed medication:<br>• alternative pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic) or<br>• a preservative-free preparation if there is evidence that the person is allergic to the preservative.<br>After trying two alternative pharmacological | Consider offering people with COAG who cannot tolerate a treatment:<br>• a drug from another therapeutic class (a beta-blocker, carbonic anhydrase inhibitor or sympathomimetic) or<br>• preservative-free eye drops if there is evidence that the person is allergic to the preservative or has clinically significant and symptomatic ocular surface disease | Clarification that the drug should be from another therapeutic class when switching to another monotherapy. Treatment adherence may be significantly affected by both allergic and non-allergic reactions (preservative toxicity). Preservative toxicity is a particular problem for people with ocular surface diseases so this group was added to the recommendation. |

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| treatments consider offering surgery with pharmacological augmentation (MMC or 5-FU) as indicated or laser trabeculoplasty. (1.4.8) | After trying drugs from 2 therapeutic classes, consider offering surgery with pharmacological augmentation (MMC) as indicated or laser trabeculoplasty. (1.5.18) | 5FU is no longer used as standard practice during surgical treatment and postoperative care. |
| 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:<br>• pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic); more than one agent may be needed concurrently to achieve target IOP<br>• further surgery<br>• laser trabeculoplasty or cyclodiode laser treatment. (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 1 of the following:<br>• pharmacological treatment; topical drugs from different therapeutic classes may be needed at the same time to control IOP<br>• further surgery<br>• laser trabeculoplasty or cyclodiode laser treatment. (1.5.19) | Clarification that the drug should be from another therapeutic class when switching to another monotherapy and when adding another drug. |
| Offer people with COAG who prefer not to have surgery or | Offer people with COAG who prefer not to have surgery or for | Clarification that the drug should be from another therapeutic class |

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| who are not suitable for surgery:<br>• pharmacological treatment (a prostaglandin analogue, beta-blocker, carbonic anhydrase inhibitor or sympathomimetic); more than one agent may be needed concurrently to achieve target IOP<br>• laser trabeculoplasty or cyclodiode laser treatment.<br>(1.4.10) | whom surgery is not suitable:<br>• pharmacological treatment; topical drugs from different therapeutic classes may be needed at the same time to control IOP<br>• laser trabeculoplasty or cyclodiode laser treatment. (1.5.20) | when switching to another monotherapy and when adding another drug. |
| 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:<br>• their specific condition (OHT, suspected COAG and COAG), its life-long implications and | Offer people the opportunity to discuss their diagnosis, referral, prognosis, treatment and discharge, and provide them with relevant information in an accessible format at initial and subsequent visits. This may include information on the following:<br>• their specific condition (OHT, suspected COAG and COAG), its life-long implications and | Amended to indicate that people should have the opportunity to discuss referral, and discharge, and that patient information should also include:<br>• reassurance that most people having treatment for COAG will have a good quality of life<br>• reference to the eye clinic |

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| their prognosis for retention of sight<br>• that COAG in the early stages and OHT and suspected COAG are symptomless<br>• that most people treated for COAG will not go blind<br>• that once lost, sight cannot be recovered<br>• that glaucoma can run in families and that family members may wish to be tested for the disease<br>• the importance of the person's role in their own treatment – for example, the ongoing regular application of eye drops to preserve sight<br>• 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 | their prognosis for retention of sight<br>• that COAG in the early stages and OHT and suspected COAG are symptomless<br>• that most people having treatment for COAG will have good quality of life and not go blind<br>• that once lost, sight cannot be recovered<br>• that glaucoma can run in families and that family members may wish to be tested for the condition<br>• the importance of the person's role in their own treatment – for example, the ongoing regular application of eye drops to preserve sight<br>• the different types of treatment options, including mode of action, frequency and severity of side effects, and risks and benefits of treatment, so that | liaison officer (ECLO) as these now available in many clinics<br>• reference to support organisations. |

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| decision-making process<br>• how to apply eye drops, including technique (punctal occlusion and devices) and hygiene (storage)<br>• the need for regular monitoring as specified by the healthcare professional<br>• methods of investigation during assessment<br>• 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)<br>• support groups<br>• compliance aids (such as dispensers) available from their GP or community pharmacist<br>• Letter of Vision Impairment (LVI), Referral of Vision Impairment (RVI) and Certificate of | people are able to take an active part in decision-making<br>• how to apply eye drops, including technique (punctal occlusion and devices) and hygiene (storage)<br>• the need for regular monitoring as specified by the healthcare professional<br>• methods of investigation during assessment<br>• 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)<br>• the eye clinic liaison officer (ECLO)<br>• support organisations and support groups<br>• compliance aids (such as dispensers) available from their GP or | |

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| Vision Impairment (CVI) registration<br>• Driver and Vehicle Licensing Agency (DVLA) regulations. (1.6.1) | community pharmacist<br>• Letter of Vision Impairment (LVI), Referral of Vision Impairment (RVI) and Certificate of Vision Impairment (CVI), registration<br>• Driver and Vehicle Licensing Agency (DVLA) regulations. (1.7.1) | |

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