



Effective Health Care Program

Treatment for Glaucoma: Comparative Effectiveness Executive Summary

Background

Glaucoma is a leading cause of visual impairment and blindness both in the United States and worldwide. It is estimated to affect 60.5 million people worldwide.¹ Glaucoma is defined as an acquired disease of the optic nerve (neuropathy) characterized by specific changes of the optic nerve and by visual field defects that correspond to the areas of optic nerve structural damage. Depending on whether the optic nerve damage is associated with an open or closed appearance to the drainage channels for aqueous humor in the front of the eye, the glaucoma is referred to as open angle (the subject of this report) or closed angle.

Mild glaucoma damage to the optic nerve may be asymptomatic, but as the damage worsens, the patient begins to have difficulty with peripheral vision, contrast sensitivity, glare, and moving from light to dark and dark to light. These symptoms of visual impairment may affect activities of daily living and quality of life. In its most severe form, glaucoma results in total irreversible blindness.

Although deficient blood supply to the optic nerve, inadequate structural support for the neurons that make up the optic nerve, and insufficient supplies of

Effective Health Care Program

The Effective Health Care Program was initiated in 2005 to provide valid evidence about the comparative effectiveness of different medical interventions. The object is to help consumers, health care providers, and others in making informed choices among treatment alternatives. Through its Comparative Effectiveness Reviews, the program supports systematic appraisals of existing scientific evidence regarding treatments for high-priority health conditions. It also promotes and generates new scientific evidence by identifying gaps in existing scientific evidence and supporting new research. The program puts special emphasis on translating findings into a variety of useful formats for different stakeholders, including consumers.

The full report and this summary are available at www.effectivehealthcare.ahrq.gov/reports/final.cfm.

neurotrophins needed to maintain the health of the optic nerve have been hypothesized as risk factors for glaucoma, experimental models and other evidence from human participants have shown that



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elevated intraocular pressure (IOP) results in damage to the optic nerve in a pattern characteristic of glaucoma.² Furthermore, studies have demonstrated correlations between the level of IOP and the risk of having glaucoma, as well as the worsening of glaucoma once present. Other studies have demonstrated that lowering IOP, even from “normal levels,” reduces both the incidence of glaucoma in individuals who do not have glaucoma damage but are at high risk for its development and the rate of progression of glaucoma in individuals with established glaucoma.³⁻⁵ For these reasons, as well as the fact that IOP is the only known modifiable risk factor for glaucoma, the treatments for glaucoma today all center on the reduction of IOP, which secondarily prevents the worsening of visual field loss. Treatments that lower IOP may therefore prevent visual impairment and blindness.

Definitions

The following terms related to glaucoma are used throughout this report:

Glaucoma: An optic neuropathy associated with progressive death of retinal ganglion cells and their axons, and associated visual field loss. The characteristic changes of the optic nerve head that distinguish glaucoma from other optic neuropathies include excavation and undermining of the neural and connective tissues.

Primary open-angle glaucoma (also chronic open-angle glaucoma): Glaucoma in the setting of an eye with a visibly open anterior chamber angle (between the iris and anterior sclera/peripheral cornea) and no other ocular or systemic disorder that might result in glaucoma.

Secondary open-angle glaucoma: Glaucoma in the setting of an eye with a visibly open anterior chamber angle (between the iris and anterior sclera/peripheral cornea) and some other ocular or systemic disorder that can result in glaucoma. Examples of secondary open-angle glaucomas include pigment dispersion syndrome, pseudoexfoliation syndrome, and steroid-induced glaucoma.

Glaucoma suspect: A nonspecific term describing someone at higher than average risk of having or developing glaucoma. In the case of open-angle glaucoma, this risk may be increased due to elevated intraocular pressure (ocular hypertension), an optic nerve with an appearance consistent with the structural changes caused by glaucoma, a significant family history of the disease, or a racial background known to confer higher rates of glaucoma. It is currently possible to estimate the risk

of future glaucoma only in some patients in the ocular hypertensive group.

Treatments for Open-Angle Glaucoma

Medical, laser, and incisional surgical treatments are used to treat glaucoma. The most common currently used medical treatment includes several classes of eye drops, including prostaglandin analogs, beta-adrenergic antagonists, oral and topical carbonic anhydrase inhibitors, and alpha-adrenergic agonists. Laser trabeculoplasty is an office-based procedure that lowers the IOP by increasing the outflow of aqueous humor from the eye. Incisional surgery to lower the IOP comprises procedures that have been performed for decades, such as trabeculectomy and aqueous drainage device surgery, as well as a host of newer procedures, such as nonpenetrating deep sclerectomy, canaloplasty, endoscopic cyclophotocoagulation, and alternative methods of trabecular bypass.

Definitions of laser and incisional treatments follow.

Laser trabeculoplasty: A procedure in which laser energy (argon, YAG, diode) is applied to the trabecular meshwork in an effort to reduce the resistance to outflow for aqueous humor. The procedure is performed as part of an office visit and requires topical anesthesia and a mirrored contact lens.

Trabeculectomy: The most commonly performed incisional surgery for lowering intraocular pressure in glaucoma patients. Under local anesthesia, a passageway is created at the limbus (junction between the cornea and sclera) that allows the aqueous humor to flow from the anterior chamber to the space between the sclera and the conjunctiva, thereby lowering the intraocular pressure. The hallmark of a trabeculectomy is the fluid-filled bleb (blister) present on the surface of the eye underneath the upper eyelid.

Trabeculectomy: An incisional surgery procedure generally used to lower intraocular pressure in glaucoma affecting infants and children. A metal probe or a suture is passed into Schlemm’s canal, a structure into which aqueous humor passes as it exits the eye. The probe is used to disrupt tissue that is typically impeding outflow of aqueous humor from the eye, thereby increasing outflow and decreasing the intraocular pressure. Some surgeons also use trabeculectomy in the treatment of glaucoma in adults.

Aqueous drainage devices: Any of a number of plastic implants used in the surgical management of glaucoma with the aim of lowering the intraocular pressure.

All devices consist of a tube that is inserted into the eye and a plate connected to the tube that is sewn to the sclera and covered by conjunctiva. Aqueous humor moves through the tube and out of the eye to drain on top of the plate into the space between the plate and the conjunctiva.

Cyclophotocoagulation: A procedure in which laser energy is used to damage the ciliary processes, reducing the amount of aqueous humor that they produce and thereby lowering the intraocular pressure. The procedure can be performed through the sclera (external cyclophotocoagulation) or from the inside of the eye (endocyclophotocoagulation).

Deep sclerectomy: A procedure in which the surgeon makes an opening in the conjunctiva to expose the sclera. The surgeon dissects a partial-thickness flap about 5 mm in width to about one-third depth in the sclera at the limbus. A second flap is dissected below this flap in order to leave a very thin layer of tissue and to expose Schlemm's canal. This underlying flap of scleral tissue is removed, and the surgeon grasps the roof of Schlemm's canal and removes a strip that is about 3 mm in length. Aqueous humor is able to permeate the remaining tissue without a full-thickness hole being necessary. The external flap is then sutured in its original position and the conjunctiva is sewn back in place.

Viscocanalostomy: A surgical procedure that is the same as for deep sclerectomy (see above) but also includes viscoelastic injected into Schlemm's canal in a circumferential fashion in an effort to dilate Schlemm's canal. The external flap is then sutured in its original position and the conjunctiva is sewn back in place.

Canaloplasty: A procedure that begins with a combined deep sclerectomy and viscocanalostomy procedure (see above), after which a microcatheter with an illuminated tip is passed through Schlemm's canal for 360 degrees. A 10-0 Prolene suture is tied to the catheter and threaded around Schlemm's canal for 360 degrees. The two ends of this suture are tied under tension in an effort to expand Schlemm's canal. The external flap is then sutured in its original position and the conjunctiva is put back in place.

Trabectome™: A procedure in which the surgeon makes a 1.7 mm incision through the peripheral cornea and injects viscoelastic into the anterior chamber. The Trabectome device is then introduced into the anterior chamber and, under visualization using direct gonioscopy with an operating microscope, the Trabectome is used to ablate about one quadrant of trabecular tissue. The Trabectome uses low-energy electrical pulses to vaporize the trabecular

tissue, and aspiration is used to remove it. The viscoelastic is removed and the corneal wound is sutured closed.

iStent™: A device placed into Schlemm's canal. The Glaukos Trabecular Micro-Bypass Stent (iStent) is made of nonferromagnetic titanium. One end sits in the anterior chamber and the posterior end sits in Schlemm's canal, allowing fluid to bypass the trabecular meshwork. The device is inserted under direct visualization (using direct gonioscopy) through a 3 mm temporal clear corneal incision. After viscoelastic is placed in the anterior chamber, the applicator is passed through the incision and the device is anchored into Schlemm's canal in the nasal angle. Viscoelastic is removed with irrigation and aspiration.

Gold shunt: A device that connects the anterior chamber to the suprachoroidal space. The SOLX™ Gold Shunt is a 24-karat gold rectangle (3.2 x 5.2 mm). There are two plates with grooves in them to allow flow from the higher pressure anterior chamber to the lower pressure suprachoroidal space. The conjunctiva is disinserted at the limbus, and a full-thickness scleral incision is created 2 mm posterior to the limbus. A crescent blade is used at 90 percent scleral depth to direct the anterior portion of the shunt to the anterior chamber and to cut posteriorly 2 to 3 mm to direct the posterior segment into the suprachoroidal space. The scleral incision is closed with 10-0 nylon sutures and the conjunctiva is closed.

Methods

Topic Development

The Agency for Healthcare Research and Quality (AHRQ) requested the formulation and refinement of the Comparative Effectiveness Review topic Effectiveness of Screening and Treatment for Glaucoma.

In consultation with AHRQ, we identified a small group of stakeholders to serve as members of a Key Informant group. The Key Informant group helped shape Key Questions (KQs) relevant to the topic by providing input regarding the populations and clinical subgroups, interventions, and outcomes of interest to clinicians, policymakers, payers, and consumers.

We incorporated the Key Informants' feedback into a draft of the KQs, analytic framework, and inclusion criteria, which was posted to the AHRQ Web site for public comment from April 22 to May 20, 2010. KQs and inclusion criteria were finalized after consideration of the public comments received.

A Technical Expert Panel (TEP) was selected to provide broad expertise and perspectives specific to the topic under development. The TEP reviewed a protocol outlining a proposed methodological approach for the completion of the Comparative Effectiveness Review, provided information to the investigators to aid in the refinement of the inclusion criteria and literature search strategies, and recommended approaches to specific issues, as requested. The final protocol, titled Comparative Effectiveness of Treatment for Open-Angle Glaucoma, was posted to the AHRQ Web site on November 16, 2010.

Analytic Framework

The analytic framework derived from the topic development phase (Figure A) is a modified version of a larger framework depicting the impact of both screening and treatment for open-angle glaucoma. The following KQs are represented in the framework.

KQ 1: Do medical, laser, and other surgical treatments for open-angle glaucoma reduce visual impairment?

KQ 2: Does treatment of open-angle glaucoma improve patient-reported outcomes?

KQ 3: Do medical, laser, and other surgical treatments for open-angle glaucoma lower intraocular pressure?

KQ 4: Do medical, laser, and other surgical treatments for open-angle glaucoma prevent or slow the progression of optic nerve damage and visual field loss?

KQ 5: Does lowering intraocular pressure or preventing or slowing the progression of optic nerve damage and visual field loss reduce visual impairment and change vision-related quality of life?

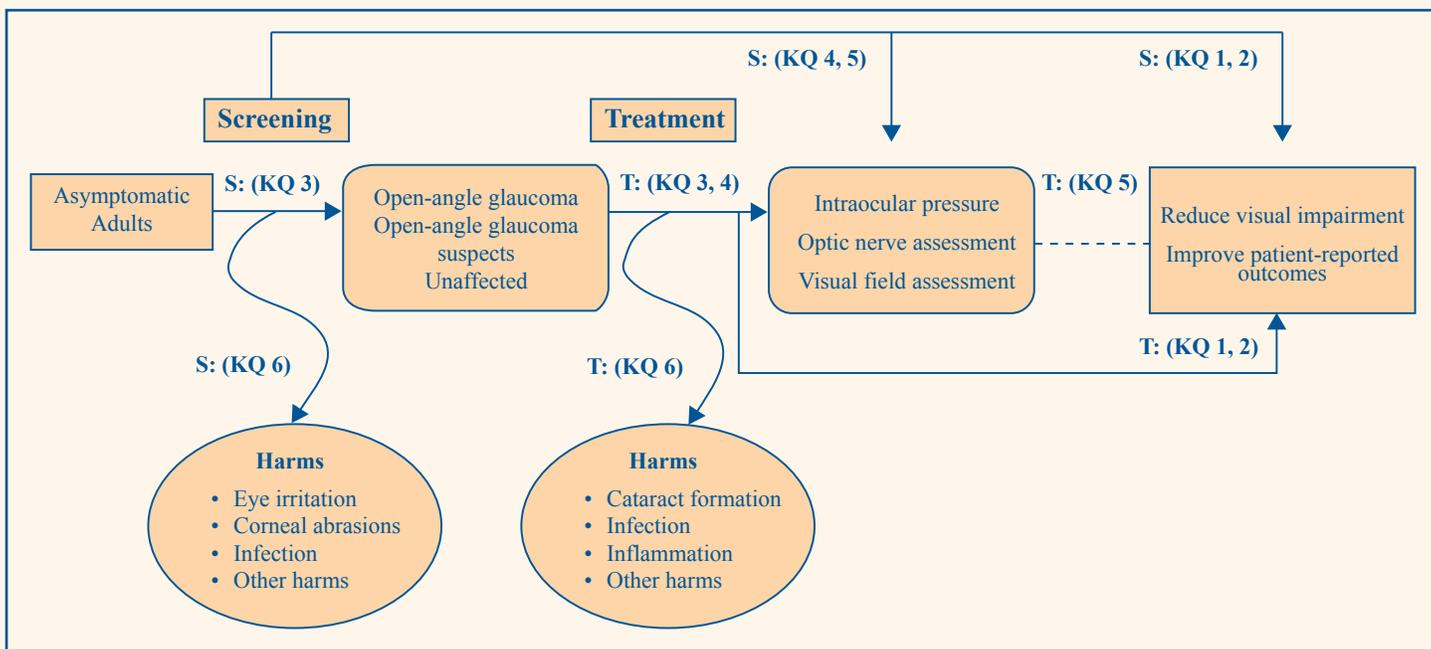
KQ 6: What are the harms associated with medical, laser, and other surgical treatments for open-angle glaucoma?

Search Strategy

To identify evidence relevant to the KQs in the analytic framework, we searched the following databases for primary studies: MEDLINE®, Embase, LILACS (Latin American and Caribbean Literature on Health Sciences), and CENTRAL (the Cochrane Central Register of Controlled Trials). We developed a search strategy for MEDLINE, accessed via PubMed, based on an analysis of the medical subject heading (MeSH) terms and text words of key articles identified a priori and adapted this search strategy for searches of Embase (using Emtree terms) and CENTRAL. We searched the literature without imposed language, sample size, or date restrictions, but excluded non-English-language studies at the time of full-text review. We searched relevant systematic reviews to identify any additional eligible articles. The search was last completed October 6, 2011.

We also conducted a search in MEDLINE and CENTRAL for systematic reviews that addressed the KQs of interest. For MEDLINE, the search included the topic strategy as noted above combined with the term

Figure A. Analytic framework for screening and treatment of open-angle glaucoma



KQ = Key Question; S = Key Questions for the Comparative Effectiveness of Screening for Glaucoma; T = Key Questions for the Comparative Effectiveness of Treatment for Glaucoma

“AND systematic[sb]” and was limited to systematic reviews published from 2009 to 2011. The search for systematic reviews was conducted on March 2, 2011. We screened an existing database of eye and vision systematic reviews to identify relevant open-angle glaucoma systematic reviews published prior to 2009.⁶

Study Inclusion Criteria

We included randomized controlled trials and quasi-randomized controlled trials of medical, laser, and incisional surgical treatments for open-angle glaucoma for inclusion as primary studies for KQs 1, 2, 3, and 4. For KQs 5 and 6, we included observational study designs, cohort studies, and case-control studies, in addition to randomized and quasi-randomized controlled trials.

We included studies of participants with primary open-angle glaucoma or open-angle glaucoma suspects. The definition of “glaucoma suspect” is not standardized, so any group in a study with this label was included. Other specific conditions that were considered to be open-angle glaucoma were low/normal tension glaucoma, pseudoexfoliation, pigmentary glaucoma, and steroid-responsive glaucoma. In keeping with the usual clinical distinction between adult and juvenile glaucomas, only studies with participants aged 40 years and older were considered. We specifically excluded the following conditions: juvenile/congenital glaucoma, traumatic glaucoma, neovascular glaucoma, refractory glaucoma, and inflammatory glaucoma.

We excluded studies that enrolled participants with conditions other than open-angle glaucoma if they did not also analyze the open-angle glaucoma subgroup separately. We also excluded case series of less than 100 subjects, as such small sample sizes are unable to capture rates of harms of less than a few percent.

There were no limitations based on stage or severity of disease, disease etiology, comorbid ocular or other medical conditions, geographic location, or demographic characteristics (e.g., gender, race/ethnicity).

Interventions

We first identified treatments currently used for open-angle glaucoma and then included studies of medical (eye drops and systemic treatment), laser, and incisional surgery. The most commonly used topical medical interventions include prostaglandin analogs, beta-adrenergic blockers, alpha-adrenergic agonists, and carbonic anhydrase inhibitors. We also included the currently available combination drops (timolol-brimonidine and timolol-dorzolamide).

Drugs no longer in use or not approved by the U.S. Food and Drug Administration were specifically excluded.

Studies of the impact of medical intervention on circadian intraocular pressure were included if outcomes were assessed over a 24-hour period and participants were admitted to a hospital, sleep laboratory, or other facility overnight.

In terms of office-based laser treatments for open-angle glaucoma, we included studies of laser trabeculoplasty without regard to the technology used (argon, diode, YAG).

We also searched for studies evaluating the currently used incisional surgeries: trabeculectomy, aqueous drainage devices, deep sclerectomy, and viscocanalostomy. Because of surgeons’ desire to find a more predictable procedure for lowering intraocular pressure, there has been a proliferation of new specialized devices intended to treat open-angle glaucoma. To assess the evidence for or against their use, studies of the iScience microcatheter, the Trabectome, the ExPRESS shunt, the Glaukos iStent, and the SOLX Gold Shunt were included.

Because glaucoma frequently is managed simultaneously with cataract, we included studies of combined cataract and glaucoma surgical procedures published after April 2000. Studies published prior to this period are summarized in the AHRQ report titled *Surgical Treatment of Coexisting Cataract and Glaucoma*.⁷

Article Screening and Abstraction

We screened potentially relevant citations (primary studies and systematic reviews) using the Web-based systematic review software DistillerSR (<http://systematic-review.net/>). Citations identified by the search strategies were uploaded to DistillerSR before two reviewers independently assessed titles and abstracts according to the inclusion criteria. We classified the titles and abstracts as “include,” “exclude,” or “unsure.” Disagreements about eligibility were resolved through discussion among reviewers.

Citations tagged as “unsure” by both reviewers, “unsure” by one reviewer and “include” by the other, or “include” by both reviewers were carried forward to full-text screening. Two reviewers independently applied the same inclusion criteria as used during abstract screening. Non-English-language articles were removed from further consideration at this stage. We resolved any disagreements regarding inclusion through discussion or, as needed, adjudicated unresolved conflicts during a team meeting.

Data abstraction forms were designed and pilot tested. For studies included at the full-text stage, one reviewer extracted descriptions of the study, including details about the population, intervention(s), and outcomes of interest, using the systematic review software DistillerSR. A second reviewer verified the data. We again resolved disagreements through discussion.

Comparators

KQs 1, 2, 3, 4, and 6 explored comparisons of medical, laser, and incisional surgical treatments for open-angle glaucoma with each other (e.g., medical vs. laser, medical vs. medical) or with no treatment (placebo). For KQs 1, 2, 3, 4, and 6, we also included studies in which the intervention was a laser or incisional surgical treatment for glaucoma but the comparator was a combined or staged procedure for cataract and glaucoma (glaucoma surgical treatments combined or staged with phacoemulsification or extracapsular cataract extraction).

Outcomes

For KQ 1, the outcome is the proportion of participants with moderate, severe, and profound visual impairment as defined in the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM).⁸ The ICD-9 criteria define moderate visual impairment as best corrected visual acuity of between 20/70 and 20/160, severe visual impairment as acuity between 20/200 and 20/400 or a visual field of 20 degrees or less, and profound visual impairment as an acuity of 10/500 to 20/1,000 or no more than 10 degrees of visual field. We also planned to consider any other nonstandard measurements of visual impairment as defined by included studies. We included visual acuity outcomes among the treatment groups of interest (Early Treatment of Diabetic Retinopathy Study or Snellen) as reported in included studies (e.g., mean visual acuity or proportion of participants in prespecified visual acuity categories).

KQ 2 deals with patient-reported outcomes, so we considered participants' mean total or relevant item/subscale scores as measured by any validated questionnaire (e.g., National Eye Institute Visual Function Questionnaire [NEI-VFQ]). To be considered, an instrument had to address the primary outcome of vision-related quality of life (primary outcome) or the secondary outcomes of treatment convenience, patient satisfaction, patient preference or utility, or adherence with medication.

KQ 3 addresses the ability of treatment to lower intraocular pressure. As standard outcomes, we included

the proportion of participants with intraocular pressure measurements at the prespecified levels of ≤ 18 mmHg or ≥ 20 -percent decrease in intraocular pressure from baseline levels. Since the analysis of intraocular pressure may vary appreciably by trial, we planned to consider other intraocular pressure outcomes as reported in included studies.

To assess the ability of treatments to reduce either visual field loss or optic nerve structural damage (KQ 4), we used two standard outcomes: the proportion of participants with progressive optic nerve damage as defined by included studies and as observed via fundus photography or other imaging of the posterior pole, and the proportion of participants with progression of visual field loss as defined by the Early Manifest Glaucoma Trial and as measured via automated threshold perimetry.⁹ We also planned to consider other assessments of visual field loss as defined by included studies.

KQ 5 explores the association between (1) lowering intraocular pressure or (2) preventing or slowing the progression of optic nerve damage and visual field loss (intermediate outcomes of treatment) and final health outcomes (reduced visual impairment and improved vision-related quality of life) among the populations of interest. The outcomes for KQ 5 were therefore the same as those described above for KQs 1, 2, 3, and 4.

Finally, we compared the proportion of participants experiencing the following adverse events among the treatment groups of interest:

Potentially serious:

- Cataract formation (visually significant cataract requiring surgery or report of cataract surgery)
- Low intraocular pressure (hypotony)
- Decreased visual acuity
- Infection (e.g., blebitis, endophthalmitis)
- Inflammation
- Strabismus
- Peripheral anterior synechiae
- Retinal tear and detachment
- Systemic allergic reaction
- Loss of an eye
- Need for additional surgery
- Hyphema
- Transient decrease in central vision

- Systemic side effects
- Choroidal detachment, effusion, hemorrhage
- Cardiac arrhythmia
- Death

Less likely to be serious:

- Eye irritation
- Eye watering
- Eye redness
- Patient discomfort
- Ocular surface disease
- Other patient complaint
- Skin discoloration
- Conjunctival injection
- Iris color change
- Punctal stenosis
- Conjunctival foreshortening

We assessed medical treatment outcomes at a minimum of 1 month postintervention. We included outcomes reported at 6 months (2–9 months) and 1 year (10–18 months) as reported in included studies. The exception was circadian medical treatment studies in which the investigators reported outcomes assessed over a 24-hour period. For studies of surgical interventions, we assessed outcomes at a minimum of 1 year (10–18 months) and at annual intervals thereafter as reported in included studies.

Risk-of-Bias Assessment

We used the Cochrane Collaboration’s tool for assessing the risk of bias of randomized and quasi-randomized trials.¹⁰ Two reviewers assessed the included studies for sources of systematic bias according to the guidelines in Chapter 8 of the Cochrane Handbook for Systematic Reviews of Interventions and evaluated the studies for the following criteria: sequence generation and allocation concealment (selection bias); masking of participants, study investigators, and outcome assessors (detection bias); incomplete outcome data (attrition bias); selective outcome reporting (reporting bias); and other sources of bias. Masking of investigators and participants was not possible with some of the interventions examined but was noted when mentioned. We reported judgments for each criterion as “low risk of bias,” “high risk of bias,” or “unclear risk of bias (information is insufficient to assess).” The two reviewers resolved disagreements through discussion.

Two reviewers assessed the methodological rigor of observational studies using a modified version of the Newcastle Ottawa Scale.¹¹ The Newcastle Ottawa Scale includes domains to assess the quality of study group selection (representativeness, selection, case definitions); comparability of cohorts/cases and controls on the basis of the design or analysis; and ascertainment of exposures or outcomes, adequacy of followup, nonresponse rate, and financial or other conflicts of interest. Each item query required a “yes,” “no,” or “unable to determine/not reported” response. In addition, reviewers provided an overall assessment of the quality of each study as “good,” “fair,” or “poor” using the reporting bias, selection bias, and confounding domains as a basis for the assessment.

We used a tool adapted by Li (2010) from the Critical Appraisal Skills Program, Assessment of Multiple Systematic Reviews (AMSTAR), and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to assess the methodological quality of systematic reviews.⁶ We used the following criteria, adapted from Li, to determine which systematic reviews were of sufficient quality to be considered for inclusion in this review: comprehensive search for primary studies (searches of more than one bibliographic database), risk-of-bias assessment, appropriate methods of analysis.

Rating the Evidence

We assessed the quantity, quality, and consistency of the body of available primary study evidence addressing KQs 1 through 6. We used an evidence grading scheme recommended by the GRADE (Grading of Recommendations Assessment, Development and Evaluation) Working Group, adapted by AHRQ in the Methods Guide for Effectiveness and Comparative Effectiveness Reviews (www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=328) and published in the Journal of Clinical Epidemiology.^{12,13}

Although we included systematic reviews that addressed our KQs and considered systematic reviews as the highest level of evidence for addressing questions of therapy, we were unable to adapt the evidence grading scheme to incorporate evidence from systematic reviews. We assessed the quality and consistency of the best available primary study evidence, including assessment of the risk of bias in relevant studies, as well as aspects of consistency, directness, and precision as described in the Methods Guide for Effectiveness and Comparative Effectiveness Reviews and by Owens et al. (2010).^{12,13}

For each outcome of interest, two reviewers graded the major outcomes for each KQ and then the entire team discussed their recommendations and reached consensus.

Data Synthesis

When we identified existing systematic reviews of sufficient quality (based on the criteria outlined in Rating the Evidence) that addressed the KQs, we cited these reviews as evidence and did not abstract and synthesize data from the studies incorporated in those reviews. We abstracted evidence from additional primary studies for interventions, comparisons, and outcomes that were not addressed by existing systematic reviews, and we searched for and summarized evidence from additional primary studies that were published or identified after the date of the last search conducted for the systematic review. We adapted the recommendations of Whitlock et al. (2008) for incorporating systematic reviews in complex reviews. They recommend providing a narrative summary of the review methods (i.e., inclusion/exclusion criteria, search strategy, statistical methodology) and findings (i.e., number of studies included, quantitative and qualitative results), and, in the instance of multiple reviews, providing an evaluation of the consistency across reviews that addressed the same KQ.¹⁴

Due to appreciable variability in interventions, followup intervals, or assessments of outcomes, we did not combine the results of primary studies in a meta-analysis and instead present a narrative summary. The plan for the analysis of primary studies, including the assessments of heterogeneity, reporting bias, measures of treatment effect, data synthesis, and subgroup analysis, was included in the protocol for this review.

Results

Our major findings are summarized by KQ. Table A provides a summary of the key points.

Medical Treatment of Open-Angle Glaucoma

KQ1a: Comparative Effectiveness of Medical Treatments for Reducing Visual Impairment

- No studies of medical therapy were identified that directly addressed outcomes related to visual impairment.
- The available studies addressing the secondary outcomes of change in visual acuity and change in visual field loss are of too short a duration to answer this question, given that glaucoma is typically a slowly

progressive disease that may take many years to cause clinically or statistically significant changes.

KQ3a: Comparative Effectiveness of Medical Treatments for Lowering Intraocular Pressure

- Prostaglandins lower IOP more than dorzolamide (carbonic anhydrase inhibitor, 2.64 mmHg, three trials), brimonidine (alpha-adrenergic agonist, 1.64 mmHg, four trials), and timolol (beta-adrenergic blocker, 5 percent lower at 6 months, four trials) (systematic review).
- The prostaglandins appear similar in the extent to which they lower IOP, but some studies have reported a greater drop in IOP with bimatoprost (prostaglandin) (systematic review).
- The combination dorzolamide/timolol appears to lower IOP the same amount as prostaglandins (systematic review).

Circadian Intraocular Pressure

- Our conclusions regarding the effect of topical therapies in lowering IOP over the 24-hour time period were limited due to the fact that one study provided almost all of the data.
- All topical medications reviewed appear to lower IOP throughout the 24-hour cycle.
- Prostaglandins appear to lower IOP more over the 24-hour cycle than beta-blockers, topical carbonic anhydrase inhibitors, and alpha agonists, but the evidence for this is weak.
- While the IOP-lowering effects of different prostaglandins appear to vary appreciably over the 24-hour time period, the results were inconsistent and the reported difference in the amount of IOP lowering was on the order of 1 mmHg.
- Results from systematic reviews comparing one prostaglandin with another were inconsistent.

KQ4a: Comparative Effectiveness of Medical Treatments for Preventing or Slowing the Progression of Optic Nerve Damage and Visual Field Loss

- A systematic review of medical treatment for glaucoma determined treatment to be protective against progressive visual field loss. This review included the results of both the Early Manifest Glaucoma Trial and the Ocular Hypertension Treatment Study.
- Other included primary studies were of insufficient size or duration to detect differences in the rates of optic

nerve damage or visual field loss. Given the slowly progressive nature of glaucoma, the large trials of glaucoma therapy have demonstrated the need to follow hundreds of participants for 5 or more years to detect change.

- A single study addressed the comparative effectiveness of glaucoma medications with respect to their ability to prevent optic nerve damage or visual field loss and found brimonidine superior to timolol.

KQ6a: Harms Associated With Medical Treatments for Open-Angle Glaucoma

- The prostaglandin agents produce more ocular redness than does timolol (beta-adrenergic blocker) (systematic review).
- Within the prostaglandins, latanoprost is least likely to cause redness (systematic review).
- Subjects on timolol (beta-blocker) were less likely to drop out of studies due to side effects than those on brimonidine (alpha-adrenergic agonist), latanoprost (prostaglandin analog), travoprost (prostaglandin analog), or betaxolol (beta-blocker) (systematic review).

Surgical Treatment of Open-Angle Glaucoma

KQ1b: Comparative Effectiveness of Laser and Other Surgical Treatments for Reducing Visual Impairment

- No studies reported on the outcome of visual impairment after laser or other surgical treatments.
- Visual acuity was not assessed as a primary outcome in any identified study comparing laser with other surgical treatments for glaucoma. Visual acuity was only irregularly reported, if at all.
- Given the limitations above, no treatment appeared to have a greater effect on visual acuity than any other treatment.

KQ3b: Comparative Effectiveness of Laser and Other Surgical Treatments for Lowering Intraocular Pressure

- Trabeculectomy lowers IOP more than nonpenetrating surgeries (systematic review).
- The use of mitomycin-C intraoperatively with trabeculectomy results in lower IOP than when it is not used (systematic review).
- Other alterations in surgical technique, location of surgery on the eye, and adjuvants other than

mitomycin-C have not been shown to result in an added pressure decrease (primary studies).

- The IOP-lowering effect of combined cataract surgery and trabeculectomy is not affected by the location of the conjunctival incision or the presence or absence of a peripheral iridectomy but may be more in two-site (cataract and trabeculectomy performed using different incisions) than one-site (cataract and trabeculectomy performed using the same incision) surgery (systematic review).
- Laser trabeculoplasty effectively lowers IOP in glaucoma patients, and effectiveness does not vary with the type of laser used (primary studies).
- The data available on the role of aqueous drainage devices in open-angle glaucoma are inadequate to draw conclusions (primary studies, systematic review).

KQ4b: Comparative Effectiveness of Laser and Other Surgical Treatments for Preventing or Slowing the Progression of Optic Nerve Damage and Visual Field Loss

- No studies comparing laser and surgical treatments were found that reported data on whether these procedures slow the progression of optic nerve damage and visual field loss.

KQ6b: Harms Associated With Laser and Other Surgical Treatments for Open-Angle Glaucoma

- Trabeculectomy results in more complications than nonpenetrating surgeries (systematic review).
- The profile of harms does not differ between one- and two-site combined cataract and glaucoma surgery (systematic review).

Medical Versus Surgical Treatment of Open-Angle Glaucoma

KQ1c: Comparative Effectiveness of Medical Versus Surgical Treatment for Reducing Visual Impairment

- Although trabeculectomy may reduce the risk of vision loss compared to medical treatment after adjusting for demographic and comorbid factors, the body of evidence is limited and inconclusive (systematic review).

KQ3c: Comparative Effectiveness of Medical Versus Surgical Treatment for Lowering Intraocular Pressure

- Incisional surgery lowers IOP more than lasers or medications (systematic review).

- Initial treatment with lasers tends to reduce the need for medications to achieve a given IOP (systematic review).

KQ4c: Comparative Effectiveness of Medical Versus Surgical Treatment for Preventing or Slowing the Progression of Optic Nerve Damage and Visual Field Loss

- Trabeculectomy may prevent more visual field loss than medicines when used as initial therapy in advanced glaucoma (systematic review).
- The Collaborative Initial Glaucoma Treatment Study (CIGTS) included current surgical techniques and medications, and found no difference in change in visual field (but did not report on change in the optic nerve).
- Treatment of ocular hypertension with medicines preserves visual fields better than no treatment (systematic review).

KQ6c: Harms Reported in Studies of Medical Versus Surgical Treatments for Open-Angle Glaucoma

- Trabeculectomy is associated with cataract worsening and an increased need for cataract surgery over time when compared to medical treatments for glaucoma (systematic review).
- Intraocular surgery rarely results in severe vision loss due to infection and/or bleeding. These risks are not associated with medical or laser treatments.
- Laser trabeculoplasty can produce peripheral anterior synechiae, whereas medical treatment does not (systematic review).

Additional KQs

KQ2: Improvement in Patient-Reported Outcomes With Treatment of Open-Angle Glaucoma

- There is no direct evidence regarding the impact of glaucoma treatment on patient-reported outcomes.
- Medical and surgical treatments reduce the patient's fear of blindness.
- Several studies suggest that the type of glaucoma treatment does not have an influence on quality of life.
- There is some evidence that, among medical treatments, patients prefer those that are less frequently applied.
- Since there are unlikely to be any future trials with a placebo arm, it will not be possible to determine

definitively if treatments improve patient-reported outcomes relative to no treatment. It will still be possible to compare the effectiveness of different treatments on patient-reported outcomes, however.

KQ5: Effect of Lowering IOP or Preventing or Slowing the Progression of Optic Nerve Damage and Visual Field Loss on Visual Impairment and Vision-Related Quality of Life

- We found no good-quality studies addressing the relationship between the intermediate outcomes of IOP reduction, prevention of optic nerve damage, or prevention of visual field loss and the outcomes of visual impairment and vision-related quality of life.

Future Research

The available evidence demonstrates definitively that intraocular pressure can be lowered by medications, laser treatments, and surgery. High-quality randomized controlled trials have also shown that reduction of intraocular pressure slows the development and progression of damage to the optic nerve and slows visual field loss. Although it is logical to presume that slowing glaucoma damage would lead to preservation of vision-related quality of life and reduction in visual impairment, this link has not been demonstrated in the research literature.

One specific area that would benefit from research is the association between treatment and visual impairment and/or patient-reported outcomes. One important reason such work has not yet been done is that the time from diagnosis to visual impairment in a treated glaucoma patient may be many years to decades. Nevertheless, such a link is important to establish.

Another general area that requires additional evidence is the relative risks and benefits of medical and surgical treatments for glaucoma. The number of studies that adequately compare two or more treatments over time is too small to draw any significant conclusions about the comparative effectiveness of most currently used therapies.

As a general comment on the available literature on glaucoma treatments, the field would benefit from more rigorous study design and more standardized reporting of outcomes. The World Glaucoma Association publication Guidelines on Design and Reporting of Glaucoma Surgical Trials should serve as a basis for all trials of new and existing treatments.¹⁵

Table A. Summary of outcomes, comparators, and main results by KQ

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ1	Visual impairment <ul style="list-style-type: none"> Visual acuity 	<u>Systematic Reviews</u> Medical: 0 Surgical: 2 Medical-surgical: 1	<u>Surgical Systematic Reviews</u> 1- vs. 2-site phacotrabeculectomy Endocyclophotocoagulation vs. Ahmed valve Molteno implant vs. no implant <u>Medical-Surgical Systematic Reviews</u> Medical treatment vs. surgical treatment	<ul style="list-style-type: none"> No statistically significant differences between surgical treatments. Although it appears that trabeculectomy may reduce the risk of vision loss, after adjusting for demographic and comorbid factors, the body of evidence is limited and inconclusive. 	<ul style="list-style-type: none"> Medical studies: Insufficient Surgical studies: Low
		<u>Primary Studies</u> Medical: 11 Surgical: 4 Medical-surgical: 0	<u>Medical RCTs</u> Timolol vs. brimonidine vs. travoprost Timolol vs. carteolol Timolol vs. levobunolol Levobunolol vs. betaxolol Levobunolol vs. untreated Crossover: Dorzolamide + timolol, travoprost vs. latanoprost Laser vs. medical <u>Surgical RCTs</u> Trabeculectomy vs. Ex-press shunt Trabeculectomy vs. NPDS with hyaluronic acid implant NPDS +/- MMC NPDS +/- collagen implant	<ul style="list-style-type: none"> No studies reported on visual impairment as main outcome. Studies addressing secondary outcomes are too short to answer this question. None of the studies identified were of sufficient duration or size to identify outcomes that could be related to visual impairment due to glaucoma, which is most often a slowly progressing disease. 	
				<ul style="list-style-type: none"> No studies reported on visual impairment after laser or other surgical treatments. We could not determine whether individual patients sustained a clinically important decrease in visual acuity, because in all our identified studies comparing laser and other surgical treatments for glaucoma, visual acuity outcomes were reported as a mean value and not assessed as a primary outcome. 	
				<ul style="list-style-type: none"> No single treatment appeared to have a greater effect on visual acuity than any other treatment. 	

Table A. Summary of outcomes, comparators, and main results by KQ (continued)

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ2	<p>Patient-reported outcomes:</p> <ul style="list-style-type: none"> Quality of life Fear of blindness Patient preference Patient satisfaction 	<p><u>Systematic Reviews</u> Medical: 0 Surgical: 0 Medical-surgical: 2</p> <p><u>Primary Studies</u> Medical: 4 Surgical: 0 Medical-surgical: 2</p>	<p><u>Medical-Surgical Systematic Reviews</u> Laser vs. medical</p> <p><u>Medical RCTs</u> Brimonidine vs. timolol Timolol + dorzolamide vs. timolol + brimonidine Timolol + dorzolamide vs. latanoprost Timolol gel vs. timolol solution</p> <p><u>Medical-Surgical RCTs</u> Trabeculectomy +/- 5FU vs. beta-blockers Betaxolol + ALT vs. no treatment</p>	<ul style="list-style-type: none"> No analyzed separately from primary reviews. There is no evidence that treatment of glaucoma improves patient-reported outcomes. There is little evidence that the treatments themselves influence patient QOL. The type of treatment does not have an influence on QOL. Among medical treatments, patients prefer the treatment that is less frequently applied. One high-quality RCT shows that glaucoma treatment reduces fear of blindness regardless of the type of treatment. 	<ul style="list-style-type: none"> For all outcomes: Insufficient
KQ3	<ul style="list-style-type: none"> Reduction of intraocular pressure 	<p><u>Systematic Reviews</u> Medical: 9 Circadian IOP: 3 Surgical: 9 Medical-surgical: 2</p>	<p><u>Medical Systematic Reviews</u> Latanoprost vs. bimatoprost Timolol vs. travoprost Latanoprost vs. dorzolamide + timolol Latanoprost vs. brimonidine Latanoprost vs. dorzolamide Latanoprost vs. bimatoprost vs. travoprost Comparison of prostaglandin analogs Timolol vs. brimonidine Timolol vs. latanoprost</p> <p><u>Medical-Surgical Systematic Reviews</u> Medical treatment vs. surgical treatment</p>	<ul style="list-style-type: none"> Prostaglandins lower IOP better than dorzolamide, brimonidine, and timolol. The prostaglandins appear similar in the extent at which they lower IOP, but some studies have reported a greater drop in IOP with bimatoprost. The combination dorzolamide/timolol has similar effect as prostaglandins. IOP of participants randomized to trabeculectomy is lower than participants receiving medical treatment at 1 year. The risk of failure was lower with argon laser trabeculectomy compared to medical treatment. 	<ul style="list-style-type: none"> Circadian IOP: Low Surgical studies: Moderate

Table A. Summary of outcomes, comparators, and main results by KQ (continued)

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ3 (cont.)	<ul style="list-style-type: none"> Reduction of intraocular pressure 	<p><u>Systematic Reviews</u> Medical: 9 Circadian IOP: 3 Surgical: 9 Medical-surgical: 2</p>	<p><u>Circadian IOP Systematic Reviews</u> Comparison of prostaglandin analogs Latanoprost vs. dorzolamide + timolol Latanoprost vs. bimatoprost</p>	<ul style="list-style-type: none"> Results from systematic reviews comparing one prostaglandin to another were inconsistent. 	<ul style="list-style-type: none"> Circadian IOP: Low Surgical studies: Moderate
			<p><u>Surgical Systematic Reviews</u> Trabeculectomy vs. NPDS Trabeculectomy + antimetabolites Beta radiation Laser trabeculectomy Aqueous shunts Trabeculectomy vs. medical treatment Efficacy and safety profile of viscoanalostomy</p>	<ul style="list-style-type: none"> Trabeculectomy lowers IOP more effectively than nonpenetrating filtering surgeries. Fewer deep sclerectomy patients and argon laser trabeculectomy patients than trabeculectomy patients achieved complete success. The addition of antimetabolites to trabeculectomy significantly reduced IOP among participants, as did receiving postoperative 5-FU. The addition of beta radiation to trabeculectomy does not appear to reduce IOP more than trabeculectomy alone. 	
	<p><u>Primary Studies</u> Medical: 46 retrieved, 0 included for analysis Circadian IOP: 5 Surgical: 20 Medical-surgical: 2</p>		<p><u>Circadian IOP RCTs</u> Latanoprost vs. bimatoprost Latanoprost vs. timolol vs. brimonidine Latanoprost vs. dorzolamide vs. timolol Latanoprost vs. bimatoprost vs. travoprost</p>	<ul style="list-style-type: none"> Conclusions were limited due to the fact that 1 study contained the majority of the data. All topical medications reviewed lowered IOP throughout 24-hour cycle. Prostaglandins appear to lower IOP more over the 24-hour cycle than beta blockers, topical carbonic anhydrase inhibitors, and alpha agonists, but the evidence for this is weak. While the IOP-lowering effects of prostaglandins appear to vary appreciably over the 24-hour time period, the results were inconsistent and the reported difference was small. 	

Table A. Summary of outcomes, comparators, and main results by KQ (continued)

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ3 (cont.)	<ul style="list-style-type: none"> Reduction of intraocular pressure 	<p><u>Primary Studies</u> Medical: 46 retrieved, 0 included for analysis Circadian IOP: 5 Surgical: 20 Medical-surgical: 2</p>	<p><u>Surgical RCTs</u> Trabeculectomy with adjuvants (MMC-5FU-ologen implant-amniotic graft-polytetrafluoroethylene membrane) Trabeculectomy techniques and variations (NPDS-Ex-Press shunt-Minitrab) Trabeculectomy with combined techniques (viscocanalostomy-iridectomy-fornix vs. limbus) Combined cataract-glaucoma surgery Laser trabeculectomy</p>	<ul style="list-style-type: none"> Trabeculectomy lowers IOP. The use of MMC intraoperatively with trabeculectomy results in lower IOP than when it is not used. Other alterations in surgical technique, location of surgery, and adjuvants other than MMC have not been shown to result in an added pressure decrease. Trabeculectomy lowers IOP more than nonpenetrating surgeries. The location of the conjunctival incision or the presence or absence of a peripheral iridectomy has no effect on how much combined cataract surgery and trabeculectomy lowers IOP. 2-site surgery might produce an added pressure drop over 1-site surgery. Laser trabeculectomy effectively lowers IOP in glaucoma subjects; effectiveness does not seem to vary with the type of laser used. The data available for the role of aqueous drainage devices in OAG are inadequate to draw conclusions. 	<ul style="list-style-type: none"> Circadian IOP: Low Surgical studies: Moderate
			<p><u>Medical-Surgical RCTs</u> Medical treatment vs. trabeculectomy</p>	<ul style="list-style-type: none"> Incisional surgery lowers IOP more than lasers or medications. Initial treatment with lasers tends to reduce the need for medications to achieve the same IOP. 	

Table A. Summary of outcomes, comparators, and main results by KQ (continued)

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ4	<ul style="list-style-type: none"> Visual fields loss Optic nerve damage 	<p><u>Systematic Reviews</u> Medical: 1 Surgical: 0 Medical-surgical: 3</p>	<p><u>Medical Systematic Reviews</u> Medical treatment vs. surgical treatment</p> <p><u>Medical vs. Surgical Systematic Reviews</u> Trabeculectomy vs. medical treatment Medical or surgical vs. no treatment</p>	<ul style="list-style-type: none"> Medical treatment for glaucoma is protective against visual field loss. (It included the results of both the Early Manifest Glaucoma Trial and the Ocular Hypertension Treatment Study.) Medically and/or surgically treated patients were less likely to experience progression of field loss and optic disc damage when compared with participants receiving no treatment. Some trials showed that progression was more likely in medically treated participants than in participants randomized to laser trabeculectomy or trabeculectomy. 	<ul style="list-style-type: none"> Medical: Low Surgical: Insufficient Medical-surgical: Insufficient
KQ5	<ul style="list-style-type: none"> Quality of life 	<p><u>Primary Studies</u> Medical: 19 Surgical: 0 Medical-surgical: 1</p> <p><u>Systematic Reviews</u> Medical: 0 Surgical: 0 Medical-Surgical: 0</p>	<p><u>Medical RCTs</u> Timolol vs. brimonidine vs. travoprost Timolol vs. metipranolol vs. carteolol Timolol vs. carteolol Timolol vs. latanoprost Timolol vs. betaxolol Latanoprost vs. bimatoprost Latanoprost vs. travoprost vs. dorzolamide + timolol</p> <p>N/A</p>	<ul style="list-style-type: none"> Most other included medical studies are too small or too short to be conclusive. No surgical studies presented conclusive data. Treatment of ocular hypertension with medicines preserves visual fields better than no treatment. 	<ul style="list-style-type: none"> Insufficient

Table A. Summary of outcomes, comparators, and main results by KQ (continued)

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ5 (cont.)	<ul style="list-style-type: none"> Quality of life 	<p><u>Primary RCTs</u> Medical: 1 Surgical: 0 Medical-surgical: 0</p> <p><u>Primary Observational Studies</u> Medical: 1 Surgical: 0 Medical-surgical: 0</p>	<p>Medical treatment in general</p>	<ul style="list-style-type: none"> There are no well-executed studies addressing the relationship between the intermediate outcomes of IOP reduction, prevention of optic nerve damage, or prevention of visual field loss and the outcomes of visual impairment and vision-related QOL. 	<ul style="list-style-type: none"> Insufficient
KQ6	<ul style="list-style-type: none"> Harms 	<p><u>Systematic Reviews</u> Medical: 11 Surgical: 8 Medical-surgical: 2</p>	<p><u>Medical Systematic Reviews</u> Latanoprost vs. bimatoprost Latanoprost vs. bimatoprost vs. travoprost Latanoprost vs. dorzolamide + timolol Latanoprost vs. brimonidine Travoprost vs. latanoprost, bimatoprost, timolol Timolol vs. brimonidine Timolol vs. latanoprost</p> <p><u>Surgical Systematic Reviews</u> Compare the efficacy and safety profile of viscocanalostomy Nonpenetrating filtering surgery Beta radiation during trabeculectomy 1-site phacotrabeculectomy vs. 2-site phacotrabeculectomy Intraoperative MMC during trabeculectomy—placebo during trabeculectomy Postoperative injections of 5FU</p>	<ul style="list-style-type: none"> A systematic review found that subjects on timolol were less likely to drop out of studies due to side effects than those on brimonidine, latanoprost, travoprost, or betaxolol. Adverse effects were experienced more often by participants randomized to trabeculectomy than by participants randomized to other nonpenetrating filtering surgeries. Harms were reported for the addition of antimetabolites to primary trabeculectomy. The addition of beta radiation to trabeculectomy resulted in significantly higher risk of cataract when compared with trabeculectomy alone. The harms associated with glaucoma drainage devices have not been adequately compared with the harms of other procedures in the treatment of OAG. 	<ul style="list-style-type: none"> Grading not completed due to heterogeneity in outcomes and comparisons across studies

Table A. Summary of outcomes, comparators, and main results by KQ (continued)

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ6 (cont.)	<ul style="list-style-type: none"> Harms 	<p><u>Systematic Reviews</u> Medical: 11 Surgical: 8 Medical-surgical: 2</p>	<p><u>Medical-Surgical Systematic Reviews</u> Medical treatment-surgical treatment</p>	<ul style="list-style-type: none"> Trabeculectomy is associated with cataract worsening and an increased need for cataract surgery over time when compared to medical treatments for glaucoma. Intraocular surgery rarely results in severe vision loss due to infection and/or bleeding. These risks are not associated with medical or laser treatments. Laser trabeculectomy can produce peripheral anterior synechiae, whereas medical treatment does not. 	<ul style="list-style-type: none"> Grading not completed due to heterogeneity in outcomes and comparisons across studies
		<p><u>Primary RCTs</u> Medical: 17 Surgical: 22 Medical-surgical: 2</p> <p><u>Primary Observational Studies</u> Medical: 10 Surgical: 3 Medical-surgical: 0</p>	<p><u>Medical</u> Timolol vs. brimonidine vs. travoprost Timolol vs. metipranolol vs. carteolol Timolol vs. latanoprost Timolol vs. betaxolol Latanoprost vs. bimatoprost Latanoprost vs. travoprost vs. dorzolamide + timolol Topical hypotensives vs. observation Latanoprost vs. bimatoprost Latanoprost vs. timolol vs. brimonidine Latanoprost vs. dorzolamide vs. timolol</p>	<ul style="list-style-type: none"> The prostaglandin agents produce more ocular redness than timolol does. Within the prostaglandins, latanoprost is less likely to cause redness. 	

Table A. Summary of outcomes, comparators, and main results by KQ (continued)

KQ	Outcomes	Studies Included	Comparators	Main Results	Strength of Evidence
KQ6 (cont.)	<ul style="list-style-type: none"> Harms 	<p><u>Primary RCTs</u> Medical: 17 Surgical: 22 Medical-surgical: 2</p> <p><u>Primary Observational Studies</u> Medical: 10 Surgical: 3 Medical-surgical: 0</p>	<p><u>Surgical</u> Trabeculectomy with adjuncts (MMC, 5FU, ologen implant, polytetrafluoroethylene membrane-amniotic graft) Trabeculectomy techniques and variations (NPDS, Ex-Press shunt) Trabeculectomy with combined techniques (viscocanalostomy, iridectomy, fornix vs. limbus) Combined cataract + glaucoma surgery Laser trabeculectomy NPDS +/- MMC NPDS +/- collagen implant</p> <p><u>Medical vs. Surgical</u> Trabeculectomy vs. medical treatment Medical or surgical vs. no treatment</p>	<ul style="list-style-type: none"> The profile of harms does not differ between 1- and 2-site combined cataract and glaucoma surgery. Reports of adverse effects across studies that addressed questions related to combined surgery for coexisting cataract and glaucoma varied by intervention under consideration. 	<ul style="list-style-type: none"> Grading not completed due to heterogeneity in outcomes and comparisons across studies

5FU =5-Fluorouracil; ALT = argon laser trabeculectomy; IOP = intraocular pressure; KQ = Key Question; MMC = mytomicin; NPDS = nonpenetrating deep sclerectomy; OAG = open-angle glaucoma; QOL = quality of life; RCT = randomized controlled trial

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Full Report

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