Nearly half of Americans who currently have glaucoma are unaware of their condition. Why?

• Most types of glaucoma are painless, with no feelings of discomfort.

• Glaucoma typically affects peripheral vision first, so many people remain unaware of the disease until their central vision is affected.

• Glaucoma is often associated with aging, and patients often precede subtle vision changes as a result of normal aging.

• For many people, professional eye care can be difficult to obtain or too expensive.

Don’t let glaucoma rob your patients of vision

Educate your patients about glaucoma risk factors and the importance of regular comprehensive eye examinations.

Risk factors:

• Over age 60
• Family history of glaucoma
• Diabetes
• People of black African, black Caribbean, Latin American, and Asian descent
• History of eye injuries
• History of multiple eye surgeries for chronic eye conditions
• High myopia or high hyperopia
• Chronic steroid use

Guidelines for routine monitoring:

• If no risk factors are present, start regular comprehensive eye exams or screenings. By age 40, repeat every 3-5 years.

• If any risk factors are present, start regular comprehensive eye exams or screenings. Before age 40, repeat every 3-5 years. After age 65, repeat every 2 years.

• If of black African descent, black Caribbean descent, Latino, or Asian, start regular comprehensive eye exams or screenings in your 20s or 30s, repeat every 3-5 years.

Glaucoma in this issue:

• Glaucoma risk factors
• Referral guidelines
• Medical and surgical management of glaucoma

In genetic research, exciting progress has led to the identification of novel genes associated with glaucoma progression, and to improve research methodologies. While still in its early stages, comprehensive, genetic diagnostic testing is becoming more widely available. Sensitive and specific genetic tests are now available for dozens of inherited eye diseases. Among its many benefits, genetic testing can diagnose disease, improve accuracy of a patient’s prognosis, identify gene mutations that could be passed on to children, and help guide genetic counseling. The Harvard Department of Ophthalmology Ocular Genomics Institute, based at Mass. Eye and Ear, is one of several sites to offer CLIA-certified comprehensive genetic diagnostic testing for inherited eye diseases, including early-onset glaucoma (learn more: massgenomics.org/genetic-testing).

We hope you find this issue of Eye Insights useful in your practice—it includes key information about glaucoma risk factors, guidelines for comprehensive eye exams, updates in the medical and surgical management of glaucoma, and links to patient handouts.

Massachusetts Eye and Ear and Massachusetts General Hospital

Glaucoma Referral Guidelines

In this issue:

Glaucoma medical and surgical treatments

Glaucoma risk factors

Glaucoma management

Glaucoma early detection

Dear colleagues,

January was National Glaucoma Awareness Month, an important time to spread the word about this vision-robbing disease. Glaucoma is a leading cause of worldwide blindness; yet, half of the three million Americans with glaucoma are not aware that they have it. People of all ages (including children) and of all ethnic backgrounds are at risk. This includes Latins, Asians, and especially people who are of black African or black Caribbean descent. By 2020, the number of people with glaucoma worldwide is expected to exceed 70 million.

While early diagnosis and routine monitoring remain the most essential tools to prevent glaucoma from causing irreversible vision loss, a new wave of diagnostic, medical, and surgical innovations are advancing treatments. For example, a new generation of pharmacologic drugs with novel outflow targets are now FDA-approved or in the pipeline. Minimally invasive glaucoma surgery (MIGS) procedures are also gaining popularity as alternatives to traditional major glaucoma surgery. MIGS procedures target various ocular tissues and can effectively reduce intraocular pressure with distinctly lower complication rates and shorter recovery times compared to traditional glaucoma surgeries—in some cases eliminating the need for medication.

Recent innovations also include the use of ultra-high resolution, three-dimensional optic nerve imaging. These new imaging methods have the potential to improve our ability to diagnose glaucoma, to more precisely detect structural changes associated with glaucoma progression, and to improve research methodologies. In genetic research, exciting progress has led to the identification of novel genes for primary open-angle glaucoma (including these new genes in 2016) and normal-tension glaucoma—a critical first step in developing targeted, gene-based therapies.
THE PROBLEM
Hypertension by targeting the trabecular meshwork. FDA-approved in December

THE SOLUTION
Netarsudil (Rhopressa®) is a once-daily eye drop that lowers eye pressure in open-angle glaucoma or ocular hypertension patients. Vyzulta® (latanoprostene bunod) is the first dual-acting prostaglandin analog - nitric oxide donator. FDA-approved in June 2017, this once-daily eye drop lowers eye pressure in open-angle glaucoma or ocular hypertension patients. Vyzulta® seems to lower IOP by ~1.2 mm Hg more than timolol 0.5%. The most common adverse reactions (≥20%) are conjunctival hyperemia (4%), eye irritation (4%), eye pain (5%), and instillation site pain (2%).

THE WAY FORWARD
Be aware of clinical features suggesting more rapidly progressive disease:
- Presence of optic disc damage or progressive excavation of the neuroretinal rim tissues
- Progressive nerve fiber layer thinning on serial optical coherence tomography testing
- Progressive reduction of retinal sensitivity on serial visual field testing that cannot be attributed to other causes like cataract

Keep in mind that glaucoma can occur at eye pressures above 20 AND with eye pressures within the statistically normal range.

1. Educate patients about risk factors, comprehensive eye exams, and healthy habits that may help prevent glaucoma.
   - What is glaucoma?
   - 7 habits that may prevent or slow progression of glaucoma

2. Refer early to a glaucoma specialist or comprehensive ophthalmologist

Be more aware of features suggesting more rapidly progressive disease:
- Progressive nerve fiber layer thinning on serial optical coherence tomography testing
- Progressive reduction of retinal sensitivity on serial visual field testing that cannot be attributed to other causes like cataract

Latest Advances in Patient Care

Diagnostic Technology
Diagnosis of glaucoma is achieved using visual fields, gonioscopy, ultrasound biomicroscopy, and optical coherence tomography. Genetic testing may be indicated in individuals with disease onset before age 50.

Diagnostic Technology
Tests include gonioscopy, slit lamp examination, perimetry and occasionally digital fundus photography, confocal scanning laser ophthalmoscopy (HRT), and optical coherence tomography (OCT). Other important diagnostic measures include gonioscopy, tilting examination, perimetry and occasionally ultrasound biomicroscopy. Genetic testing may be indicated in individuals with disease onset before age 50, or for patients with an affected family member with disease onset before age 50.

Medical Management
Many glaucoma medicines—such as prostaglandin analog, beta-blockers, alpha agonists, carbonic anhydrase inhibitors, and combination therapies—are available to lower intraocular pressure (IOP). Prostaglandins often have the best user compliance because they are required only once daily.

FLASH UPDATE
Two new glaucoma drugs will become available in early 2018: netarsudil (Rhopressa®) and latanoprostene bunod (Vyzulta®)

Netarsudil ophthalmic solution (Rhopressa®, Aerie Pharmaceuticals) is a rho kinase inhibitor administered in the evening to lower IOP in open-angle glaucoma or ocular hypertension by targeting the trabecular meshwork. FDA-approved in December 2017, Rhopressa® lowers IOP by as much as timolol 0.5% for many glaucoma patients. The most common side effect (53%) is conjunctival hyperemia, or eye redness. Other common (approximately 25%) adverse reactions are conjunctival hyperemia (seen within first few weeks; resolved upon discontinuation of treatment), instillation site pain, and conjunctival hemorrhage.

Latanoprostene bunod ophthalmic solution (Vyzulta®, Bausch + Lomb and Nikon) is the first dual-acting prostaglandin analog - nitric oxide donator. FDA-approved in June 2017, this once-daily eye drop lowers eye pressure in open-angle glaucoma or ocular hypertension patients. Vyzulta® seems to lower IOP by ~1.2 mm Hg more than timolol 0.5%. The most common adverse reactions (≥20%) are conjunctival hyperemia (4%), eye irritation (4%), eye pain (5%), and instillation site pain (2%).

Surgical Management
Minimally invasive glaucoma surgery (MIGS) procedures are generally considered ones that limit surgical manipulation of the sclera and conjunctiva. They take less time and support faster postoperative healing of eye tissue than traditional glaucoma surgery, and the more invasive procedures are less time consuming to patients. However, these procedures are not always as effective as traditional IOP lowering and may not be appropriate for patients with advanced pressure. For very high IOP, MIGS procedures concentrate on two pathways:

1. Increasing aqueous outflow and 2. Lowering aqueous production. Most MIGS procedures are approved for patients with minimally invasive and mild-to-moderate glaucoma.

MIGS Procedures that Increase Aqueous Outflow:

The iStent® is currently the most commonly used MIGS procedure in the United States. It is a micro-implantable canal-based device that bypasses the trabecular meshwork. It has the potential to mildly lower eye pressure in combination with standard cataract surgery and may reduce a patient’s need for glaucoma eye drops.

The Trabecome® is an electrode device that ablates part of the trabecular meshwork. When combined with cataract surgery, the Trabecome® can lower eye pressure to the mid-teens. In use since 2004, the Trabecome®’s investigators have broadcasted its use after failed trabeculectomy and in narrow angles.

MIGS Procedures that Lower Aqueous Production:

The EndoABX Cyclophotocoagulator (ECP) is a laser procedure that can lower IOP by treating the ciliary processes directly. ECP can be performed in combination with cataract surgery or as a stand-alone procedure. It can be especially beneficial in patients with narrow-angle glaucoma or plateau iris syndrome.

MicroPulse Cyclophotocoagulation is a transcleral, non-penetrating procedure that targets the ciliary processes. It is associated with fewer complications than a traditional cilio-disk laser and can significantly lower IOP. Like ECP, it can be combined with cataract surgery, although care must be taken to control postoperative inflammation.

What is glaucoma?
Glaucoma specialists have the training and expertise to medically and surgically treat all stages of glaucoma—common, advanced, rare, and complex. Eye care providers should consider referring a patient to a glaucoma specialist when:
- The diagnosis of glaucoma is uncertain
- Available diagnostic resources are limited
- The patient is taking multiple medications
- The patient is not responding to treatment
- The disease is progressing, despite normal IOP