HHS Public Access

Author manuscript

J Glaucoma. Author manuscript; available in PMC 2019 December 01.

Published in final edited form as:

J Glaucoma. 2018 December ; 27(12): 1068–1072. doi:10.1097/IJG.0000000000001093.

Compliance with Primary Open-Angle Glaucoma and Primary Open-Angle Glaucoma Suspect Preferred Practice Patterns in a Retail-Based Eye Clinic

Jordan Stanley, MD[1], **Carrie E. Huisingh, MPH**[1], **Thomas A. Swain, MPH**[1], **Gerald McGwin Jr., MS, PhD**[1,2], **Cynthia Owsley, PhD, MSPH**[1], **Christopher A. Girkin, MD, MSPH**[1], and **Lindsay A. Rhodes, MD**[1]

[1]Department of Ophthalmology and Visual Sciences, School of Medicine, University of Alabama at Birmingham, Birmingham, AL, USA

[2]Department of Epidemiology, School of Public Health, University of Alabama at Birmingham, Birmingham, AL, USA

Abstract

Purpose: To determine the level of adherence to the American Academy of Ophthalmology (AAO) preferred practice pattern (PPP) guidelines for quality primary open angle glaucoma (POAG) and POAG suspect (POAGS) care among retail-based optometrists.

Methods: Patients with a diagnosis of POAG or POAGS who participated in a telemedicine pilot project were included. Patients' charts were evaluated for 15 elements of PPP guidelines for glaucoma care. Results were further stratified by number of follow-up visits and diagnosis.

Results: Of 360 identified patients, ten elements were documented in over 98%. Documentation of the remaining five components was as follows: dilated fundus exam (DFE) 91.1%, central corneal thickness (CCT) 88.6%, visual field 78.9%, gonioscopy 47.5%, and target intraocular pressure (IOP) 15.6%. 32.8% of patients were seen once while the remaining 67.2% had multiple visits. In patients with multiple visits, providers were more likely to document systemic history (100.0% versus 97.5%, P=0.0346), review of systems (100.0% v. 97.5%, P=0.0346), gonioscopy (60.0% v. 22.0%, P<0.001), CCT (94.2% v. 77.1%, P<0.001), visual field (97.5% v. 40.7%, P<0.001), and target IOP (22.4% v. 1.7%, P<0.001) compared to single visit patients. In stratifying results by diagnosis, POAG patients more often received visual field testing (92.7% v. 68.9%, P<0.001) and had an established target IOP (35.1% v. 1.4%, P<0.001) compared to POAGS patients.

Conclusions: Compliance with PPP guidelines for glaucoma care was very high for most elements but lower for performing DFE, CCT, visual field, gonioscopy, and target IOP. This study highlights deficiencies in care likely to hamper the detection of glaucoma progression.

Correspondence: Lindsay A. Rhodes, MD, Department of Ophthalmology and Visual Sciences, University of Alabama at Birmingham, 1720 University Blvd, Suite 601, Birmingham, Alabama 35233 P: +1-205-325-8353 F: +1-205-325-8692 lindsayrhodes@uabmc.edu.

Disclosures: No author has a financial or proprietary interest in any material or method mentioned. The findings and conclusions in this paper are those of the authors and do not necessarily reflect the official position of the Centers for Disease Control and Prevention.

Précis:

This study examines compliance with glaucoma preferred practice pattern guidelines in a retail-based clinic revealing deficiencies which may thwart detection of disease progression.

Keywords

Primary open-angle glaucoma; Primary open-angle glaucoma suspect; Preferred practice pattern; Retail-based eye clinic; Optometry

Introduction

Glaucoma is one of the most common eye diseases of aging and the leading cause of irreversible visual impairment worldwide. In 2011, 2.71 million persons in the United States had primary open-angle glaucoma (POAG) and this number is projected to rise to 7.32 million by 2050. [1] The prevalence of POAG suspect (POAGS) has not been documented as definitions vary based on visual field, intraocular pressure (IOP), and optic nerve damage criteria. However, studies have documented the prevalence of ocular hypertension, usually defined as IOP greater than 21 mmHg or in the highest 97.5% percentile for the population without clinical evidence of optic disc or visual field damage, as affecting 3 to 6 million persons in the United States. [2]

The American Academy of Ophthalmology (AAO) has developed preferred practice pattern (PPP) guidelines for POAG and POAGS[2, 3], which are very similar to the practice guidelines recommended by the American Optometric Association (AOA)[4], that identify characteristics and components of quality eye care. The differences in the PPP by the two organizations are minimal with the AAO guidelines preferring Goldmann applanation tonometry as well as visual field testing using automated static threshold perimetry while the AOA guidelines explicitly recommend reducing IOP by 30–50% from pretreatment levels. The AAO guidelines, based on the best available scientific data as interpreted by an expert panel of glaucoma specialists, are geared to inform clinicians regarding disease prevalence, risk factors, diagnosis, and management in the care of POAG and POAGS patients. However, components of an initial POAG or POAGS evaluation as well as ongoing examination and testing to monitor for disease progression are often not performed in accordance with current PPP by primary eye care providers, both ophthalmologists and optometrists. [5–11] This is unfortunate, as optimal management of POAG and POAGS is dependent upon careful interval examination and documentation of ophthalmic findings with specific emphasis on monitoring of the structure and function of the optic nerve in order to detect progressive injury. [12]

There is a lack of ophthalmologists practicing in underserved areas, including in Alabama, where many people at-risk for POAG and POAGS reside, including those of African American race, older age, and with diabetes. [13, 14] The most accessible eye care providers in many of these underserved areas are optometrists practicing in retail-based eye clinics, such as Walmart Vision Centers. With an increasing population of people at-risk for POAG and POAGS, optometrists in such retail-based eye clinics will likely be the initial providers

examining people and identifying POAG and POAGS, yet little is known about the practice habits of such optometrists, particularly in regard to compliance with the PPP of POAG and POAGS.

In the current study, we aim to determine the level of adherence to the PPP guidelines for quality POAG and POAGS care among optometrists practicing in retail-based eye clinics while participating in a telemedicine pilot project, the Eye Care Quality and Accessibility Improvement in the Community (EQUALITY) project, that was deployed in retail-based clinics. [15]

Methods

The study was approved by the Institutional Review Board (IRB) of the University of Alabama at Birmingham (UAB) and was consistent with the Declaration of Helsinki. Verbal informed consent was obtained as the study was considered “usual care” and thus the UAB IRB waived written informed consent. Patients were enrolled as part of a one year, telemedicine pilot project deployed in two primary eye care clinics (Walmart Vision Centers) staffed by optometrists located within retail centers (Walmart Supercenters) that serve predominantly African descent communities in underserved areas of Alabama. [16] Briefly, The EQUALITY telemedicine project aimed to leverage existing retail-based optometric providers in these underserved communities to provide distributed, community-based care and was organized as follows: optometrists working in the retail-based clinics performed comprehensive eye exams per their usual standard of care with the additional use of automated optic nerve structural and functional assessment, such as pachymetry, visual field, and optical coherence tomography (OCT) testing, as they felt necessary. The data from the comprehensive eye exam and automated optic nerve assessment was transmitted electronically to a tertiary glaucoma center, located geographically remotely from the primary eye care clinics, where it was evaluated by a fellowship-trained glaucoma subspecialist and feedback was provided to the optometrist on diagnosis and/or management. Patients presenting to the primary eye care clinic for a routine eye examination who were found to be at-risk for glaucoma based on demographic factors prior and prior to the eye exam or those who had an existing diagnosis of POAG, normal tension glaucoma, POAGS, or ocular hypertension were eligible and invited to participate in the telemedicine project upon completion of their routine comprehensive eye examination by the optometrist. At-risk criteria for glaucoma included: (1) African American or Hispanic ≥40 years old, (2) Caucasian ≥50 years old, (3) persons of any age or race/ethnicity with diabetes, and/or (4) a self-report of any family history of glaucoma. These criteria were selected because they are established risk factors for glaucoma. [3]

Patients with a new or existing diagnosis of POAG, normal tension glaucoma, POAGS, or ocular hypertension made by the optometrist in one or both eyes at the first study visit of the telemedicine project were included. For purposes of stratification, a diagnosis of normal tension glaucoma was included in the POAG analysis and a diagnosis of ocular hypertension was included in the POAGS analysis. Patients were enrolled from May 2013 through May 2014 for the Walmart Vision Center in Tuscaloosa, Alabama and from May 2013 through July 2014 for the center in Homewood, Alabama. Both optometrists have been practicing for

over 15 years, and see over 4,000 patient visits annually at the Walmart Vision Center locations. The optometrist at each site performed a comprehensive eye exam and optic nerve assessment per the optometrist's individual usual standard of care, made an optic nerve diagnosis, and instituted a treatment plan based on his clinical judgement and recorded all data in an electronic medical record (EMR). The telemedicine project protocol was then instituted where additional imaging of the optic nerve such as OCT was performed if it had not already been obtained as part of the optometrist's usual care exam.

EMRs for these participants were abstracted by two independent reviewers for all patient visits ranging from the patients' initial study visit through the end of the study period. Information on whether the fifteen elements of a complete POAG or POAGS evaluation as recommended by the PPP were performed was recorded for each visit. Five of the elements were related to history taking: ocular history, systemic history, family history, review of systems, and medications. Nine elements were related to ocular examination and testing: visual acuity measurement, pupil examination, slit lamp examination of the anterior segment, intraocular pressure (IOP) measurement, gonioscopy, optic nerve head and retinal nerve fiber layer examination with imaging, dilated fundus examination (DFE), measurement of central corneal thickness (CCT), and visual field evaluation. The final element pertained to patient management: setting a target IOP.

Compliance was defined as documentation in the EMR that the PPP element was performed during any of the visits that occurred during the study period. Demographic characteristics of the patients were tabulated and compliance rates for each PPP element was tabulated for all patients. Bivariate analysis for completion of each PPP was by number of visits (single v. multiple) and by diagnosis (POAG v. POAGS) using Fisher's exact testing. The significance threshold was set at 0.05.

Results

Of the 653 total patients seen during the study, 360 patients had a diagnosis of POAG or POAGS. Demographic details of our study population include 60.8% female, 70.6% African American, 39.4% with a family history of POAG or POAGS, and 58.1% POAGS while the remainder (41.9%) carried a diagnosis of POAG (Table 1). Ten of the fifteen POAG PPP elements were documented in over 98% of patients (Table 2). Of the remaining five components, a DFE was performed in 91.1% of patients, CCT measured in 88.6%, visual field performed in 78.9%, gonioscopy performed in 47.5%, and a target IOP determined in 15.6%.

Approximately one-third (118; 32.8%) of patients were seen once and the remaining 242 (67.2%) had multiple visits. Compliance with the fifteen elements recommended by the PPP was stratified between these two groups (Table 3). The ten elements of the POAG PPP which were documented in over 98% of total patients were also found in over 96% of single visit patients. In patients with multiple visits, providers were more likely to document systemic history (100.0% v. 97.5%, P=0.0346), review of systems (100.0% v. 97.5%, P=0.0346), gonioscopy (60.0% v. 22.0%, P<0.001), CCT (94.2% v. 77.1%, P<0.001), visual field (97.5% v. 40.7%, P<0.001), and target IOP (22.4% v. 1.7%, P<0.001) compared to single

visit patients. Comparing PPP compliance by diagnosis (Table 4), POAG patients more often received visual field testing (92.7% versus 68.9%, P <0.001) and had an established target IOP (35.1% versus 1.4%, P<0.001) compared with POAGS patients.

Discussion

This study examines adherence to the AAO PPP guidelines for POAG and POAGS by optometrists practicing in retail-based clinics. Overall, we found excellent adherence (>98%) to ten of the fifteen PPP elements. DFE, measurement of CCT, and visual field examination were also performed with high frequency. Gonioscopy was documented in less than half of patients while setting a target IOP was only performed in a fraction of patients. Our study provides a unique look into the practice patterns of optometrists working within retail-based clinics within a defined telemedicine protocol. Since these providers were aware of their participation in a telemedicine project and knew their exam results would be reviewed by an outside glaucoma subspecialist, these practice patterns are likely a “best case scenario” of community optometrists. This may explain the high rate of compliance with a majority of the PPP elements. Yet in spite of this, some PPP elements still had low compliance rates.

Vertically integrated healthcare models such as the EQUALITY demonstration telemedicine project are a potential tool to address the rapid growth in patients requiring subspecialist care and the limited number of subspecialists. Such models aim to integrate care between subspecialist physicians and primary care providers. These models combine the decision making of highly-trained subspecialists with the ubiquity and improved patient access to care of primary care providers. Such vertically integrated models of eye care offer benefits of standardization of care, provision of subspecialty care for the patients with the most severe and complex disease, and potentially reduced costs.

Winkler et al. implemented such a protocol for glaucoma care at Mayo Clinic’s campus in Rochester, Minnesota reviewing records of 591 patients with newly diagnosed glaucoma for documentation of 9 POAG PPP elements in the three years before and after protocol implementation. [17] They found a significant increase in adherence to AAO recommendations in documentation of target IOP (+24%), gonioscopy (+27%), fundus photos (+29%), and OCT (+20%) after protocol initiation. While this model is more complex, glaucoma specialists benefit from focusing their efforts on those who most need their care, optometrists benefit from easy access to glaucoma specialists for consultation, and both groups benefit in a collaborative model without risk of patient attrition to either practice. Ehrlich et al. demonstrated improved evaluation of visual function and target IOP determination via a physician collaborative approach. [18] Such care models and collaborative methods along with improved provider education regarding the importance of the PPP constitute possible approaches to enhancing quality of care.

Our study has several limitations. Some elements of the PPP were part of the EQUALITY project clinical examination recommendations, such as obtaining CCT, gonioscopy, and optic nerve imaging for each of the enrolled patients. While the optometrists were also instructed to proceed with usual patient care as the telemedicine project was being conducted, this could have made the compliance rates with the PPP higher than would have

occurred outside of the project setting. Regardless, the result, as seen in the PPP compliance rates, is that the providers did not always follow the telemedicine examination recommendations. Practice patterns are also being analyzed within a single retail chain which may have protocols in place where particular data is recommended for inclusion in the EMR. The payment model for providers within this retail chain is unknown but may also influence which procedures are performed and documented in the EMR. Additionally, there was a mix of health insurances amongst the study participants that may have potentially affected which testing and imaging was performed in that a provider may have not performed a particular test due to worry about reimbursement. However, this seems unlikely to have largely affected the providers' decision making given the high rate of visual field and OCT testing performed. Another limitation is that it is difficult to generalize the results of this study as only two optometrists' practice patterns were studied. As described above, these are highly experienced optometrists that see a large volume of POAG and POAGS patients, and these results may overestimate the PPP compliance rates in a larger population of optometrists who have less experience managing patients with glaucoma or who do not have access to the devices needed for glaucoma testing and imaging.

In conclusion, this study supports the growing body of literature highlighting key deficiencies in glaucoma care likely to reduce clinicians' ability to detect potentially blinding progressive glaucomatous injury. As the aging population grows and more patients are seen by primary eye care providers such as optometrists in retail-based clinics, knowledge of PPP compliance is important in order to maintain patients' vision and reduce rates of irreversible blindness. It is important to monitor and stress compliance with the PPP amongst all providers.

Acknowledgments

Funding: This research was supported by a cooperative agreement with the Centers for Disease Control and Prevention (#1U58DP004061) and a National Eye Institute grant (NIH/NEI 1K23EY025724–01A1), with supplemental support from the EyeSight Foundation of Alabama, Birmingham, AL, and Research to Prevent Blindness, New York, NY.

References

1. Vajaranant TS, et al., The changing face of primary open-angle glaucoma in the United States: demographic and geographic changes from 2011 to 2050. Am J Ophthalmol, 2012 154(2): p. 303–314 e3. [PubMed: 22541661]
2. Prum BE, Jr., et al., Primary Open-Angle Glaucoma Suspect Preferred Practice Pattern((R)) Guidelines. Ophthalmology, 2016 123(1): p. P112–51. [PubMed: 26581560]
3. Prum BE, Jr., et al., Primary Open-Angle Glaucoma Preferred Practice Pattern((R)) Guidelines. Ophthalmology, 2016 123(1): p. P41–P111. [PubMed: 26581556]
4. Fingeret M Optometric Clinical Practice Guideline, care of the patient with open angle glaucoma. St. Louis MO: American Optometric Association 2010 http://www.aoa.org/documents/optometrists/CPG-9.pdf. Accessed May 1, 2018.
5. Albrecht KG and Lee PP, Conformance with preferred practice patterns in caring for patients with glaucoma. Ophthalmology, 1994 101(10): p. 1668–71. [PubMed: 7936565]
6. Coleman AL, Yu F, and Evans SJ, Use of gonioscopy in medicare beneficiaries before glaucoma surgery. J Glaucoma, 2006 15(6): p. 486–93. [PubMed: 17106360]
7. Fremont AM, et al., Patterns of care for open-angle glaucoma in managed care. Arch Ophthalmol, 2003 121(6): p. 777–83. [PubMed: 12796247]

8. Friedman DS, et al., Glaucoma management among individuals enrolled in a single comprehensive insurance plan. Ophthalmology, 2005 112(9): p. 1500–4. [PubMed: 16039717]
9. Lee PP, Understanding the new primary open-angle glaucoma preferred practice pattern. Int Ophthalmol Clin, 1998 38(3): p. 93–9. [PubMed: 9742437]
10. Lee PP, et al., Longitudinal rates of annual eye examinations of persons with diabetes and chronic eye diseases. Ophthalmology, 2003 110(10): p. 1952–9. [PubMed: 14522771]
11. Quigley HA, Friedman DS, and Hahn SR, Evaluation of practice patterns for the care of open-angle glaucoma compared with claims data: the Glaucoma Adherence and Persistency Study. Ophthalmology, 2007 114(9): p. 1599–606. [PubMed: 17572498]
12. Weinreb RN and Khaw PT, Primary open-angle glaucoma. Lancet, 2004 363(9422): p. 1711–20. [PubMed: 15158634]
13. Kass MA, et al., The Ocular Hypertension Treatment Study: a randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open-angle glaucoma. Arch Ophthalmol, 2002 120(6): p. 701–13; discussion 829–30. [PubMed: 12049574]
14. Zhao D, et al., Diabetes, fasting glucose, and the risk of glaucoma: a meta-analysis. Ophthalmology, 2015 122(1): p. 72–8. [PubMed: 25283061]
15. Owsley C, et al., Perceived barriers to care and attitudes about vision and eye care: Focus groups with older African Americans and eye care providers. Investigative Ophthalmology and Visual Science, 2006 47: p. 2797–2802. [PubMed: 16799016]
16. Owsley C, et al., Eye Care Quality and Accessibility Improvement in the Community (EQUALITY) for adults at risk for glaucoma: study rationale and design. Int J Equity Health, 2015 14: p. 135. [PubMed: 26582103]
17. Winkler NS, et al., Analysis of a Physician-led, Team-based Care Model for the Treatment of Glaucoma. J Glaucoma, 2017 26(8): p. 702–707. [PubMed: 28617721]
18. Ehrlich JR, et al., Establishing a Regional Glaucoma Physician Collaborative to Improve Quality of Care. Am J Ophthalmol, 2017 179: p. 145–150. [PubMed: 28483494]

Table 1.

Demographic and Clinical Characteristics (n=360 patients)

Demographics	Number of Patients (%)
Sex	
Male	141 (39.2%)
Female	219 (60.8%)
Race	
African American	254 (70.6%)
Caucasian	103 (28.6%)
Hispanic	4 (1.1%)
Asian or Pacific Islander	1 (0.3%)
Other	2 (0.6%)
Family History of POAG or POAGS	
Yes	142 (39.4%)
No	218 (60.6%)
Location	
Homewood	140 (38.9%)
Tuscaloosa	220 (61.1%)
Diagnosis	
POAG	151 (41.9%)
POAGS	209 (58.1%)

Abbreviations: POAG, Primary open-angle glaucoma; POAGS, Primary open-angle glaucoma suspect

Table 2.

Compliance with 15 Elements of the American Academy of Ophthalmology Preferred Practice Patterns for Primary Open-Angle Glaucoma and Primary Open-Angle Glaucoma Suspect (n=360 patients)

Preferred Practice Patterns Element	Percent Compliance
Ocular history	99.7%
Systemic history	99.2%
Family history	98.0%
Review of systems	99.2%
Medications	99.2%
Visual acuity measurement	99.7%
Pupil examination	100.0%
Slit lamp examination of anterior segment	100.0%
Intraocular pressure measurement	100.0%
Gonioscopy	47.5%
Optic nerve head and retinal nerve fiber layer examination with imaging	99.4%
Dilated fundus examination	91.1%
Central corneal thickness	88.6%
Visual field evaluation	78.9%
Target intraocular pressure selected	15.6%

Table 3.

Compliance with 15 Elements of the American Academy of Ophthalmology Preferred Practice Patterns for Primary Open-Angle Glaucoma and Primary Open-Angle Glaucoma Suspect Stratified by Number of Visits

Preferred Practice Pattern Element	Percent Compliance in Patients with One Visit (n=118)	Percent Compliance in Patients with > 1 Visit (n=242)	P-values *
Ocular history	99%	100%	P=0.3278
Systemic history	98%	100%	P=0.0346
Family history	97%	99%	P=0.2245
Review of systems	98%	100%	P=0.0346
Medications	98%	100%	P=0.2488
Visual acuity measurement	99%	100%	P=0.3278
Pupil examination	100%	100%	
Slit lamp examination of anterior segment	100%	100%	
Intraocular pressure measurement	100%	100%	
Gonioscopy	22%	60%	P<0.0001
Optic nerve head and retinal nerve fiber layer examination with imaging	99%	100%	P=0.5437
Dilated fundus examination	87%	93%	P=0.0795
Central corneal thickness	77%	94%	P<0.0001
Visual field evaluation	41%	98%	P<0.0001
Target intraocular pressure selected	2%	22%	P<0.0001

* Bivariate analysis performed using Fisher's exact testing

Table 4.

Compliance with 15 Elements of the American Academy of Ophthalmology Preferred Practice Patterns for Primary Open-Angle Glaucoma and Primary Open-Angle Glaucoma Suspect Stratified by Diagnosis

Preferred Practice Pattern Element	Percent Compliance in Patients with POAG (n=151)	Percent Compliance in Patients with POAGS (n=209)	P-values*
Ocular history	99%	100%	P=0.4194
Systemic history	98%	100%	P=0.0729
Family history	97%	99%	P=0.1327
Review of systems	98%	100%	P=0.0729
Medications	99%	99%	P=1.000
Visual acuity measurement	100%	100%	P=1.000
Pupil examination	100%	100%	
Slit lamp examination of anterior segment	100%	100%	
Intraocular pressure measurement	100%	100%	
Gonioscopy	51%	45%	P=0.3350
Optic nerve head and retinal nerve fiber layer examination with imaging	100%	99%	P=0.5109
Dilated fundus examination	89%	92%	P=0.3529
Central corneal thickness	92%	86%	P=0.0935
Visual field evaluation	93%	69%	P<0.0001
Target intraocular pressure selected	35%	1%	P<0.0001

*Bivariate analysis performed using Fisher's exact testing