

The Journal of the Association of Schools and Colleges of Optometry

# OPTOMETRIC EDUCATION

Volume 35, Number 1

Fall 2009

## GROWING PATIENT VOLUME IN AN ACADEMIC SETTING

### Also inside:

- Focus on the President
- Teaching Case Report:  
Diagnosing POAG
- Think Tank: Views on  
Board Certification

# Association of Schools and Colleges of Optometry

The Association of Schools and Colleges of Optometry (ASCO) represents the professional programs of optometric education in the United States. ASCO is a nonprofit, tax-exempt professional educational association with national headquarters in Rockville, MD.

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Past issues of Optometric Education are available on the ASCO Web site at <http://www.opted.org/i4a/pages/index.cfm?pageid=3404>. Funding for archiving was generously provided by Transitions Optical.



## ARTICLES

**A Strategic Approach to Growing Patient Volume in an Academic Setting**

Joseph B. Fleming, OD  
Richard E. Stroud, MBA  
Rodney W. Nowakowski, OD, PhD  
*Adequate patient flow is an absolute requisite for fiscal health in any clinical environment. In an academic setting, patient visits are also a cornerstone of the curriculum. This paper presents historical patient volume data of the University of Alabama at Birmingham School of Optometry and describes recent strategic initiatives, which have resulted in growth of patient volume by 23 percent in a single year.*

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(Continued on page 4)

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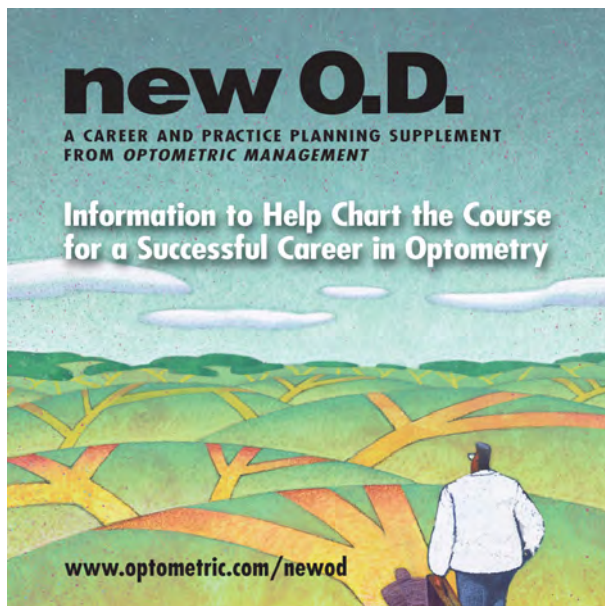
### Critical Thinking in Diagnosing Primary Open-angle Glaucoma: A Teaching Case Report

Aurora Denial OD,FAAO

Bridget Hendricks OD, MS, FAAO

*Glaucoma and ocular hypertension are common conditions encountered by many eye care professionals. Important critical thinking concepts, such as determining appropriate and relevant information, analyzing data, justifying a diagnostic conclusion, evaluating implications, and assessing the role of assumptions and point of view are used in the analysis and discussion of the case. This case demonstrates the ambiguities and challenges of diagnosis, along with the use of evidence-based medicine, critical thinking, and the art of questioning.*

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References:  
1. Data on file, Alcon Laboratories, Inc. 2. Neilson MS, Davis J, Mawardi DL. Characterization of a novel polymers artificial tear delivery system. Poster 63.33 presented at ARVO, April 2008, Fort Lauderdale, FL.

**This is relief.**

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## INDUSTRY NEWS

The following companies support ASCO's national programs and activities benefiting the schools and colleges of optometry in the United States and Puerto Rico.\*

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Vision Source!

*\*For the period*

*July 1, 2008 to June 30, 2009*

### Grants/Scholarship Available for 3rd and 4th Year Students



HOYA Vision Care is offering third- and fourth-year students a \$1000 grant and an opportunity to qualify for a \$6,000 scholarship. To be considered, students must submit a patient case study involving HOYA products. One winner will be selected at each school, and each winner will receive \$1,000. The winning case studies will then be reviewed by HOYA's ECP Advisory Panel, and an overall winner will be chosen. This student will receive an additional \$6,000 scholarship.

Judging will be based on originality, application of technology, product knowledge and overall analysis and composition. The written case study report must be submitted to the faculty judge designated at each school by May 1, 2010. Grant winners will be notified by June 1, 2010. Grant winners will be invited to the annual meeting of the American Optometric Association in Orlando, Fla., June 17-20, 2010, and Hoya will pay their airfare and hotel costs. The scholarship winner will be announced at the HOYA Awards Luncheon on Friday, June 18, 2010.

### New Roles at Vistakon



DIVISION OF  
**Johnson & Johnson Vision Care, Inc.**

Vistakon, Division of Johnson & Johnson Vision Care, named Colleen Riley, OD, MS, FAAO, Dipl CL, Vice President, Professional Development. In this role, Dr. Riley will lead the company's continuing efforts to develop and implement

strategies and programs that focus on professional and practice development for eye care professionals. She also will oversee all activities for The Vision Care Institute, LLC, a Johnson & Johnson Company. Dr. Riley is a graduate of Indiana University School of Optometry.

Dave Brown was named President, Vistakon Americas. In his new role, Mr. Brown will be responsible for Vistakon's US and Canadian businesses.

### Marco Offers EMR Certification Program



**THE LEADER IN VISION DIAGNOSTICS®**

Marco recently initiated the Marco EMR Certification Program, which is designed to assure doctors and their staff that Marco products will integrate seamlessly with Marco Certified EMR Partners.

To become certified, each EMR company must confirm and demonstrate that their software integrates with all Marco automated products. Moving forward, Marco and EMR-certified companies will work together as a team so that the integration will continue as new products are introduced by Marco or new technologies by EMR-certified companies.

### Haag-Streit USA Receives Distinguished Friend Award

Haag-Streit USA received the Distinguished Friend Award from the Illinois College of Optometry during ICO's Alumni Weekend celebration. President Dr. Arol Augsburger presented the award to Mr. Steve Juenger, Vice President of Haag-Streit USA at a dinner and reception on Sept. 11.



## New Online Resource for Practitioners



Bausch & Lomb US Vision Care launched the Center for Patient Insights Web site (<http://www.centerfor-patientinsights.com/>) to increase access to unbiased industry information, trends, market research, and insights for eye care professionals.

The company announced the Center in June at the annual meeting of the American Optometric Association. The main goal of this initiative, according to the company, is to deliver news and insights that help eyecare professionals better understand their patients, their industry and the information and opportunities available to them. The Web site is an extension of this initiative and will provide an easily accessible reference source to this information for eye care professionals.

## Polarization Testing Available



M&S Technologies now offers polarization testing on the Smart System 2020, giving eye care professionals the ability to perform binocular balancing, fixation disparity and suppression using polarization. For information, visit <http://www.mstech-eyes.com>.

## FDA Approves Preservative-free Ketorolac



The US Food and Drug Administration approved Acuvail (ketorolac tromethamine ophthalmic solution; Allergan), an advanced, preservative-free formulation of ketorolac, a nonsteroidal anti-inflammatory drug indicated for the treatment of pain and inflammation after cataract surgery.

According to the manufacturer, Acuvail, which is dosed twice daily, is formulated at pH 6.8, enabling deionized drug delivery on the corneal surface. It contains carboxymethylcellulose (CMC), a viscous molecule also found in Allergan's Refresh Brand Tears that enables the drug to adhere to the ocular surface and enhances patient comfort. Full prescribing information is available at [http://www.allergan.com/products/eye\\_care/acuvail.htm](http://www.allergan.com/products/eye_care/acuvail.htm).

## Volk Receives Ohio Award



Volk Optical was awarded a Governor's Excellence in Exporting Award by Ohio Governor Ted Strickland. The award recognizes Ohio companies that have shown superior performance in exporting, which is a vital component of the state's economy.

Volk's diagnostic ophthalmic lenses, equipment, and accessories are used extensively throughout the global ophthalmic community. The company has formed international distribution partnerships that give Volk strong regional representation and deliver good local sales and service expertise to its customers.

In other news, Volk reports increasing interest among optometrists in its HR Wide Field lens, particularly to examine for peripheral retinal tears. According to the company, the lens provides a panretinal view not possible with a noncontact slit lamp or BIO lens and a clear view of the entire retina, not possible with a 3-mirror lens, which needs to be rotated. Most importantly, it is distortion-free across the entire viewing area.

## SiHy Lens Parameters Expanded



CooperVision has expanded the parameters of Avaira 2-week replacement silicone hydrogel lenses. With the addition of plus sphere powers of +0.25D to +8.00D on a new 8.4mm base curve, Avaira's parameters now range from -12.00D to +8.00D. For more information, visit <http://www.coopervision.com>.

# Have you thought about the future of Optometry?

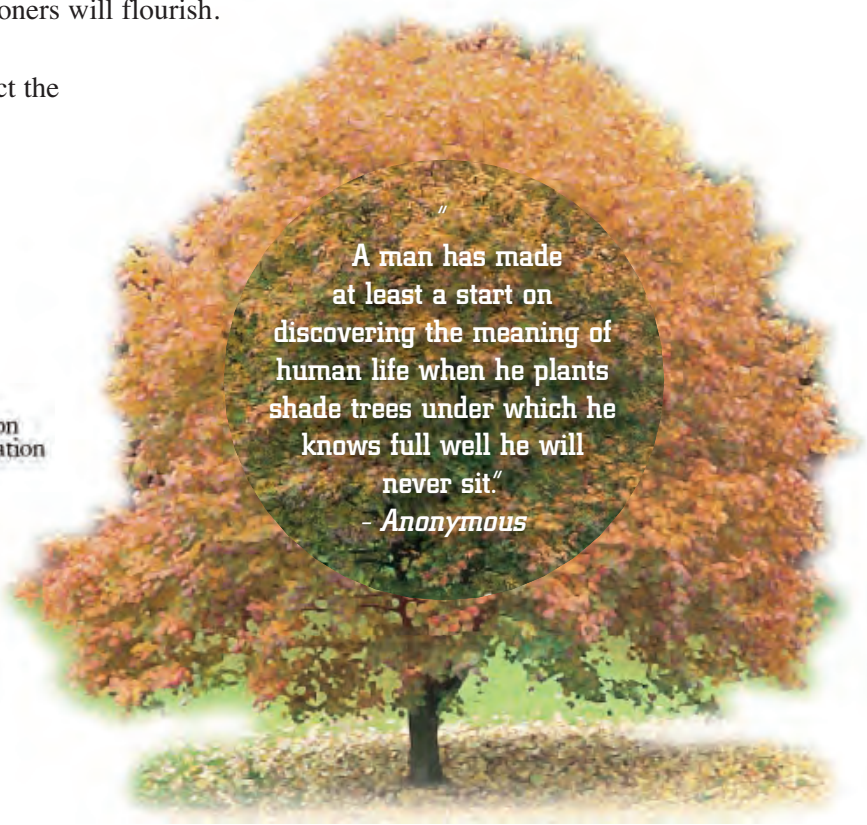
## We have!

The Partnership Foundation for Optometric Education is planting, cultivating, and nurturing. Together, this “true partnership” of state, regional, and national organizations is making a long-term investment in tomorrow. With the investment we make today in optometric education, future generations of practitioners will flourish.

For more information, contact the Partnership Foundation at [www.opted.org](http://www.opted.org) or 301-231-5944, ext 3018.



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for Optometric Education



A man has made  
at least a start on  
discovering the meaning of  
human life when he plants  
shade trees under which he  
knows full well he will  
never sit.”  
- Anonymous

# EDITORIAL

## The Times They Are A-Changin’

Elizabeth Hoppe, OD, MPH, DrPH



**A**s we finalize this issue of *Optometric Education*, we are facing many changes in our society, our profession, and even at the journal itself. In the words of the immortal Bob Dylan, the times certainly are “a-changin’.”

*Come senators, congressmen, please heed the call  
Don't stand in the doorway, don't block up the hall  
For he that gets hurt will be he who has stalled  
There's a battle outside and it is ragin'.  
It'll soon shake your windows and rattle your walls  
For the times they are a-changin'.<sup>1</sup>*

The battle over health care reform dominates the news. Opposing views, controversy, and uncertainty cloud the issues. Advocacy to ensure access to comprehensive optometric care as an integral part of health care reform legislation is a high priority. Other legislative initiatives also have the potential to impact the provision of optometric services. The Schakowsky-Hall Optometric Equity in Medicaid Act (HR 2697) seeks to enhance the role of optometry in state Medicaid programs by including optometrists in the definition of “physicians,” as has been previously incorporated in federal Medicare legislation. The National Health Service Corps Improvement Act of 2007 (HR 1884) strives to amend the Public Health Service Act to provide for the participation of optometrists in the National Health Service Corps scholarship and loan repayment programs.

These changes to our national legislation all have the potential to influence the clinical education of our students. The ultimate impact remains uncertain, but in this issue of *Optometric Education*, Fleming, Stroud, and Nowakowski describe a framework for considering strategic approaches to growing patient volume from the unique perspective of the academic setting. Strategic planning and evidence-based decision-making will certainly serve our clinical education programs well, regardless of the changes on the horizon.

*The line it is drawn, the curse it is cast  
The slow one now will later be fast  
As the present now will later be past  
The order is rapidly fadin'.  
And the first one now will later be last  
For the times they are a-changin'.<sup>1</sup>*

More changes have taken place on a profession-wide level. Our profession recently made the historic move to endorse a plan for board certification. Respondents in this issue's Think Tank feature anticipate the potential impact that board certification may have on optometric education.

Specific to our profession of optometric education, ASCO welcomes a new leadership team. Dr. Melvin Shipp took the helm to serve as president of the association in June. Readers can learn more about Dr. Shipp and his vision for the organization in this issue's Focus on the President.

*Come writers and critics who prophesize with your pen  
And keep your eyes wide the chance won't come again  
And don't speak too soon for the wheel's still in spin  
And there's no tellin' who that it's namin'.  
For the loser now will be later to win  
For the times they are a-changin'.<sup>1</sup>*

This issue of the journal also introduces the new position of associate editor. Dr. Aurora Denial has been selected by the ASCO Board of Directors for a one-year term as associate editor. After the completion of this one-year term, she will assume the role of journal editor. Dr. Denial shares her vision for the future direction of the journal in her guest editorial.

Our educational philosophies continue to shift away from memorization to embrace the development of critical thinking skills and clinical reasoning skills that can be applied in the patient care setting. These are skills that will serve our students long after graduation and skills that set the foundation for the life-long learning required to remain current in contemporary optometric practice. This change is embraced and described in a guest editorial by Dr. José De Jesús.





# EDITORIAL

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## (continued)

One of the changes I have worked to incorporate in my role as editor of the journal has been to introduce a new article format, the teaching case report. This article format is designed to produce publications that can be used as teaching resources for our readers. The case presentation format is structured so that it can be used for different curriculum levels and in different teaching and learning settings, ranging from small group discussions to the classroom. This edition of the journal includes our third teaching case report, presented by Denial and Hendricks.

We have all seen the tremendous changes taking place in our methods for communication and dissemination of information, first through e-mail and now through other forms of Web-based technology. This issue's ASCOTech column describes the changing role of social networking in health care education and provides new insights into ways to utilize the latest technology.

Despite all of these changes, one thing seems to remain constant: the special relationship that forms a bond between students and faculty. Dr. David Damari reminds us of this constant when he shares fond memories of his best day in optometric education.

I hope you enjoy this issue of the journal, and I hope it gives you some new perspectives on the “changin’ times” in which we live.

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*Dr. Hoppe is founding dean of Western University of Health Sciences College of Optometry. E-mail: [ehoppe@western.edu](mailto:ehoppe@western.edu)*

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<sup>1</sup>Lyrics from “The Times They Are A-Changin’” <http://www.bobdylan.com/#/songs/times-they-are-changin>. Accessed Sept. 17, 2009. Copyright ©1963; renewed 1991 Special Rider Music

# GUEST EDITORIAL

## My Goals and Vision As Associate Editor

Aurora Denial, OD, FAAO



In June, I was selected to fill the position of associate editor of *Optometric Education*. It is an honor and privilege to assume this position. For the next year, I will be working with the current editor, Dr. Elizabeth Hoppe to learn and contribute to the journal, the only publication devoted entirely to optometric education. I would like to take this opportunity to share some information about my background and my interests as an educator, as well as my vision for the journal.

I have been a faculty member at the New England College of Optometry since 1997. My area of special emphasis is the science of optometric education, and within that area, I have a particular interest in critical thinking and teaching clinical thought process. In the past 5 years, I have lectured at several conferences dedicated to education and critical thinking. Additionally, my research and teaching efforts have provided many opportunities for me to explore academic journals, teaching tools, and philosophies in other health care professions. My experiences and interests have given me a unique perspective to be an effective associate editor.

The role of *Optometric Education* is to provide a venue for disseminating information that will move the profession forward. High-quality educational research has significant impact on the profession. The scholarship of teaching and learning requires inquiry, research, dissemination, and reflection to create evidence-based teaching and learning.<sup>1</sup> I hope to always remain open-minded and flexible when developing new ideas related to the advancement of the journal. I am excited and enthusiastic about the many possibilities that lie ahead.

I envision the journal as a resource for high-quality educational articles written by optometric educators, as well as educators in other professions. My vision includes an emphasis on the scholarship of teaching and learning, the creation of a useful reserve of teaching case reports, and the development of a more interactive format.

### Scholarship of Teaching and Learning

In their book *Advancement of Learning: Building the Teaching Commons*, Mary Huber and Pat Hutchings write: "Teaching will be advanced when it is seen as intellectual work inviting careful deliberation among those who constitute the professional community and who take responsibility, as professionals in all fields must do, for improving the quality of the enterprise."<sup>2</sup>

The goal of most optometric faculty is effective teaching. Student/peer assessments, faculty development workshops, and anecdotal evidence are often used to achieve this goal. The concept of the scholarship of teaching and learning embraces the production of a public body of knowledge, which is characterized by high-quality, peer-reviewed research to achieve the goal of effective teaching.<sup>1</sup> Increased awareness and support of the concept of evidence-based teaching/learning will serve to advance the profession, enhance the quality of the journal, contribute to professional development, and benefit junior faculty members seeking advancement. Increasing the awareness of this concept at individual schools and colleges of optometry as well as at professional meetings is a priority.

### Teaching Case Reports

The teaching case report is a unique format that is meant to capture the teachable moments common in a clinical setting. The purpose of including this format in *Optometric Education* is twofold: 1) to develop a bank of cases to be available for all educators; and 2) to provide a format for publication that is adaptable to a broad spectrum of optometric educators.

The teaching case report differs from a clinical case report in several significant ways, but the most significant difference between the two formats is that the teaching case report outlines and presents a strategy for teaching. The teaching case report is written to help faculty educate students. The goal of publishing teaching case reports is to have a collection of diverse cases published over time. Having a collection of teaching cases will be a useful resource for optometric educators. Teaching materials that are not disseminated have only local impact.



# GUEST EDITORIAL

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## (continued)

### Web-based Technology

The format of the journal itself will be influenced and changed by current technology. Some potential interactive Web-based functions are: article views, reference links, citation manager, download to PowerPoint, related content and citing articles, and personalization tools, such as e-mail alerts. Interactivity will allow readers to use the journal more effectively and with greater ease and to value the journal as an educational resource.

I am very much looking forward to the upcoming year. Please feel free to contact me if you have any comments, ideas, or proposals for future editions of *Optometric Education*.

### References:

1. [http://academics.georgiasouthern.edu/cet/sotl\\_info.htm](http://academics.georgiasouthern.edu/cet/sotl_info.htm), What is SOTL. Accessed Aug. 26, 2009.
2. Huber MT, Hutchings P. The advancement of learning: building the teaching commons. San Francisco CA: Jossey-Bass 2005.



# GUEST EDITORIAL

## An Interrelated Curriculum to Improve Students' Clinical Reasoning

José M. De Jesús, OD, MA



Many optometric institutions are striving to develop ground-breaking integrative teaching strategies to provide students with a better clinical perspective in conceptual science courses and to improve their correlative knowledge to clinical applications. These strategies, however, may not produce optimum results within the structure of the current curriculum.

In this article, I discuss: 1) why I believe students struggle to associate basic and clinical concepts; and 2) the hindrance of applying innovative teaching to current curricula. I describe the characteristics of a proposed interrelated curriculum that may facilitate the implementation of integrative teaching tactics with an emphasis on developing conceptually based clinical reasoning skills that can be applied in clinical practice.

### Impetus for Change

The Applied Basic Science Examination (ABS Part I) of the National Board of Examiners in Optometry (NBEO) has prompted many educators to look for ways to provide optometry students with a more clinical perspective in conceptual science courses and to improve their ability to correlate this information to clinical applications. This external force, the ABS examination, coupled with the long-standing existence of curricula sustaining unsatisfactory correlation between basic and applied science concepts has compelled optometric institutions to develop new teaching strategies to address these issues. Most optometric institutions make a clear distinction between basic and clinical science courses in their curricula. In addition, many institutions subdivide courses into track categories, which further isolate the individual topics.

In my opinion, presenting scientific concepts as separate and distinct from clinical concepts may interfere with students' abilities to draw associative parallels. Recognizing this potential stumbling block, some institutions now include integrative seminars in their curricula and interactive clinical case discussions in the conventional classroom setting, similar to those adopted by educators in other health disci-

plines.<sup>1</sup> Although some of these strategies may help improve conceptual and clinical reasoning, their implementation under current curriculum designs may have limited benefits.

Integrative seminars, for instance, may offer some benefit in improving students' interrelated knowledge, but to a certain extent, their application in current curricular structures seems impractical because of the way courses are segregated. I believe the inclusion of innovative integrative teaching strategies may render more fulfilling results under what I have designated an interrelated curriculum.

### Interrelated Curriculum

With an interrelated curriculum, courses are not defined as purely basic science or clinical science. They are assembled and taught in one of the following three categories that are somewhat overlapping:

- Conceptually inclined courses with clinical relevance
- Clinically inclined courses with conceptual significance
- Parallel-corresponding courses with comparable conceptual and clinical relevance.

Common denominators among courses in these categories may facilitate students' abilities to develop clinical reasoning with a conceptual background. Based on this ideology, however, emphasis on concept and application varies, depending on the course modality. In addition, course presentation must be cohesive and synchronized, following either an integrated or a correlative format.

Conceptually and clinically inclined courses require an integrative presentation, whereas parallel-corresponding courses are presented correlatively. Integrative presentations of conceptually inclined courses involve congruent insertions of clinical associations within the predominant conceptual course content. In the same manner, basic concepts are systematically interposed into clinically inclined course content to provide background comprehension.

Conversely, parallel-corresponding courses consist of proportioned presentations of fundamental concepts related to medicine and their respective clinical applications, utilizing a complementary approach. Ultimately, these teaching systems may be consistent with integrative discussions and/or interactive clinical case presentations at the conclusion of a

# GUEST EDITORIAL

## (continued)

major topic section in a course.

Evidently, not all basic facts in conceptually inclined courses warrant clinical relevance, and not all clinical concepts in clinically inclined courses necessitate integration of scientific background explanations. It is the responsibility of the faculty member teaching the course to scrutinize and decide which concepts have important correlation to aspects that can be carried over to clinical practice. For the

most part, concepts of this nature are the ones that improve students' clinical reasoning and critical thinking. The conceptually inclined coursework section that follows exemplifies basic concepts that are in association with relevant clinical applications. As previously stated, clinically inclined courses also follow this same layout interposing scientific concepts into the predominant clinical course content.

Functional Ocular Pharmacology Autonomic Drugs							
1. Efferent oculosympathetic and oculoparasympathetic pathways							
2. Functional concepts of oculosympathetic and oculoparasympathetic post-ganglionic receptor types							
3. Autonomic drugs that influence post-ganglionic oculosympathetic and oculoparasympathetic activity							
a. Adrenomydriatics (phenylephrine, hydroxyamphetamine, cocaine)				b. Cyclomydriatics (atropine, scopolamine, homatropine, cyclopentolate, tropicamide)			
Chemical characteristics and ocular metabolism	Drug-receptor activity and tissue response	Adverse effects	Interaction	Chemical characteristics and ocular metabolism	Drug-receptor activity and tissue response	Adverse effects	Interaction
	<ul style="list-style-type: none"> <li>Dilator muscle</li> <li>Conjunctival vessels</li> <li>Mueller's muscle</li> <li>Clinical relevance                             <ul style="list-style-type: none"> <li>a. Pupil dilation procedure</li> <li>b. Differential diagnosis of miotic pupil</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Ocular</li> <li>Systemic</li> <li>Clinical relevance                             <ul style="list-style-type: none"> <li>a. Mechanism and induction of acute angle closure in anatomical narrow angle</li> <li>b. Malignant systemic hypertension</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Drug – drug</li> <li>Drug – disease</li> <li>Clinical relevance                             <ul style="list-style-type: none"> <li>a. Treatment for Parkinson's disease</li> <li>b. Treatment for mental depression</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>Sphincter muscle</li> <li>Ciliary muscle</li> <li>Clinical relevance                             <ul style="list-style-type: none"> <li>a. Pupil dilation procedure</li> <li>b. Cycloplegic refraction procedure                                     <ul style="list-style-type: none"> <li>1. Latent hyperopia</li> <li>2. Refractive accommodative esotropia</li> </ul> </li> <li>c. Accommodative spasm/myopia therapy</li> <li>d. Amblyopia therapy</li> <li>e. Iridocyclitis treatment</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Ocular</li> <li>Systemic</li> <li>Clinical relevance                             <ul style="list-style-type: none"> <li>a. Mechanism and induction of acute angle closure in anatomical narrow angle</li> <li>b. Increased intraocular pressure</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Ocular</li> <li>Systemic</li> <li>Clinical relevance                             <ul style="list-style-type: none"> <li>a. Primary open angle glaucoma</li> <li>b. Pediatric patients with motor and mental retardation</li> <li>c. Vagal block and tachycardia</li> </ul> </li> </ul>
4. Integrative group discussion							

# GUEST EDITORIAL

## (continued)

Parallel-corresponding courses, on the other hand, require constant complementation of fundamental concepts with clinical applications. They are based on fundamentals in pathology and clinical applications exposed with equivalent significance. Thus, disease-related facts presented are supplemented in tandem with clinical application counterparts. Faculty members teaching this type of course must assure that every fundamental concept has matching clinical correlations. Conceivably, topics in this course modality bear stronger association to clinical practice. The course-work section illustrated below characterizes the basis of this course format.

### Difficult but Worthwhile Endeavor

Unmistakably, implementing this teaching philosophy may be difficult. Development of some courses may require a coordinated blending of counterpart subjects. In others, it may demand expanding their descriptive scope. From a teaching standpoint, a great deal of coordination is imperative. It may require extensive verbal interaction between educators, particularly when faculty engage in team-teaching courses.

Complexities of this nature, however, may be nominal in comparison to the benefits obtained. Interaction among educators may stimulate their interest in reevaluating teaching skills and didactic approaches. From an educational perspective, institutions may be able to successfully assist students develop competent clinical reasoning skills with conceptual basis and meet the demands placed on them to apply these skills in optometry practice.

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*Dr. De Jesús is Dean for Academic Affairs at the Inter American University of Puerto Rico School of Optometry. He has a fellowship degree in clinical education from IAUPR and a master's degree in biomedical science from the University Del Caribe School of Medicine.*

## Advanced Neuro-Ocular Disease Efferent Pupillary Pathway Disorders

### 1. Parasympathetic Disorders

a. Anisocoria		b. Disorders	
Fundamental Concepts • Anisocoria testing	Clinical Applications • Differences in pupillary response related to parasympathetic anisocoria	Cranial nerve III palsy, Adie's pupil, dorsal midbrain syndrome	
		Fundamental Concepts a. Causes b. Signs and symptoms c. Pharmacological and ancillary testing d. Management options based on etiology and/or degree of involvement	Clinical Applications a. Associated signs and symptoms related to etiology b. Diagnostic workup c. Differential diagnosis based on results d. Management selection

### 2. Sympathetic Disorders

a. Anisocoria		b. Disorders	
Fundamental Concepts • Anisocoria testing	Clinical Applications • Differential diagnosis of miotic pupils	Horner's syndrome, Argyll Robertson pupil	
		Fundamental Concepts a. Causes b. Signs and symptoms c. Pharmacological and ancillary testing d. Management options based on etiology and/or degree of involvement	Clinical Applications a. Associated signs and symptoms related to etiology b. Diagnostic work-up c. Differential diagnosis based on results d. Management selection

### 3. Interactive clinical case presentations



## *“Will board certification impact optometric education, and if so, how?”*

*As I ruminate on the actions of the House of Delegates at the 2009 Annual Meeting of the American Optometric Association and the effect those actions will have on optometric education, I am distressed about the fate of the young professionals at entry into practice. In the not-too-distant future, it is likely that third-party plans will use this credential in selecting panelists for their reimbursement program. Therefore, board certification will become mandatory for doctors wishing to participate in third-party care (physicians cannot obtain hospital privileges without board certification). So a board certification program that was voluntary and merely to certify maintenance of competency will become mandatory and a prerequisite to practice in tomorrow's economy. As an aside, what happened to State Boards being the arbiter of maintenance of competency?*

*According to the plan, which is vague, new graduates will have three years to complete requirements to sit for the examination to become board-certified. I know of no mechanism for their inclusion in the managed-care system during the period prior to their certification by the board. Must the new graduate forego panel*

*inclusion? If so, from where does recompense arise? Will the panels accept them as “board eligible?” If so, from whence does that status confer? If the program of board certification is voluntary, then what differentiates the new graduate to the third-party program? In other words, if I am a third-party provider, how do I differentiate between a new graduate who is working toward board certification and one who is not working toward board certification? The immediately preceding question creates problems for those conferring “board eligible” statuses if board certification is voluntary. One other question comes to mind: How long can one spend in the “board eligible” status? If it lasts for only three years, then candidates should lose the status at year three of that status. How does that circumstance affect their status with the third-party panel? I do not believe that we should return to the days of a non-paid year of service before licensure or board certification could be conferred.*

*I would posit that these are but a few of the questions that must be answered to protect the public and the profession.*

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*Charles Haine, OD, MS  
Associate Dean of Clinical Affairs  
Western University of Health Sciences College of Optometry*

## Think Tank ...

The availability of board certification may be the most transformative change in optometry since the incorporation of pharmaceutical agents into optometric patient care. For the first time, optometrists will be afforded an opportunity to demonstrate competence in the principles and practice of general optometry through a rigorous and comprehensive post-licensure process. Will board certification impact optometric education? Absolutely! The initial impact will be the pursuit of faculty to serve as content experts and item writers for the various components of the certification process. Faculty also will be needed to lead continuing educational activities approved by the ABO.

Because the qualifying process that leads to board certification places a high value upon the completion of a residency, an additional short-term effect will likely be an increase in the number of applicants for existing residency positions. Projecting forward five to 10 years, it is likely the profession and ABO will expect the schools and colleges to facilitate the development of additional residency positions, including some that emphasize a focused experience on a path toward subspecialty certification.

Larry J. Davis, OD  
Dean,  
University of Missouri-St Louis  
College of Optometry

At the American Optometric Association's 2009 Convention, the House of Delegates voted to establish the American Board of Optometry and to begin the institution of the process of board certification in optometry. This occurred despite a seeming majority of the association's rank-and-file being opposed to the board certification concept. In parallel events on the national stage, national health care reform, seemingly a shoe-in to be passed by a Democratic Congress, has become far more controversial than anticipated and far less a sure thing. At this point, it is not perfectly clear what the model of optometric board certification will look like, and what the model for national health care reform will develop into. Despite the adversarial nature of these issues, it is highly likely that both board certification in optometry and national health care reform will be instituted in the near future in some yet-to-be-determined format.

The optometric profession has been in a constant state of change for the last 30 to 35 years. Optometric educators have most often been at the leading edge of the changes instituted into optometric practice and also engaged in a constant struggle to adapt optometric education to the increasing demands of optometry's enhanced scope of practice. The expanded scope of practice has compelled optometric educators, who are largely PhD-educated scientists, into collaborating with their colleagues who are largely clinical educators for the common ground and the links between the disciplines. The new National Board Examination in Optometry is certainly the most readily visible example of this.

Optometric board certification in its current proposed format will almost certainly inspire more interest in optometric residency programs and the increased clinical experience they represent. As we continue to vie with legislators, third-party payers, and public perception, it is highly likely that the optometric education program, which now stands at four years, will be expanded to include both an internship and a residency year as part of the standard preparation for future optometrists. This will allow optometric educators to expand didactic class work to the specific areas of our expanded scope of practice without sacrificing the traditional subjects that have made optometry such a unique and viable profession, while also allowing for the necessary clinical experience.

Mark W. O'Donoghue, OD  
Clinical Director  
New England Eye Commonwealth  
New England College of Optometry

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**T**he creation of the American Board of Optometry has been agreed upon by the recent signing of a memorandum of understanding between the American Optometric Association (AOA), the American Academy of Optometry, the American Optometric Student Association, and the Association of Schools and Colleges of Optometry. The 2009 AOA House of Delegates approved the formation of the American Board of Optometry and the proposed model of board certification/maintenance of certification (MOC) process. With the proposed model for MOC including concepts used in medicine's MOC programs known as Self-Assessment Modules and Performance in Practice Modules, and the recent Senate Finance Committee's Health Care Reform Bill tying the Physician Quality Reporting Initiative (PQRI) to MOC, it is likely that partici-

pating optometrists will need to demonstrate use of evidence-based medicine. As written in the aforementioned bill, demonstration of evidence-based medicine will be part of the requirements for eligible professionals to qualify for the Centers for Medicare and Medicaid Services (CMS) in PQRI incentive payments. Evidence-based medicine being brought into clinical practice to improve the quality of health and clinical care outcomes for patients is being asked for in support of clinical decision-making in health care reform. Optometric education will need to integrate more evidence-based medicine to prepare all optometrists to be ready to volunteer to participate in the MOC process. Furthermore, with residency programs playing a role in the initial board certification process, a rise in residency programs may be seen for the schools and colleges of optometry, again with the integration of more evidence-based medicine.

*Jan L. Cooper, OD, FAAO  
Trustee, California Optometric Association  
Adjunct Clinical Instructor Loma Linda University  
School of Medicine, Dept. of Ophthalmology*

Think Tank ...



# My Best Day in Optometric Education: Wednesday

David A. Damari, OD, FCOVD, FAAO



**M**y career in optometry has been quite diverse. I have done a residency, been a part-time associate in a private practice, and worked a few days a week at a mall-based commercial practice. I started and eventually sold my own practice specializing in vision therapy, and I did a fellowship-in-residence at the National Board. I returned to full-time academic optometry 12 years ago, and I have held administrative posts for the last 10 years.

Having experienced so many aspects of our profession, however, I still get my biggest kick from seeing patients, which I do only one day a week. That day is Wednesday.

Even though I have learned from and been mentored by some of the best, most knowledgeable optometric educators ever, I believe I have learned more about optometry from my patients than from any one teacher or mentor. I certainly learn more from my patients than I learn in any continuing education course. I discover more about how different conditions are manifested in real life and how those conditions can affect the quality of life of people in every aspect of school, recreation, and work. Most importantly, I learn how to effectively communicate what I have found during the visual evaluation and ocular examination, regardless of the patient's educational or cultural background. And the best thing about being an optometric educator is that I get to experience this learning process in the presence of my students, so they can share in the process and become better optometrists. My students challenge me every day to be a more effective clinician and educator, and I would not have it any other way.

I am not suggesting that my other work is not important. If there is any question about the importance of outcomes assessment in higher education today, just review any publication from our regional accrediting organizations, the Accreditation Council on Optometric Education, or the Department of Education from the last seven years or so. We owe it to our students to know, through valid measurements, that we are delivering on the promise of a quality professional education. Classroom teaching is also important, although the more experience I have with lecturing, the less enamored I become with it as a teaching technique. I became an optometrist to help patients use their vision

more effectively, and I find that, even after 20 years, I still get considerable joy from doing just that.

Of all the activities in which I have participated, however, seeing patients is most effective at making me a better optometrist, a better optometric educator, and a better administrator. Seeing patients with students is an even richer experience for me, and it allows my students to experience how optometry can improve people's quality of life at least as much as any other health care profession, by helping improve human achievement in academics, most occupations, and athletics.

So as long as my patient care day is Wednesday, you will be able to find me in our Eye Center, surrounded by patients and students and enjoying every minute. Yes, Wednesday is indeed a very good day.



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*Dr. Damari is professor and chair of the Department of Assessment at Southern College of Optometry.*

# ASCOTech: Digital Social Networking and Health Care Education

Dominick M. Maino, OD, MEd, FAAO, FCOVD-A  
Geoffrey W. Goodfellow, OD, FAAO

Do you have a presence on My Space (<http://www.myspace.com/>), Facebook (<http://www.facebook.com/>) and LinkedIn (<http://www.linkedin.com/>)? Do you tweet on Twitter (<http://twitter.com/>)? Do you broadcast your blogs (<https://www.blogger.com/>)? Your students certainly do. You would think that digital social networking would be an incredible opportunity for us to develop “teaching moments” within a new social context not encumbered by the usual stressors and expectations of health care education.

We know that 85% of college students use Facebook, with 60% logging in daily. Of the college students who use Facebook, almost 85% visit once a week, with 93% of them checking in at least once a month.<sup>1</sup> Librarians in academia are being asked for help to set up Facebook pages and are taking an interest in how students use these new tools.<sup>2</sup>

Faculty from the Georgia Institute of Technology conducted a survey at a mid-sized public research university to understand how contact on Facebook was influencing student perceptions of faculty. They found that one-third of the students surveyed did not want faculty on Facebook because of possible identity and privacy concerns, even though contact on Facebook had no effect on the students' ratings of professors.<sup>3</sup>

*Dr. Goodfellow is an associate professor at the Illinois College of Optometry. Dr. Maino is a professor at the Illinois College of Optometry. E-mails: ggoodfel@ico.edu or dmaino@ico.edu*

**Figure 1**  
**Facebook Page of**  
**Dr. Nathan Bonnilla-Warford's Practice**



Do health care students use digital social networking as well? One study noted that social networking with Facebook was very common among medical students. As many as 44.5% had an account and 64.3% said they used it frequently. Medical residents however, used it less frequently (12.8%). A review of the students who used Face-

book found that the majority of those evaluated (83.3%) listed at least one form of personally identifiable information, and only a third (37.5%) were made private. Unfortunately, some of the students' Facebook pages displayed what could be interpreted as unprofessional content as well.<sup>4</sup>



Can social networking help us teach professionalism and ethics?<sup>5</sup> Can we use Web-based professional development portfolios to promote “right, moral and professional behavior,” as our students journey toward becoming health care professionals?<sup>6</sup> What about those of us who conduct research? Is it professional and ethical to do research using Internet social networking sites? What guidelines should we use? What about privacy and consent issues?<sup>7</sup> Currently there are more questions than answers. As far as we can tell from a PubMed search on this topic, those of us in optometric education have not even been asking the questions.

So if we do not really know at this time how facing the music on Facebook, tweeting on Twitter and giving folks plenty of room on My Space can affect what we do as educators, do we know what the future of health care will look like when we are all interconnected? Are we teaching what our students need to know to survive in a technologically networked world? One article, “Take two aspirin and tweet me in the morning...” suggests that at least some medical practices will move beyond telemedicine and electronic health care records toward something more intimate and personal.<sup>8</sup>

The office of Nathan Bonilla-Warford, OD, FAAO,<sup>9</sup> uses digital social networking to educate patients, to help support charitable activities, to promote business-to-business marketing,<sup>10</sup> and to professionally market their many services to a wider community. They blog,<sup>11</sup> Twitter<sup>12</sup> (they have 629 followers!), and have even been given six stars on the Yelp rating service.<sup>13</sup> Are we educating our students for this kind of open-to-the-world 21st century?

I (DM) have discovered that one of the easiest ways to keep my students current on research in the areas of eye and vision care of children and special needs patients is to blog it at them.<sup>14</sup> This allows the student to choose which articles to look up and read, whether they are on campus or at an off-campus affiliated site. I remind them by a quick “tweet” and an announcement on my Facebook page when my blog is updated. They have also been known to make comments and send me messages about these articles so that “unofficial”

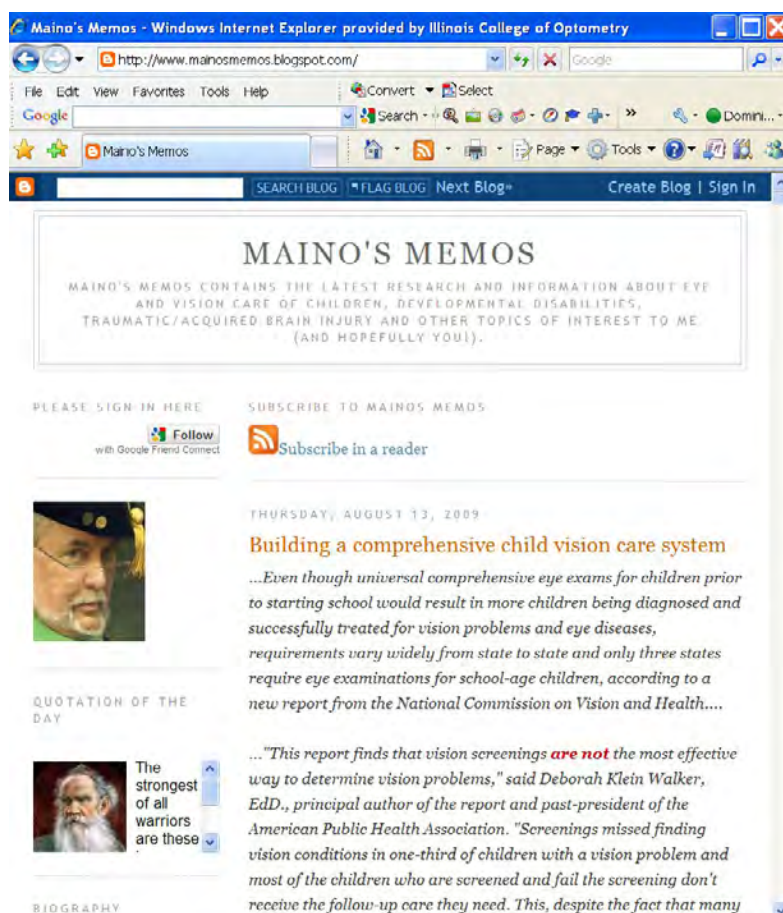
teaching/learning can take place. I can only imagine what might happen if I incorporated digital social networking into the courses and laboratories that I teach. Would learning occur more readily?

How do optometry school administrators use the social networking sites? Dr. Taline Farra, Assistant Dean of Students and Director of Admissions at the New England College of Optometry, tells us: “We have been using Facebook as a way to keep contact with our incoming students. Last year, we set up a page for the class of 2012, and it was a venue where students could meet each other virtually before they arrived and a place where they could ask questions of our staff. We are in the process of setting up a general info group for ... ques-

tions people may have.” Other schools are also dipping their digital feet into the cyberspace pond as well, but cautiously.

Are there other uses for Internet interfacing other than research and student recruitment? With dwindling fiscal resources and alumni support constraints during these difficult economic times, can the schools and colleges of optometry use digital social networking as a mechanism to raise funds? Fund Raising Success<sup>15</sup> notes that “... as of July 2009, there are more than 6 million users on Facebook older than 55, with total growth of 513.7% in the previous six months alone. That makes your main donor demographic ... the fastest-growing Facebook user segment.” They also state: “Online outreach is a

**Figure 2**  
**Dr. Dominick Maino's Blog**





cost-effective and efficient way to reach people at a time when we're all low on resources," and "Word-of-mouth marketing has historically been the most powerful way to engage people with your brand, and social marketing is really word-of-mouth marketing at its core.... It is a relational way to engage the communities that support your brand and mission." Can you Twitter dollars or Facebook endowments? These sites have not yet been noted as being viable fund raisers at this time, but large organizations like United Way<sup>16</sup> and Easter Seals<sup>17</sup> see them as offering great potential. Finally, Facebook itself offers Facebook For Good,<sup>18</sup> a site where you can share your stories about how Facebook has helped individuals give back to their communities and effect positive change.

Will learning in a socially interconnected, digital environment lead to a more personal approach toward acquiring knowledge? Will this allow our students to learn professionalism and ethics appropriately? Or will it all become a collection of online connected "National Enquirers" of sensationalism with a total lack of regard for personal privacy and standards expected from a more genteel and civilized society? Will the schools and colleges of optometry use cyber-socializing for research, student recruitment, and fund raising? It is obvious there are numerous questions. Who will do the research?

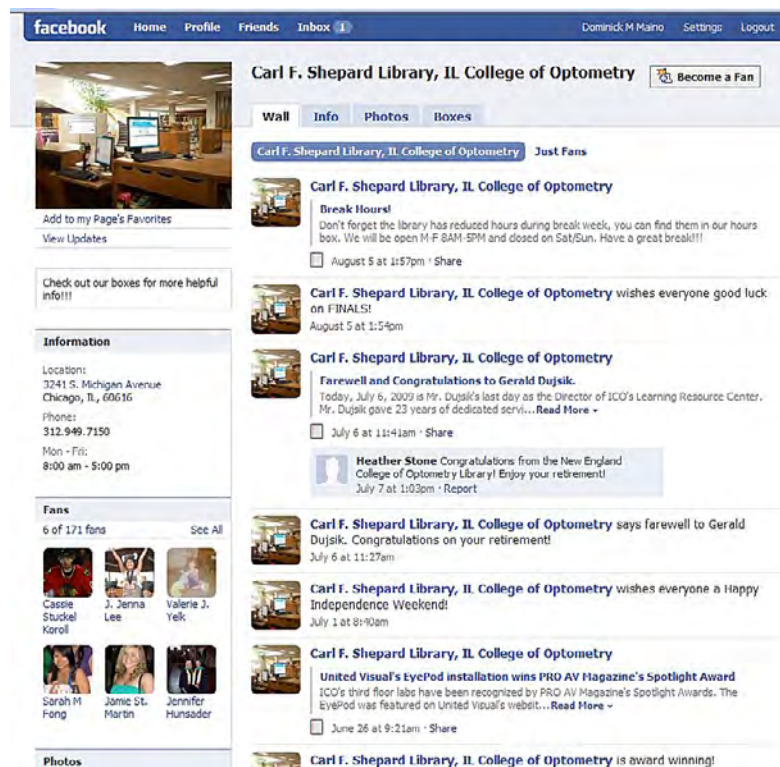
*Drs. Maino and Goodfellow invite you to offer your feedback about this and all ASCOTech columns and to make suggestions for future columns by emailing [dmaino@ico.edu](mailto:dmaino@ico.edu) and/or [GGoodfel@ico.edu](mailto:GGoodfel@ico.edu). Please visit <http://www.Mainos-Memos.blogspot.com> as well.*

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Figure 3



*Librarians at the Carl F. Shepard Library at Illinois College of Optometry use Facebook to keep in touch with students and faculty.*

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# Focus on the President

An interview with Melvin D. Shipp, OD, MPH, DrPH



## A Brief Bio of President Shipp

After receiving Bachelor of Science and Doctor of Optometry degrees from Indiana University, Melvin D. Shipp, OD, MPH, DrPH, served in the US Navy and the US Naval Reserve, achieving the rank of captain. He earned a Master of Public Health degree from Harvard University and a Doctor of Public Health degree from the University of Michigan.

Dr. Shipp began his teaching career at the University of Alabama at Birmingham School of Optometry, where he attained full professorship in 1999. He joined the OSU faculty in 2004, when he was named dean.

Dr. Shipp has been co-chair of the National Vision Program of the Centers for Disease Control and Prevention. He has also served on the Ophthalmic Devices section of the US Food and Drug Administration. Dr. Shipp is a fellow of the American Academy of Optometry and an AAO diplomate in Public Health and Environmental Vision. He has held numerous leadership positions with the American Optometric Association and the American Public Health Association.

**M**elvin D. Shipp, OD, MPH, DrPH, dean of The Ohio State University College of Optometry in Columbus, began a one-year term as president of the Association of Schools and Colleges of Optometry in June 2009. *Optometric Education* talked to Dr. Shipp recently to learn more about his goals as president, his interest in public health, his philosophy regarding optometric education and his personal interests.

*OE: As you begin your term of office, what are the key issues challenging the schools and colleges of optometry?*

Two issues in particular are most prominent: the current state of the US economy and the opening of new optometry schools after many years of status quo. The economy has an impact on education and the number of students supporting the academic enterprise. The new optometry schools are a mixed blessing. On the one hand, they provide more opportunities, both for people who want to become optometrists and for faculty to advance their careers, but the new schools also create stresses on our existing schools to provide sufficient and appropriately trained faculty to accomplish our missions of research, teaching and service.

*OE: As ASCO president, what steps will you take to address these issues?*

I want to make sure that we at ASCO recognize these challenges and share information and best practices between and among ourselves to help us through this period. One goal is to orient the current and new board members to ensure that the board is as effective as possible and that it will be helpful and have

a positive impact on the participating institutions. To that end, I plan to hold some sessions in which invited speakers from outside optometry talk about the legal aspects of boards, their fiduciary responsibilities and how the policy versus practice orientation should be. It is important for the ASCO board members to function at the policy level as opposed to overseeing the actual day-to-day operations of ASCO.

*OE: How will you address the needs of the new deans and presidents?*

Some board members who have served for a long time have institutional memory for ASCO as well as for their respective institutions and are in a good position to assist, advise, and support people who are just starting out. The new deans and presidents may have been involved in academics for a long time or, as in the case of some of our newest board members, they were not involved in academics at all or, in one case, not involved in optometry at all. That is where mentoring is important, to bring folks up to speed about some of the historical experiences so they can avoid making some mistakes and start at a different level.

*OE: Shifting gears now, what prompted your interest in public health?*

After I earned my OD degree, I practiced in the military for a while and then decided to return to graduate school. At the time, I thought I wanted to become better informed about a narrow perspective or field, either pathology or pharmacology. After attending UAB and looking at those two fields, I realized I was much more interested in broadening my perspective. Public health became my interest.



*OE: How has that interest influenced your approach to optometric education?*

The field of public health is broad, encompassing prevention as well as health care at the primary, secondary and tertiary levels. Understanding that has prepared me to do what I am doing today, because I have a better appreciation for how optometry fits within the spectrum of public health and health care delivery.

Another advantage of my education is that I feel comfortable interacting with and collaborating with other health providers, decision-makers and stakeholders within the health care system. I understand their issues, so I can better communicate with them and explain how optometry, which is a relative newcomer to the healthcare delivery system, fits into public health. As those of us in the profession know, optometry is not well understood. More often than not, we are confused with ophthalmology and opticianry, so we are constantly educating. I am comfortable with that, and I am able to do that more effectively thanks to my education in public health. I feel an understanding of public health is key to any health practitioner, but most importantly to optometrists because of the special circumstances in which we find ourselves.

*OE: What advice would you give optometrists who want to engage with their communities and with other members of the health care team?*

One of the most important things to remember when talking with someone who is not an optometrist is to speak in their language. As clinicians, we are inclined to talk about 20/20, visual fields or eye disease, whereas, the lay person does not relate to those terms. We need to translate what we do in a way that is meaningful to others. If you ask the average person what sense he would least want to lose, inevitably, the answer is vision. So we have a head start on educating people about the value of what we do. As opposed to talking about 20/20, visual fields or eye disease, we should talk in terms of performance and explain that the devices and treatments that we prescribe can help people achieve better grades in school, improve their job performance, have fewer accidents, do well in sports, and so on. People will then understand the value we bring and the difference we make.

The approach should be similar when talking to other members of the health care team. When talking to an internist, for example, I talk about the illnesses that are most important to him, such as diabetes, hypertension, or heart disease. Optometrists play an important role in early detection and/or reinforcing treatment modalities for those conditions.

I used to teach a course in communication, and one lecture was devoted to giving lectures and public speaking. The three key things to remember are to relate, relate, relate, because if you are not relating to your audience, you will lose them.

*OE: What changes do you predict in health policy, and how can optometry be "at the table" to help influence those changes?*

I would hope that health policymakers will look for safe, efficacious, effective methods to promote and optimize health for all. How do we do that? One way is to make sure that everyone involved in health promotion, disease prevention, and health care is at the table. The medical model is extremely important to the health of this country, but if you take a more holistic view, you understand that many changes that have occurred in this country have occurred not so much because of health care but as a result of identifying risk factors that cause people to become sick. For example, hygiene, sterilization, and sanitation have had the most profound effect on health around the world.

So, ideally, those who will make health policy will recognize that you need not only the traditional health care providers but also the newcomers to the field like optometry. I would hope that any and all disciplines involved with health care or health status at large are at the table and have an equal voice and opportunity to argue their case for contributing to the health of the country. Effective interaction between optometry and decision-makers at local, state, and national levels is essential if this is to happen. This interaction must occur at individual and organizational levels.

*OE: Who influenced your educational, administrative and leadership ideas? Who were your mentors?*

That is a tough question because they are too numerous to name. I am an amalgam of my family, teachers, col-

## On Being a Good Dean

Becoming a dean is almost like having played an instrument in an orchestra, then having someone say, "OK, you're going to stop playing your instrument now, and you're the conductor." So you put down the instrument that you have become comfortable with and rather accomplished at, and suddenly, you are asked to lead a group of other talented people in making music, but you are not making any sound at all. They are. And now, to maximize the music, you have to make sure you have the appropriate score for them to play as a group, and you have to motivate and direct them so that the final product is something everyone is proud of and happy about.

In my case, when I was a faculty member, I had my course, my students, my research, but now as a dean, nothing is mine. I am all about helping other faculty members with their courses, their research, their students, and making sure that I optimize and enable what they do.

Any faculty member who wishes to be a dean must recognize that trade-off when taking a leadership role. It's not all about you any more. It's about others, specifically those who are working within the institution to make things happen.

leagues, and friends. I also learned from other folks the things I do not like, and I make sure I do not do those things. So I consider both groups important: those who taught me what to do and those who taught me what not to do.

What I learned most importantly about education is to be able to ask questions comfortably of anyone so that I have a clear understanding or appreciation of what I know, and to make sure I know what I know. I try not to assume anything. I am a perennial student, trying to learn and know more and more and then stretching to try to learn more after that.

The administrators that I have appreciated and try to emulate are those who are respectful of others. They emphasize teamwork, try to support those who work with them and enable people to do their best work. My own model is that of a servant/leader. Although I may be the person who is leading, I want to be ready to assist anyone who works with me.

Regarding leadership, I do not anticipate that I will have all the answers. Instead, I like to listen to other people, lots of people in fact, and try to learn what they have to teach me. I try to surround myself with smart people, so listening to them is easy and helpful. I try to assimilate what they know and synthesize that with what I know and my experiences, make a decision and then move on. After having made a decision, I make sure that I evaluate what happened as a result of that decision and then repeat that loop as often as necessary.

I am a work in progress. I never feel like I have finished. There's always something else I can do, reexamine, tweak, revise, modify, enhance, etc. I try to make people comfortable with that, so they are not afraid of making mis-

takes, because I think we learn as much from our mistakes as we do from our successes. Because I appreciate all those things, you really don't get that from one person. You get it from a variety of people.

*OE: What leadership opportunities exist in optometry for someone interested in stepping into a position of dean or president and how can someone best prepare for them?*

There are now 20 schools in which there is a leader, and obviously, there will be changes and transitions in the future. Opportunities will not be difficult to come by. In fact, the difficulty may be in making sure the people who do emerge as leaders and presidents are prepared for those roles.

How can one best prepare for those opportunities? First, a person must understand optometry and the issues related to optometry. Obviously, most optometrists who are faculty members do understand that. But you have to understand it not just in a superficial way, but a specific way and how it relates to the constituencies — how alumni would feel, for example, about certain issues versus other optometrists versus non-optometrists, such as other healthcare providers, decision-makers, community leaders, etc. A person must be able to interact comfortably with any and all of those stakeholders. (See "On Being a Good Dean.")

*OE: What gives you the most satisfaction as dean?*

It's all about making a difference. If, at the end of the day, I feel I made a positive difference for a faculty person, a student or a group, then I'm OK. Fortunately, I have enough of those days, that it makes coming to work fun.

*OE: What is the single professional accomplishment of which you are most proud?*

If I had to point to one, it would be my induction into the Hall of Fame in 2002, in part, because it was totally unexpected. I still pinch myself and wonder how I might have been considered deserving of that. I perceive that as my colleagues saying that what I had done up to that point was, in their minds, good.

*OE: What are your hobbies and interests outside of optometry? Describe your perfect day.*

The focal point of my life is my family. My life revolves around my wife of 27 years, our two daughters and all my relatives. Beyond that, I very much enjoy golf. Not so much that I am good at it, but it is one of those singular things that, no matter how good you get, you always feel you could do a little better. I guess that goes back to what I was saying before — that I am a work in progress. I am constantly trying to improve, and I find that invigorating and energizing. I enjoy the challenge of trying to master something that cannot be mastered.

I also enjoy traveling, probably because I was an Army brat and I lived in various places in the United States and Europe. I also enjoy reading from time to time, although I don't get a chance to do much of that just for pleasure.

My perfect day? It goes back to making a difference. On my drive home or when I am relaxing at home with my wife, if I can reflect back and feel like I made a difference, then that's great. If I have had a positive impact on someone or some group, then I have had a great day, and that gives me the energy to get up and do it again tomorrow.



# A Strategic Approach To Growing Patient Volume in an Academic Setting

Joseph B. Fleming, OD  
Richard E. Stroud, MBA  
Rodney W. Nowakowski, OD, PhD

## Abstract

*Adequate patient flow is an absolute requisite for fiscal health in any clinical environment. In an academic setting, patient visits are also a cornerstone of the curriculum. In order for clinical education to be effective, students and residents must have a reasonable volume of patient encounters. For these reasons, substantial efforts are aimed at maintaining the patient base in a school or college of optometry. This paper presents historical patient volume data of the University of Alabama at Birmingham School of Optometry and describes recent strategic initiatives, which have resulted in growth of patient volume by 23 percent in a single year. A rapid increase in patient visits is achievable, even in an academic health center. Lessons learned have wide applicability, inside and outside the educational arena.*

**Key Words:** Patient volume, patient flow, patient base, patient visits, clinical education

*All authors are associated with the University of Alabama at Birmingham School of Optometry. Dr. Fleming is an associate professor and the current chief of staff. Mr. Stroud is the practice manager. Dr. Nowakowski is a professor and the former chief of staff. Email: [fleming@uab.edu](mailto:fleming@uab.edu)*

## Background

The University of Alabama at Birmingham (UAB) is a research university and academic health center. Student enrollment exceeds 18,000. With more than 19,000 faculty and staff, UAB is Alabama's largest employer<sup>1</sup> and is located in the state's largest metropolitan area, with a population of approximately one million.<sup>2</sup> The entire campus encompasses more than 80 city blocks and includes a large graduate school, a world-renowned health care complex, and more than 70 research centers.<sup>1</sup> The UAB School of Optometry is centrally located within this large academic environment. As is true for all schools and colleges of optometry, the patient care program is at the heart of the professional program curriculum, and patient volume is an important metric by which the health of the patient care program is assessed. In addition to receiving didactic education, optometry students must see patients in order to attain entry-level competencies in eye care, and optometry residents must see patients in order to attain advanced competencies in eye care. In any practice, patient volume is important for economic reasons; in an academic practice, it is important for educational reasons, as well.

Around the turn of the century, a disturbing trend of declining patient visits became evident at the UAB School of Optometry. In an effort to reverse that trend, the school undertook a major renovation project to update the clinical facility. Goals of the renovation included heightened visibility with a relocated entrance, large windows, and a prominent and inviting optical area. This renovation involved years of planning and cost in excess of \$5 million. The construction phase spanned 15 months from the summer of 2003 through the summer of 2004. During the construction phase, the clinic floor had to be completely vacated, and patient care was delivered in alternate locations throughout the building. Since the inception of the school, the clinical enterprise had been known as the UAB School of Optometry Clinic, and a new name seemed important from a marketing perspective. The process of selecting the name involved marketing experts as well as a focus group of people from UAB and the community.

On Sept. 7, 2004, the new clinic was opened for patient care under a new name, UAB Eye Care.

Patient volume had continued to drop during the clinic renovation. During the year immediately after completion of the renovation, patient volume grew. However, it became stagnant thereafter. By the end of the 2005/2006 fiscal year, it became apparent that the clinic renovation alone would not grow the patient base at UAB Eye Care. A stagnant patient base jeopardized not only the fiscal health of the program but also its educational effectiveness. There was an obvious need for a strategic plan aimed specifically at growth, but change is often slow in an academic health center, especially one within a state institution. One additional challenge was the saturation of the eye care market in the Birmingham area. Like any school or college of optometry, the UAB School of Optometry creates its own competition. When the school was founded in 1969, there were relatively few eye care providers in the area. Each year, the school graduates a class of new optometrists and releases them into the marketplace. Over the years, a significant number of graduates have remained in the Birmingham area, and competition for patients has increased. A clinically active Department of Ophthalmology located immediately next door to the UAB School of Optometry has further enhanced the competition for patients. Another challenge was a longstanding reputation of the school's clinic as a "teaching clinic" rather than a center of excellence delivering patient-centered care. In the face of these challenges, rapid and substantial growth was needed in order to maintain and improve the educational viability of the institution. A well-conceived plan to grow UAB Eye Care was crucial, and this paper describes that plan.

## Strategic Plan Development

A strategic plan for growth of the clinical enterprise was developed, and implementation was begun during the 2006/2007 fiscal year. No consulting or marketing firm was employed. The

plan had two major components: supply and demand. In this context, supply means the capacity of UAB Eye Care to see patients. Supply involves the density of appointment slots, as well as the efficiency of patient flow. As supply improves, more patients can be seen on any given day, and open appointments are available to prospective patients within shorter periods of time. Demand means the desirability of obtaining services at UAB Eye Care. Demand involves marketing and customer service. As demand improves, more of the public wants to come to UAB Eye Care for their eye care needs. Table 1 outlines the specific supply and demand elements of the strategic plan.

The supply elements of the strategic plan began with a complete reorganization and reallocation of the clinic staff. Historically, a UAB Eye Care staff member often simply inherited his or her responsibilities from the retiring or resigning person he or she replaced. A fresh look at staff assignments with a goal of maximizing patient flow resulted in substantial movement of individ-

uals and responsibilities. In addition, a new emphasis on cross-training clinic staff began to allow temporary shifting of individuals to cover any unexpected staff absence or any bottleneck of patients to process. The primary telephone line had been answered at the main reception desk of the clinic. This function was moved to a back office location in order to allow staff at the main reception desk to give their undivided attention to patients entering and leaving the clinic. The patient parking lot had been poorly monitored. No one watched the entrance or exit, and a numeric code for the exit gate was given to each patient at check-out. As a result of this poor monitoring, people who were not patients regularly parked in the patient lot and periodically created an overcrowded situation where a patient would have to find remote parking and then arrive late for an appointment. An entrance gate with a camera and intercom was added. This allowed an employee inside the clinic to monitor the entrance gate, raising it only for patients, which ensured adequate park-

**Table 1**  
**Strategic plan for growth of the clinical enterprise. Plan elements are categorized as supply (capacity to see patients) or demand (desirability of services).**

Supply	Demand
Reorganizing and reallocating staff	Focusing on patient-centered care
Cross-training staff	Articles in university publications
Moving telephone function away from main reception desk	Public interest stories in local news
Monitoring patient parking gate at entrance	Integrating new third-party vision plans
Installing telephone-based medical translation service	Optical trunk show
Hiring bilingual staff	Distributing "Save Your Vision" postcards through campus mail
Replacing clinic computer system	Publicizing discount for university employees and students
Increasing density of appointment slots	Participating in university Benefits Fair
	Screening at campus locations
	Agreements with government and charitable organizations to serve special clinical populations

ing for patients. With more patients on time for appointments, patient flow could improve.

Other supply elements of the strategic plan dealt with patient flow bottlenecks related to language barriers. The Birmingham area has a growing Spanish-speaking population, and a number of languages are represented in the university population. When a non-English-speaking patient telephones for an appointment or presents to the clinic to receive care, efficiency of patient flow can suffer substantially. Two steps were taken in an effort to improve efficiency for non-English-speaking patients. First, a telephone-based medical translation service, CyraCom's ClearLink, was installed at UAB Eye Care. Each telephone in this system has two handsets: one for the patient and the other for the person communicating with the patient. At the other end of the line, the medical translation service provides a person who is fluent in both English and the language of the patient. More than 100 languages are covered by this service. Second, because Spanish is the most frequently encountered non-English language and because UAB Eye Care had only one faculty member fluent in English and Spanish, a bilingual staff member was recruited and hired to replace a departing staff member. In addition to her regular duties in the clinic, she is available any time a Spanish-speaking patient calls or arrives.

Another supply element of the strategic plan dealt with the density of appointment slots. UAB Eye Care had been using outdated and inefficient software for patient scheduling and practice management. A new clinic computer system was needed. After writing a detailed request for proposals, interviewing the respondents, and arranging extensive demonstrations of each product, Compulink's Eyecare Advantage was selected and implemented. This new system's features allow faster processing of patients on the telephone and in person. It seemed desirable to have one consistent patient scheduling template which could be applied to the various appointment types across the entire clinic. Even more importantly, the template needed to allow room for an expanding patient base by providing additional appointment slots. A single customized template in the new computer system accomplished these goals. With more appointment slots avail-

able and a relatively simple procedure to schedule patients in them, UAB Eye Care could accommodate growth.

The demand elements of the strategic plan attempted to make UAB Eye Care more attractive to patients. These elements needed to overcome the challenges of enhanced competition for patients inherent in a saturated eye care market and of a long-standing notion that UAB Eye Care was simply a "teaching clinic." The specific focus was on people geographically close to the facility: those in the university community and downtown businesses. The primary goal was to build a solid reputation as a center of excellence delivering patient-centered care. From an internal marketing perspective, faculty, staff, students, and residents grew to understand the importance of letting every patient know that meeting his or her needs is at the core of UAB Eye Care and that diverse and deep expertise is available within the facility. External marketing, although soft and professional, was much more prominent than it had been. An enhanced media presence was aimed at keeping UAB Eye Care in the public eye. A series of articles was run in various university publications, and media releases resulted in public interest stories in local news. Faculty members were credentialed in some new vision plans, including Spectera and Humana Vision VCP, which had grown to cover a sizeable number of lives in area businesses. The first annual Optical Trunk Show was hosted at UAB Eye Care. "Save Your Vision" postcards were distributed to the university community via campus mail. These postcards simply promoted regular, preventive eye care, and contained instructions on obtaining an appointment at UAB Eye Care. A discount for university employees and students was publicized. This discount was a waiver of out-of-pocket expenses up to a total of \$25 for an annual comprehensive eye examination. As required by federal regulations, those insured by a federal health care program were excluded from the discount. UAB Eye Care became increasingly visible across campus by participating in the annual university Benefits Fair and then holding screenings at a variety of campus locations. Although screenings had long been part of the professional program curriculum, most screenings had been

held at public schools. Screenings had never been regularly scheduled on the UAB campus. Two campus screenings per month, utilizing the students assigned to the screening rotation, were simple to initiate. Finally, through agreements with the United Cerebral Palsy Center, Children's Rehabilitation Service, homeless shelters, and a foster children's ranch, UAB Eye Care was able to build its service to special clinical populations with unmet needs. Although these special populations provided only a small number of patient visits, they added diversity to the patient base and helped in accomplishing the public service aspect of the School's mission.

## Strategic Plan Results

With strategic plan implementation beginning during the 2006/2007 fiscal year, the stage was set for growth in the 2007/2008 fiscal year. As a result of the strategic initiatives combined with the commitment and dedication of the team of people constituting UAB Eye Care, patient volume experienced growth of 23 percent in a single year, with 18,672 patient visits during the 2007/2008 fiscal year.

A patient visit represents a billable encounter in which codable services are provided, and optical visits and screenings are specifically excluded from the count. Figure 1 presents the number of patient visits during each fiscal year from 1998/1999 through 2007/2008. Each fiscal year begins on October 1 and ends on September 30. Patient visits declined from 1998/1999 through 2002/2003. The patient volume sunk to its lowest level in 2002/2003. Clinic renovation occurred during the 2002/2003 and 2003/2004 fiscal years. The patient volume recovered substantially in 2004/2005, immediately after the renovated clinic was opened to the public. However, patient visits became stagnant during the next two fiscal years. Rapid growth occurred in the final year, and a new record level of patient visits was attained in 2007/2008.

From a financial perspective, clinic income increased 26 percent from the 2006/2007 to the 2007/2008 fiscal year. Over the same two-year period, the quantity of human resources remained constant, with 26 full-time equivalents (FTE) of clinic staff, eight FTE of providers assigned to clinic, and 32 FTE



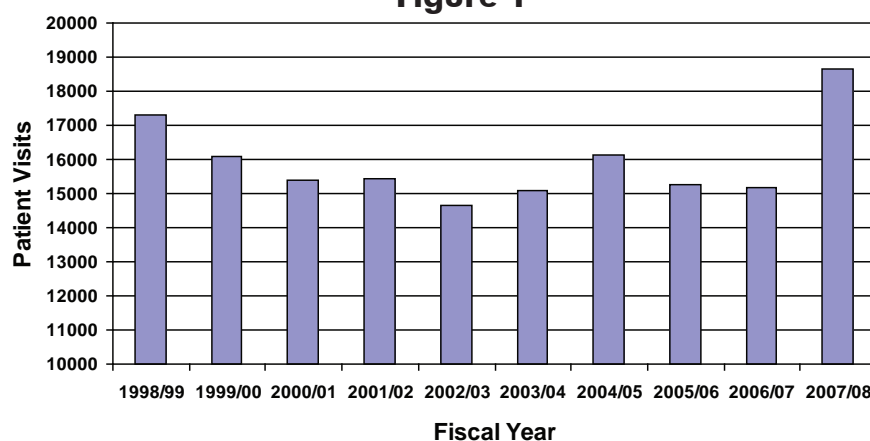
of students assigned to clinic. Students continued in their regular schedule of clinic rotations during the second, third, and fourth years of the curriculum. Noteworthy differences between the 2006/2007 and 2007/2008 fiscal years are summarized in Table 2. Many of these differences may be attributed to implementation of the strategic plan. With a marketing focus on the university community and downtown businesses, it is expected that the patient demographics would shift toward a younger age and an increased percentage of males during the 2007/2008 fiscal year. Because many in the university community and downtown businesses are covered by vision plans, growth in the percentage of “other insurance,” most of which is vision insurance, is predictable as well. Although the percentage of production from major medical carriers and from self-pay was lower in 2007/2008, the actual dollar amount of production from major medical carriers and from self-pay was larger. In a setting of strategic growth, an increased percentage of new patient visits and an improved show rate are also expected. In spite of the fact that the percentage of established patient visits was lower in 2007/2008, the actual number of established patient visits was larger, and this numeric growth is evidence of strong patient retention.

## Discussion

A strategic plan for practice growth involves understanding the environment, strengths, and weaknesses of a practice and developing a plan to achieve specific goals.<sup>3</sup> Most practices plan for growth with a goal of financial reward, and an effective growth plan can produce significant financial benefits.<sup>4</sup> In the academic setting of UAB Eye Care, although substantial financial growth occurred in the 2007/2008 fiscal year and was welcomed, patient volume growth was the driving force because of its relationship to educational viability.

Early in the strategic planning process, it became apparent that movement toward patient-centered care would be central to UAB Eye Care’s success in growth. Patient-centered care was described by Balint in 1969.<sup>5</sup> Over the past four decades, the concept has evolved and expanded. A broad definition of patient-centered care is care that

**Figure 1**



Fiscal Year	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008
Patient Visits	17,311	16,080	15,411	15,429	14,673	15,085	16,136	15,244	15,189	18,672
Change from Prior Year		-7%	-4%	0%	-5%	+3%	+7%	-6%	0%	+23%

↔ Renovation
↔ 23% Growth

*Note.* Annual patient visits, excluding optical visits and screenings, over the 10-year period beginning Oct. 1, 1998, and ending Sept. 30, 2008. Note the initial decline continuing into the period of renovation, the recovery immediately after the renovation (2004/2005), and the stagnation that followed. Also note the growth of 23 percent from the 2006/2007 fiscal year to the 2007/2008 fiscal year, coincident with implementation of the strategic plan.

**Table 2**  
**Comparison of the 2006/2007 and 2007/2008 fiscal years. Since 2007/2008 was the fiscal year of strategic growth focused on the university community and downtown businesses, many of the changes in measured parameters are expected. Specifically, note the shift toward an improved show rate, new patients, male gender, younger patient age, and payer mix more heavily weighted with vision plans (“other insurance”).**

Parameter	Specific Measure	2006/2007	2007/2008
Show rate	Shows	70%	78%
	No shows	30%	22%
New versus established	New patient visits	28%	33%
	Established patient visits	72%	67%
Patient gender	Male	38%	42%
	Female	62%	58%
Patient age	0-25 years	42%	51%
	26-52 years	39%	34%
	53 years and over	19%	15%
Production by plan	Medicare	19%	18%
	Medicaid	10%	12%
	BlueCross BlueShield	25%	20%
	Other insurance	32%	35%
	Self-pay	12%	11%
	Indigent	2%	4%



revolves around the patient and the patient's wants, needs, and desires.<sup>6</sup> Many view patient-centered care as it contrasts with physician-centered care and as it increasingly involves the patient in making well-informed decisions about diagnostic and therapeutic options. In other words, the physician becomes more of a consultant and educates the patient about the choices that he or she can make.<sup>7</sup> In the educational setting, patient-centered care can be viewed as it contrasts with student-centered care. At UAB Eye Care, the history of a clinic revolving around the student and the student's wants, needs, and desires was the reason for a "teaching clinic" reputation and was a significant competitive disadvantage. Movement from student-centeredness and toward patient-centeredness could alter this reputation and serve as a competitive advantage. Patient-centeredness is intended to make every patient feel special and expertly treated,<sup>8</sup> and patient-centeredness was instrumental in moving UAB Eye Care toward a new reputation as a center of excellence.

In any strategic plan for practice growth, it is crucial that the entire team focus on the chosen goals.<sup>3</sup> At UAB Eye Care, adequate buy-in from the entire team of faculty, staff, students, and residents was a requisite for transforming the clinic from one centered around the student into one centered around the patient. Given the long history of student-centeredness, a cultural shift in attitude toward patient-centeredness was the most difficult aspect of the strategic plan to accomplish. Although no specific incentives were employed, frequent and interactive communication about the vision of patient-centered care was pivotal. The convincing message of patient-centeredness was carried to the regularly scheduled meetings of faculty, staff, students, and residents as a focal agenda item. One-on-one follow-up with individuals after the meetings was extremely helpful, especially for those individuals who initially resisted move-

ment away from student-centeredness. Since patient-centeredness is not a concept that can be attained and subsequently ignored, periodic reinforcement was important in order to keep the patient first, even among those who initially supported the idea. This periodic reinforcement was accomplished through regular communication with the team, in a group setting as well as individually, and was enhanced through public and private recognition of those whose behavior exemplified patient-centeredness.

Little et al. demonstrated that patients prefer a patient-centered approach.<sup>9</sup> The unprecedented growth of UAB Eye Care's patient volume in the 2007/2008 fiscal year further suggests that patient-centered care attracts a viable patient base. Since a viable patient base is the foundation of effective clinical education, it follows that patient-centered care may be better for students than student-centered care. In fact, patient-centered care in an educational setting models appropriate practice for the students, and one can argue that it is "just the right thing to do."<sup>10</sup> If an environment of patient-centered care is created, effective education follows naturally.

Most of the strategic initiatives for growth presented in this paper and listed in Table 1 are not unique to academia and can be adapted for application in any clinical setting where growth is desired. However, a careful analysis of one's unique situation is necessary in order to formulate a customized strategic plan suitable for a specific setting.<sup>3</sup> The success of UAB Eye Care in achieving a rapid increase in patient volume is attributed as much to strategic planning itself, which resulted in an attitudinal shift toward patient-centeredness, as it is to any of the specific strategic initiatives. The primary lessons to be learned from this revival of a stagnant patient base are that strategic planning is an effective tool to grow a practice and that rapid and substantial growth is attainable.

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# Critical Thinking in Diagnosing Primary Open-angle Glaucoma: A Teaching Case Report

Aurora Denial OD, FAAO  
Bridget Hendricks OD, MS, FAAO

## Abstract

*This paper will discuss the care of a patient with glaucoma over a period of time and how critical analysis influences the patient's management. Glaucoma and ocular hypertension are common ocular conditions encountered by many eye care professionals. Primary open-angle glaucoma is the leading cause of irreversible blindness worldwide. Important critical thinking concepts, such as determining appropriate and relevant information, analyzing data, justifying a diagnostic conclusion, evaluating implications, and assessing the role of assumptions and point of view, are used in the analysis and discussion of the case. This case demonstrates the ambiguities and challenges of diagnosis, along with the use of evidence-based medicine, critical thinking, and the art of questioning.*

**Key Words:** glaucoma, critical thinking, ocular hypertension

*Dr Denial is an associate professor at the New England College of Optometry. Her main interests are educational research and teaching clinical thought process. Dr Hendricks is an assistant professor of optometry at the New England College of Optometry. She is an attending optometrist at Boston Medical Center, and her teaching focuses on ocular disease and glaucoma.*

## Background

This case involves a patient who was initially diagnosed with glaucoma in 2001 and then follows the patient over an 8-year period. During the course of the patient's care, the diagnosis and treatment changed, highlighting how changes in information can alter the diagnosis and treatment of a chronic condition. During the course of the patient's treatment, several vital questions arose: Is this glaucoma? Is this ocular hypertension? Does she need treatment? This case can be analyzed and discussed at a multitude of levels and time frames. It is most appropriate for use with first- and second-year students, who possess a basic knowledge base about glaucoma. At more advanced levels, the case can be used as a review of knowledge and to initiate debate.

Throughout the continuum of learning from first to fourth year, the expectations for a case discussion should change. At the early stages of education, the expectations should focus on how changes in information influence decision-making, development and appreciation of critical thinking concepts, and raising fundamental questions needed to analyze and evaluate a case. As students advance, in addition to the above concepts, the students should be able to independently apply critical thinking concepts, evidence-based medicine and their own clinical experience in the analysis of the case. Students at all levels should be encouraged to identify assumptions, analyze points of view, and recognize the impact of these concepts on the case and a patient encounter.

Primary open-angle glaucoma is the leading cause of irreversible blindness worldwide.<sup>1</sup> In 2004, the overall prevalence of diagnosed open-angle glaucoma in the United States was 2.22 million people or 1.9% of the population over age 40.<sup>2</sup> It is estimated that an additional 2 million people are undiagnosed.<sup>3</sup> By the year 2020, 3.6 million people in the United States will be affected by the disease.<sup>1</sup>

In the United States, optometrists are responsible for the detection, diagnosis, and management of glaucoma. This includes identifying patients at risk, assessing risk factors, implementing treatment, and educating the patient to ensure patient adherence and compliance.

The increasing prevalence of primary open-angle glaucoma and the negative consequences of this disease make this case educationally and clinically relevant. Additionally, the increase in scope of practice and responsibility within the profession of optometry along with the challenges associated with the diagnosis of glaucoma emphasize the importance of this case in optometric education. The value of this case does not lie in its uniqueness or rarity but rather in its commonality, prevalence, and ability to initiate debate.

## Student Discussion Guide

### Case Description

#### Profile:

Patient G is of Trinidadian descent, female, and born in September 1948. She immigrated to the United States in 1989 and works as a dietary specialist. She lives with her immediate family and has no history of drug, alcohol, or tobacco use. She first presented to a local area clinic in 2005, desiring to transfer her eye care to a facility that was geographically closer to her home. She brought her eye examination records dating from 1998 to 2005. Patient G had been diagnosed with primary open-angle glaucoma in 2001. She was a knowledgeable and compliant patient. She stated that she “never missed” taking her medication. She understood the nature of this asymptomatic, chronic disease and felt it was important to do everything possible to control the disease.

Between 1998 and 2009, the patient had multiple office visits. A summary of relevant examination findings will be presented for four intervals; 1998–2001, 2001–2005, 2005–2007, and 2007–present.

#### Summary of examination findings: 1998–2001

From 1998 to 2001, the records indicated a history of arthritis, which was treated with Vioxx, and otherwise unremarkable systemic health. Her family history was positive for a sister being treated for glaucoma. Records indicate a corneal scar OS, secondary to a laceration obtained in a car accident in 1970, which resulted in a decrease in visual acuity. During this time (1998–2001), she was followed for ocular hy-

pertension in both eyes. In 2001, after the visual field test, the diagnosis was changed from ocular hypertension to primary open-angle glaucoma, and treatment (OU) was initiated with Travatan. After two months on treatment with Travatan, the patient reported side effects of conjunctival injection and irritation, and medication was changed to Xalatan. Table 1 shows baseline data; Table 2 shows post-diagnosis/treatment data.

#### Summary of examination findings: 2001–2005 Table 3

From 2001 to 2005, visual acuity and C/D ratio remained stable with no changes. In 2002, the patient requested a change in medications secondary to

a change in her insurance formulary, which no longer covered Xalatan. At this time, her treatment was changed to Lumigan 0.03% SOL (bimatoprost) one drop before bed. In 2005, in addition to the diagnosis of arthritis, the patient was diagnosed with hypercholesterolemia and hypertension. Her medications from this time period included; lisinopril, hydrochlorothiazide, and naproxen.

#### Summary of examination findings: 2005–2007 Table 4

In 2005, the patient transferred care to our clinical facility. She reported good health with well-controlled systemic hypertension. Current systemic medications were: hydrochlorothiaz-

**Table 1**  
**Baseline data before treatment 1998–2001**

	OD	OS
Best corrected VA OD +1.25 = -0.50 x 100 OS +1.50 = -2.50 x65	20/20–	20/40-ph ni Secondary to corneal scar
Pupils	ERRL-APD	
TAP 4:00PM, 11/25/98	21 mmHg	19 mmHg
TAP 3:39PM, 3/2/01	22 mmHg	20 mmHg
TAP max no time, 7/17/01	26 mmHg	24 mmHg
Biomicroscope	WNL	Stromal scar
Van Herick Angle	1:1	1:1
Fundus with dilation, C/D	55%	55%
Humphrey Visual Fields (HVF) 24-2 SITA standard-reliable	Scattered, nonspecific defects superior and nasal MD-1.49DB PSD 2.60DB	No defect MD -3.33DB PSD 2.34DB

**Table 2**  
**Post diagnosis/treatment 2001**

Diagnosis	Primary open-angle glaucoma OU
Initial treatment	Travatan 0.004% SOL (travoprost) one drop before bed, OU
TAP post 2 month Tx @3:08PM, 6/21/01	OD 20 mmHg, OS 20 mmHg
Med change secondary to side effects (Conjunctival injection and irritation)	Xalatan 0.005% SOLN (latanoprost) one drop before bed, OU

ide 25 mg, once per day, lisinopril 10 mg, one tablet per day, and naproxen 500 mg. We referred the patient for a baseline Heidelberg Retina Tomograph (HRT), and pachymetry readings were obtained.

At this time, the point of view of the treating doctor was that the lower the IOP the better. However, a target pressure was not established. This patient expressed her point of view as being very trusting of medical providers; she felt that the medical provider knew what was best for her.

In 2005, during the patient's first visit at our clinical facility, her treatment was changed. Cosopt 2 0.5%, administered twice a day, was added to her list of current ocular medications, which included Lumigan 0.03% SOL, one drop before bed. Her medical history remained stable with no changes in diagnosis or medications. In 2007, the patient reported that her adult son was recently diagnosed and treated for glaucoma. Her C/D remained symmetrical and stable with estimates of 55% OD, OS.

#### *Summary of examination findings: 2007–present Table 5*

In December 2007, the diagnosis was reevaluated. The patient was ordered to stop all glaucoma medications for a medication holiday. The optometrist was open to reevaluating all data and information, which included the data gained after the medication holiday. The patient had developed a trusting relationship with the eye care providers and was comfortable taking a medication holiday.

In 2009, atenolol 25 mg, one tablet per day was added to the patient's systemic medications for better control of hypertension. Her C/D remained stable at 55%, symmetrical with healthy rim tissue. A repeat HRT (2008) was performed at the same facility as the first HRT in 2005. Subsequent HRTs performed in 2009 were performed at the current clinic, with new equipment.

#### *Key Concepts*

1. Strategy for diagnostic reasoning emphasizing the art of analysis, evaluation, and assessment of thinking<sup>4</sup>
2. Evidence-based medicine: how research can drive and change stan-

**Table 3**  
**Data from 2001–2005**

	OD	OS
Best corrected VA	20/20–	20/40–
Treatment 2001–2002	Xalatan 0.005% SOLN (latanoprost) one drop before bed	Xalatan 0.005% SOLN (latanoprost) one drop before bed
TAP 4:07PM, 11/30/01	18 mmHg	16 mmHg
TAP 3:12PM, 6/3/02	19 mmHg	18 mmHg
Fundus with dilation C/D	55%	55%
Treatment 2002–2005	Lumigan 0.03% SOL (bimatoprost) one drop before bed	Lumigan 0.03% SOL (bimatoprost) one drop before bed
TAP 3:16PM, 10/11/02	17 mmHg	17 mmHg
TAP 6:30PM, 7/12/04	21 mmHg	22 mmHg
TAP 6:12PM, 5/15/05	16 mmHg	15 mmHg
HVF 2002 24-2 SITA standard-reliable	No glaucomatous defects MD –3.28DB PSD 1.33DB	Few scattered defects, no glaucomatous pattern MD –3.01DB PSD 2.46DB

**Table 4**  
**Data from 2005–2007**

	OD	OS
Best corrected visual acuity	20/15	20/40
Treatment (2005) when first presenting to new clinic	Lumigan one drop before bedtime	Lumigan one drop before bedtime
TAP 10:30AM, 5/31/05	22 mmHg	18 mmHg
TAP 6:30PM, 07/12/05	22 mmHg	19 mmHg
Pachymetry (2005)	620 $\mu$ m	629 $\mu$ m
HRT (2005)	SD 25 $\mu$ m, no defects	SD 84 $\mu$ m, poor quality secondary to corneal scar
HVF (2005) 24-2 SITA fast OD low reliability secondary fixation losses OS reliable	Isolated nasal defect MD –1.10DB PSD 1.59DB	No glaucomatous defects MD –3.92 DB PSD 1.57DB
Fundus with dilation C/D	55% H/V, healthy rim, no heme, moderate depth	55% H/V, healthy rim, no heme, moderate depth
Change in treatment (2005) 11/02/05	Lumigan 0.03% SOL (bimatoprost) one drop before bed and Cosopt 2-0.5% SOLN (dorzolamide-timolol) one drop bid	Lumigan 0.03% SOL (bimatoprost) one drop before bed and Cosopt 2-0.5% SOLN (dorzolamide-timolol) one drop bid
TAP min 7:01PM, 2/13/07	13 mmHg	13 mmHg
TAP 7:09PM, 8/10/07	17 mmHg	17 mmHg
Tap max 6:25PM, 5/13/06	20 mmHg	19 mmHg
Pachymetry (2006)	617 $\mu$ m	631 $\mu$ m
HVF (2006) 24-2 SITA fast reliable	No defects MD +0.15 DB PSD 1.25 DB	No defects MD –3.39DB PSD 1.55 DB
HVF (2007) 24-2 SITA fast Borderline reliability secondary to false positives	Scattered defects nasal and inferior ? beginning arcuate defect MD –1.10 DB PSD 2.14 DB	No defects MD –3.33 DB PSD 1.59 DB
Gonioscopy with 3 mirror lens	Open with normal structures, no excessive pigmentation	Open with normal structures, no excessive pigmentation



- dard of care
3. Pathophysiology of glaucoma, integration of basic science concepts in a clinical presentation
4. Assessment of risk factors, including the concept of steady state and modifiable factors
5. Reliability, sensitivity, and specificity of diagnostic testing
6. Treatment, “Do no harm” risk/benefit ratio; role of economic and psychosocial factors.

### Learning Objectives

At the conclusion of the case discussion, the participants should be able to:

1. Describe how evidence-based medicine can influence and change standard of care, utilizing recent clinical studies in the analysis of and diagnosis of glaucoma
2. Utilize critical thinking concepts in diagnosis
3. Discuss the importance of the concept of point of view and how it can influence decision-making
4. Describe the role of risk factors, pathophysiology, diagnostic testing, and pharmacology in the diagnosis and treatment of glaucoma and management of ocular hypertension.

### Discussion Questions

The depth of the discussion questions may vary according to the academic level of the student. All discussion questions should be applied to primary open-angle glaucoma.

#### A. Concepts, Knowledge, Facts Required for Critical Review of the Case

1. What concepts are involved in critical thinking? Discuss analysis, evaluation, and reflection.
2. What tissue and structures are involved in primary open-angle glaucoma? What happens at a cellular level? Relate the disease process at the tissue or cellular level to the signs and symptoms of the disease.
3. What are the risk factors for glaucoma? How are the risk factors used in the management of glaucoma?
4. What diagnostic tests, according to standard of care, are

**Table 5**  
**Data from 2007–present (post medication holiday)**

	OD	OS
Fundus with dilation C/D	55% H/V, healthy rim, no heme, moderate depth	55% H/V, healthy rim, no heme, moderate depth
TAP 6:45PM 1 month post holiday, 12/18/07	20 mmHg	19 mmHg
TAP 7:30PM 6 month post holiday, 6/10/08	21 mmHg	22 mmHg
HRT (2008)	SD 34 $\mu$ m, no defects	SD 87 $\mu$ m, no defects
TAP 7:49PM 13 month post holiday, 1/20/09	22 mmHg	22 mmHg
TAP 9:15AM 14 month post holiday, 2/3/09	28 mmHg	28 mmHg
TAP 9:35AM 15 month post holiday, 2/10/09	28 mmHg	26 mmHg
TAP 7:12PM 16 month post holiday, 4/7/09	16 mmHg	18 mmHg
HRT (2/2009), new equipment	SD 19 $\mu$ m one borderline defect, temporal	Poor image
HRT (5/2009), new equipment	SD 15 $\mu$ m no defects	Poor image
HVF (2009) 24-2 SITA fast reliable	No defects MD –0.83 PSD1.30 DB	No defects MD –3.20 DB PSD1.72 DB

needed to follow a patient with ocular hypertension?

5. Summarize the important clinical studies used in the management of ocular hypertensive patients.
  6. What medications are commonly used in the treatment of glaucoma? What are the modes of action, side effects (short and long term), costs, etc.
- #### B. Critical Analysis: Purpose, Question, Information, and Inferences
1. What is your goal/objective in caring for this patient?
  2. What evidence/information do you need to evaluate this case?
  3. Is there sufficient evidence to diagnose glaucoma?
  4. At each interval, what evidence supports/negates the diagnosis of glaucoma?
  5. If the diagnosis is ocular hypertension, what evidence supports/negates the decision to treat?
  6. How should we interpret the data? Discuss the inferences/con-

clusions that can be made from the data, including the evaluation of the reliability of evidence such as HVF and HRT.

7. Discuss the inference/conclusions that can be made from the relevant clinical studies.

#### C. Critically Assessing: Points of View and Assumptions

1. What assumptions are made in this case?
2. How do the assumptions impact the case?
3. What information can be obtained to justify the assumptions?
4. What are the different points of view involved in the case?
5. How do the different points of view impact the case?

#### D. Critically Assessing: Implications

1. Discuss the implications of treating or not treating. Consider cost, risk/benefit ratio, psychosocial issues, side effects, time, evidence, points of view, etc.
2. Discuss the psychosocial issues

and implications of these issues. Consider doctor/patient relationship, compliance, anxiety of patient and doctor, etc.

3. Discuss implications of under-versus over-treatment.
4. Discuss the implications of systemic medications on intraocular pressure.
5. Discuss the psychological implications of changing or removing a diagnosis.

### Recommended Reading

1. Paul R, Elder L. *Critical Thinking, Tools for Taking Charge of Your Learning and Your Life*. Upper Saddle River, New Jersey, Pearson Prentice Hall; 2006.
2. Facione NC, Facione PA. *Critical Thinking and Clinical Reasoning in the Health Science*. Millbrae: California, Academic Press; 2008.
3. Nosich G. *Learning to Think Things Through*. Upper Saddle River, New Jersey, Pearson Prentice Hall ; 2009

### Educator's Guide

The educator's guide contains the information needed to discuss the case. Individual educators should tailor the information to a level appropriate for students in the first and second year of optometric education.

### Background

The American Academy of Ophthalmology defines primary open-angle glaucoma (POAG) as a chronic, progressive disease that most often presents with characteristic optic nerve damage, nerve fiber layer defects, and subsequent visual field loss. It occurs primarily in adults and is generally bilateral but not always symmetrical in presentation. The majority of people with POAG have elevated intraocular pressures.<sup>5</sup> There is currently no single agreed-upon standard reference for identifying POAG.<sup>6</sup> Ocular hypertension is defined as an abnormal level of IOP (IOP >21mm Hg) with normal visual fields and nerve head.<sup>7</sup> The Baltimore Eye Study estimates that 8% of adults over the age of 40 have ocular hypertension.<sup>8</sup> The management of patients with ocular hypertension is complicated by the general agreement among eye care pro-

fessionals that a "safe" or "normal" level of intraocular pressure differs among patients. Therefore, potential risk factors are an important component in the care of ocular hypertensive patients.<sup>2</sup>

### Strategy for Critical Thinking

Introductory information on critical thinking is presented. To expand your knowledge of critical thinking concepts, refer to the list of recommended reading. The recommended readings are appropriate for both students and faculty. Table 6 provides a summary of basic information for critical thinking and the parts of analysis.

Critical thinking provides a guide or strategy for accurate and efficient clinical judgment. Critical thinking involves thinking about thinking, with the aim of improving thinking.<sup>4</sup> Critical thinking utilizes analysis, evaluation, and reflection of thinking.<sup>4</sup> Analysis focuses on the parts of thinking: its purpose, question, information, inferences, assumptions, concepts, implications, and point of view.<sup>4</sup> Evaluation indicates assessing the clarity, accuracy, precision, relevance, depth, and breadth of thinking.<sup>4</sup> Reflection involves thinking about thinking to build on its strengths while reducing weaknesses.<sup>4</sup> The teaching and utilization of critical thinking skills

within the framework of a case report will aid students in achieving the skills of an ideal thinker.

One characteristic of an ideal thinker is the ability to recognize and differentiate information, inferences, assumptions, and points of view.<sup>9</sup> Inferences are made to make sense of information and are influenced by assumptions and point of view.<sup>9</sup> Inferences and assumptions can be accurate or inaccurate, justifiable or unjustifiable, or logical or illogical.<sup>9</sup> Good clinical judgment often involves making inferences based on assumptions. For students to develop good clinical judgment they must develop the ability to recognize assumptions and determine the quality of the assumption.

### Pathophysiology of POAG

Glaucoma is a multifactorial optic neuropathy that ultimately affects the individual axons of the optic nerve. We know that obstruction to axoplasmic flow is the culprit in the pathogenesis of glaucomatous optic atrophy through a process of programmed cell death called apoptosis. However, we still do not know if this cascade of events is initiated by mechanical or vascular factors or by a mechanism that we have not yet discovered.

**Table 6<sup>4</sup>**  
**Parts of Analysis**

Parts of Analysis	Definition
Purpose	Your purpose is your goal, your objective, what you are trying to accomplish.
Question	The question(s) lays out the problem or issue and guides thinking.
Information	Information includes the facts, data, evidence, or experiences we use to figure things out.
Inference	Inferences are interpretations or conclusions you reach. Inferring is what the mind does to figure something out.
Assumptions	Assumptions are beliefs you take for granted or presuppose.
Concepts	Concepts are ideas, theories, laws principles, or hypotheses we use in thinking to make sense of things.
Point of View	Point of view is literally the place from which you view something.
Implications	Implications are the things that might happen if you decide to do something.

According to the mechanical compression theory, elevated IOP causes a backward bowing of the lamina cribrosa, kinking the axons as they exit through the lamina pores. This may lead to focal ischemia, deprive the axons of neurotrophins, or interfere with axoplasmic flow, triggering cell death.<sup>10</sup>

According to vascular theories, death is triggered by ischemia, whether induced by elevated IOP or as a primary insult. Reduced blood flow to the optic nerve starves the cells of oxygen and nutrients. This reduced flow may be associated with systemic factors, such as migraine headaches, cardiovascular disease, diabetes, systemic hypertension, and systemic hypotension.<sup>10</sup>

There is a genetic theory that cell death is triggered by genetic predisposition. Following the death of individual axons, substances may be released into the environment causing a secondary triggering of apoptosis in neighboring cells, including glutamate (a neurotransmitter that may cause excitotoxicity), calcium, nitric oxide, and free radicals. Some glaucoma patients exhibit elevated levels of the neurotransmitter glutamate within the vitreous. Ganglion cells contain protein receptors that, when activated by glutamate, increase intracellular calcium to toxic levels, killing the cells.<sup>11</sup>

It may be that all of these theories are involved to some degree or that there is more than one mechanism of optic atrophy that depends on each individual's particular susceptibility.

Research has suggested that the vascular theory may be the predominant factor in patients who develop glaucoma in spite of a low IOP, whereas the mechanical theory is more prevalent in patients with higher IOP.<sup>10</sup>

### *Risk Factors for POAG*

When discussing risk factors for POAG, it is important to note that associations do not imply causation. They do, however, help us in identifying high-risk populations for whom close observation and routine screenings would be most beneficial. There is strong evidence supporting age, race, family history, high myopia, and intraocular pressure as risk factors.<sup>12</sup> In fact, the evidence for intraocular pressure as a potential risk factor for glaucoma is so strong that it is considered one of the potential causes as well as a risk. There is moderate evi-

dence for large cup-to-disc ratio, optic disc hemorrhage, and diabetes posing increased risk for glaucoma. There is slightly weaker evidence showing an association between glaucoma and systemic conditions, such as increased systolic blood pressure, migraine headaches, hypothyroidism, sleep apnea, and autoimmune disease.<sup>10</sup> It is also important to note that some systemic medications may increase a patient's risk for development of glaucoma. No environmental, infectious, or social risk factors have been identified. Recognition of a patient's risk factors for glaucoma can lead to earlier detection and better management.

### *Risk Assessment*

It is important to incorporate evidence-based medicine into the decision-making processes when evaluating a patient's risk for development of glaucoma. There are several ongoing clinical trials that provide evidence for the risk factors that we have discussed above, as well as for the importance of early intervention and treatment of those with high risk for the development of glaucoma.<sup>13</sup> The Ocular Hypertension Treatment Study evaluated the effect of treatment vs. no treatment in ocular hypertensive patients and found that

lowering IOP with medical therapy reduces by half the rate of conversion to open-angle glaucoma in high risk individuals.<sup>2</sup> This study also supports age, IOP, cup-to-disc ratio, and central corneal thickness as baseline factors that may predict the onset of glaucoma. The Early Manifest Glaucoma Treatment Study examined the effects of treatment vs. no treatment in newly diagnosed POAG patients. The study demonstrated that lowering IOP with medical therapy and argon laser trabeculoplasty inhibits progression of optic disc and visual field damage by 50%.<sup>14</sup>

Analysis of long-term, population-based studies of patients with high IOP and glaucoma reveals that treatment may reduce the risk of progression from untreated high IOP to blindness by a range of 1.2 percent to 8.1 percent over 15 years.<sup>15</sup> It has also been determined that between 12 and 83 patients with high IOP require treatment to prevent one patient from progressing to unilateral blindness over a 15-year period.<sup>15</sup> A brief summary of relevant clinical trials is listed in Table 7.

Results from these studies can be used in conjunction with a thorough case history and examination findings to assess a patient's risk for development of

**Table 7**  
**Clinical Trials**

Study	Description	Summary
Collaborative Normal Tension Glaucoma Study	Compared topical drug and/or surgical treatment to no treatment for normal-tension glaucoma patients	Over 10 years, it was found that a 30% IOP reduction cut glaucoma progression by 50%
Advanced Glaucoma Intervention Study	Compared effect of trabecular surgery type on black and white glaucoma patients	After 10 years, IOP was lower for both racial groups (but the best surgery type was race-specific)
Collaborative Initial Glaucoma Treatment Study	Compared trabecular surgery first versus topical drug treatment first for glaucoma patients	Both groups had equal IOP reductions after 5 years
Ocular Hypertensive Treatment Study	Compared topical drug treatment versus no treatment for ocular hypertensives	Treatment reduced progression to glaucoma by over 50% and thin central corneal thickness increased risk of glaucoma
Early Manifest Glaucoma Trial	Compared effects of argon laser trabeculoplasty plus betaxolol treatment versus no treatment over an average period of 6 years	Argon laser trabeculoplasty plus betaxolol reduced progression of glaucoma by 50% more than progression without treatment



glaucoma and support or refute a decision to initiate treatment. Multicenter data from the Ocular Hypertension Treatment Study and the Early Manifest Glaucoma Treatment Study allowed for the development of the glaucoma risk calculator that may be downloaded and used to evaluate a patient's risk for development of glaucoma.

### *Testing used to aid in the diagnosis of POAG*

In this case, the Heidelberg Retina Tomograph (HRT) was used to evaluate the structure of the optic nerve and nerve fiber layer. The HRT is a laser imaging technique that uses confocal scanning laser ophthalmoscopy to produce pseudo-three dimensional images of the optic nerve head, as well as numerical measurements (e.g. rim area, rim volume, cup shape measure, height variation contour, mean retinal thickness, etc.).<sup>16</sup> These numerical measurements can be used to document the optic nerve head and monitor changes in measured parameters. The HRT also performs a Moorfields Regression Analysis, which is a statistical tool allowing us to compare each patient's parameters to those of a normative database (meaning averaged values over a large group of normal patients who do not have glaucoma). From this, the examiner can statistically predict the likelihood of the individual patient having optic nerve changes suggestive of glaucoma.<sup>16</sup>

Automated visual field testing with the Humphrey field analyzer is the most frequently used psychophysical test for measuring and monitoring the function of the optic nerve. Factors such as patient selection, test selection, test reliability, and proper interpretation of test results are important when using visual field testing to diagnose and manage glaucoma.<sup>11</sup>

Although most patients are capable of performing visual field tests, modifications to testing technique must be made to compensate for patients with physical or mental limitations (e.g. elevation and stabilization of the head, frequent rests, and test-shortening strategies). It is important that the clinician recognize when such modifications are necessary in order to assure reliable, consistent automated field results.<sup>11</sup>

The Humphrey visual field analyzer offers a battery of test strategies from

which the clinician may choose. Table 8 shows the most commonly used tests.

In selecting which test strategy to use, the clinician should consider certain factors, such as the patient's physical or mental limitations, first-time test-taker vs. experienced test-taker, and level of suspicion/risk for glaucoma. The testing strategy should be kept as consistent as possible when monitoring a patient for visual field changes, so that any change in the field is attributable to the disease process rather than a change in the testing condition. Close attention should be given to reliability indices (fixation losses, gaze tracking, false-negatives, false-positives) as well as possible artifacts, pseudodefects, and defects from other diseases.<sup>11</sup>

Field defects commonly found in early glaucoma include nasal steps, paracentral scotomas, visual field loss in the upper hemifield that is different com-

pared with the lower hemifield, and defects within the arcuate bundle. As the disease progresses, further loss of axons causes these defects to coalesce. In end-stage disease, only a central and/or temporal island remains.<sup>12</sup> The determination of whether or not a defect is glaucomatous is not always straightforward and can be challenging. Several algorithms are available, either by computerized printout or computed by the practitioner. These algorithms can be complex and are beyond the scope of this paper. However, there is extensive literature readily available to aid the clinician in the analysis/interpretation of visual field defects.<sup>11,12,16</sup>

### *Pharmacology of Medical Treatment of POAG*

Medical treatment is usually the first line of treatment for POAG and includes the use of several classes of topical agents. All act by reducing intraocu-

**Table 8:**  
**Test Strategies for the Humphrey Visual Field Analyzer**

Name of Test	Points Tested	Comments
Full Field 120 (F120)	120 points over full field	Good sensitivity, fair specificity; useful as practice test
Full Threshold 30-2	76 points in central 30 degrees	Gold standard; longest test
Full Threshold 24-2	54 points in central 24 degrees (eliminates all edge points from 30-2 except for 2 most nasal points on horizontal meridian)	Reduces test time by 10%-20%; comparable sensitivity and specificity to the 30-2 test
Full Threshold 10-2	68 points in central 10 degrees	Preferred test in end-stage glaucoma or when fixation is threatened
SITA Standard 30-2 or 24-2	76 points in central 30 or 24 degrees	Determination of threshold is reached with fewer questions asked; reduces test time by 50% of the time it takes for a full threshold; Same accuracy as full threshold
SITA Fast 30-2 or 24-2	76 points in central 30 or 24 degrees	Requires a lower level of confidence to stop testing at a given point; reduces test time by 25% of the time it takes for a full threshold; less accurate than SITA Standard
FASTPAC	variable	Can be used in conjunction with 10-2 or 24-2 test patterns to reduce test time by as much as 40%; less precise than full threshold; scotomas may be underestimated

lar pressure. The main classes of topical agents used in the treatment of POAG include prostaglandin analogues, topical beta-blockers, alpha agonists, and carbonic anhydrase inhibitors (Table 9).<sup>10</sup> Two topical agents may be combined if one agent is ineffective.

### Discussion

This section will focus on key elements to stimulate discussion and is not inclusive of all possible discussion points. This discussion focuses on the use of critical thinking, while actual classroom discussion should include more in-depth integration of knowledge, current literature, and expertise.

With regard to the time period from 1998 to 2001, several important questions should be formulated and discussed. What is the differential diagnosis? What information is needed to support or rule out the diagnosis? What is the validity of the information? What are this patient's risk factors for glaucoma?

Patients with POAG present to clinicians at different stages of the disease. The earliest stages are asymptomatic with undetectable acceleration of apoptosis, ganglion cell death and retinal nerve fiber layer changes.<sup>6</sup> Later stages are still asymptomatic but with detectable nerve fiber layer changes. As the disease progresses, the symptom of visual field loss initially may or may not impact function.<sup>6</sup> Therefore, the man-

agement and analysis of risk factors becomes a key element in the diagnosis and management of POAG. What evidence (risk factors) puts the patient at risk for glaucoma? Are all risk factors equal? What clinical studies identify risk factors for primary open-angle glaucoma? How do clinicians evaluate clinical studies? From 1998 to 2001, information about IOP, family history, visual fields, ethnicity, and optic nerve head evaluation is needed to evaluate the patient's risk for glaucoma.

The evidence (risk factors) that puts this patient at risk is: positive family history (sister), elevated IOP, age, and visual field results. Data is random information unless it is analyzed. Analysis of information is guided by our knowledge base and experience and leads to reasonable inferences and conclusions.

Review of the literature reveals many different reports of a statistical mean IOP. Leydhecker's investigation of 10,000 individuals without glaucoma indicates an average IOP of 15.5 mmHg +/- 2.57 mmHg.<sup>11</sup> Additionally, "normal" levels of IOP differ among patients. Therefore, it is difficult to conclusively determine if the patient's IOP is outside the normal range for that particular patient. Referring to the definition of ocular hypertension, the patient's pressure readings of high teens, low twenties does put her in the borderline ocular hypertensive range. One high reading of 26 mmHg, 24mmHg

is recorded. It is impossible to analyze the significance of this reading since the time of the reading was not recorded. Based only on IOP readings during this time period, the diagnosis of ocular hypertension is reasonable to consider.

Most clinicians at the time assumed that the measured IOP accurately reflected the actual IOP. Information was published in the 1990s dealing with the accuracy of applanation tonometry.<sup>6</sup> There are two hypotheses to address why this assumption was not questioned: most clinicians at that time were conservative about incorporating new information into clinical practice, or the clinician was unaware of the findings in the literature. The record indicates that, based on the IOP, the patient was diagnosed as ocular hypertensive.

In 2001, the patient was 53 years old. There is significant evidence that with each decade of life there is an increased risk of progression in patients with ocular hypertension to glaucoma.<sup>17</sup> The Beaver Dam Eye Study reported the prevalence of open-angle glaucoma in people aged 43 to 54 years was 0.9%, while it was significantly greater, 4.7%, in individuals 75 years and older.<sup>18</sup>

In 2001, family history was a known risk factor for glaucoma.<sup>18</sup> Patients with a first-degree relative who had the disease were estimated to be 4-8 times more likely to develop the disease.<sup>19</sup> Family history may reflect genetic simi-

**Table 9:**  
**Medical Treatment for POAG**

Class	Mechanism of Action	Examples	Side Effects
Prostaglandin analogues	Increase aqueous outflow	Xalatan, Travatan, Lumigan	Changes in eye color and eyelid skin, stinging, blurred vision, eye redness, itching, burning
Beta-blockers	Decrease aqueous production	Timolol, Timoptic XE, Betoptic, Carteolol	Low blood pressure, reduced pulse rate, fatigue, shortness of breath; rarely, reduced libido, depression
Alpha agonists	Decrease aqueous production	Iopidine, Alphagan (brimonidine)	Burning or stinging, fatigue, headache, drowsiness, dry mouth and nose, relatively higher likelihood of allergic reaction.
Carbonic anhydrase inhibitors	Decrease aqueous production	Trusopt (dorzolamide), Azopt (brinzolamide), Diamox, Neptazane	Stinging, burning, eye discomfort; in pill form, tingling hands and feet, stomach upset, memory problems, depression, frequent urination
Combination	Decrease aqueous production	Cosopt (timolol/dorzolamide), Combigan (brimonidine/timolol)	Side effects of combined medications may include any of the side effects of the drug types they contain

larities related to the disease process, IOP, optic nerve head anatomy, shared previous exposure, or access to health care.<sup>20</sup> Therefore, the patient's self-reported information that her sister was being treated for glaucoma, increased her risk of the disease.

As clinicians, we routinely ask patients to report on their family history. From this information, inferences and conclusions about the patient's risk of disease are formulated by the clinician. The inferences and conclusions are based on the assumption that the patient's report and the diagnosis of a family member's disease is accurate. One goal of critical thinking is to decide what to believe in a given context, with available evidence, knowledge, and criteria.<sup>21</sup> What evidence can be elicited to justify the assumptions? Due to time, privacy, and practical limitations, most clinicians are unable to review evidence related to accuracy of information about family history. Therefore, it is important that each clinician recognize the assumptions made and use his or her best judgment to evaluate information and justify assumptions.

The initial visual field was taken one month before the diagnosis of glaucoma. Analysis of the visual field does indicate a cluster of defective points, which could indicate a nasal defect in the right eye. The mean deviation in the left eye was decreased. Questions to discuss: Is a one-time visual field defect a reliable piece of evidence? What can we infer or conclude from this piece of data? What is the significance of the mean deviation and does it impact the case? The reliability and reproducibility of the evidence must be explored before any conclusions can be drawn. Most experienced clinicians would not draw conclusions from one visual field result.<sup>2</sup>

In 2001, after the visual field, the clinician involved in the patient's care concluded that the evidence was sufficient to support the diagnosis of glaucoma, and treatment was initiated. Is this a reasonable conclusion? What other evidence is available to analyze? What is the doctor's hypothesized points of view on diagnosing and treating glaucoma? What evidence is missing?

The diagnosis of primary open-angle glaucoma is based on ruling out secondary causes including the filtration angle

being anatomically normal and observable by gonioscopy. The initial angle evaluation reported was from the Van Herick technique. A definitive test, such as gonioscopy, either was not performed or not recorded at that time. Therefore, the diagnosis of primary open-angle glaucoma was inferred based on the assumption that if the angle by Van Herick is open, the anatomical angle is actually open and normal in structure. Is this assumption justifiable?

The patient's ethnicity was not recorded on any exam form from 1998 to 2005. Since we lack specific information, we can infer that ethnicity was not elicited and not evaluated as a risk factor. This is based on the assumption that if it is not recorded, it was not elicited.

The C/D ratio was initially recorded as 55% OD, OS. From this information, we can infer that the cups were symmetrical with no vertical elongation. Other common glaucomatous signs were not mentioned in the record. It is impossible to conclude if the clinician did not look for other signs of glaucoma or if that information was just not recorded. The importance of accurate record-keeping and recording negative findings should be emphasized. As with ethnicity, in the absence of specific information, clinicians are inclined to make inferences based on assumptions. Is it reasonable to assume that saucerization, disc heme, peripapillary atrophy, abnormalities of blood vessels and excessive depth of cup were not present? Is a C/D ratio of 55% a risk factor?

In 2001, treatment was initiated with the prostaglandin analogue anti-glaucoma medication, Travatan, followed by Xalatan and then Lumigan. The changes in medications were precipitated by side effects from Travatan and a change in the patient's formulary, which no longer allowed for coverage of Xalatan. These prostaglandin analogue anti-glaucoma drugs work by increasing uveal scleral outflow. The anticipated drop in IOP from this class of drugs is an average of 30 %.<sup>22</sup> Over the next 4 years, the IOP never consistently reached the desired outcome from the medication. Is this finding significant? Is it an indication to change or increase the medication? Compliance to treatment must always be investigated when desired medication results are not achieved. The patient reported excel-

lent compliance with medication. We are assuming the patient is being honest. What evidence can we ask for to justify the assumption?

Over this time period, C/D ratio and visual fields remained stable with no glaucomatous progression.

In 2005, the patient transferred care. New information from pachymetry and Heidelberg Retinal Tomography were added to the database. The pachymetry demonstrated thick corneas of 620 nm and 629 nm. What is the relevance and significance of this information? Corneal thickness can influence the accuracy of IOP as measured by applanation tonometry.<sup>23</sup> Why is the corneal thickness so important in this case? Thicker-than-average corneas may result in an overestimation of IOP. The Ocular Hypertensive Treatment Study demonstrates an increased risk for ocular hypertensive patients with thin corneas. The corneal thickness is a critical piece of evidence. Could any other conditions such as edema, scars, etc. influence the pachymetry measurement? Is the reading reliable? Is the reading reproducible? The corneal thicknesses were confirmed with repeat measurements the following year.

The initial diagnosis was based on the assumption that the measured IOP accurately reflected the actual IOP. This assumption would have a large impact over the course of 10 years.

Results from the HRT (2005) provide an additional piece of information. The Moorfields Regression Analysis indicates normal rim tissue as compared to a normative database. What conclusions can be drawn from this information? Reports of sensitivity and specificity of HRT parameters in detecting glaucoma are good.<sup>20</sup> The HRT has more longitudinal patient data than other imaging devices.<sup>20</sup> As a result, the HRT's role in determining disease progression is well-established.<sup>20</sup> However, analysis of the information must consider test susceptibility to media opacities, subjectivity of setting the contour lines, and defining the normative database and cannot be used as a conclusive diagnostic tool at this time.

Analysis of HVF (2005) indicates an isolated nasal defect in the right eye and no defects in the left eye. A nasal defect in the right eye was first reported in the



initial baseline HVF, however this defect was not repeated in 2001. The visual field from 2005 demonstrated low reliability, secondary to fixation losses. What conclusions, if any, can we draw from this information? Would additional information from other types of visual field testing, such as frequency-doubling technology or short wavelength automated perimetry be beneficial or influence decision-making? What is the role of visual field testing? Is it detection, progression, or both?

The C/D ratio remains stable, with healthy rim tissue, no disc heme and moderate depth. No glaucomatous progression is reported. What is the best way to monitor the status of the optic nerve?

The point of view of the treating doctor at this time (2005) was that for patients who are diagnosed with glaucoma, the lower the IOP the better. As a result of this point of view, the treatment was changed to include Cosopt 2 in an effort to further lower IOP. The merits and limits of establishing a target IOP and the aggressiveness of the treatment can be discussed. The patient was willing to add the additional medication and reported good compliance with the new treatment plan. Patients often present with different points of view on medical care. Some patients view the doctor as an authoritarian and will not question the diagnosis or treatment, while others want to be considered a partner. This patient's point of view was of the doctor as an authoritarian, and she willingly complied with the treatment.

In 2007, clinicians came to the conclusion that the diagnosis of glaucoma needed to be reevaluated, and a medication holiday (temporary discontinuation of glaucoma medications) was considered. Clinicians now had the benefit of information from the Ocular Hypertension Treatment Study and analysis of data over time. This represented the ability to review multiple IOP measurements, HVF, HRT, and fundus evaluations. The HVF from 2007 before the medication holiday indicated a questionable arcuate scotoma. Before deciding to initiate the holiday, several important questions need to be evaluated. Does the evidence still support the diagnosis of glaucoma? What evidence supports the diagnosis of ocular hypertension? If the diagnosis is ocular hypertension, should the patient

be treated? Does the visual field need to be repeated? A clinician's point of view can be influenced by past experiences, knowledge base, new information, and new technology. Willingness to reevaluate represents open-mindedness, flexibility of thinking, skills in habitually questioning, and willingness to reconsider and reflect on thinking. This includes questioning previous diagnoses made by the same clinician or another clinician.

In 2007, evidence supporting the diagnosis of glaucoma is age and positive family history, sister, and son. Is family history a fact or an assumption? What information on family history can we gather from the literature? Could the patient's sister and brother have inherited thick corneas?

Evidence not supporting the diagnosis of glaucoma is lower IOP due to the influence of thick corneas, no repeatable glaucomatous defects on HVF, C/D ratio stable (symmetrical with no glaucomatous progression or defects reported), no defects on HRT and thick corneas. Is the lack of progression the result of lack of disease or the result of effective treatment?

The role of ethnicity is difficult to evaluate. The ethnicity of the people of Trinidad was influenced by many different cultures.<sup>24</sup> Because of this fusion of cultures, it is impossible to draw any accurate conclusions on the role of ethnicity as a risk factor.

A medication holiday was initiated in 2007 to gain additional information. The specific length of time for the medication holiday was not initially established. The plan was to monitor the patient closely and evaluate her response to the discontinuation of medication. Post-holiday IOPs were consistently stable 3 mmHg to 4 mmHg above treatment IOP with diurnal variation 6 mmHg to 7 mmHg higher. Is the diurnal variation significant?

The psychological implications of a change in diagnosis and discontinuation of treatment needs to be explored. This patient always reported good compliance with treatment, demonstrated trust and respect for her doctors, and had been educated about the potential sight-threatening prognosis of untreated glaucoma. Initially, the patient was educated about the use of new tests, such as pachymetry, and new clinical

studies, which necessitated a reevaluation of her diagnosis. She was compliant with discontinuing medications for the first few months. However, after 6 months she became very concerned about the possible removal of her diagnosis and the continual discontinuation of the medications. What are the psychological implications of a change in diagnosis? What are the psychological implications of discontinuing glaucoma medications?

After the patient was off medications for one year, HRT (2/2009) demonstrated one questionable area. Is this a true potential defect, or does this represent the variability of the test with a different examiner on a new piece of equipment? Repeat testing (5/2009) indicated no defects. After the patient was off medications for one year, HVF indicated a reliable test-taker and no defects. The question remains: Is this glaucoma? Is this ocular hypertension? Does this patient need treatment?

## Conclusion

Critical thinking is the strategy that allows clinicians to accurately and efficiently use their knowledge base and experiences in clinical reasoning. Acting without adequate analysis, failure to recognize assumptions and points of view, failure to evaluate implications, and unwillingness to reflect and reevaluate behavior are characteristics detrimental to a clinician's ability to provide the highest level of care. This case demonstrates the challenges related to diagnosis and treatment. There are no clearcut conclusions to this case, and, therefore, it provides an excellent stimulus for debate. In the future, new clinical trials and technology, such as risk management calculators and other optical imaging devices, may provide additional useful information. Developing good critical thinking skills will last a student a lifetime. It will allow students the ability to judge new information, incorporate relevant information into clinical practice, and provide the highest level of patient care.

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The original HVF, HRT, and disc photos are available by contacting the corresponding author at [deniala@neco.edu](mailto:deniala@neco.edu).