Contact lenses are increasingly viewed as a commodity, not a medical device, especially in recent years with pressure through legislation from online retailers.

In business literature, commoditization means a lack of meaningful differentiation in goods. Commoditized products are largely sold on the basis of price, not brand. This process would create the perception that all contact lenses are created equally in the eyes of the consumer.

Our job as eyecare professionals is to provide our patients with the best possible options for their personal visual demands. Contact lenses are one of the primary correcting options and, the desire to wear them spans centuries (see box, “History of contact lenses”).

Let's take a look at contact lenses in the retail marketplace.

Medical devices are not commodities

Contact lenses have been and are considered a medical device. Medical devices are regulated within the FDA’s Center for Devices and Radiological Health. This regulatory environment helps ensure products are safe and effective for patients.

Contact lenses and commoditization:

Looking forward & back

New technology helps

IOP measurement

See Technology and IOP on page 8

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References: 1. In a subject-masked clinical trial (n=93); Alcon data on file, 2010.

See product instructions for complete wear, care, and safety information.

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Using toricity with SCLERAL LENSES

Front and back surface curves provide stability and performance

By Lynette K. Johns, OD, FAAO

Scleral lenses are indispensable in a specialty contact lens practice. The indications for scleral lens use are well established in the literature and range from visual rehabilitation of irregular corneas to severe ocular surface disease management. Many more uses may still be revealed.

The hallmark of scleral lens fitting is vaulting the cornea and limbus and landing on the conjunctiva overlying the sclera. Much attention is placed on proper corneal clearance; however, equally important is the landing of the periphery of the scleral lens on the ocular surface. We are fitting the scleral shape, after all.

FIGURE A. A steep-fitting spherical lens on a with-the-rule sclera.

FIGURE B. Fluorescein highlighting mild edge lift nasally that would likely go unnoticed without the dye.

Front toric vs. back toric: What’s the difference?
Toricity may mean different things depending on the practitioner. Remember, toricity is

See Scleral lenses on page 22

Contact lenses and commoditization: Looking forward & back
By Jason Miller, OD, MBA, FAAO

Contact lenses are increasingly viewed as a commodity, not a medical device, especially in recent years with pressure through legislation from online retailers.

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See Commoditization on page 5

New technology helps IOP measurement
By Benjamin P. Casella, OD, FAAO

Going beyond standards of care in treatment elevates the conversation

Not long ago, a colleague asked me if I performed Goldmann tonometry on all of my glaucoma patients. Without hesitation I said, “No.” When asked why not, I simply answered that not all of my patients are physically able to have the test performed on them. For various reasons, some of our patients just can’t get positioned in the slit lamp. This is the same reason why I do not per-

See Technology and IOP on page 8
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Much has been written about Opternative, and I will not rehash what the product is and what it purports to do. I will say the product presents a clear and present danger to the eye health of the unsuspecting public. We can argue the merits of disruptive technology, but the bottom line is the product as currently marketed as an “eye exam” is a public health threat. This has been recognized because the product has been banned in seven states to date.

The most recent is South Carolina, and the mechanics of how the South Carolina Optometric Physicians Association (SCOPA) had to overcome the ignorance and arrogance of its governor is a model for all optometry.

The bill, R178, S1016, “The Consumer Eye Care Protection Act,” was first introduced in January 2016. It states that “a prescription for spectacles or contact lenses may not be based solely on the refractive eye error of the human eye or be generated by a kiosk.”1

The bill initially passed 100-1 in the House and 40-0 in the Senate. Yet South Carolina Governor Nikki S. Haley vetoed the legislation on May 16, stating, “I am vetoing this bill because it uses health practice mandates to stifle competition for the benefit of a single industry, effectively banning eye care kiosks statewide... a small group of eye care professionals is seeking to block new technologies that expand low-cost access to vision correction services.”

I wouldn’t consider the SCOPA nor the AOA, who have been quite vocal about this technology, to be a “small group.” As well as the fact the legislation passed so readily, Gov. Haley was obviously uninformed or simply chose to ignore the wishes of her constituents. No matter. Her veto was overturned by an overwhelming vote from the state legislature. The Senate voted 39-3, while the House voted 98-1 to override the veto. South Carolina joins Georgia and Indiana as states that have banned online eye exam technology like Opternative. Opternative has now ceased operations in South Carolina.2

This is what organized optometry looks like at its best. It took the grassroots efforts of South Carolina ODs contacting their legislators as well as the ceaseless work of SCOPA and AOA. Johnson & Johnson even lent its support by reaching out to SC legislators.

Our colleagues’ efforts in South Carolina provide a template for other states in what will surely be an ongoing, protracted battle with companies who choose to put profits before patient health. To allow such a bill to pass in any state will result in a cancer-like spread which cannot be tolerated.

REFERENCES

Check out July’s contact lens special section starting on page 16.
MISSION STATEMENT

Community. In partnership with our readers, we will achieve mutual success by:

- Nature in a timely and accurate manner for members of the optometric community.
- Disseminating news and information of a clinical, socioeconomic, and political nature.
- Addressing political and socioeconomic issues that may either assist or hinder the optometric profession, and reporting these issues and their potential outcomes to our readers.

Dr. Carl Spear asks if you would want your children to become optometrists. In an informal poll during one of his lectures, he asked that very question. Hand-raising results showed 35 percent said yet while 65 percent said no. Read more on this provocative discussion topic.

Dr. David Kading uses video to share how you can use the latest technology to improve your patient care. Take a look.

Dr. Tracy Schroeder Swartz compiles an optometry-related list of epiphenomena—words derived from the names of people. It includes such notable names as Descemet, Muson, and Bowman, and more. Check it out!

Dr. Leslie O’Dell recently met a veteran during his trip to Washington, DC, for Honor Flight, and she says ODs have some things they can learn from veterans.

The content above is from the July 2016 issue of Optometry Times. You can check it out for yourself by visiting OptometryTimes.com/10bestmemes.
Commoditization
Continued from page 1

vices and Radiological Health, and contact lenses are regulated under the authority of the medical device amendments.3

Most contact lenses that are removed daily fall within Class II medical device category. They are in this class as they “provide a reasonable assurance of safety and effectiveness.” Other things regulated in this category are X-ray systems. Extended wear contact lenses are regulated as Class III medical devices because they pose a higher risk of injury. This is the same category as heart valves and pacemakers.3

I challenge this contact lens commoditization concept in that these medical devices are equal—very far from it. Contact lenses differ in material properties and how they are fit. There is no one size fits all contact lens. Many eyecare professionals will use everything in their contact lens toolboxes on a given day in order to take care of their patient’s visual needs. Contact lens practitioners today are able to choose from a variety of new contact lens materials, lens care solutions, moisturizing eye drops, and prescription therapies to help with various contact lens-related needs.

For example, a 49-year-old female patient presented looking to wear contact lenses again due to blurred vision at near. She had LASIK 10 years ago and was happy until recently when she had needed to wear her readers more and more often. Her refraction was slightly hyperopic (+0.50 D OD, +0.75 D OS) at distance and required a +2.00 D add. It is difficult to maintain stable vision in LASIK patients because of the altered corneal architecture. The central flattened corneal can be difficult for soft lenses to conform to and will, at times, lead to the lens vaulting the cornea. This will inherently result in visual instability between blinks.

If the patient could choose any multifocal contact lens she wanted, her visual success would be extremely unsatisfactory. She would most likely not wear contact lenses and never try them again, thus contributing to fewer contact lens wearers in the market. This patient ultimately needed a flatter fitting contact lens which did not vault her altered cornea, resulting in better visual acuity at distance and near.

This patient’s success was achieved through my knowledge of and experience in fitting contact lenses. Choosing the lens with the lowest price would not have netted a similar outcome. Imagine this happening to the thousands of patients we see who require specialized care.

Many outside forces can challenge contact lens comfort during long days in front of visually demanding tasks, such digital device usage. Innovation continues to be strong with many new disposable lenses and multifocal and toric designs, which can enhance our patients’ lives. These products are constantly evolving to address these needs of our patients, including lenses to improve ocular surface health, better eyesight at multiple distances and most importantly to improve the comfort.

Optometrists have been closely involved in the development of this technology from its early beginnings to where we are now with nearly 41 million contact lens wearers in the U.S.4

Contact lens legislation
Online contact lens retailer 1-800 Contacts has been aggressive via legislation in the past year to increase its contact lens sales. However, the fight to commoditize contact lenses has been ongoing for more than a decade.

Let’s take a look at four pieces of legislation that affect contact lens prescribing.

1. 2003 Fairness to Contact Lens Consumers Act
This act deals with the availability of contact lens prescriptions to patients. There are many aspects to this bill, but it primarily states that there are rules for the prescriber and the seller of contact lenses.3

In short, the prescriber:
- Shall provide to the patient a copy of the contact lens prescription
- Shall, as directed by any person designated to act on behalf of the patient, provide or verify the contact lens prescription by electronic or other means

While the seller may sell contact lenses only in accordance with a contact lens prescription for the patient that is:
- Presented to the seller by the patient or prescriber directly or by facsimile; or
- Verified by direct communication

The grey area happens in a couple of areas. First, the prescriber has eight business hours to communicate with the seller after receiving a request. Many requests

History of contact lenses

To understand where we are now with contact lenses, we have to look back.
- 1508: Leonardo da Vinci illustrated the concept of contact lenses in his notebooks.
- 1823: British astronomer Sir John W. Herschel conceptualizes a practical lens design by creating a mold of the eye. This mold would match the eye’s surface curvature and there was significant advancement in 1884 with the development of anesthesia.
- 1888: Adolf Eugene Fick manufactured the first “contact lens” from glass to correct his vision. It fit over the entire eye and had a maximum wearing time of about two hours.
- 1947: Modern contact lenses were born when Kevin Tuohy accidentally discovered corneal “hard” lenses. These covered the cornea only, rather than the whole eye.
- 1950s: The soft contact lens came to life when Czech chemists Otto Wichterle and Drhoslav Lima developed a transparent hydrogel plastic called hydroxyethylmethacrylate (HEMA). Made up largely of water, the material had the characteristic of being hard when dry but soft and pliable when wet.
- 1972: Bausch + Lomb launched hydrogel contact lenses.
- 1978: Gas permeable (GP) contact lenses introduced.
- 1981: FDA approved overnight extended wear contact lenses.
- 1987: Disposable soft contact lenses launched.
- 1996: One-day disposable soft lenses introduced.
- 2002: Silicone-hydrogel contact lenses first marketed.

Source: www.contactlenses.org/timeline.htm

The fight to commoditize contact lenses has been ongoing for more than a decade

See Commoditization on page 6
Commoditization
Continued from page 5

come in at times when the prescriber does not have an opportunity to respond within that time frame, such as over a weekend or holiday. Additionally, a seller may not alter the contact lens prescription in any circumstance unless that same contact lens by the same manufacturer is sold under multiple labels. The seller can sell that lens under any of the available labels.

(UPP) under attack legislatively with bills in various states

UPP is a method by which manufacturers protect the brand of their products. By setting the lowest price, manufacturers prevent that product from being a “discount” product. UPP has been applied in many other markets, including clothing, high-definition televisions, cell phones, sunglasses, and others, notably including Apple products. UPP is usually set on the newest products and/or technologies.

a passive verification process in that the seller can sell any lens if the prescriber fails to communicate within the eight business hours after receiving the request.

If the prescriber communicates a question or concern through the toll-free telephone service or email address within the eight-hour window, this bill would require the prescription to remain unverified until the seller obtains confirmation on the accuracy of the prescription from the prescriber.

Such legislative attacks are taken very personally by ECPs and are often directed at online contact lens retailers’ own financial gains. ECPs want their patients to be safe with contact lens wear and have the best possible visual outcomes.

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Keeping patient safety top of mind

Most of our patients are not compliant contact lens wearers. This fact was exposed publicly in late summer 2015 in USA Today.1 We have to assume that our patients are sleeping overnight in their lenses, not changing them on time, and/or not even cleaning their lenses.

Compliance is a major concern for eyecare practitioners. Contact lens complications—such as red eyes, infiltrative keratitis, corneal ulcers, giant papillary conjunctivitis (GPC), and more—could potentially damage the patient’s ability to wear contact lenses.

Communication is our best opportunity to educate patients on how to best care for their lenses. This is the critical moment during the patient encounter in which we incorporate all of the findings and combine them with our knowledge base and experience to give the patient the best recommendation.2

Patients can become passive about contact lens wear. I witnessed a patient who stored his gas permeable (GP) lenses in his mouth while he slept and applied them without cleaning the next morning. As eyecare professionals, we play a critical role in helping our patients avoid contact lens-related complications that might arise from improper contact lens care.

I challenge this contact lens commoditization concept in that these medical devices are equal—very far from it

and gives consumers certain rights, imposes duties on contact lens prescribers and sellers, and requires the FTC to develop and enforce implementing rules.

3. 2014-2016 Universal pricing policy

Anti-UPP bills have been supported by 1-800 Contacts, Costco, and others. While these bills are generally aimed at eliminating UPP, some are attempting to push further, especially in Arizona.2 These bills are attempting to eliminate expiration dates and contact lens brand on prescriptions, prevent eyecare providers (ECPs) from selling contact lenses, and allow online refractions/vision kiosks to prescribe contact lenses without an ocular health examination from an ECP.

These legislative efforts sponsored by online retail sellers attempt to remove the ECP from the equation and drive business directly to their outlets—but they are also extremely bad for patient safety. (See box.)

4. 2016 Contact Lens Consumer Health Protection Act

SB 2777, sponsored by Sen. Bill Cassidy, MD (R-LA), and currently in the Senate, “amends the Fairness to Contact Lens Consumers Act to require contact lens sellers to provide a toll-free telephone number and email address that prescribers can use to ask questions about a seller’s prescription verification request.” Currently, the law is
Coming Soon!

SOMETHING NEW FROM RESTASIS®
Technology and IOP
Continued from page 1

I never thought I would be measuring IOP on babies, but I am now able to do just that.

I use the word “true” in quotation marks because direct IOP measurement involves invasion into the globe. Nonetheless, the notion that patients with thicker central corneas may tend to have lower IOPs as measured by Goldmann tonometry (and vice versa) prompted the circulation and use of correction tables in an attempt to calculate “true” IOP based on a linear relationship between Goldmann readings and central corneal thickness.

The science behind this attempt to cope with the fact that the central cornea is almost never 520 μm thick, however, breaks down when one takes into account corneal hysteresis, notably the “squish factor.” The hallmark example of such would be a patient with Fuch’s endothelial corneal dystrophy, in which central corneal thickness could be up around 650 μm, but in such a “squishy” cornea that IOP could end up being underestimated.

Dynamic contour and rebound tonometry

Dynamic contour tonometry (DCT) was developed about 20 years ago in an attempt to measure IOP without influence (or with minimal influence) from central corneal thickness or hysteresis. The Pascal (Ziemer) DCT tonometer does well employ the principles of DCT clinically.

“Dynamic contour” is a clinically descriptive term which means there is little to no tangential force on the apex of the cornea, but instead a type of contact in which the cornea is closer to its natural and tonic state during the measurement. In a perfect scenario, this would mean a truer measurement of IOP, and, indeed, Pascal has proven to be of benefit. The Pascal was designed to be used in conjunction with the slit lamp.

When I cannot perform Goldmann tonometry on a patient, for whatever reason, I use an Icare rebound tonometer, which consists of a probe that touches the central cornea and then rebounds at a certain rate of acceleration (or deceleration). The software within the instrument makes use of an algorithm to determine IOP based on values taken at the point of contact and rebound.

Correlation between Icare measurements and Goldmann measurements seems to be good, but not exact. That is not to say, however, that either is clinically better than the other because all methods of IOP measurement have their limits. We simply measure new technologies against our current gold standards.

Needless to say, I am comfortable with the measurements I get when I am unable to perform Goldmann tonometry on a glaucoma patient. I also enjoy the fact that anesthetic is not needed for the Icare tonometer. This is especially helpful in my pediatric patients. I never thought I would be measuring IOP on babies, but I am now able to do just that.

Standards of care are important both clinically and legally because they dictate in no unclear terms how we are to care for our patients. That being said, they are just that: standards.

Novel concepts, such as the Pascal and Icare tonometers, have the propensity to improve care where improvements are needed—be that ocular pulse amplitude measurements with the Pascal tonometer yielding information regarding blood flow or Icare measurements in pediatric populations and in patients who are impeded by stercis. More importantly, however, their advent helps to not only elevate the conversation regarding in what direction standards of care should go, but they also keep the discussion going.

REFERENCES
“At International Vision Expo, people take these online connections offline and actually meet.”

ALAN GLAZIER, optometrist; Shady Grove Eye & Vision Care; founder of ODs on Facebook; @eyeinfo

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Insulin resistance is more important than you think

ODs have the opportunity to make change for the better for their patients

In the city of Chicago, there’s a 95-year-old retired pathologist and professor with a wry smile on his face. More than 50 years ago, Joseph Kraft, MD, identified that many tinnitus patients were in fact pre-diabetic. Back then this was a leaner America, and far fewer citizens had diabetes. Of course, much has radically changed.

Most modern citizens today have become one or more of the following: sedentary “screen huggers,” stress-induced overeaters, sweetened beverage and processed food consumers, poor quality manufactured/restaurant food aficionados, and multiple pharmaceutical takers that further reduce the nutrients needed to process banquets of ubiquitous sugar and protein.

IR, poor health, and poor vision

Insulin resistance (IR) is the inability of insulin to exert its metabolic functions on cells and is considered the seminal initiating characteristic of type 2 diabetes. IR results in hyperinsulinemia, with some 60 percent of pancreatic beta cells nonfunctional at the time of type 2 diabetes diagnosis.

By 2020, 52 percent of Americans will have or be well along their way to developing pre-diabetes. These two inter-related stealth processes likely lead to virtually all modern health problems. They directly and indirectly contribute to a vast array of metabolic diseases, including all inflammatory conditions, all vascular diseases, gestational and type 2 diabetes, non-alcoholic fatty liver disease, kidney disease, dementia, and epithelial cancers of the breast, colon, lung, prostate.

In its earliest stages, IR and hyperinsulinemia manifest as hunger, difficulty concentrating, lethargy, visceral abdominal obesity, and high blood pressure. Subtle vision and eye changes such as non-optical blurring, poor low contrast vision, and foveal dysfunction manifesting as short wavelength (blue) color vision defects—lower focal ERG amplitudes and longer ERG latency can be present before retinopathy. By the time one’s blood sugar is erratic and/or elevated, the pathological damage of pre-diabetes is well along. IR and hyperinsulinemia cause all the sequelae of diabetes up to 24 years sooner.

9 ways to decrease insulin resistance

1. Decrease high fructose corn syrup, refined (simple) carbohydrates, excess protein (induces hepatic gluconeogenesis)

2. Increase exercise, activity, movement

3. Intermittent fasting (12–18 hours)

4. High-fat diet (non-insulinemic)

5. High-fiber diets

6. Vinegar before meals

7. Coffee with meals to prevent sugar spiking

8. Minerals, spices, herbs, such as:
   - Chromium
   - Ceylon cinnamon
   - Berberine
   - Tumeric
   - Resveratrol

9. Optimize intestinal flora for a healthy GI microbiome

Push away from the table

I’ve devoted two previous columns to diabetes and some positive steps our government is taking to confront it through minimization of refined sugar/simple carbohydrates, moderate protein intake, and promotion of exercise. Those laudable steps are embodied within the new 2016–2020 USDA “eating recommendations.”

But what if an even better way exists? Nephrologist Jason Fung, MD, believes pushing away from the table, or not eating, is the simplest, least expensive, least time-consuming, and most effective way to reset our cellular response to insulin. This way has been practiced by all major religions for thousands of years as a means to physical and spiritual health. It can even be accomplished intermittently over short periods of time ranging from 12 to 18 hours. (See box.)

Optometry, once again

Conventional early diabetes diagnosis and treatment focuses on monitoring blood sugar and considers elevated insulin largely irrelevant, even in patients with traditional risk factors of increased waist circumference, high body mass index, family history, and so on. Unfortunately, this clinical approach is no longer aligned in science, although it is creating great monetary rewards and expectations for multiple stakeholders.

Managing IR and hyperinsulinemia has the potential to increase both the quantity and quality of life of our patients while decreasing morbidity and mortality. Optometrists examine the human eye with both low tech and increasingly high tech instrumentation. Multispectral retinal imaging, OCT angiography, and clini-
CooperVision expands Biofinity XR toric availability

PLEASANTON, CA—CooperVision, Inc. expanded availability of Biofinity XR toric, the latest addition to the company’s Biofinity range of monthly silicone hydrogel contact lenses. The product, first announced in January, was initially introduced to select practices.

Biofinity XR toric is a cast-molded, made-to-order lens that incorporates the same uniform horizontal ISO thickness and optimized ballast band design as Biofinity toric. Its optimized, continuous surface ensures that the eyelid interacts with a smooth lens surface on every blink, according to the company.

Like all Biofinity lenses, Biofinity XR toric features Aquaform Technology, which the company says allows more oxygen to reach the eyes, helping to maintain clear, white eyes and healthier corneal physiology. The lens material is naturally smooth and uniformly wettable, providing a soft and flexible lens.

Biofinity XR toric lenses are available in sphere powers from +10.00 D to -10.00 D (0.50D steps after +/- 6.00 D), with cylinder powers from -2.75 D to -5.75 D (0.50 D steps) and an axis of 5 degrees to 180 degrees in 5-degree steps, and +8.50 D to +10.00 D with cylinder powers from -0.75 D to -2.25 D (0.50 D steps) and axis of 5 degrees to 180 degrees in 5-degree steps.

“This lens helps address some of the fitting challenges for patients with high refractive errors,” says Kerry Giedd, OD, MS, FAAO, in Orlando, FL.

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Dr. Richer is president of the Ocular Nutrition Society (ONS). He is associate editor of Journal of the American College of Nutrition and associate professor of family and preventative medicine at Chicago Medical School.
What is the coffee ring effect?

The Line of Marx, cell physiology, vital dyes, and liquid evaporation patterns

I was once characterized as an “information parasite” by a colleague. I must admit that I do troll the Internet, particularly Pub Med, for new, intriguing information, especially when it’s related to one of my two favorite ocular phenomenon that are pseudoexfoliation syndrome and the lid margin.

Another non sequitur confession: I am addicted to coffee.

You can imagine my surprise, when in a Pub Med literature search, I discovered two of my favorite things, coffee and the lid margin, together, in the title of a 2016 article in Medicine.1

I know that you too find it hard to believe that coffee and the lid margin can be connected, but “Coffee Ring Effect” in Ophthalmology: ‘Anionic Dye Deposition’ Hypothesis Explaining Normal Lid Margin Staining“ definitely intrigued me.

The coffee ring effect

To understand the article, I first had to understand the “coffee ring effect.” In physics, a “coffee ring” is a pattern left by a puddle of particle-laden liquid after it evaporates, as a droplet or ring of coffee would. The edges of a coffee (or water) drop sitting on a table or a piece of paper, for example, are often “pinned” to the surface. This means that when the water evaporates, the drop can’t shrink in circumference but instead flattens out. That flattening motion pushes water, and anything suspended in it, such as coffee particles, to its edges. By the time the drop fully evaporates, most of the particles have reached the edge and are deposited on the surface, making a dark ring.

The coffee ring effect and the Line of Marx

At this point I know you are thinking, “What can this evaporation pattern have to do with the lid margin?”

It all boils down to (no pun intended) vital dye staining of the lid margin, specifically the Line of Marx that runs along the inner eyelid. The Line of Marx—parakeratinized cells (an epithelium in which the superficial cells have not lost their nuclei, but have become filled with keratin) that cover the muco-cutaneous junction of the eyelid margin—stains distinctly with vital dyes (especially lissamine green).

Characterizing the Marx Line, Bron et al suggested that that evaporative water loss from the tear meniscus may result in a physiological zone of hyperosmolar tears.2 Stresses related to this stimulate a high epithelial cell turnover at this site, incomplete epithelial maturation, and a failure to express key molecules which, with the tight junctions between surface epithelial cells, are necessary to seal the ocular surface and prevent penetration of dyes and other molecules into the epithelium. Thus staining happens in this area.

Our “coffee” authors, however, state that the theory above is based on the characteristics of the stained area and do not pay attention to the behavior of dye solution itself on the surface—these authors studied the “coffee ring effect” and its possible applications in explaining the staining of the Marx line.

Dyes and their evaporation patterns

The “coffee” authors evaluated evaporation patterns of rose bengal and fluorescein dyes on different surfaces and the effect of tear meniscus alteration on lid margin staining. They noted that during the evaporation process of dye solutions that almost all of the solute was deposited at the edge of the drop. Furthermore, in the study of lid margin staining, it was observed that tear meniscus alteration during gaze affects staining pattern. According to the observations in this study, it is proposed that Marx line staining occurs as a result of “anionic dye deposition,” that is, properties of the dye itself, due to evaporation.

Thus, we are left with a question: is the observed Marx line a function of the cell physiology in this area on the lid margin or a property of the vital dyes used to evaluate it?

What does this mean to us clinically?

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Managing LASIK complications

From preop to postop dryness and IOP, stay on track with adverse events

A U.S. patent was granted to Gholam A. Peyman, MD, in June 1989 for a method of modifying the corneal curvature of the eye. The surgical procedure involved cutting a flap in the cornea, pulling the flap back to expose the corneal bed, ablating the exposed surface and then replacing the flap. The current procedure of laser assisted in-situ keratomileusis (LASIK) was not FDA approved until 1999.

LASIK is now part of the vernacular and is recognized worldwide with millions of procedures performed and still tens of thousands performed annually in the U.S. The satisfaction of LASIK has been reported to be as high as 94 to 98 percent, a rating on Rotten Tomatoes that would warrant a blockbuster!

However, this is still surgery, and with every success there is the potential of a complication. Thus, in order to stay focused on this awesomesauce—yes another word added to the dictionary—procedure, a reminder of how to handle the infrequent complication is warranted.

**LASIK patient evaluation**

The evaluation of a LASIK patient is the first step in the process of avoiding and managing complications. The evaluation is designed to root out these outliers who would not benefit from this procedure. In fact, I look at that examination to prove why the patient should not have LASIK surgery as opposed to finding reasons why he should. We know that a cornea can be thinned only so much before it succumbs to ectasia. Thus, the corneal thickness needs to be commensurate with the amount of tissue ablated to obtain the desired correction. So, the refractive error is a slightly moving target comparable to the corneal thickness. Topography needs to be symmetrical and void of any signs of ectastic disorder. This vetting process must also include a cerebral component, justifying that the patient has a clear understanding of what the procedure will accomplish. Yes, I am specifically referring to those low myopic presbyopes.

**Managing a LASIK patient requires quick response time to complications to ensure a favorable recovery**

Managing a LASIK patient requires quick response time to complications to ensure a favorable recovery. When this procedure was first introduced, surgeons used a blade that rolled over a cornea bulging from tremendous pressures greater than a bottle of root beer filled with Mentos (try it!). Fortunately the introduction of IntraLase from Advanced Medical Optics and femtosecond technology have made this process bladeless. It is hard to imagine this procedure without the use of the laser; however, it still happens. Although complications can occur with the laser—such as losing suction or having a short flap or a smaller-than-normal flap—these are limited and scarce. The flap is the one place where you can get a “redo”—that is, if the surgeon does not lift it or try to ablate under the mishap. Short flaps or irregular flaps are limiting for vision only if the ablation is performed. Thus, doing nothing and waiting is the best treatment.

The same cannot be said about a displaced flap, which needs to be replaced immediately. Striae and folds should be distinguished as clinically significant because they will limit best-corrected visual acuity (BCVA). The use of NaFL stain will give a good indication of the magnitude of these folds. The appearance of negative staining at the area of the striae is an indication that a re-float (lifting the flap and floating it back onto the striae) is warranted. However, lifting the flap is a catch-22. Lifting the flap means the edges need to re-epithelialize and consequently could initiate cell downgrowth. The flap should be lifted when there is an imminent threat to the central vision. Therefore, when the patient has central striae, central epithelial cell downgrowth, changes in the refraction from epithelial cells or an elevated flap from cells, the flap should be lifted and treated. Differential of flap debris is also important because meibum can be mistaken as epithelial cells. The brownish, glistening of the meibum is easily distinguished from the grayish, dull appearance of the epithelial cell growth. Meibum doesn’t propagate and thus is not a complication that should elicit any great response.

**Postoperative concerns**

In the early 2000s we talked about the “shifting sands of the Sahara,” a cute See LASIK complications on page 14
LASIK complications
Continued from page 13

Moniker for diffuse lamellar keratitis (DLK) or the inflammatory appearance seen in a large percentage of LASIK patients. The understanding of this inflammatory response from exotoxins has led to a significant decrease in the occurrence. However, every LASIK procedure is not immune, and recognizing the granular inflammatory response early in the process and increasing anti-inflammatory medications has proven to resolve this side effect.²

Although complications can occur with the laser—such as losing suction or having a short flap or a smaller-than-normal flap—these are limited and scarce

Frankly, I don’t consider DLK as much of a complication as I do an over-response of the inflammatory mediators. This is in contrast to central toxic keratopathy (CTK), which is a direct insult to the stromal tissue and often is accompanied by inflammation, as seen in DLK. The CTK patient will have a reduction in vision and may take months to reestablish a healthy stromal bed. Although no treatment is advised, it is important keep the patient close to the practice with monthly evaluations to see the progress.

As the patient heals from this keratorefractive procedure, there may be slight sensitivity or light sensitivity. Patients may experience—usually around 30 days postop—an inordinate amount of photosensitivity. The origin is unknown, although it is hypothesized that this regeneration of the nerve endings creates this discomfort. Patients should be placed on a steroid and monitored bimonthly until resolution.

The inflammation from the procedure may also induce dryness that may be symptomatic. The use of Restasis (cyclosporine, Allergan) around LASIK has been widely reported to help stabilize the vision and reduce symptoms.² Empirically, this would also help to stabilize glare and halos. The treatment of the inflammation and time has the remarkable ability to eliminate or reduce any unwanted night effects.

Lastly, the change in the curvature and thickness of this refracting tissue is going to create a false reading with your standard measuring of intraocular pressure (IOP). Care should be taken to obtain the most accurate pressure, especially in glaucoma patients in which each mm Hg is critical for stabilization. The use of a handheld tonometer, such as Reichert’s Avia, can measure pressure away from the ablated cornea and record a measurement that is more accurate. An even more impressive way to measure post-refractive pressure is to incorporate the biomechanics of the cornea, hysteresis. For example, the Ocular Response Analyzer and the 7C-R, both from Reichert, provide a measurement of the IOP that compensates for changes to the cornea.

As clinicians, we are fortunate to be able to have technologically advanced procedures for our patients. Be diligent in your preoperative discussion and as conscientious in your efforts to manage the postoperative eyes. LASIK is like Bey’s Lemonade, just sweeter!●

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Haag-Streit adds Hill-RBF calculator for Lenstar

MASON, OH—Haag-Streit USA has integrated the Hill-RBF Calculator, an advanced method for intraocular lens (IOL) power selection, in its next EyeSuite software cycle and exclusively available to Lenstar biometry users.

Radial basis function, or RBF, is an advanced, self-validating method for IOL power selection, employing pattern recognition and sophisticated data interpolation. In summary, peak performance occurs where it has the most data.

According to the company, the fundamental advantage of pattern recognition for selecting an IOL power is achieved through the process of adaptive learning. In this method, short, normal, and long eyes are simply viewed as a pattern.

RBF IOL power selection utilizes the boundary model, which indicates to the user when the calculator is performing within a defined area of accuracy. Unlike older, static theoretical formulas, this approach will be an ongoing project and updated on an ongoing basis.

Says Michael E. Snyder, MD, a member of the physician research team, “The RBF Calculator is a paradigm shift in IOL power selection. As more data is added to the Hill-RBF Calculator’s data set, the accuracy will continue to improve. This may herald the need for smaller increment steps in IOL powers.”

The Hill-RBF Calculator integration combines six years of cross-functional research and is a collaboration among a team of 24 surgeons in 13 countries, Haag-Streit Switzerland, and MathWorks.

Says project leader Warren E. Hill, MD, FACS, “The idea behind the the project was to develop a completely new self-validating power selection method that is entirely data-driven and independent of the limitations of theoretical vergence formulas.”●
Looking deeper
Exploring innovation

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Use contact lens manufacturer rebates to your benefit

This tactic can help drive patient compliance and improve clinical care

By Charissa Young, OD

Revenue lost from patients not purchasing contact lenses at your practice also relates to revenue lost from missed annual exams. In a study of 151 college students, 23 percent reported having ordered contact lenses online rather than purchasing from their eyecare provider. Of those surveyed who exclusively bought contact lenses online, 24 percent admitted to not getting regular annual eye exams (the survey was conducted in a state with contact lens prescriptions limited to one year), and the same number of people acknowledged ordering contact lenses online with an expired prescription.

Using manufacturer rebates to promote in-office purchases not only helps your patient’s bottom line, but also most importantly their long-term eye health.

Encourage compliance

I conducted a review of major contact lens manufacturer rebates, and I found patient savings as high as $130 for an annual supply of contact lenses. Offsetting sticker shock of a contact lens supply order by informing patients of rebate offers can encourage patients to not only support your business but also encourages lens wear compliance.

In an age of competing with online contact lens retailers, rebates can make your practice shine by highlighting your personalized customer service

A 2013 study by Dumbleton et al showed that patients who purchased their contact lenses from their eyecare provider returned for their annual eye examinations sooner than those who didn’t by almost two months (466 vs. 522 days). Unsurprisingly, those who didn’t buy contact lenses from their eyecare provider not only took longer to return for their annual appointments but also were less compliant following the manufacturer’s recommended replacement frequency.

Some 75 percent of subjects reported wearing contact lenses every day, but only 43 percent purchased the suggested annual supply. That’s a lot of patients not wearing their lenses appropriately and also not getting the proper follow-up care. These buying habits put patients’ eyecare health at risk, but if we can make the contact lens examination a seamless transition from exam chair to order at the same visit, it truly is in the best interest of the patient.

Today’s contact lens rebates

If you haven’t looked at how rebates work recently, here’s a quick rundown. Rebate tear sheets overview the discount based on boxes bought as well as a time-sensitive offer code. Patients typically need to register the code on the manufacturer’s website with their information and mail the manufacturer the original eye exam receipt, the original UPC codes from the contact lens boxes once they’ve received them. Patients usually receive the rebate in the form of a prepaid Visa gift card within 60 days of receipt of materials. You could even go as far as to help patients register their rebate offer codes online in-office by having the rebate websites bookmarked at your office desktops or linked on your webpage. Patients can also log in to the manufacturer website to monitor the progress of their rebate.

I look forward to the day when there’s a phone “app for that:” if patients could take photos of their receipts and box’s UPC codes online in-office by having the rebate offer code. Patients typically need to register the code on the manufacturer’s website with their information and mail the manufacturer the original eye exam receipt, the original UPC codes from the contact lens boxes once they’ve received them. Patients usually receive the rebate in the form of a prepaid Visa gift card within 60 days of receipt of materials. You could even go as far as to help patients register their rebate offer codes online in-office by having the rebate websites bookmarked at your office desktops or linked on your webpage. Patients can also log in to the manufacturer website to monitor the progress of their rebate.

I look forward to the day when there’s a phone “app for that:” if patients could take photos of their receipts and box’s UPC codes rather than mailing the information, the process would be a little less tedious and more rewarding for everyone involved.

Make rebates work for you

In an age of competing with online contact lens retailers, rebates can make your practice shine by highlighting your personalized customer service. I’ve worked at a private practice that addressed, stamped, and included in the envelope a copy of the contact lens purchase receipt for patients as a custom amenity they hadn’t experienced at any other office. Free shipping regardless of order amount should always be offered as well—it saves you labor cost, staff time, and gives an extra convenience to patients. You could also offer free lens replacements, within reason of course, for any ripped or defective lenses. We’ve all had it happen before with our own lenses, and there’s nothing worse than finishing off a year supply with an odd lens out.

At checkout, staff should always specifically lead with annual supply information to support the doctor’s recommendation and make rebates work for you.
As an optometrist previously serving in the United States Air Force, my aim was “to ensure our airmen are able to achieve ideal vision.” Having later worked in a private practice and now as a university educator, I have this same goal for all of my patients, whether a pilot flying a combat air patrol mission or a mom driving her precious cargo to a play date. Not only should contact lenses provide excellent visual acuity, they must also be comfortable throughout the day. I therefore recommend for most of my patients the same contact lenses that I wear—DAILIES® AquaComfort Plus®.

Living in a Digital World

Daily disposable contact lenses are an excellent choice for vision correction for many of my patients. However, one drawback is that contact lenses can disrupt the tear film when placed on the surface of the eye, which in turn can increase the risk of dryness and discomfort. Moreover, computers are an ever-growing part of our daily lives, and the more that people stare at digital devices—from the control panel of an F16 fighter jet to the latest app on a smart phone—the more they experience reductions in blink rates and destabilization of the tear film. One solution for addressing these multiple challenges is the DAILIES® AquaComfort Plus® family of lenses, which incorporate a proprietary blink-activated moisture technology to help support the stability of the tear film.

The DAILIES® AquaComfort Plus® Family of Lenses

How does this technology work? DAILIES® AquaComfort Plus® contact lenses are made from a hydrogel polymer that contains the moisturizer polyvinyl alcohol (PVA). What is remarkable about this material is that some of the PVA molecules are not bound within the structural matrix of the lens, allowing for sustained release over the surface of the eye every time a patient blinks (Figure 1). Another important quality of this material, particularly for younger patients and new wearers, is that it provides “built-in compliance”; discomfort becomes obvious if a patient tries to wear DAILIES® AquaComfort Plus® lenses for longer than the recommended period, encouraging daily replacement. It’s reassuring to know a 2009 study showed that more than 90% of patients wearing DAILIES® AquaComfort Plus® lenses are compliant with the recommended replacement frequency.

Overall, DAILIES® AquaComfort Plus® contact lenses have been found to support better stability of the tear film compared with other leading brands of lenses. These results, combined with my own clinical experience, have led me to select DAILIES® AquaComfort Plus® contact lenses as the first choice of vision correction for many of my patients, especially new and younger wearers. While these patients may not need to meet the rigorous vision requirements of the Air Force, they all deserve optical care that helps them see, look and feel their best.

Figure 1. The Blink-Activated Moisture of DAILIES® AquaComfort Plus® Contact Lenses Helps Support Tear Film Stability.

AquaComfort Plus® family of lenses, which incorporate a proprietary blink-activated moisture technology to help support the stability of the tear film.
Contact lens rebates
Continued from page 16

will be backed up with the best rebates, which usually are for annual supplies. I recommend having staff explain how unilateral pricing policies (UPP) work or offer to price match competitors if patients are wary to order at checkout, which gives the patient little reason to spend their dollars for contact lenses outside your practice. Do the math for the patient and make it as easy as possible for her to say yes. And speaking of competition, private practice ODs have a unique advantage: most rebates can’t be used at big box stores. You save your patients an extra trip with incentivizing in-practice purchases.

Typically the highest manufacturer rebates are for daily disposable lenses, helping offset their higher cost from longer wear modalities. This savings is far from making the cost comparable to non-daily disposables, so it is important to add to the conversation about the savings from no longer needing to purchase lens cleaners, which can save upwards of $100 per year.

If you’re not offering patients manufacturer rebates for contact lens orders, why not? With retail sales increasingly moving toward online purchasing, rebates not only help a patient’s bottom line but also your practice’s (by potentially thousands if not tens of thousands of dollars) by encouraging in-office purchases. Using rebates may prevent a cascade of events leading to contact lens noncompliance: Rebates support patients purchasing annual lens supplies from their eyecare provider, and we know patients who not only purchase their lenses from the ECP but also an annual supply of lenses from their ECP see their doctors more regularly and are at less risk of over-wear and the associated side effects. Let’s break the noncompliance cycle and break out the rebate sheets.

466 days
Number of days patients who bought lenses from their ECP returned for an eye exam compared to 522 days for patients who bought elsewhere

In Brief

CooperVision launches Biofinity Energys for device usage

PLEASANTON—CooperVision, Inc. announced the introduction of Biofinity Energys contact lenses. The lens features Digital Zone Optics lens design and was specifically created for digital device users.

Energys lenses will be rolled out on a phased basis in the United States beginning in July and will enter select European markets later this year.

“A stunning 90 percent of patients do not talk with their eyecare practitioners about interactions with digital devices, leaving them to believe that tired and dry eyes are an inescapable part of modern life,” says Gary Orsborn, OD, vice president of global professional and clinical affairs for CooperVision.

The patent-pending Biofinity Energys contact lenses are designed for all-day wear, helping patients’ eyes seamlessly and continuously shift focus between digital devices and offline activities. After one week of wear, eight out of ten digital device users agreed that Biofinity Energys lenses made their eyes feel less tired, according to the company.

Two elements are at the heart of the lens’ performance for digital device users, CooperVision says:

• Digital Zone Optics lens design, the breakthrough that integrates multiple front-surface aspheric curves across the entire optical zone. These curves distribute power evenly, simulating more positive power in the center of the lens. This helps ease accommodating burden as wearers move their gaze from on-screen to off-screen and back with less effort.

• Aquafomn Technology, which attracts and binds water throughout the silicone hydrogel lens material (comfilcon A) to retain moisture and help alleviate dryness even during times of reduced blinking, which is common with digital device use. Long silicone chains optimize oxygen transmissibility, and reduced silicone content results in a low modulus for softness and flexibility, enhancing comfort and fitting versatility.

The lenses also incorporate a smooth, naturally wettable surface design with a special rounded edge. This reduces conjunctival interaction, improving wearing comfort, according to the company.

Biofinity Energys wearers may notice a difference after a period of several days. More than 90 percent of adults use digital devices more than two hours a day, and nearly 60 percent of adults use digital devices for greater than five hours per day, according to the company. Individuals using such devices may experience eye tiredness and dryness more frequently.

To address the ocular health challenges posed by increasing screen time, CooperVision has launched FightEyeFatigue.com—a resource that can help eyecare professionals begin conversations with patients about device use in a humorous, realistic, and non-threatening manner.

Biofinity Energys contact lenses will be available in the same material (comfilcon A, 48 percent water content) and parameter range as Biofinity sphere lenses, with an 8.6 mm base curve, 0.08 mm center thickness at -3.00 D, and 14.0 mm diameter in sphere powers from +8.00 D to -12.00 D. The Dk/t of Biofinity Energys is also the same as Biofinity sphere lenses at 160 at -3.00 D.

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Introducing

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Using tinted contact lenses in practice
Colored lenses have both clinical and cosmetic applications

By Chad Rosen, OD, and Stephanie Ramdass, OD

From the first introduction on the cinematic screens for visual effects in 1950 to its mainstream use today for masking both natural iris pigment and ocular disfigurement, colored contact lenses are an important addition to your contact lens toolbox. Industry has made fitting this type of lens more appealing by offering improvements in color matching techniques and healthier contact lens materials compatible with commercially available inks and dyes. However, trend analysis reveals that as a category, colored, cosmetic, or tinted contact lenses remain the least fitted type of soft contact lenses among eyecare providers over the last decade.

While economic principles of supply and demand may lead us to believe that lack of consumer interest is the sole cause for low number of tinted lens fits in clinical practice, modern medicine suggests otherwise. Numerous techniques exist for patients who are interested in modifying their eye color. These patients will seek out alternative methods to accomplish this, often outside of their eye doctor’s offices.

Silicone iris implants, laser ablation of iridal melanocytes, and even corneal tattooing have been introduced in different parts of the world to offer patients alternatives to change their eye color or improve cosmesis. Although there are many patients who would greatly benefit from safe and effective surgical options, there are others who get drawn in by the awe of what end up being sight-threatening procedures. Complications may include elevated eye pressure, intraocular inflammation, and corneal edema that often result in additional surgery to salvage ocular health of affected patients.

Cosmetic lenses
As eyecare providers, it is our duty to have a working knowledge of products available that can improve a patient’s quality of life by altering his natural eye color or providing functional vision improvement. For those looking to simply alter the color of their eyes, cosmetic products are available. Alcon Air Optix Colors (lotrafilcon B) are monthly replacement silicone hydrogel lenses that can alter the color of a patient’s iris color. Johnson & Johnson Vision Care 1-Day Acuvue Define (etafilcon A) is a daily disposable lens that can enhance the natural eye color of a patient. These are two examples of soft contact lenses used primarily for cosmetic purposes.

Prosthetic lenses
Patients may present to your office with visual symptoms that impact their daily function. Photophobia is a common functional symptom due to systemic conditions such as oculocutaneous albinism (OCA), achromatopsia, or trauma. In these cases, patients may need a contact lens that blocks or filters light so they aren’t as sensitive to it. The contact lens serves as a prosthetic device to help the patient achieve her best functional ability.

While “prosthetic contact lens” may seem difficult or daunting to eyecare practitioners, it simply requires attention to detail to troubleshoot your patients’ challenges. For example, when a 48-year-old patient comes into your office and explains that he is having trouble reading up close, you may ask questions about lifestyle and daily activities to provide him with the best recommendations.

The same holds true for patients who present with an iris abnormality that has decreased their ability to perform certain tasks; we ask them questions about their struggles and visual capability to provide a proper recommendation that may benefit them. We also consider the patient’s age and lifestyle factors such as occupation, hobbies, and typical daily routines.

Case examples

Case

A 4-year-old girl with cculocutaneous albinism (OCA) presented to the clinic with her mother. The mother asked, “My daughter wears her sunglasses all the time, even indoors. Is there anything that you can do for her light sensitivity?” The first question that needed to be answered was whether or not this young girl was mature enough for contact lenses. After assessing her, it was clear that she had transillumination defects (TIDs) in both eyes, causing light to scatter inside the eye and not focus solely on the macula.

The solution was to create an annular tint that was dark black and had a clear 4.0 mm pupil (see Figure 1). After fitting her with the lenses and allowing her to wear them, her mother and father noted how much of a difference it made in daily function.

Case

There are many patients who experience insecurities about their physical appearance where there is evident facial asymmetry. An

Figure 1.
OCA patient with back-tinted annular lenses and clear pupil.
18-year-old young woman with a history of monocular vision loss secondary to a Toxocara parasitic infection early in life entered the exam room with a shy demeanor and her head down. She presented with iris heterochromia, a whitened right pupil and anisocoria. When the visual acuity of an affected eye is no light perception, the clinical considerations are more for improving social functionality of the patient rather than improving visual function.

Using the Biocolors contact lens diagnostic set, a custom colored contact lens was designed in a piggyback fashion to match this patient’s unaffected left eye (see Figures 2a-c). Important considerations when designing the final cosmetic lens included pupil size under normal room illumination, appropriate horizontal visible iris diameter measurements, and the specific layering sequence of the individually tinted diagnostic lenses. The smile on this teenager’s face knowing that she could now be confident in making eye contact in social environments was a rewarding experience for all parties involved.

Other applications
Tinted or colored contact lenses can be used for purposes other than cosmetic enhancement or significantly impaired eyes. They can be used with athletes for various sports or activities (see Figure 3). As we know, athletes are looking for any edge they can get over their competition. While no specific tint has been proven to work better than another for any specific sport, many athletes will have a preference for what works best for them.

When fitting these patients with tinted or cosmetic contact lenses, you can use an in-office tinting system yourself to create tint options, or you can custom order a lens for the athlete and ask to have it tinted a specific color and density. There are a number of contact lens laboratories that have lens tinting capabilities, so just ask your manufacturer.

Ocular health considerations
Any time you are considering prescribing a tinted contact lens, remember a few details. Whether the lens is to be used for cosmetic purposes or for visual function, you must consider the material that is being used and the prescription in the lens. Tints and high prescriptions decrease the amount of oxygen to the cornea, so you must monitor your patients to ensure their eyes are healthy enough for a tinted contact lens. Close evaluation during your exam to ensure there is no corneal edema or neovascularization is essential for using this modality.

Tinted lens use benefits
There are many types of patients who may benefit from tinted lenses, either cosmetically or functionally. As a practitioner, finding ways to set you apart from the doctor down the street is crucial. Using tinted contact lenses for those who might benefit from them is one way to carve a niche in your area. Not only can you receive financial benefits from specialty contact lens prescribing, but you can also help patients improve their daily function. All too often we see patients in our clinic who say, “I was never aware this was even a thing.”

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Dr. Chad Rosen, is assistant professor at Michigan College of Optometry. He spends time fitting specialty contact lens patients in clinic and enjoys lecturing on contact lens topics. ChadRosen@ferris.edu

Dr. Stephanie Ramdass, is the clinical research fellow at Michigan College of Optometry, Ferris State University, Vision Research Institute in Big Rapids, MI. Her research interests include the application of scleral lenses on normal eyes and in tinted form, presbyopic lens designs, and treatment options to halt the progression of myopia. StephanieRamdass@ferris.edu
two curves separated by 90 degrees and oriented at a given axis. In optics, those two curves have dioptric power that induces astigmatism.

When employing front surface toricity, the effect is optical. Front surface toricity is utilized when astigmatism is revealed with a sphero-cylindrical over-refraction. Orientation is important, and the lens requires stabilization via prism ballasting, dual thin zones, or double slab-off prism to provide stable vision.

Back surface toricity is used for lens alignment. Scleral lens back surface toricity is typically found in the peripheral curve/landing zone/haptic system. Figure 1 shows the profiles of a scleral lens with back surface toric curves. Scleral asymmetry is increased further from the limbus. If the landing zone of a spherical or rotationally symmetric lens is producing asymmetric compression, impingement, or edge lift, then the fit may be improved by employing back surface toricity.

To recap, front surface toricity is an optical feature, and back surface toricity is a fitting feature. Both can be manufactured in the same lens. The result can be excellent lens stability (from back surface toricity scleral lens alignment) with outstanding optical performance (from front surface optical toricity).

Benefits of back surface toricity
Lens stability is the trademark of incorporating back surface toricity into the design. One study has shown that once applied and if rotated more than 45 degrees either clockwise or counterclockwise, the lens returns to the original position on average within four seconds. Statistically significant improvement and increases in patient comfort, satisfaction, and wearing times also were demonstrated in the same study.

Often peripheral “curve” terminology is used to define back surface toricity. However, peripheries are not necessarily curves in some designs. Referring back to the scleral shape study, scleral shape between the junction of limbus and sclera are often tangential. Bitangential scleral lenses with a 20.0 mm diameter were shown to have improvements in comfort. In this case, back surface toricity was created with tangent peripheries in each meridian.

Measuring scleral toricity
Technological tools can help find scleral shape patterns. Optical coherence tomography (OCT) can easily illustrate the difference between a steep and flat meridian. The scleral shape study was conducted using OCT technology. An example of scleral toricity is shown in Figure 2 in which the horizontal and vertical meridians of a highly toric eye are shown. Despite the horizontal meridian image not being well-aligned, there is still an impressive difference between the horizontal flat meridian (above) and the vertical steep meridian (below). OCT has also been shown to be effective when empirically fitting scleral lenses.

Newer technology that maps scleral shape also includes the Eye Surface Profiler (Eaglet Eye, b.v.) and the sMap3D (Precision Ocular Metrology, LLC). Both of these scleral topography instruments have the ability to map scleral

**TAKE-HOME MESSAGE**
Use toricity to your advantage in better fitting scleral contact lenses. Remember that front surface toricity is an optical feature, and back surface toricity is a fitting feature. Technology such as OCT and scleral topography can help measure toricity. Diagnostic lenses and fluorescein patterns is a less expensive way to measure. Identify and evaluate meridians, then consult with your lab for better fitting scleral lenses. Toric peripheries can increase wearing time and contribute to long-term success by minimizing fit-related complications.
asymmetry up to beyond 20.0 mm with proper decentration. Both instruments require fluorescein on the eye for imaging.

**Using diagnostics to find patterns**
Investing in these technological tools can be expensive. There is an inexpensive and easy way to determine scleral toricity to optimize the fit by using diagnostic lenses. In the case of corneal lenses, one can identify the corneal curvatures and elevations by using diagnostic lenses and fluorescein patterns. Similarly, scleral topography and meridional asymmetry can be determined by observing the scleral lens bearing patterns.

As a review of the basic scleral landing zone and conjunctival relationships, compression causes conjunctival blanching, and it can be observed in any sector of the landing zone or even circumferential (Figure 3). If the compression is significant, then rebound hyperemia occurs after the lens is removed (Figure 4).

Impingement occurs when the outermost edge digs into the conjunctival tissue and blanching may or may not be observed.\(^5,6\) Impingement will leave behind arcuate staining as shown in Figure 5, and over time, it may hypertrophy (Figure 6). Sometimes if impingement is seen at the edge of the lens, compression may be occurring concurrently with an extremely tight scleral landing zone (Figure 7).

Edge lift, on the other hand, creates no bulbar conjunctival effects; however, it potentially could exacerbate giant papillary conjunctivitis (GPC) on the palpebral conjunctiva. Edge lift creates initial lens awareness. Pulling the lid away from the sector of patent awareness will reduce symptoms immediately and confirm edge-to-lid interaction. Fluorescein nicely highlights edge lift similar to a corneal lens (Figure 8).

**Steep scleral lens on a toric sclera**
Most fitting sets have standard rotationally symmetric peripheral landing zones. A symmetric scleral lens will reveal patterns on an asymmetric sclera. Whether the scleral lens is tight or flat, using the signs of compression, impingement, and edge lift will highlight a scleral toric pattern.

Often the pattern can be easily observed outside the slit lamp. Immediately after lens application, most practitioners evaluate the lens for bubbles. During that gross examination, meridional compression patterns are easily identified (impingement and edge lift may require a slit lamp). Figure 9 is an example of viewing the pattern outside the slit lamp. At first glance, circumferential compression is observed. However, with closer evaluation, the horizontal meridian is demonstrating increased compression with more pronounced limbal injection. This is an example of a steep/tight fitting scleral lens with a symmetric periphery on a with-the-rule toric sclera.

With-the-rule scleral toricity is defined by the horizontal meridian corresponding to the flat meridian and the vertical meridian is steep. Often steep topography values are associated with elevation, but in this case, the sclera is presenting a higher amount of curvature, which means that the sclera curves away from the lens. A steep fitting symmetric lens will be tight on the flat meridian; compression, impingement, or both may be observed. However, the steep meridian may demonstrate compression, impingement, or even edge lift depending on the amount of curvature and difference. If compression and/or impingement are observed on the steep meridian, findings will be significantly less than the flat meridian. Referring back to Figure 4, the flat meridian had been more compressed creating meridional rebound hyperemia in a with-the-rule sclera.

**Flat scleral lens on a toric sclera**
Conversely, a flat-fitting rotationally symmetric scleral lens will either align or have edge lift on the flat meridian. Remembering that the steep meridian is curving away from the flat meridional scleral plane, the scleral lens will demonstrate much more edge lift on the steep meridian.

With excessive edge lift comes tear exchange, which may also be extreme and may create a path for bubbles and debris (Figure 10). Fortunately, it is easier to tighten a loose-fitting peripheral curve than to try to loosen a tight-fitting lens because the edge lift can be measured.

Figure 11 is an example of a global white and cobalt light view of with-the-rule scleral topography and a flat-fitting scleral lens. Not
Scleral lenses

Continued from page 23

every sclera is with the rule. Referring back to Figure 7 is an example of against-the-rule because the vertical meridian is displaying the tighter fitting features. The inferior quadrant displays a similar fitting pattern (not shown). Oblique patterns are also possible (Figure 12).

Piecing it together

Once the meridians are identified, evaluate each independently of the other. Inform the lab that the periphery is toric because not every design is capable of back surface toric peripheries. If there is compression on one meridian, then order flatter peripheral curves, tangents, or angles depending on the design. Conversely, if there is edge lift, order steeper peripheries in that meridian.

If a toric trial set is available, apply the toric diagnostic lens on the eye to confirm the scleral toricity. A toric diagnostic lens will always have

Figure 6. Conjunctival hypertrophy after longstanding scleral lens impingement. Image courtesy Eef van der Worp from the I-site newsletter (netherlens.com)

Figure 7. Compression and impingement occurring together at the superior edge of the lens. Compression is observed with the superior band of conjunctival vessel blanching. The area of fluorescein superiorly is lacerated conjunctival tissue overlying the edge from impingement. Note there is mild compression from the 10 o’clock to 11 o’clock. This demonstrates that compression can occur anywhere in the landing zone—not just the edge. Because the eye is injected, this amount of compression is observed; however, likely there would be no evidence of any blanching if the eye was quiet.

Figure 8. Fluorescein highlighting mild edge lift nasally that would likely go unnoticed without the dye.

Figure 9. A steep-fitting spherical lens on a with-the-rule sclera.

Figure 10. Edge lift with excessive tear exchange and bubble intrusion on a with-the-rule sclera.

Figure 11. Example of a flat-fitting scleral lens on a with-the-rule toric eye. This is the same eye imaged in Figure 2.
the flat and steep meridians labeled on the lens, and there is typically a laser mark designating one of the meridians. Strategically beginning with a symmetric (non-toric) diagnostic lens first despite the suspicion of scleral toricity can be helpful because there is only one peripheral curve. It can confirm the presence or requirement for toric peripheral curves.

It can be very easy to mix up meridians when applying a toric diagnostic trial. By beginning with a toric trial, a scenario may occur in which the flat meridian needs to be steepened, and the steep meridian requires flattening—this negates a toric lens completely and creates a spherical or symmetric scleral periphery. However, when placing a toric trial lens on a toric sclera, the meridians will align. The axis of the meridians can be determined by rotating the slit lamp beam to the laser marks (similar to measuring rotation of a soft toric lens). Identifying the axis of toricity becomes important for the lab to mark the lens with a dot in the appropriately designated meridian. It is also important when designing a back surface toric lens that requires front surface toricity.

**Back and front surface toricity in the same lens**

As stated earlier, back surface toricity is used for scleral alignment and front surface toricity corrects spherocylindrical over-refractions. The axis of the back toricity and front optical toricity do not always align. Approach this scenario methodically.

First, determine the flat and steep scleral meridians. If a toric diagnostic set is available, determine the axis of the flat meridian. Specify the changes required for each meridian. For example, the flat meridian may require flattening by two steps from standard, and the steep meridian may require steepening one step from standard. Order a “flat 2/steep 1” with the flat axis at whatever is determined (180 degrees with a with-the-rule sclera).

Next, determine the required sphero-cylindrical over-refraction, remembering to vertex. Make sure the lab is informed whether the over-refraction was vertexed. If there is misalignment of the back surface toricity axis and the optical axis, then the ordered prescription axis would be calculated just like a soft toric lens using left add/right subtract (LARS) technique. Again, notify the lab if the LARS compensation was performed. Sometimes lab consultants prefer the raw data, and they take care of all the calculations for the practitioner.

If a toric fitting set is unavailable and the patient requires front surface toricity, the accurate axis of scleral toricity is not confirmed yet. Order a back surface toric scleral lens with a spherical equivalent power first. Apply that lens to the eye, and then determine the axis of the flat (or steep) meridian. At that point, a spherocylindrical lens power can be ordered once the axis of scleral toricity is known in order to provide the patient the best optical performance of the lens. Unfortunately, this is a two-step process. Always be sure to check with labs about their return and warranty policies.

**Summary**

There are many benefits of back surface toric peripheral landing zones. Alignment is exceptional and creates a stable and well-balanced lens while also providing a stable platform for front surface optical toricity.

Figure 13 shows a 23.0 mm diameter lens that could not demonstrate even vascular alignment without incorporating peripheral toric, and in this case, eight meridian-specific peripheries. Some labs may have the ability to create quadrant-specific or even eight meridians of alignment.

Figure 14 shows a profile of one these unique lenses. Comfort is significantly improved by eliminating symptoms of edge awareness and end-of-day discomfort from tight lenses by using back surface toricity.

Toric peripheries can increase wearing time and contribute to long-term success by minimizing fit-related complications. By decreasing the path of excessive tear exchange, another benefit is a reduction in debris and fogging that has been very problematic with scleral contact lens wear. Using technology and standard scleral lens diagnostic sets can be very helpful to design these beneficial lenses for patients in need.

**REFERENCES**


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Dr. Johns is a fellow of the Scleral Lens Education Society and the British Contact Lens Association. He serves as a clinical and education consultant for Bausch + Lomb Specialty Vision Products group. lynnettekjohns@gmail.com
Monthly lens wearers can thrive, not just survive

Help your patients avoid compensating behaviors to achieve contact lens comfort

By Cristina M. Schnider, OD, MSc, MBA, FAAO and Michelle Wales, MMR

Contact lens practitioners have a range of soft contact lens replacement modalities available—from daily disposable to reusable lenses with a two-week or monthly replacement schedule. Personality, lifestyle factors, and ocular health should all be taken into account when deciding which lens and which lens modality to prescribe.

The monthly wearer

Most practices prescribe monthly replacement lenses to some degree. But is there such a thing as a “monthly” personality?

Contact lens wearers with a strong preference for monthly replacement tend to be people who want to wear contact lenses every day as their primary source of vision correction, according to market research from Johnson & Johnson Vision Care Companies. They are busy living life and not particularly engaged in the contact lens experience. These patients want reliable and hassle-free contact lens wear and seek simplicity in their health care and product choices. They are value-conscious and seek to maximize their use of each pair of contact lenses.

From the prescriber point of view, we want to make sure these patients have no significant ocular health concerns before recommending monthly replacement. We also need to be sure that patients have not experienced problems with contact lens comfort or visual performance in the past.

But once that decision has been made, how do we know monthly replacement was the right choice? Are patients extracting the value they crave out of the wearing experience? We think the answer is probably not.

To determine whether a contact lens patient’s wear experience is relatively trouble-free, practitioners want to know how the patient’s lenses perform throughout the replacement interval. With monthly wearers, this can be challenging because replacement frequency does not coincide with typical exam frequency.

Office visit timing

In the typical scenario, the patient comes in for a contact lens exam and fitting, and diagnostic lenses are dispensed at that time. Most doctors see the patient again five to 10 days later for a contact lens check. If everything is satisfactory, the patient orders a supply of the lenses (or walks out with the prescription). There may be no other scheduled appointments until the next annual visit, especially for an experienced wearer.

At the time of that initial lens check, a daily disposable lens wearer has replaced his lenses multiple times, and a two-week wearer is at least halfway through the end of the replacement cycle. But the monthly lens wearer is still very early in the replacement cycle. Problems with lens comfort and satisfaction, when they occur, tend to become much more noticeable after the second week.

“‘A few years ago, I decided to have my monthly lens patients come in for their follow-up visits at one month so that I could get a better sense of their experience over the full replacement cycle,’ said Robert A. Davis, OD, FAAO, in Pembroke Pines, FL. Although he suspected that some of his monthly lens patients weren’t fully satisfied, they weren’t actively complaining at annual visits. “When I started consistently seeing patients at the one-month mark, it was immediately apparent that they were feeling more dryness at that point than earlier in the replacement cycle,” Dr. Davis said. “That’s one of the things that convinced me to shift to a much greater emphasis on shorter replacement cycles, including single-use lenses.”

Two surveys of current monthly contact lens wearers conducted by independent market research firms for Johnson & Johnson Vision Care Companies suggest that what Dr. Davis was seeing is not unusual. In the first survey by Leger (Canada) of 758 wearers from the U.S., UK, and Germany, nearly three-quarters of monthly wearers (73 percent) reported experiencing comfort-related problems (discomfort, lens awareness, feelings of dryness or irritation) during the month.

The share of those saying they were very/extremely comfortable dropped by almost 20 percentage points between Week One (68 percent) and Week Four (49 percent), according to a second study. In this study, 237 participants responded to a daily digital survey (Kadence, Boston) over the course of a month of wear of a new pair of their habitual lenses (Figure 1). Blurry vision also became more prevalent as the month went on. As a result, as patients approached the end of the replacement cycle, half of the monthly lens wearers were no longer satisfied with their contact lenses.

Compensating mechanisms

The return visit schedule typically isn’t set up to capture the full monthly experience. Patients who experience problems after the initial contact lens check would have to proactively contact their doctors to set up a separate follow-up visit if they wanted to raise concerns about the experience. Most won’t take that step. Instead, they try to “power through” using compensating mechanisms (see box).

“What I found is that patients were using drops more frequently and taking their lenses out right after work,” said Dr. Davis. “By the end of the month, they couldn’t wear them as long as they wanted—but they thought that was normal.”

According to the Leger study, 84 percent of those who experience comfort-related concerns compensate with lens removal, rinsing, cleaning, breaks from wear, or rewetting drops during the month. Some of these behaviors, especially when relied upon sparingly, are harmless. But directly touching a lens or extra handling during the day may introduce bacteria or negatively affect the lens surface. One study showed that symptomatic patients actually get little relief from compensating behaviors.

8 ways patients compensate for contact lens discomfort

- Remove lenses earlier in the day than desired
- Give eyes a “break” from lenses during the day
- Remove and immediately replace with same lenses
- Remove and replace with a new lens
- Remove lenses temporarily to rinse or clean, then re-insert
- Move lens in the eye by touching directly with fingers (scleral swish)
- Use rewetting drops
- Rub eyes due to discomfort

See Monthly wearers on page 29
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<tbody>
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</tr>
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</tr>
<tr>
<td>ART OPTICAL</td>
<td>19</td>
</tr>
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<tr>
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<td>9</td>
</tr>
</tbody>
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Monthly wearers
Continued from page 26

This is troubling. If patients are removing lenses earlier in the day than desired, replacing them more often than intended due to discomfort, or taking breaks during the day, it’s not hard to imagine that the “breaks” may become longer, the wear duration shorter, and patients may eventually shift to part-time wear or drop out altogether.

Suffering in silence
But if the contact lens experience is so uncomfortable, why aren’t these monthly wearers complaining?

More than 80 percent of the monthly wearers who experienced comfort-related problems said that discomfort made them feel annoyed, inconvenienced, or frustrated.1 However, the majority of these monthly wearers (73 percent) said they don’t plan to tell their eyecare providers about their comfort problems at their next visit.2

Why would that be? Some don’t mention it because they are afraid their doctors will recommend they stop wearing lenses, but 61 percent of patients in the Leger study view declining performance over the month as normal and expected—as Dr. Davis said he found. By the time the next annual checkup rolls around, expectations for lens wear and performance have become so routine they may go unmentioned.

Some patients can keep this up for years, but we should consider them at increased risk of contact lens dropout. Practitioners often don’t even know when dropout happens because that patient—who wasn’t particularly engaged in her vision correction—wasn’t particularly engaged in her vision correction and wanted something hassle-free in the first place—just stops coming back for annual exams.

Improving the lens-wearing experience
We owe patients a better lens-wearing experience.

Short of scheduling repeat follow-up visits, there are ways to dig more deeply into the wearing experience during annual exams. Probing questions can help the practitioner better understand whether patients are comfortable and satisfied for the entire month. Are they getting the full 30 days of wear out of their lenses so that they feel like they got a good value? Or are they “making do” and becoming grumpy about it, as the survey data suggests?

Good questions may include:

- Are there times during the month when you need to take a break from your lenses?
- How often do you need to use rewetting drops?
- At what time of the day do you start noticing your lenses? Does that happen earlier in the day toward the end of your replacement cycle?

Then, if the patient does seem to be struggling, it may be time to reset expectations. Patients need to hear from their doctors that it is possible to enjoy more consistent contact lens performance—it isn’t normal to be uncomfortable or to have to temporarily remove their lenses every day. Red eyes and frequent eye rubbing or drops don’t have to be the price of admission to the contact lens wear.

For these struggling patients, a shorter replacement schedule may be more appropriate.

A daily disposable lens is the ideal choice for patients who are struggling with lens performance. A fresh lens every day is the most convenient and eliminates problems with solution compatibility as well. But it might be too much of a jump for the patient who really wants to be a monthly lens wearer.

Those patients may simply be demanding a great deal of their lenses. Declines in lens performance have been associated with high levels of digital device use or challenging environments. Patients with these types of high demands may do better with a shorter, two-week replacement period.

One study that looked at 112 “problem patients”—those who were struggling with frequent or constant discomfort or dryness (at least two hours per day of uncomfortable wear or certain slit-lamp findings)—found that being refit in Acuvue Oasys (senofilcon A, Johnson & Johnson Vision Care) made a big difference.3 Some 88 percent percent of struggling patients experienced statistically significant improvement in comfort (p < 0.0001), and 76 percent had more hours of comfortable wear (p = 0.004).

Although that study was conducted a decade ago, Acuvue Oasys has not been outperformed in comfort by any monthly lens, according to trials reported in the clinical trials database.4

Strategies for success with patients who have a “monthly personality” but need to move to a shorter replacement schedule include emphasizing that getting the best value from their lenses means enjoying worry-free lens wear every day, not just the first week or two of the replacement cycle. Suggesting an annual supply is also an effective way to encourage compliance. Studies have shown that when patients have more lenses on hand, they are less likely to stretch out the replacement cycle and more likely to replace the lenses on time.5

There are patients who prefer a monthly replacement schedule and who may be able to tolerate it. However, it can be challenging to identify those patients without a one-month contact lens check. Many of them are choosing to suffer in silence or resorting to compensating behaviors instead of telling their doctors about the negative aspects of their lens wear experience. Think about what you are doing now to prevent these problems before your patients begin the slow spiral to lens dropout.

Your patients deserve a lens that can sustain excellent performance all month, including Weeks Three and Four. We need to give our patients the opportunity and permission to tell us that their comfort is not acceptable at the end of the replacement cycle, or that they are requiring help to make it through the full month. Be sure to evaluate new monthly contact lens offerings about comfort and performance at Weeks Three and Four...because a month is not just the first two weeks.

REFERENCES

The authors are employees of Johnson & Johnson Vision Care Companies. Dr. Schneider is director of global professional affairs Acuvue Oasys platform and reusable lenses. Ms. Wales is manager of global strategic insights.
Why contact lenses? My interest began when I was working at The Ohio State University running our student health clinic. It was amazing to me the number of seemingly healthy students who for the most part were noncompliant with wear and had unhealthy lifestyles in general. My interest sparked when I started to learn a lot more about contact lens wear and the impacts it has on people.

Have you always been interested in communications and writing? I thought I would have my own practice coming out of optometry school. I didn’t—I went right into working at OSU. While there you teach, educate, and write. A mentor of mine, Joe Barr, got me into writing for trade journals, and you pick up how you communicate via written words. My interest in medical communications came about over time and stems from educating and in getting points across in a clear, concise way.

What attracted you to industry? The first attraction was to get my MBA. That opened my eyes to a whole new world. There’s a basic business acumen, and it’s very much common sense. It was good for me to have that grounding and basic understanding that helped me with my job then at OSU and to begin looking at other opportunities.

How challenging was the transition from academia to industry? I had some very good contacts in industry. I think every place you work has a culture unto its own. You adapt to that culture, or you don’t. It was not as hard as I expected, but at times it probably was. I went into it with pretty open eyes, and I know I had a steep learning curve. Being at Alcon is very different than where I was previously. Functioning as an OD in a private setting vs. being an OD in an industry setting—they’re very different. They’re worlds apart.

What’s the craziest thing you’ve ever done? Deciding to go back to school mid-career. It was at a time in my life when I had a lot going on personally and professionally and trying to fit that in was very difficult. It came about very quickly. It was almost like I did it before I could allow myself to think about what I was getting into. If I allowed myself to focus on it too much, I could probably talk myself out of it. It’s one of the things I’m proud of, but if I’d thought too much about it, I probably wouldn’t have done it.

Contact lenses, communications, and knowing how to properly bill and code

Carla Mack, OD, MBA, FAAO; Director of Professional and Clinical Support for U.S. Vision Care at Alcon

What’s one thing you would change about optometry?

One of my long term beefs is understanding the importance of what we do and the value of what we provide as optometrists. Part of that value is understanding coding and billing. There’s value in what we do, and optometrists still give away things way too much. It’s having a true understanding of the coding and billing system and making sure you abide by those rules, which is better than ignoring them and not charging for things.

How do you keep a work/life balance? Some of us have perfectionist mentalities and you have to think about what you’re working on, and how long it should take and manage your time. And work is definitely one part of our lives—we have to think outside of that box and truly own all the other aspects of our lives from our families to focusing on ourselves, our own health, and the other activities that we like to do. I think that makes for a much a happier individual. When you love what you do, it makes your work more a part of your life in general so that it’s not work. I think you grow and learn as you get older. There are times I know I worked way too much, probably to the detriment of things at home. You learn from that, too. But I think it’s part of the learning and growing process. You don’t get everything right the first time.

How do you see professional relations changing? Professional relations is different in every company. The true art behind that is that you are the liaison to your professionals in the field and it’s your responsibility to bring in their insights and to represent them well inside the company. The way I see it changing, and it’s been changing over time, is that we have compliance rules that we all abide by. Every company takes a slightly different look and interprets them in slightly different ways, but they’re very important. We want to make sure that we’re doing everything we can to not influence our peers in an undue way and to make sure we’re having appropriate interactions.

How do you see a health business professional? I’d thought too much about things I’m proud of, but if I’d thought too much about it, I probably wouldn’t have done it.

—Vernon Trollinger

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\(^1\) Compared to MPS in symptomatic users.