March 2022

evolve medical education

MasterClass

FUNDINGSLAND GROUP

A CE activity is administered by Evolve Medical Education LLC.
This activity is supported by an unrestricted educational grant from Alcon, Avellino, Bausch + Lomb, Johnson & Johnson Vision, RVL, Santen, Sight Sciences, Tarsus, TearLab, and Thea.

Sponsored by

UAB SCHOOL OF OPTOMETRY
The University of Alabama at Birmingham

OCULAR SURFACE DISEASE MASTERCLASSES: OFFICE-BASED DIAGNOSIS, TREATMENT TUTORIALS, AND REAL-WORLD PATIENT COMMUNICATIONS

MARC BLOOMENSTEIN, OD, FAAO
Schwartz Laser Eye Center
Director of Optometric Services
Scottsdale, AZ

DOUGLAS K. DEVRIES, OD
Co-founder
Eye Care Associates of Nevada
Sparks, NV

Distributed with
MODERNOPTOMETRY

Release Date: February 10, 2022
COPE Expiration Date: February 10, 2023

OCULAR SURFACE DISEASE MASTERCLASSES: OFFICE-BASED DIAGNOSIS, TREATMENT TUTORIALS, AND REAL-WORLD PATIENT COMMUNICATIONS

Content Source

This CE activity captures content from a virtual discussion.

Activity Description

This roundtable discussion brings together optometric experts in ocular surface disease to discuss office-based diagnosis, treatment options, and real-world patient education.

Target Audience

This certified CE activity is designed for optometrists.

Learning Objectives

Upon completion of this activity, the participant should be able to:

- **Review** the definition, prevalence, and impact of various ocular surface diseases (OSDs) within the overall population and in the following groups: patients with OSD, cataract and refractive surgery patients, and contact lens dropout patients
- **Utilize** video tutorials to better understand how to implement and perform specific steps in utilizing: new and emerging diagnostic tests in differentiating and classifying ocular surface categories and disease severity; and new and emerging therapeutic options and protocols for various types of OSD patients
- **Increase** confidence in navigating decisions in various OSD cases, from simple to complex
- **Understand** the OSD patient journey: utilizing videos to demonstrate how to better communicate with and educate patients, set expectations, and manage these patients postoperatively

Grantor Statement

This activity is supported by an unrestricted educational grant from Alcon, Avellino, Bausch + Lomb, Johnson & Johnson Vision, RVL, Santen, Sight Sciences, Tarsus, TearLab, and Thea.

Credit Designation Statement

Evolve is a COPE-accredited administrator.

This activity, COPE Activity Number 12330, is accredited by COPE for continuing education for optometrists for 1.0 hour.

Course # 76594-TD
Activity # 12330

To Obtain Credit

To obtain credit for this activity, you must read the activity in its entirety and complete the Pretest/Posttest/Activity Evaluation/Satisfaction Measures Form, which consists of a series of multiple-choice questions. To answer these questions online and receive real-time results, please visit http://evolvemeded.com/course/2153-supp. Upon completing the activity and self-assessment test, your certificate will be available. Alternatively, please complete the Posttest/Activity Evaluation/Satisfaction Form and mail or fax to Evolve Medical Education LLC, 353 West Lancaster Avenue, Second Floor, Wayne, PA 19087; Fax: (215) 933-3950.

Disclosure Policy

It is the policy of Evolve that faculty and other individuals who are in the position to control the content of this activity disclose any real or apparent financial relationships relating to the topics of this educational

activity. Evolve has full policies in place that will identify and resolve all financial relationships prior to this educational activity.

The following faculty/staff members have the following financial relationships with ineligible companies:

Marc Bloomenstein, OD, FAAO, has had a financial relationship or affiliation with the following ineligible companies in the form of *Consultant*: Aerie Pharmaceuticals, Allergan, Azura, Bausch + Lomb, Johnson & Johnson Vision, Kala Pharmaceuticals, OcuSoft, Sight Sciences, Sun Pharmaceutical Industries, and Tarsus. *Grant/Research:* Sight Sciences. *Speaker's Bureau:* Allergan, Bausch + Lomb, Johnson & Johnson Vision, Kala Pharmaceuticals, OysterPoint, RVL, Sight Sciences, and Sun Pharmaceutical Industries.

Douglas K. Devries, OD, has had a financial relationship or affiliation with the following ineligible companies in the form of *Consultant/ Speaker's Bureau:* Akorn, Alcon, Allergan, Avellino, Azura, Bausch + Lomb, Bio Tissue, BlephEx, Bruder, Eyevance, Kala Pharmaceuticals, Lumenis, Johnson & Johnson Vision, Novartis, OcuSoft, Ophthalmic Resource Partner, Quidel, Science Based Health, Sight Sciences, Sun Pharmaceutical Industries, Tarsus, TearLab, Thea, and Visus. *Share/Stockholder:* RPS.

Editorial Support Disclosures

The Evolve staff and planners and reviewers have no financial relationships with ineligible companies. Steve Lenier, writer, has had a financial relationship or affiliation with the following ineligible companies in the form of *Share/Stockholder:* Aura Biosciences, Cidara Therapeutics, Clearside Biomedical, Eyenovia, and Outlook Therapeutics.

Off-Label Statement

This educational activity may contain discussion of published and/ or investigational uses of agents that are not indicated by the FDA. The opinions expressed in the educational activity are those of the faculty. Please refer to the official prescribing information for each product for discussion of approved indications, contraindications, and warnings.

Disclaimer

The views and opinions expressed in this educational activity are those of the faculty and do not necessarily represent the views of Evolve, The Fundingsland Group, *Modern Optometry*, Alcon, Avellino, Bausch + Lomb, Johnson & Johnson Vision, RVL, Santen, Sight Sciences, Tarsus, TearLab, or Thea.

Digital Edition

To view the online version of the material, log in to your Evolve account and go to https://evolvemeded.com/course/2153-supp or scan the QR code with your smartphone's camera.

To view the videos that this supplement summarizes, log in to your Evolve account and go to: https://evolvemeded.com/course-collection/ OSDMasterClasses.

evolve
medical education

PRETEST QUESTIONS

Please complete prior to accessing the material and submit with Posttest/Activity Evaluation/Satisfaction Measures for credit.

1. Please rate your confidence in your ability to understand and integrate into practice ocular surface disease diagnostic modalities and treatment (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).

a. 1
b. 2
c. 3
d. 4
e. 5

2. Please rate your confidence in your ability to educate patients on ocular surface diseases (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).

a. 1
b. 2
c. 3
d. 4
e. 5

3. Dry eye disease (DED) is characterized by which of the following?

a. A decrease in intraocular pressure
b. A loss of homeostasis of the tear film
c. Red eyes
d. Decreased ocular sensitivity

4. In the PHACO study, what percentage of patients scheduled for cataract surgery were diagnosed with ocular surface disease?

a. 20%
b. 35%
c. 62%
d. 87%

5. Measuring the level of MMP-9 is a test for:

a. Inflammation
b. Osmolarity
c. Homeostasis
d. Meibomian gland function

6. Collarettes are a pathognomonic sign for:

a. Meibomian gland dysfunction
b. *Demodex* mites
c. Rosacea
d. Inflammation

7. Stimulating the ophthalmic branch of the trigeminal nerve is used in:

a. Lid sealing
b. Blepharitis treatment
c. Neurostimulation
d. Adding nutraceuticals to the diet

8. The purpose of microblepharoexfoliation is:

a. Reduce the prevalence of rosacea
b. Long-term eyelid maintenance
c. Cleaning the biofilm from the eyelids
d. Eliminating *Demodex* mites

9. Corneal collagen crosslinking is approved for use in:

a. *Demodex* blepharitis
b. Meibomian gland dysfunction
c. Epithelial hyperkeratinization
d. Keratoconus

10. Punctal plug occlusion can be useful in which one of the following?

a. Aqueous deficient dry eye
b. Neurotrophic keratitis
c. Keratoconus
d. Blepharoptosis

11. Cenegermin is a treatment for which one of the following?

a. Neurotrophic keratitis
b. Keratoconus
c. Aqueous deficient DED
d. Meibomian gland dysfunction

12. A lab measurement of the degree of corneal sensitivity can be done with:

a. A Cochet-Bonnet esthesiometer
b. A cotton wisp
c. Dental floss
d. A gentle finger press

OCULAR SURFACE DISEASE MASTERCLASSES: OFFICE-BASED DIAGNOSIS, TREATMENT TUTORIALS, AND REAL-WORLD PATIENT COMMUNICATIONS

EXPLORING THE ROLE AND IMPACT OF OCULAR SURFACE DISEASE ON PATIENT SATISFACTION

The Tear Film and Ocular Surface Society Dry Eye Workshop II definition of dry eye disease (DED) is "a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities, play etiological roles."

"This definition should act as a blanket that covers everything you're doing," explains Marc Bloomenstein, OD, FAAO "and get you to start thinking: how is this patient's ocular surface and what needs to be managed?"

Douglas K. Devries, OD, adds "The definition points out that a patient has to prove that they don't have ocular surface disease and DED."

Prevalence of DED and Patient Impact

There is debate about the actual prevalence of DED, but the disease state has tripled over the last decade, with about a 10% growth expected between 2015 to 2025 (Figure 1).[1] DED is prevalent among patients with glaucoma/ocular hypertension (59%),[2] patients with diabetes (54%),[3] patients who wear contact lenses (50%),[4] and patients with allergies (24%).[5]

Patients who use an artificial tear should be examined for DED. "A study[6] showed 91% of patients say they've used an artificial tear," says Dr. Bloomenstein. "That is telling me they know they've got a problem."

Contact lens wearers often encounter chronic DED. In fact, a variety of inflammatory mediators have been found to be upregulated in patients who wear contact lenses.[7] Studies have also found that contact lens users have decreased goblet cells,[8] which create a protective layer on the eye called mucin. Contact lens intolerance is a major factor driving patients in for refractive surgery.

The PHACO study[9] showed that 87% of patients scheduled for cataract surgery were diagnosed with ocular surface disease (OSD). "That tells you if you're referring a patient for cataract surgery, then do a dry eye evaluation," says Dr. Devries. "You're going to be right 87% of the time. Now that we're into high-technology IOLs, we're finding we need to really identify those patients because they have very high expectations."

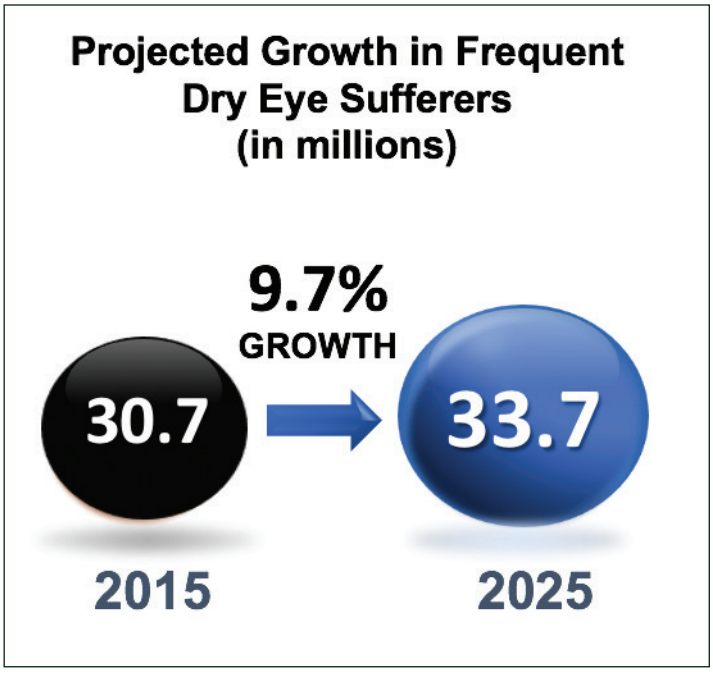

Figure 1. Projected growth in DED.[1]

Dr. Bloomenstein adds that with proper OSD evaluation and management, he believes eye care professionals have the opportunity to obtain improved biometry, providing more accurate outcomes with faster healing (Figure 2).

WHERE TO BEGIN AND WHAT TO CONSIDER

Patient History Review

Reviewing a patient's history and medications list is important. "I think sometimes we get so busy we don't look at medications," says Dr. Devries. "I'll spend a little more time talking to patients, especially those who use antihistamines and diuretics."

Both optometrists say the No. 1 DED symptom they encounter is fluctuating vision.

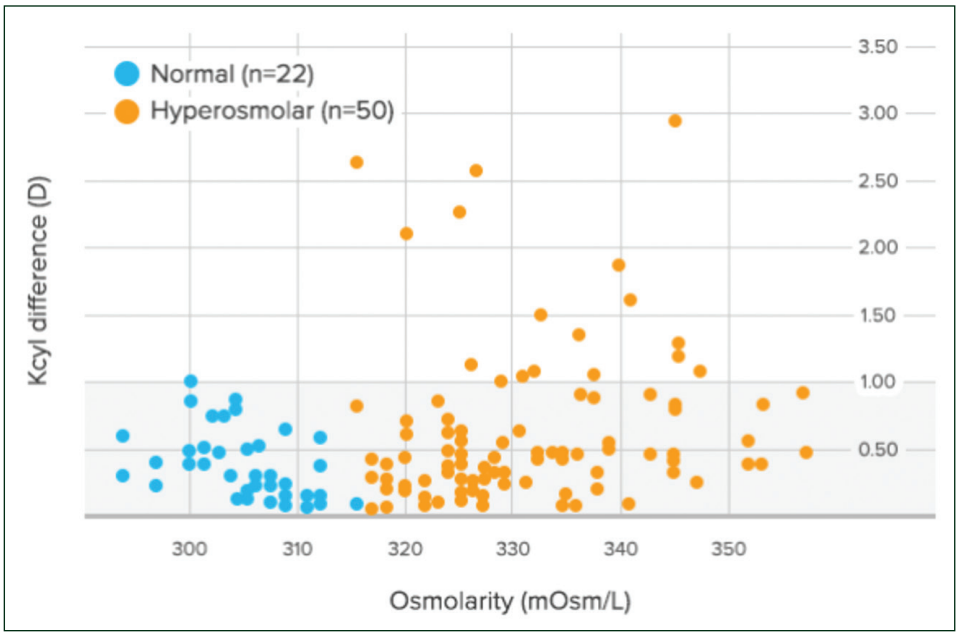

Figure 2. Impact on IOL outcomes. 17% of hyperosmolar eyes had >1 D difference in K cyl and 10% had >0.5 D change in IOL power. (From: Epitropoulos AT, Matossian C, Berdy GJ, et al. Effect of tear osmolarity on repeatability of keratometry for cataract surgery planning. *J Cataract Refract Surg*. 2015 Aug 1;41(8):1672-7.)

Vision Exam

Exam lane diagnostic technology starts with the slit lamp. There are also instruments that measure tear breakup time and tear meniscus. Dr. Bloomenstein encourages the use of the look, lift, pull, and push (LLPP) method of examining a patient.[10]

"This type of exam can tell us a lot," says Dr. Devries. "We're going to look at the lids, the lashes, the laxity of the lids, and the quality of the meibum."

Questionnaires

Questionnaires provide an opportunity to examine practice demographics and compare current impact for patients compared to potential impact that could be realized if the practice were to provide a higher level of care.

"If you analyze that information," Dr. Devries says, "it will tell you the number of patients in your practice that you could be treating and the number of procedures you could be doing."

"Another point about questionnaires," says Dr. Bloomenstein, "is they get patients to start thinking about the things that we know exacerbate OSD."

The Standardized Patient Evaluation of Eye Dryness (SPEED) questionnaire is one popular option (Figure 3). Other questionnaires to consider are the Ocular Surface Disease Index (OSDI), the Dry Eye Questionnaire (DEQ-5), and the Symptom Assessment In Dry Eye (SANDE) Questionnaire.

"In my practice," Dr. Bloomenstein explains, "a score of six and above on the SPEED test will trigger us to do a meibography."

In Dr. Devries' practice, a SPEED score of six and above generates meibography, osmolarity, and inflammation testing.

Meibomian Gland Analysis

Meibomian gland expression can be done by pressing on the glands and examining the meibum, or a meibomian gland evaluator can be used. Meibography images and video can be helpful to educate patients.

"I always like to tee it up with the perspective of, there's obstruction and there's inflammation," says Dr. Bloomenstein. "I talk to patients about how it looks, and why we have to work on the obstruction as well as maintaining and improving the quality of the tears, by reducing the inflammation."

"I tell patients," says Dr. Devries, "that when we do this imaging, we're looking at the structure, and when I'm pressing on the lids, I'm looking at the function, because I want to see what that oil actually looks like."

Osmolarity Test

Dr. Bloomenstein explains that an abnormal osmolarity means homeostasis has broken down.

"When you don't have homeostasis," he says, "it turns everything upside down, and creates that unstable tear film. So, having those high solutes is a very easy metric to correlate OSD."

Dr. Devries explains, "Variability really is what we look at. A difference of greater than 8 mOsm/L between the eyes is an indication, or anything above 300, but we use 308 as a cutoff to really define that."

Inflammation Test

Inflammation tests measure the level of MMP-9, a matrix metalloproteinase. This inflammatory enzyme is secreted when the epithelium is stressed. A normal range is between 3 and 41 ng/mL.

Exposure Testing

"We want to get to the root of what's causing the inflammation, what's deteriorating the meibomian glands," says Dr. Devries. "The root cause could be a lid lag or a lid misalignment. It could be nocturnal lagophthalmos. Ask patients how their eyes feel first thing in the morning, and if they have dryness at night. When they first wake up should be the best time for patients. Unless they have staphylococcal blepharitis or *Demodex*, what is actually going on may be exposure."

Demodex Exam

Demodex is an underlying cause of blepharitis, and collarettes are pathognomonic for patients who have *Demodex*.

SPEED™ QUESTIONNAIRE

Name: _____ Date: ___/___/___ Sex: M F (Circle) DOB: ___/___/___

For the Standardized Patient Evaluation of Eye Dryness (SPEED) Questionnaire, please answer the following questions by checking the box that best represents your answer. Select only one answer per question.

1. Report the type of SYMPTOMS you experience and when they occur:

	At this visit		Within past 72 hours		Within past 3 months	
Symptoms	Yes	No	Yes	No	Yes	No
Dryness, Grittiness or Scratchiness						
Soreness or Irritation						
Burning or Watering						
Eye Fatigue						

2. Report the FREQUENCY of your symptoms using the rating list below:

Symptoms	0	1	2	3
Dryness, Grittiness or Scratchiness				
Soreness or Irritation				
Burning or Watering				
Eye Fatigue				

0 = Never **1** = Sometimes **2** = Often **3** = Constant

3. Report the SEVERITY of your symptoms using the rating list below:

Symptoms	0	1	2	3	4
Dryness, Grittiness or Scratchiness					
Soreness or Irritation					
Burning or Watering					
Eye Fatigue					

0 = No Problems
1 = Tolerable - not perfect, but not uncomfortable
2 = Uncomfortable - irritating, but does not interfere with my day
3 = Bothersome - irritating and interferes with my day
4 = Intolerable - unable to perform my daily tasks

4. Do you use eye drops for lubrication? ☐ YES ☐ NO **If yes, how often?** _____

Cornea. 2013 Sep;32(9):1204-10
© 2011 TearScience, Inc. All rights reserved.
13-ADV-123 A

For office use only
Total SPEED score (Frequency + Severity) = ___/28

Figure 3. Questionnaires such as the SPEED questionnaire provide eye care professionals an opportunity to examine practice demographics.

"Everybody has a certain amount of these mites that are basically inside the lash," says Dr. Bloomenstein. "But when they overpopulate, they irritate the lid margin and create what we call collarettes."

The ATLAS study found 80% of patients who have been diagnosed with *Demodex* report a negative impact on their daily life.[11]

PUTTING IT ALL TOGETHER TO START TREATMENT

Artificial Tear

Treatment for OSD typically begins with an artificial tear, but Dr. Devries rapidly moves on from those because most patients have already tried two or three before presenting. Dr. Bloomenstein says artificial tears only provide a quick, short burst of relief and are not therapeutic. There are two types of artificial tear.

"The demulcents are lubricating drops that typically are going to be very comfortable, and the emollients are really the oil drops," says Dr. Devries. "I find myself using a lot of emollients because of the prevalence of meibomian gland dysfunction (MGD). We know that the patient's oil film is deficient or of poor quality. An emollient increases the thickness of the patient's lipid layer."

Dr. Bloomenstein adds, "If I'm pushing on the meibomian glands, and I see anything less than an olive oil texture, I'll use emollients. For younger patients, I gravitate more toward the demulcents."

Dr. Devries says that drops containing hyaluronic acid can be very comforting, and he expects to see more of them come onto the market.

Addressing Inflammation

Treatment protocols for inflammation include cyclosporine and lifitegrast. Below are some of the benefits of each formulation currently available for patients with OSD.

- **0.05% cyclosporine**
  - Inhibits T-cell activation, enabling patients to produce their own tears[12]
  - Decreases inflammatory cytokines
  - Shown to increase Schirmer scores, reduce corneal staining, increase goblet cell density, and reduce need for artificial tears

There are many triggers of dry eye flares and these should be considered when examining patients (Figure 4). Flares typically occur four to six times per year. "Ninety percent of patients surveyed experienced flares," says Dr. Devries, "and the majority had multi-day episodes."

- **0.5% lifitegrast**
  - Inhibits T-cell migration and secretion of inflammatory cytokines
  - Shown to improve both signs and symptoms with improvement as early as 2 weeks
- **0.09% cyclosporine**
  - Novel, aqueous, nanomicellar formulation of Ayclosporine A 0.09%
  - Well tolerated in a 12-week Phase 2b/3 study[13]
- **0.1% cyclosporine**
  - Cyclosporine embedded in core of droplets
  - Shown to reduce corneal damage, ocular surface inflammation, and signs/symptoms in DED patients with severe keratitis[14]

Cyclosporine, a diverse immunomodulator, is a challenging molecule to get on and into the epithelial surface. Mucin acts as a barrier that prevents molecules or foreign bodies from invading the epithelial surface, thus the vehicle used is very important to the success of this molecule.

Dr. Bloomenstein points out that these treatments are for chronic dry eye patients, and he notes that the different concentrations and delivery systems can be tailored for patients.

"The biggest problem right now is the quality of tears," says Dr. Bloomenstein. "We now have the ability to put you on a drop that will help you make more of your own real tears, and this will help you stay more visually comfortable."

Dr. Devries tells his patients, "You've reported to me that you're using your artificial tear on a frequent basis, yet you still notice the discomfort. We need to elevate your level of treatment. We're going to prescribe a therapeutic medication to lower inflammation."

Many of these medications are free of preservatives. "I like the preservative-free option," says Dr. Bloomenstein, "because we know BAK can be harmful to the ocular surface and decrease goblet cell densities. Preservative-free options come in single vials, but patients don't always like to use single vials."

A new technology delivers a drop from a bottle through a filter, which prevents microbial contamination and removes the preservative. It can be used up to 3 months.

Tackling Dry Eye Flares

In the past, dry eye flares were called acute blepharitis. In the fall or spring, when a patient came in with red, irritated eyes, they would be given a combination drop, with aminoglycoside and a steroid. There are many triggers of dry eye flares and these should be considered when examining patients (Figure 4). Peer-reviewed literature shows inflammation is the driving force.[15,16]

Flares typically occur four to six times per year. "Ninety percent of patients surveyed experienced flares," says Dr. Devries, "and the majority had multi-day episodes."

There is now a corticosteroid, 0.25% loteprednol etabonate, that can be used as a rescue drug.

Dr. Bloomenstein says, "I like using a steroid around inflammation for that immediate action."

Nutraceuticals, Neurostimulation, and More

Dr. Devries starts his patients on nutraceuticals in the office, then gives them the manufacturer's information so they can order it directly. Dr. Bloomenstein feels nutraceuticals are important but doesn't recommend a specific one. "I advise patients," he says, "to try the omegas-3s, the omega-6s, go for that fish oil."

A new FDA-approved handheld device provides neurostimulation, which stimulates the functional lacrimal unit so that patients get a complete tear. Another FDA-approved device is a varenicline nasal spray that is used twice a day to stimulate the ophthalmic branch of the trigeminal nerve.

For patients with nocturnal lagophthalmos, a new overnight treatment is available. The simple device helps the eyelids maintain a complete seal all night long.

Eyelid cleansers and tea tree oil have been used in the management of *Demodex* blepharitis, but these are not a cure. A topical lotilaner 0.25% is in development, and Dr. Devries says the clinical trials have been impressive with how much eradication there is of the *Demodex* mites.[17,18]

INTEGRATING INNOVATIVE TREATMENT TECHNOLOGIES INTO THE MODERN OSD PRACTICE

Dr. Devries recommends starting small by using equipment you already own and then making incremental informed investment decisions based on the demographics of your practice.

Staff should be organized, including developing a coding expert. Doctor time should be maximized. Patient conversations should be refined, and treatment options added and refined.

Dr. Bloomenstein tries to assist patients with the affordability and accessibility of treatments. "I love utilizing the rebate programs," he says, "and having patients go to a specialty pharmacy

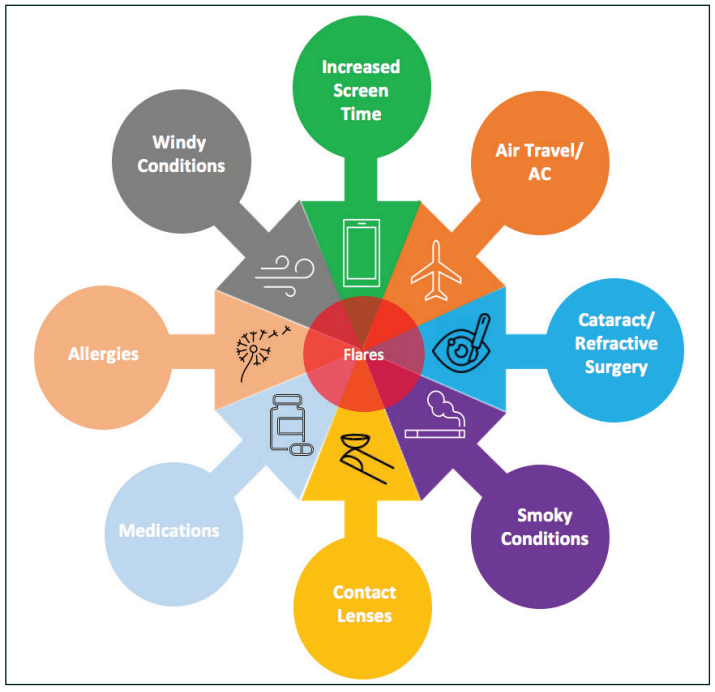

Figure 4. Triggers of dry eye flares.

that I know is going to build it in there or at least help with the prior authorizations."

Meibomian Gland Dysfunction

"If you press on a meibomian gland," explains Dr. Devries, "and the meibum is a thick oil, it's likely MGD. If you're seeing scalloped lid margins, it becomes obvious as well. When you look at the pathophysiology, when there is epithelial hyperkeratinization, we start getting obstruction of those ducts."

Some glands can be heated up, and the meibum melted and pushed out, but some are so highly keratinized that it would take too much heat to clear them.

Dr. Bloomenstein says there is typically not enough emphasis on the meibomian glands from the perspective of getting patients to accept what you're telling them.

"I love pushing on those glands," he says. "There's almost an auditory sensory feedback. When you tell a patient you're seeing a lot of stuff coming out of their lids, they realize there's an issue."

Prevalence of MGD across all ages is 42%. In the elderly it's 48%, and in pediatric patients and young adults it's 36%.[19] Among cataract surgery candidates, it's 75%.[20] Comorbidities include androgen deficiency/androgen therapy, discoid lupus erythematosus, rosacea, and hypertension.

"If you're putting young people into contact lenses," Dr. Devries says, "and finding that they're not able to adapt, start looking at the meibomian glands."

Dr. Devries says a lot of practitioners know they should introduce some type of MGD procedure into their practice but are not sure which one.

"For that," he says, "I would say do a questionnaire to find out how many patients you could possibly treat. It will make the decision to invest in one of the technologies easy."

"It's about finding something that's going to work in your practice," says Dr. Bloomenstein. "You might see small differences between the different devices that you feel will benefit your patient population."

"Part of the challenge we have as clinicians is to make things easy for patients," says Dr. Bloomenstein. "We need to find something that we feel works, and then tell them what they need to use."

"I think that's really important," agrees Dr. Devries. "Don't give options, instead say, 'This is what I want you to do.'"

Lid Cleaning

Dr. Devries says scrubs and cleansers have always been a part of lid maintenance, and patients benefit from using them. Lid debridement should be done under anesthetic drops on upper and lower lids to remove the keratin. Dr. Devries sees microblepharoexfoliation as a full procedure that thoroughly cleans the biofilm on the lids, and then lid scrubs become maintenance following the procedure. Dr. Bloomenstein adds that this procedure is about cleaning, not curing.

Keratolytic Treatment

An ophthalmic selenium sulfite ointment is in development as a treatment for MGD. Early pilot and clinical studies have been impressive, with 58% becoming nonsymptomatic after 3 months of treatment.[21]

Thermal Pulsation

"Once I've done meibography," Dr. Devries says, "I will tell them, 'We're going to get you started on a prescription drug right now to take care of the acute nature of this dry eye, but we're going to have to do something about the lids.' Then I describe thermal pulsation, and then intense pulsed light. They leave with literature that says what we're going to have to do at some point, because I really want them prepared."

Automatic vector thermal pulsation is directly treating an obstruction that can be melted. It heats the inner lid surface to about 108°F, or 10° above body temperature, and it adds pressure while it continues to heat. It protects the cornea and globe by vaulting over and having a protective surface.

In one study after 1 year, 100% of the treated eyes had a change in visible meibomian gland structure (Figure 5).[22] Sixty-nine percent of treated eyes showed an improvement in visible meibomian gland structure.

A semi-automated thermal pulsation treatment heats the eyelid with automated application of LED light, as an eye care professional compresses the glands.

Dr. Devries says, "The benefit here is you can see specifically the glands are producing meibum as you do the compression. The treatment tends to take about 8 to 12 minutes and increases meibomian gland function by 300% at 4 weeks posttreatment

compared to the baseline.[23] And you can see the actual expression, and you can show patients."

"A picture is the best way of getting patients to appreciate what we see and what they need to do," said Dr. Bloomenstein. "So any device that allows you to see the expression will be helpful in showing patients there is an opportunity for them to feel better symptomatically. And when you start deciding what glands need to be expressed, visualizing the glands allows you to tailor it."

Intelligent Heat and Manual Expression

Another option is a thermal eyelid treatment that uses intelligent heat followed by manual expression. It takes about 12 minutes, and as it heats there is a display to show the timing. If a patient says it's too hot, the physician can stop it so it doesn't go to the full temperature.

"What makes this intelligent is that it's constantly monitoring," says Dr. Devries, "so if you lose a connection, it will tell you."

A postmarket trial showed 100% improvement in signs and symptoms of dry eye within 1 week of treatment, and 83% of subjects experienced clinically meaningful symptom relief.[24]

Thermal Eyelid Treatment

For touchups on patients with MGD, a simple thermal eyelid treatment can be beneficial.

"This is a very low expense, to bring this into the practice," says Dr. Bloomenstein. "I don't feel it provides the same level of heat and consistency, so I would not utilize this as my intelligent, manual expression device or even the vectored thermal pulsation, but I'll have patients come in, and in between those treatments I'll have them do this."

WATCH IT NOW

This supplement summarizes a series of engaging MasterClass videos hosted by Drs. Bloomenstein and Devries.

https://evolvemeded.com/course-collection/OSDMasterClasses

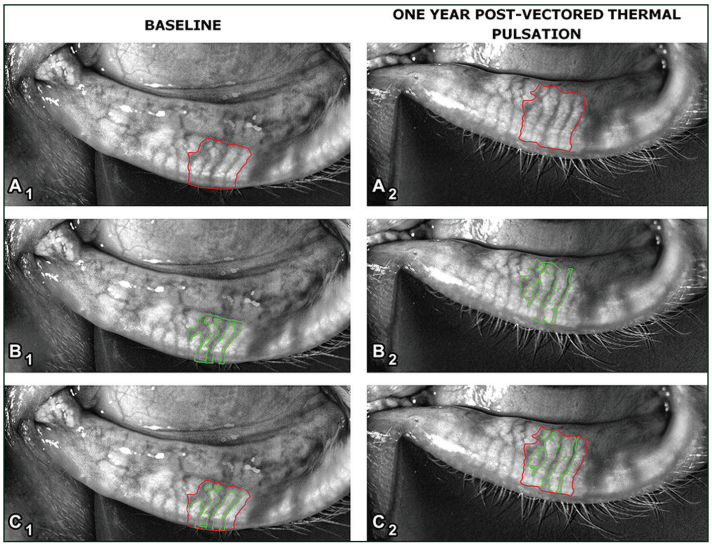

Figure 5. Outcomes of vectored thermal pulsation. In a retrospective, single-masked cohort study, after 1 year: 100% of the treated eyes had a change in visible meibomian gland structure and 69% of treated eyes showed an improvement in visible meibomian gland structure.[22]

Intense Pulsed Light

Intense pulsed light (IPL) was used first in dermatology and then adopted into eye care. Dr. Devries tells his patients, "We're finding that there is not only a cosmetic benefit, but also a therapeutic benefit." Cosmetic benefits include tightening collagen and reducing rosacea, age spots, and sunspots.

IPL uses cutoff filters with intense energy to photocoagulate abnormal tissues. It absorbs in melanin, water, and hemoglobin. For dry eye treatment, the energy is broken into three different pulses, so it minimizes impact and allows the tissue to cool in between pulses.

Dr. Devries explains, "The number of joules is recorded, and we keep track so I know how to go up higher. Typically, we'll do two passes. It's going to be somewhere around 100 different impulses."

Aqueous Deficient Dry Eye

For aqueous deficient dry eye, punctal occlusion is an option. It prevents tear drainage, increases natural tear film volume, decreases tear film osmolarity, and prolongs the effect of any drop.

Dr. Bloomenstein performed a study of 50 contact lens wearers, placing a plug in one eye but not the other. In the occluded eyes, osmolarity was improved and tear breakup time increased by 2 seconds. There was reduced staining and, importantly, a 42% reduction in OSDI score.

There are two types of plugs: semipermanent and dissolvable. Dr. Bloomenstein prefers starting with a dissolvable plug because it allows him to see if the treatment works.

Neurotrophic Keratitis

With neurotrophic keratitis (NK) there is impairment of trophic supply in the trigeminal nerves. This leads to epithelial

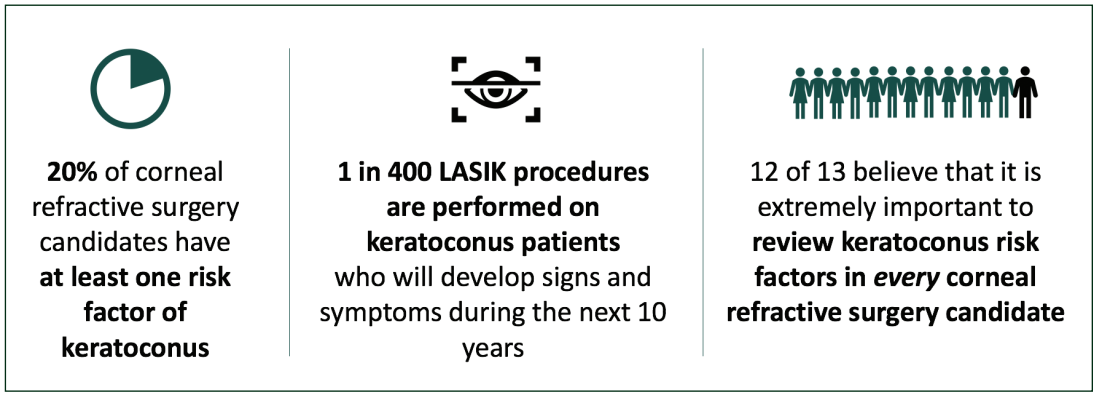

Figure 6. Prevalence of keratoconus among refractive surgery candidates.[27]

alterations, which can reduce tear production and blink rate, and then to spontaneous corneal epithelial breakdown. But it starts earlier. As with OSD in general, the sooner treatment starts, the better.

"NK can be really significantly asymmetric," says Dr. Devries. "It can be an older or younger individual, or a patient with a history of herpes simplex virus (HSV). When there's a history of HSV, it's very obvious that one cornea is different from the other."

"There's a disconnect between signs and symptoms," says Dr. Bloomenstein. "That has been one of the hallmarks of this disease state. When we start looking at this neurotrophic aspect of it, and if we start being more proactive and start thinking about treating these patients sooner before they develop an ulcer, it's going to help us and our patients."

Corneal sensitivity can be tested with a cotton wisp or dental floss as contact tests, or a Cochet-Bonnet esthesiometer can be used for a lab measurement.

Dr. Devries says the important aspect of this is it's a bilateral comparison. "You really want to test one eye against the other," he explains, "because it becomes very easy if you have a patient that has had a herpetic event on that eye. You can test the affected eye versus the nonaffected eye, you'll see a difference."

Treatments for NK include therapeutic bandage contact lenses, amniotic membranes, and cenegermin. Amniotic membranes are created using amniotic tissue from the innermost layer of the placenta. It has the same biologic properties that protect a developing baby. It promotes new tissue formation, reduces scar tissue, and modulates inflammation. It also may have antimicrobial effects when used on the cornea. The tissue is available either cryopreserved or dehydrated. Dr. Devries says a cryopreserved amniotic membrane will usually help restore some of the sensitivity as well as the nerve density in patients with NK. Dr. Devries adds, "It can be used for common corneal pathology associated with dry eye. The recalcitrant patient is where I use most of those, and in epithelial basement membrane dystrophy."

Cenegermin is a recombinant human nerve growth factor, structurally identical to nerve growth factor protein produced in the ocular tissue. Clinical trials showed 72% of patients with NK had complete corneal healing with this, and 80% of those patients remain completely healed 1 year after completing the therapy.[25,26]

ADDITIONAL OSD TREATMENTS

Keratoconus

Keratoconus is an asymmetric, bilateral, progressive condition that usually begins in younger patients. Importantly, there is a familial, genetic component to it.

Looking at the numbers, there are 370 million people at risk for keratoconus worldwide; 63 million people have keratoconus; and 309 million have curvatures between 46-48 D. One in 400 LASIK procedures are performed on keratoconic patients who develop signs later (Figure 6).[27]

Patients can have a genetic test to determine their risk. They receive a numeric risk score and risk assessment. It's done with a simple swab of the cheek to collect DNA, which is then analyzed to determine risk factors for several different dystrophies.

The importance of detecting the likelihood of keratoconus progression as early as possible is that there is the opportunity to talk to patients about scleral lenses or other types of contact lens opportunities. If the condition does occur, corneal collagen crosslinking is an approved treatment.

Dr. Bloomenstein's practice has been involved in corneal collagen crosslinking for several years. "We were doing an investigational device exemption for the epi-on procedure," he says, "and right now, we are doing the FDA-approved corneal collagen crosslinking system, which stops the progression of the disease."

Blepharoptosis

Talking about OSD should include how the eyelids aesthetically look (Figure 7).

"We've become acutely aware that low-lying lids, acquired blepharoptosis, not only gives a perception to our patients that something is not right, but it can affect the quality of their vision," says Dr. Bloomenstein.

There is now a treatment called oxymetazoline hydrochloride ophthalmic solution 0.1% that acts on the Muller's muscle to lift the upper eyelid by around 1 to 2 mm, which makes a significant difference on some eyes.

"If a patient with a little bit of an acquired ptosis is interested, you can give them a prescription," Dr. Bloomenstein explains,

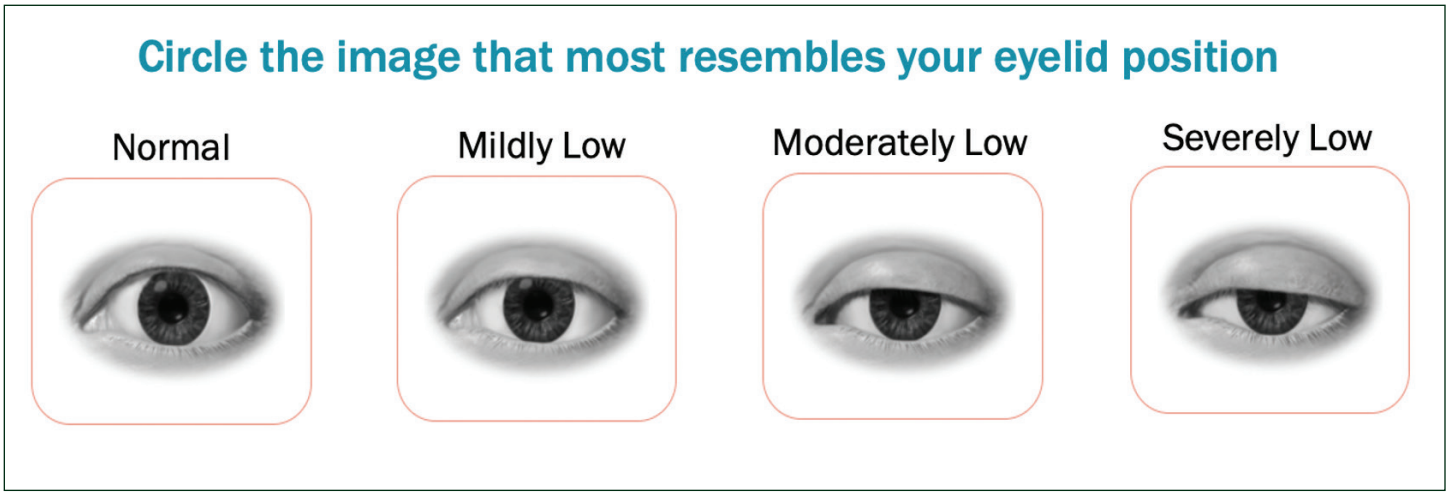

Figure 7. Blepharoptosis patient self-assessment.

"and let them first try a sample at home, with a self-assessment test. If they like it, they'll fill the prescription, and the next time they come in you find out." ■

1. Paulsen AJ, Cruickshanks KJ, Fischer ME, et al. Dry eye in the beaver dam offspring study: prevalence, risk factors, and health-related quality of life. *Am J Ophthalmol.* 2014;157(4):799-806. doi:10.1016/j.ajo.2013.12.023
2. Leung EW, Medeiros FA, Weinreb RN. Prevalence of ocular surface disease in glaucoma patients. *J Glaucoma.* 2008;17(5):350-355. doi:10.1097/IJG.0b013e31815c5f4f
3. Manaviat MR, Rashidi M, Afkhami-Ardekani M, Shoja MR. Prevalence of dry eye syndrome and diabetic retinopathy in type 2 diabetic patients. *BMC Ophthalmol.* 2008;8:10. Published 2008 Jun 2. doi:10.1186/1471-2415-8-10
4. Doughty MJ, Fonn D, Richter D, et al. A patient questionnaire approach to estimating the prevalence of dry eye symptoms in patients presenting to optometric practices across Canada. *Optom Vis Sci.* 1997;74(8):624-631. doi:10.1097/00006324-199708000-00023
5. Moss SE, Klein R, Klein BE. Long-term incidence of dry eye in an older population. *Optom Vis Sci.* 2008;85(8):668-674. doi:10.1097/OPX.0b013e318181a947
6. Lienert JP, Tarko L, Uchino M, et al. Long-term natural history of dry eye disease from the patient's perspective. *Ophthalmology.* 2016;123(2):425-433. doi:10.1016/j.ophtha.2015.10.011
7. Craig JP, Willcox MD, Argüeso P, et al. The TFOS international workshop on contact lens discomfort: report of the contact lens interactions with the tear film subcommittee. *Invest Ophthalmol Vis Sci.* 2013;54(11):TFOS123-TFOS156. Published 2013 Oct 18. doi:10.1167/iovs.13-13235
8. García-Posadas L, Contreras-Ruiz L, Soriano-Romaní L, et al. Conjunctival goblet cell function: effect of contact lens wear and cytokines. *Eye Contact Lens.* 2016;42(2):83-90. doi:10.1097/ICL.0000000000000158
9. Trattler WB, Reilly CD, Goldberg, DF, et al. Cataract and dry eye: prospective health assessment of cataract patients ocular surface study; Poster, ASCRS; March 2011.
10. Starr CE, Gupta PK, Farid M, et al. An algorithm for the preoperative diagnosis and treatment of ocular surface disorders. *J Cataract Refract Surg.* 2019;45(5):669-684. doi: 10.1016/j.jcrs.2019.03.023
11. Yeu E, Holdbrook MJ, Baba SN, Gomes PJ. Psychosocial impact of demodex blepharitis. *IOVS.* 2021;62(8):1261.
12. Nelson JD, Helms H, Fiscella R, et al. A new look at dry eye disease and its treatment. *Adv Ther.* 2000;17(2):84-93.
13. Tauber J, et al. ASCRS 2017 Paper presentation.
14. Baudouin C, Figueiredo FC, Messmer EM, et al. A randomized study of the efficacy and safety of 0.1% cyclosporine A cationic emulsion in treatment of moderate to severe dry eye. *Eur J Ophthalmol.* 2017;27(5):520-530. doi:10.5301/EJO.5000952
15. Tsubota K, Pflugfelder SC, Liu Z, et al. Defining dry eye from a clinical perspective. *Int J Mol Sci.* 2020;21(23):9271. Published 2020 Dec 4. doi:10.3390/ijms21239271
16. Perez VL, Stern ME, Pflugfelder SC. Inflammatory basis for dry eye disease flares. *Exp Eye Res.* 2020;201:108294. doi:10.1016/j.exer.2020.108294
17. Salinas RG, Karpecki P, Yeu E, et al. Safety and efficacy of lotilaner ophthalmic solution, 0.25% for the treatment of blepharitis due to demodex infestation: a randomized, controlled, double-masked clinical trial [published online ahead of print, 2021 Jul 28]. *Cont Lens Anterior Eye.* 2021;101492. doi:10.1016/j.clae.2021.101492
18. Gonzalez-Salinas R, Yeu E, Holdbrook M, et al. Safety and efficacy of topical lotilaner ophthalmic solution 0.25% for the treatment of demodex blepharitis: a pilot study. *J Ophthalmol.* 2021;2021:3862684. Published 2021 Sep 21. doi:10.1155/2021/3862684
19. Blackie CA, Folly E, Ruppenkamp J, Holy C. *IOVS.* 2019;60(9):2736.
20. Devries DK, Bloomenstein M, et al. MGD consensus panel. *Modern Optometry.* 2019.
21. Business Wire. Azura ophthalmics announces positive topline results from phase 2 program of the company's investigational treatment for meibomian gland dysfunction. Press Release. https://www.businesswire.com/news/home/20210303005272/en/Azura-Ophthalmics-Announces-Positive-Topline-Results-From-Phase-2-Program-of-the-Company%E2%80%99s-Investigational-Treatment-for-Meibomian-Gland-Dysfunction.
22. Hura AS, Epitropoulos AT, Czyz CN, Rosenberg ED. Visible meibomian gland structure increases after vectored thermal pulsation treatment in dry eye disease patients with meibomian gland dysfunction. *Clin Ophthalmol* (Auckland, NZ). 2020;14:4287.
23. Tauber J, Owen J, Bloomenstein M, et al. Comparison of the iLUX and the lipiflow for the treatment of meibomian gland dysfunction and symptoms: a randomized clinical trial. *Clin Ophthalmol* (Auckland, NZ). 2020;14:405
24. Karpecki P, Wirta D, Osmanovic S, Dhamdhere K. A prospective, post-market, multicenter trial (CHEETAH) suggested TearCare® System as a safe and effective blink-assisted eyelid device for the treatment of dry eye disease. *Clin Ophthalmol* (Auckland, NZ). 2020;14:4551.
25. Bonini S, Lambiase A, Rama P, et al., REPARO study group. Phase II randomized, double-masked, vehicle-controlled trial of recombinant human nerve growth factor for neurotrophic keratitis. *Ophthalmology.* 2018;125:1332–43.
26. Pflugfelder SC, Massaro-Giordano M, Perez, VL, et al. Topical recombinant human nerve growth factor (cenegermin) for neurotrophic keratopathy: A multicenter randomized vehicle-controlled pivotal trial. *Ophthalmology.* 2020;127:14–26.
27. Donnenfeld E, et al. The 2021 keratoconus testing consensus statement. *CRST.* July 2021.

OCULAR SURFACE DISEASE MASTER CLASSES: OFFICE-BASED DIAGNOSIS, TREATMENT TUTORIALS, AND REAL-WORLD PATIENT COMMUNICATIONS

Release Date: February 10, 2022
COPE Expiration Date: February 10, 2023

INSTRUCTIONS FOR CREDIT

To receive credit, you must complete the attached Pretest/Posttest/Activity Evaluation/Satisfaction Measures Form and mail or fax to Evolve Medical Education LLC; 353 West Lancaster Avenue, Second Floor, Wayne, PA 19087; Fax: (215) 933-3950. To answer these questions online and receive real-time results, please visit http://evolvemeded.com/course/2153-supp. If you experience problems with the online test, email us at info@evolvemeded.com. If you experience problems with the online test, email us at info@evolvemeded.com.
NOTE: Certificates are issued electronically.

Please type or print clearly, or we will be unable to issue your certificate.

Full Name_____ DOB (MM/DD): _____

Phone (required) _____ Email (required*) _____

Address/P.O. Box_____

City _____ State/Country _____ Zip _____

License Number:_____OE Tracker Number:_____National Provider ID:_____

*Evolve does not share email addresses with third parties.

DEMOGRAPHIC INFORMATION

Profession
___ MD/DO
___ OD
___ NP
___ Nurse/APN
___ PA
___ Other

Years in Practice
___ >20
___ 11-20
___ 6-10
___ 1-5
___ <1

Patients Seen Per Week (with the disease targeted in this educational activity)
___ 0
___ 1-15
___ 16-30
___ 31-50
____ >50

Region
___ Northeast
___ Northwest
___ Midwest
___ Southeast
___ Southwest

LEARNING OBJECTIVES

Did the program meet the following educational objectives?	Agree	Neutral	Disagree
Review the definition, prevalence, and impact of various ocular surface diseases (OSDs) within the overall population and in the following groups: patients with OSD, cataract and refractive surgery patients, and contact lens dropout patients	_____	_____	_____
Utilize video tutorials to better understand how to implement and perform specific steps in utilizing: new and emerging diagnostic tests in differentiating and classifying ocular surface categories and disease severity; and new and emerging therapeutic options and protocols for various types of OSD patients	_____	_____	_____
Increase confidence in navigating decisions in various OSD cases, from simple to complex	_____	_____	_____
Understand the OSD patient journey: utilizing videos to demonstrate how to better communicate with and educate patients, set expectations, and manage these patients postoperatively	_____	_____	_____

POSTTEST QUESTIONS

Please complete at the conclusion of the program.

1. Based on this activity, please rate your confidence in your ability to understand and integrate into practice ocular surface disease diagnostic modalities and treatment (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).

a. 1
b. 2
c. 3
d. 4
e. 5

2. Based on this activity, please rate your confidence in your ability to educate patients on ocular surface diseases (based on a scale of 1 to 5, with 1 being not at all confident and 5 being extremely confident).

a. 1
b. 2
c. 3
d. 4
e. 5

3. Dry eye disease (DED) is characterized by which of the following?

a. A decrease in intraocular pressure
b. A loss of homeostasis of the tear film
c. Red eyes
d. Decreased ocular sensitivity

4. In the PHACO study, what percentage of patients scheduled for cataract surgery were diagnosed with ocular surface disease?

a. 20%
b. 35%
c. 62%
d. 87%

5. Measuring the level of MMP-9 is a test for:

a. Inflammation
b. Osmolarity
c. Homeostasis
d. Meibomian gland function

6. Collarettes are a pathognomonic sign for:

a. Meibomian gland dysfunction
b. *Demodex* mites
c. Rosacea
d. Inflammation

7. Stimulating the ophthalmic branch of the trigeminal nerve is used in:

a. Lid sealing
b. Blepharitis treatment
c. Neurostimulation
d. Adding nutraceuticals to the diet

8. The purpose of microblepharoexfoliation is:

a. Reduce the prevalence of rosacea
b. Long-term eyelid maintenance
c. Cleaning the biofilm from the eyelids
d. Eliminating *Demodex* mites

9. Corneal collagen crosslinking is approved for use in:

a. *Demodex* blepharitis
b. Meibomian gland dysfunction
c. Epithelial hyperkeratinization
d. Keratoconus

10. Punctal plug occlusion can be useful in which one of the following?

a. Aqueous deficient dry eye
b. Neurotrophic keratitis
c. Keratoconus
d. Blepharoptosis

11. Cenegermin is a treatment for which one of the following?

a. Neurotrophic keratitis
b. Keratoconus
c. Aqueous deficient DED
d. Meibomian gland dysfunction

12. A lab measurement of the degree of corneal sensitivity can be done with:

a. A Cochet-Bonnet esthesiometer
b. A cotton wisp
c. Dental floss
d. A gentle finger press

ACTIVITY EVALUATION

Your responses to the questions below will help us evaluate this activity. They will provide us with evidence that improvements were made in patient care as a result of this activity.

Rate your knowledge/skill level prior to participating in this course: 5 = High, 1 = Low____

Rate your knowledge/skill level after participating in this course: 5 = High, 1 = Low____

This activity improved my competence in managing patients with this disease/condition/symptom. _____ Yes _____No

Probability of changing practice behavior based on this activity: _____High _____ Low _____No change needed

If you plan to change your practice behavior, what type of changes do you plan to implement? (check all that apply)

Change in pharmaceutical therapy _____
Change in nonpharmaceutical therapy _____
Change in diagnostic testing _____
Choice of treatment/management approach _____
Change in current practice for referral _____
Change in differential diagnosis _____
My practice has been reinforced _____
I do not plan to implement any new changes in practice _____

Please identify any barriers to change (check all that apply):

_____ Cost
_____ Lack of consensus or professional guidelines
_____ Lack of administrative support
_____Lack of experience
_____ Lack of time to assess/counsel patients
_____ Lack of opportunity (patients)
_____ Reimbursement/insurance issues
_____ Lack of resources (equipment)
_____ Patient compliance issues
_____ No barriers
_____ Other. Please specify: _____

The design of the program was effective for the content conveyed	___ Yes	___ No
The content supported the identified learning objectives	___ Yes	___ No
The content was free of commercial bias	___ Yes	___ No
The content was relative to your practice	___ Yes	___ No
The faculty was effective	___ Yes	___ No
You were satisfied overall with the activity	___ Yes	___ No
Would you recommend this program to your colleagues	___ Yes	___ No

Please check the Core Competencies (as defined by the Accreditation Council for Graduate Medical Education) that were enhanced through your participation in this activity:

_____ Patient Care
_____ Practice-Based Learning and Improvement
_____ Professionalism
_____ Medical Knowledge
_____ Interpersonal and Communication Skills
_____ System-Based Practice

Additional comments:

_____

_____ I certify that I have participated in this entire activity.

This information will help evaluate this activity; may we contact you by email in 3 months to inquire if you have made changes to your practice based on this activity? If so, please provide your email address below.

_____

_____

MODERNOPTOMETRY