

# Remote Possibilities

## New Business Models Unlock Telemedicine's Potential for Eyecare



ANDREW KARP / GROUP EDITOR, LENSES & TECHNOLOGY

### Take this pop quiz. Ocular telemedicine is:

1. Having a comprehensive, in-office eye exam supervised remotely by a technician or optometrist, with the results then analyzed by the optometrist or an ophthalmologist.
2. Using a smartphone app to schedule an eye doctor appointment, consult with their doctor, send them photos or videos of their eye, and get a prescription for medication.
3. A do it yourself, online test for refractive error that uses a computer, a smartphone and an app and can generate a prescription for eyeglasses or contact lenses from an optometrist or ophthalmologist.
4. A do it yourself vision test performed with a smartphone and a low cost, handheld device. The test results are fed into an algorithm that pro-

duce “Eyeglass Numbers” that can be used to order glasses from some online retailers.

5. A vision screening performed out of office by a doctor, optician or technician using a mobile device.
6. A vision exam performed in a clinic or public space equipped with a kiosk containing diagnostic instruments.
7. All of the above

If you answered, “All of the above,” you’d be correct. Many different forms of ocular telemedicine—also referred to as ocular telehealth—have emerged in the past few years. They create a dynamic but fragmented market in which different business models and service offerings compete for consumer dollars and buy-in from eyecare professionals. The proliferation of ocular telehealth options and the growing investment in the category leaves little doubt that it is gaining momentum, VM has learned for this special Megatrend report.

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Telehealth's growth is apparent not only in eyecare but in other fields of medicine as well. As of 2018, 34 states plus the District of Columbia had enacted parity laws for private insurance coverage of telemedicine, up from 12 states in 2010, and five other states were reviewing proposed legislation, according to the American Telemedicine Association.



Vitor Pamplona

"We see about 200 different models of telehealth being run these days in the U.S. and abroad," said Vitor Pamplona, founder and CEO of EyeNetra, which markets a mobile refraction system and was an early entrant in the ocular telehealth market.

"They are all different from each other and generally very protective of their way of doing it, for obvious reasons. Most of them are successful, profitable businesses already."



Moshe Mendelson, OD

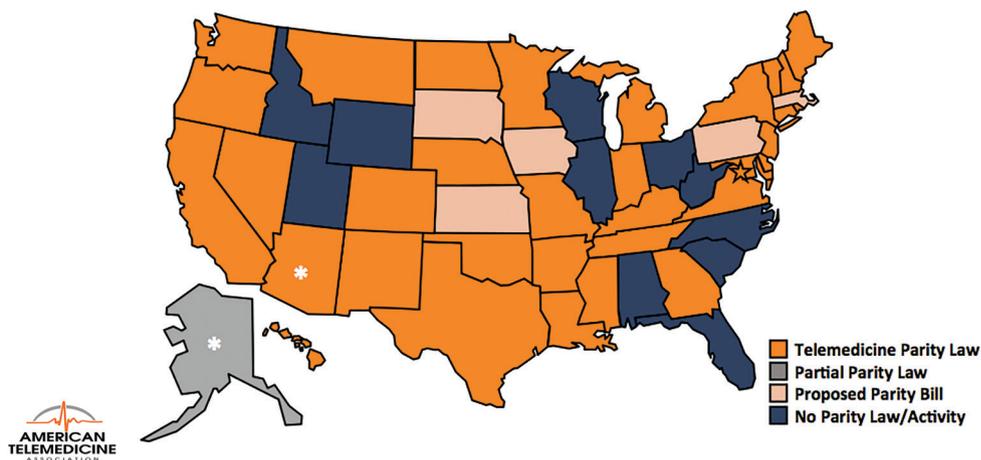
"The market for ocular telemedicine is growing," said Moshe Mendelson, OD, FIOA, who is chief medical officer for EyecareLive, a HIPAA-secure telemedicine portal that uses smartphone apps to link patients with doctors and schedule appointments. "Some commercial carriers are paying for telemedicine, and Medicare is expanding coverage. Most optometric conferences now cover telemedicine in their program.

"We see a significant increase in interest as ECP's understand that in order to stay relevant and competitive they will have to be active in the telemedicine space," said Mendelson.

Features and customer experiences can vary greatly from one form of ocular telehealth to another, making comparisons difficult. At one end of the spectrum are remote controlled, comprehensive eye exams and direct patient-to-doctor communications over HIPAA-secure channels.

At the opposite end are self-administered vision tests made popular by Visibly and online retailers

## States with Parity Laws for Private Insurance Coverage of Telemedicine (2018)



such as Warby Parker and 1800Contacts that enable consumers to quickly renew an eyeglass or contact lens prescription issued by an ECP who has reviewed the test results. Despite the significant differences between these and various other approaches to telehealth, their underlying premise is the same as it is for other types of telemedicine: expanded access to quality healthcare services delivered quickly and conveniently at affordable prices.



Greg Lechner

"Lower exam and health care costs through increased efficiencies and more screenings for critical eye disease is one of factors driving ocular telehealth," said Greg Lechner, director of marketing and communications for 20/20Now which provides comprehensive eye exams, including eye health screenings via telehealth using advanced technology, proprietary software and patented exam processes.

Younger consumers are particularly receptive. "Millennials are helping drive telehealth. They want to be served when it's convenient for their schedule, not the doctor's," observed Lechner.

Ocular telehealth companies report that most consumers who try their services are enthusiastic about the experience. Yet general awareness of ocular telehealth among consumers is still relatively

low. A VisionWatch survey conducted by the Vision Council in December 2018 found that only 24.8 percent of respondents had any awareness, with 7.2 percent being very aware and familiar. The report concluded that while ocular telemedicine services are growing in popularity, they have yet to penetrate the "mainstream" consumer consciousness. (For more detailed survey results, see the related article, "The Telehealth Consumer.")

Optometrists, ophthalmologists and even opticians who want to expand their services by adding refraction are beginning to embrace telehealth in its various forms.



William Mallon, MD

"Eyecare is the most natural fit for telehealth because of the ease of acquisition and the volume of information that can be gathered from non-invasive testing," observed William Mallon, MD, an ophthalmologist and co-founder of GlobeChek

Enterprises, a Florida-based company that has developed a kiosk-based vision screening system.

As consumer interest in ocular telehealth increases and its impact on vision care ramps up, health care and business leaders are grappling with a complex and challenging trend that is reshaping relationships between doctors and patients and

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fundamentally changing the delivery of health care services and diagnoses. Telehealth models that enable practitioners to build connections with patients for diagnosis and disease management are gaining traction, as well as models that keep the doctor in the loop for comprehensive care.

Proponents of ocular telehealth say it enables optometrists and ophthalmologists to leverage modern technology in order to extend and even raise the level of care they provide.

“We have to understand the limitations and boundaries that are set by what we can physically do at the moment. Once we recognize those boundaries, we need to think how we’re going to enhance the ultimate service we provide. That’s where telehealth comes in,” said Paul Super, OD, FAAO, a co-founder of EyecareLive and medical director and owner of Eyesight Optometric Group, which operates two locations in Los Angeles.

Ocular telehealth’s detractors question whether quality care is being sacrificed for the sake of convenience. They argue that in-office, in-person eye exams are the gold standard, and caution that some forms of ocular telehealth fall short of it. They also maintain that some consumers will forgo a comprehensive eye exam and instead opt for just a visual acuity test in order to obtain an eyeglass or contact lens prescription. Adding to the controversy are online eye “tests” which are expanding their reach while blurring the distinctions between “routine refractions” and “Rx verifications” versus comprehensive eye exams.

The debates are playing out in a series of legislative battles at the state level that pit state optometric associations, sometimes with the support of the American Optometric Association (AOA), against some ocular telehealth companies. However, the AOA has indicated an openness to optometrists participating in telehealth under certain conditions. In a February 2017 position paper, the AOA stated, “Telehealth, which includes the related concept of telemedicine, is a rapidly-evolving tool for the delivery of health information and services. The AOA supports the appropriate use of eye and vision telehealth services to supplement access to

high-value, high-quality eye and vision care. Eye and vision telehealth services, when used appropriately, can serve to improve patient coordination and communication among and between doctors of optometry and ophthalmologists, as well as other primary care or specialty care providers.” (A complete version of the AOA’s position paper on telehealth is posted on the organization’s website.)

On the national level, the FDA has also entered the fray, warning prescription renewal service Visibly that it had violated the Federal Food, Drug, and Cosmetic Act, and requiring it to submit to an approval process before granting market clearance for its online vision test.

A Visibly spokesperson told *VM* the company is continuing to work with the FDA on its De Novo application process.

Separate legal battles have erupted between several ocular telehealth companies that have sued each other over patent infringement, a scenario common to emerging tech sectors.

Despite a fragmented market and legislative and legal hurdles, ocular telemedicine is steadily gaining ground in the U.S. Hundreds of thousands of U.S. consumers have had remote eye exams, remote consultations or taken online eye tests, according to suppliers and practitioners, and the number is steadily increasing.

However, the biggest factor that could determine ocular telehealth’s growth trajectory is insurance reimbursement, and managed vision care companies are approaching the idea of reimbursement cautiously. (For more on this topic, see related article, “Managed Vision Care Perspectives on Ocular Telemedicine.”)

To understand what’s driving this segment of the vision care market, and why it’s gradually gaining traction with consumers, *VM* spoke with some of the leading players in ocular telemedicine as well as eyecare practitioners and optical retailers who offer this service.

## Analyzing Ocular Telehealth’s Appeal

Today’s eyewear customers and patients are also healthcare consumers, and many want eyecare delivered on their terms, both in-office and online. That

demand has fueled the growth of telehealth, which, by nature, is consumer-centric. For some consumers, that means having their ECP be available at their convenience and be able to use the latest technology to monitor an eye condition, give a diagnosis, and if needed, issue a prescription for medication.



Howard Fried, OD

“The market driver for ocular telehealth has been patients’ need for better access to quality comprehensive eye health and vision analysis coupled with early detection of disease,” said Howard Fried, OD. “Patients want comprehensive eye exams at their convenience, including evenings and weekends. It has to be accessible to patients in remote areas and where access to eye exams by licensed optometrists varies from limited to unavailable.”



John Serri

Eager to meet patients’ expectations, a growing number of ECPs are embracing telehealth as a way to expand and enhance their service, generate additional revenue and add flexibility to their practice. “ECPs recognize a need to differentiate by innovating, embracing technologies that establish patient loyalty, expand patient reach, improve patient care, and provide differentiated services,” said John Serri, CEO of EyeQue, a maker of vision testing devices for consumers that enable ECPs to remotely monitor changes in their patients’ vision.

Many patients want the convenience of on-demand access to eye tests or consultations with doctors. That can be 24/7 access to an online vision test, or being able to walk into a practice and get a vision test without an appointment and without an eye doctor present.

“Businesses that may not have the funds to employ a doctor full-time are finding that they are losing out on quite a bit of foot traffic,” noted Yaopeng Zhao, co-founder and president of Smart Vision Labs, which markets a smartphone-based vi-

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sion testing system that can be used both in-store and in the field.



Yaopeng Zhou

“Our customers see our device as a solution for prescribing as well as a way to differentiate from the intense competition,” said Zhou.

Health and wellness, which has become a huge consumer trend, is also accelerating the spread of ocular telemedicine. “Consumers have an insatiable desire to self-monitor and an expectation that technology will provide them a means to gather information about their health—including their vision—saving them time and money, and making them more participatory in their care and wellness,” said EyeQue’s John Serri. “The power and ubiquity of smartphones provides a platform for digital health applications, and advancements in technologies like Inverse Shack Hartman make it possible for tests like refraction error to become low-cost, mobile, and self-administered.”

### Ocular Telehealth as a Practice Builder

Optical chains as well as independent practices are finding that telemedicine is a solid investment.

Joe Einhorn, manager of Classic Vision in Brooklyn, N.Y., said telemedicine enables him to offer an eye exam to anyone who wants one, which has increased eyewear sales significantly.

“Our peak hours are 4 to 7 p.m.,” he explained. “I can’t find a doctor to come two to three hours a day. Even if I could, it would cost \$600 a day. At four days a week, that’s \$2,400, which is not economical.

“We’re in the high end of the industry, and people always want their glasses yesterday,” said Einhorn. “We would send them out for an exam, and people would end up buying their glasses at that practice.”

Einhorn’s solution was to install the DigitalOptometrics system, which enables Classic Vision to provide a comprehensive exam using a remote controlled system. A live video consultation with an optometrist is a key part of the experience.

“DigitalOptometrics actually saved my business,”

he said. “Now I have ability to offer an exam to anyone who wants one. We can’t really make money from exams, it’s just an aid to capture customers. But now we make a sale to everyone that comes in. This is the biggest game changer in years.

“We have \$100,000 worth of equipment and my monthly lease is \$1,500,” said Einhorn. “If we generate three sales it covers that completely.”

The ability to do refractions on demand is building business at Modern Day Optx in Manhattan, which uses Smart Vision Labs’ technology. The system uses a specially equipped smartphone and the company’s proprietary app and machine learning algorithm to perform an autorefractometer. The measurements are quickly checked and verified by an licensed ophthalmologist, who then issues a prescription for glasses. Smart Vision Labs also offers a five-minute “basic exam” that uses wavefront technology to detect higher order aberrations. Test results are stored in the cloud for future reference.

“It’s changed the way my store functions,” said owner Vladimir Mordukhayev. “I communicate by phone directly with the doctor right after the test. Ninety-nine percent of the time the prescription is perfect. Clients love it.”

Cohen’s Fashion Optical, the New York-based optical retail chain, has partnered with 20/20Now to enable its franchisees to provide comprehensive eye exams. Susan Kayata, Cohen’s chief marketing officer, said the chain has had “tremendous results” with the system technology in terms of improving accessibility for patients.

“Having the remote experience in our stores lets our franchisees be available for eye examinations at all times, whether or not the doctor is present. They always have a support system, so they can easily take walk-ins. It also allows them to handle overflow, so they’re not slowing down the process. And they’re definitely not compromising the level of care to their patients.” Currently, Cohen’s has equipped 10 stores with the 20/20Now system. Kayata noted that the adoption rate among franchisees is “very high.”

Kayata went through the 20/20Now exam herself during an initial evaluation period for the system. She was impressed by the experience, which she said was “very much aligned to the experience that

I would have at my doctor’s office.”

Dr. Paul Super sees telemedicine as an extension of the fundamental eyecare services he provides. A user of Eyecare Live’s system, he first sees patients in his office and does a thorough case history on them before expanding the relationship with technology.

He praised Eyecare Live’s ability to let patient’s send him images of their eye through a HIPAA-secured channel that he can then enlarge on his computer screen.

“I can deal with chronic issues very expediently with this telehealth system,” said Dr. Super. “I can



Paul Super, OD, FAAO

tell you to look at the camera, and if I see you have bacterial conjunctivitis, I’m quite comfortable diagnosing it and sending a prescription to your pharmacy. Or if I feel confident that you have a retinal detachment, I can say you really need to get

the hospital immediately because it’s beyond my comfort level. Saving time is a vital factor, especially in an emergency.”

The ability to do mobile refractions is another dimension of telehealth that many practitioners are exploring. EyeNetra offers a mobile clinic kit containing three small, portable vision testing devices.

Smart Vision Lab also touts the mobility of its autorefractor. One customer who takes advantage of that feature is Tim Hennings, owner of Top Opticians, a mobile vision service based in Huntington Beach, Calif. that performs refractions and sells eyeglasses.

“I use Smart Vision Labs with about 90 percent of my customers,” said Hennings, who has been worked as an optician for 30 years and who has been doing home and office visits for the past two-and-a-half years. “A lot of people are blown away by the concept.

“Smart Vision Labs usually turns around the prescription in a matter of hours. The prescription goes to the patient’s email and to me on the Smart Vision Labs website.

“There is a learning curve on how to do the vision test itself,” Hennings noted. But, overall, it’s been incredible.”

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## Three Distinct Approaches

Ocular telehealth is characterized by three distinct approaches: Comprehensive Care, Do It Yourself Vision Testing and Smartphone-based Testing. Here's a look at the companies that embody each of these approaches.

### COMPREHENSIVE CARE

Companies that offer comprehensive ocular telemedicine are, by their nature, technology-intensive. Some, including 20/20Now, DigitalOptometrics and a retail chain, My Eyelab, use sophisticated, remote-controlled instruments to perform a full-battery of diagnostic tests, supervised by a technician or eye doctor in a remote location who appears live on a video screen and walks the patient through the exam.

Another approach, developed by Eyecare Live, uses mobile apps and a cloud-based portal to connect patients and doctors.

A new entrant into the market, GlobeChek Enter-

prises, offers a novel approach that uses a kiosk equipped with diagnostic equipment.

### 20/20Now

20/20Now's telehealth model consists of a digital comprehensive eye exam conducted by licensed optometrists and ophthalmologists using patented technology and digital equipment. The privately held company reports that its system has been used to perform 52,500 comprehensive eye exams have been performed over the past four years by a growing roster of retail customers, and more than 2.6 million eye exams have been performed since 2014 using its proprietary software. 20/20Now currently operates in 15 states, and another 32 states are open to its telehealth model, which it continues to refine and expand.

During the past year 20/20Now has pursued a strategy to become more of a technology and healthcare company rather than simply an eye exam services company, director of marketing Greg Lechner told *VM*. "We're leveraging new

technology to enhance the standard of care and improve the patient experience. This includes using wavefront technology to provide a higher level of exam accuracy while shortening the exam time, and using Artificial Intelligence to enable doctors to provide early diagnosis of critical eye disease such as diabetic retinopathy." He added that 20/20Now is working on new applications to diagnose glaucoma and hypertension.

Lechner also noted other new features, including a rollout of multi-functional equipment to provide a better patient experience, and a new financing program that enables clients to offer telehealth with no up-front capital investment. In addition, the company launched a new website to educate ECPs about telehealth.

"20/20Now's new website and refreshed branding reflect the company's unique value proposition—to provide greater access to comprehensive digital eye exams, while lowering costs and enhancing the standard of care through new tech-

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nology and meaningful innovation. Our new website helps communicate our role as a technology developer and service provider for eyecare providers," said Chuck Scott, 20/20Now's CEO.

To help position itself prospective customers, 20/20Now recently hired Chad Overman, OD as optometry subject matter advisor. Dr. Overman has extensive optical industry experience, including 12 years of private practice and leadership roles in corporate optometry at Walmart where he was director of professional relations and led the doctor talent acquisition efforts for Walmart's Vision Centers and pharmacies.

20/20NOW®



A technician guides a patient through 20/20Now's exam.

Overman said that many optometrists are overcoming their initial skepticism about telemedicine as they learn more about its capability to deliver quality eyecare. "We're having to educate optometrists about telehealth, those that aren't the first adopters. I've actually had a couple of them tell me that 20/20Now actually delivers a better eye exam than what they themselves provide.

They may not be able to do some of the things 20/20Now can, such as take retinal photos."

### DigitalOptometrics

DigitalOptometrics developed and launched just over a year ago a patented remote comprehensive eye health and vision analysis system which permits patients, at an optical exam location, to receive comprehensive

eye examinations performed by a licensed optometrist from a location remote from the patient. A live remote video conference between optometrist and patient and remote operation of optical equipment is utilized with subjective visual findings by an optometrist followed by an accurate prescription for correction of vision at the conclusion of the examination.

"Our remote eye exam system is designed for in-office utilization by replicating an in-person quality comprehensive eye exam by a licensed optometrist and offers the doctor-involved practice the ability to expand office hours and locations while addressing their quality of life needs by providing support with remote exams performed by our staff of licensed optometrists," noted Howard Fried, OD, DigitalOptometrics founder and principal owner. He added that the company has performed more than 11,000 remote exams and expects to have its system installed in 150 practices by the end of 2019.

VM reported in September, 2018 that DigitalOptometrics had received a "significant investment" from "an S&P 500 company," although the DigitalOptometrics didn't reveal details.

Fried described DigitalOptometrics as a flexible system that can integrate its technology into "hundreds of devices," as well as some electronic medical records systems, including Crystal PM.

The company recently added veteran optometrist Chad Fellows, OD, as professional liaison.



A patient takes diagnostic tests which are part of DigitalOptometrics' exam, which is performed remotely by an optometrist.

### GlobeChek

Kiosks are an increasingly common feature of modern life, and many consumers are now comfortable interacting with them in shopping malls, hotels, airports and even hospitals. In fact, many types of healthcare kiosks are now popping up in public places.

The latest entry into this growing field is GlobeChek, a versatile system developed by two ophthalmologists, Adam M. Katz, MD and William J. Mallon, MD. Their goal was to provide convenient affordable access to medical eye screening exams in order to prevent asymptomatic people from losing vision.

GlobeChek is in the process of launching the Eye Screening Globe, or ESG 1200, following a teleophthalmology pilot study conducted at New York-Presbyterian/Columbia University Medical Center that successfully identified asymptomatic people with vision threatening conditions.

The unit houses a number of diagnostic instruments in a compact, globe-shaped structure that will easily fit through a standard double door, according to Dr. Mallon, who called it "a complete solution for ocular telehealth." Guided by a technician, patients can look into different windows in the globe to access the various testing devices which are connected to the company's GlobeChek Reading Center software.

The Globe is capable of checking visual acuity

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and performing auto-refraction, intraocular pressure, OCT of the optic nerve and macula, as well as external and fundus photography. Wavefront technology is used to measure corneal thickness, topography, and angle. A cataract screening feature uses retro-illumination to grade posterior, cortical and nuclear lens opacification. “The entire no-touch/no-dilation scan still only takes about eight minutes to complete,” said Dr. Mallon.



GlobeChek's William Mallon, MD (l) and Adam Katz, MD with the ESG 1200.

Test results are sent to a HIPAA-compliant portal. Patients can download a PDF and forward it to their eyecare provider. GlobeChek can send the images captured during the exam if the doctor requests it. Patient are not provided with a prescription for glasses or contact lenses, but their doctor can provide one based on measurements taken during the testing.

## EyecareLive

EyecareLive enables optometrists and ophthalmologists to interact with patients online in real time or asynchronously. Developed by Moshe Mendelson, OD and Raj Ramchandani, a software and IT expert, EyecareLive consists of mobile apps for patients and a cloud-based portal for doctors. The company provides training for ECPs on the

best practices for telemedicine, education on telemedicine regulations in their state and information on insurance reimbursements and malpractice coverage. It has also partnered with several contact lens labs which utilize its platform for ECP education and trouble-shooting for specialty contact lenses.

EyecareLive provides free iPhone, iPad and Android apps for patients, who can use the apps to schedule new or follow-up appointments with their doctor, upload photos and videos of their eye conditions in real time and take eye tests such as Acuity, Dry Eye SPEED, Amsler and Halo. An Alexa-enabled visual acuity test is also available. Patients can securely communicate with the doctors using Messenger, receive notifications when doctors update their treatment plans and receive medication reminders.

“Two hundred and fifty doctors are currently using EyecareLive,” Mendelson told VM. “Ninety percent are ODs, and the rest are MDs, but we haven’t done much marketing yet to MDs,” he said.

Mendelson said the

company received a significant investment from “a Fortune 100 company,” in December, 2018, enabling it to expand its range of services.

EyecareLive is currently launching a new version of its platform that is designed to provide virtual care for emergent as well as chronic ocular conditions. The company recently released PeerMed, a feature that allows doctor-to-doctor consultations for second opinions and is covered by Medicare. The EyecareLive platform is embedded in several EHR systems, including Crystal PM and Compulink.

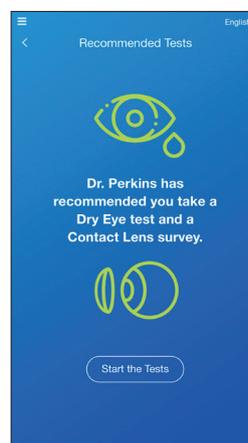
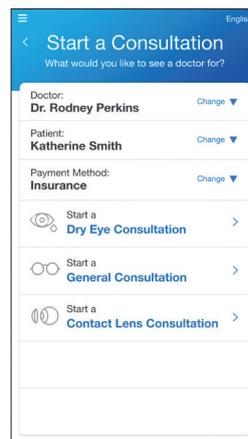
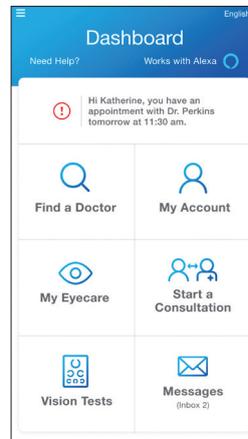
## DO IT YOURSELF VISION TESTING

Products and services that empower consumers to not only learn about their health and wellness but take an active role in maintaining it are riding a wave of popularity. Optical companies that are using telemedicine to tap into that trend are finding a receptive audience among consumers who prefer the Do It Yourself (DIY) approach to vision care. This involves an online vision test requiring either a computer, smartphone and app—a method used by Visibly, Warby Parker and 1800Contacts—or a smartphone and app used together with a special viewer, an approach pioneered by EyeQue.

## Visibly

Visibly, formerly known as Opternative, introduced the industry’s first online vision test in 2014. Consumer who take the five-minute, self-administered test submit the results to a licensed ophthalmologist or optometrist in whatever state the test taker is in, and, the doctors issues them a prescription for glasses or contact lenses within 24 hours.

Visibly’s approach was controversial from the start, drawing fire from optometrists who felt threatened by a remote refraction process that replaced a visit to the optometrist’s office. Many ODs expressed concern that consumers would forgo a comprehensive eye exam, thinking that the remote “vision test” would suffice. State optometric associations filed lawsuits to try to block Opternative from doing business in their



EyecareLive apps.



state. The American Optometric Association filed complaints against the company with the Food and Drug Administration (FDA).

Opternative pushed ahead, raising \$9 million in November, 2018, bringing to \$18.5 million the total investment the company has attracted. In December, 2018, the company rebranded as Visibly and repositioned itself as a technology company that is seeking to partner with eyecare providers and eyewear retailers. Brent Rasmussen, chief executive officer at Visibly, told *VM* that the company's former name, Opternative, carried "a negative connotation...not only in the industry, but, obviously, with optometrists." He added, "I thought it was important that we rebrand the company with a name that really better represents the partnerships that we are actually building with individual eyecare professionals and with eyecare professionals who own four or five practices."

Visibly is also working to overcome hurdles placed in its path by the Food and Drug Administration (FDA). Rasmussen said Visibly has submitted documentation that the agency has requested and is working toward the agency's approval for its online eye test in the near future. (The company received a warning letter from FDA in 2017 which advised the company that its online eye test mobile app did not have the agency's marketing clearance or approval.) Although Visibly declined to be interviewed for this article, a company spokesperson told *VM*, "We are continuing to work with the FDA on our De Novo application process."

Apart from legal entanglements, Visibly has proved to be a hit with consumers. Visibly now operates in 39 states, the Visibly spokesperson said. The company has issued hundreds of thousands of prescriptions with a 99.6 percent satisfaction rate, according to its website.

## EyeQue

EyeQue offers inexpensive devices that it sells online, direct to consumers. EyeQue VisionCheck, which was named a CES 2019 Innovation Awards Honoree in the Technology for a Better World category by the Consumer Technology Associa-

tion, tests refractive error and generates EyeGlass Numbers (EGNs) for sphere, cylinder, and axis. Consumers can use the EGNs to order eyeglasses from Zenni (Zenni founder Tibor Laczay is also a co-founder of EyeQue) as well as from GlassesUSA and EyeBuyDirect and other online eyeglass retailers that accept manually entered prescription numbers.

Another EyeQue device, EyeQue Insight, uses a smartphone, app and a VR headset to measure refractive error in addition to color vision and contrast sensitivity.



EyeQue VisionCheck (l) and PDCheck.

EyeQue customers are required to take at least three full tests before EyeGlass Numbers are provided. EyeQue's backend EyeQue Cloud processes the results using proprietary algorithms that evaluate the tests for precision and consistency, discarding poor results and presenting EyeGlass Numbers only when confidence is high. Optometrists and ophthalmologists do not involved in the process. If users are not obtaining good results, EyeQue emails help including tutorial videos, tips and tricks, FAQs and online support.

At-home vision testing offers considerable benefits to consumers, investors, and ECPs, said John Serri. "Consumers can benefit by knowing when their glasses need to be updated, obtaining and saving their correction measurements from home, and can save money and expand their selection by ordering eyeglasses online."

Although some ECPs are concerned that DIY vision testing may lead consumers to neglect hav-



EyeQue's VisionCheck lets customers test their own vision.

ing comprehensive eye exams on a regular basis, EyeQue asserts on its website that at-home vision testing, particularly to enable consumers to test their vision from home, "is a compliment and not a replacement for an annual eye health exam performed by a professional."

As Serri explained, "ECPs can provide at-home vision tests to patients for remote monitoring, for example, post-Lasik or cataract surgery to monitor changes and progress in recovery. Telehealth applications like these save both the doctor and the patient time and costs, prioritizing office visits for those who need to be seen in person."

Some ECPs are using EyeQue to monitor patients' vision in-between visits, particularly in situations like post-cataract surgery where their vision may change often. "Since the average patient only checks their eyes every two to three years, important visual information could be detected using the EyeQue suite of products. With the vast changes in technology and demand for greater accessibility, EyeQue is leading the way to help consumers with their vision demands," said Jay Kaufman, OD, a Seattle area practitioner who serves as a paid advisor to EyeQue.

## TAPPING THE SMARTPHONE'S POWER

When smartphones hit the market in the mid-2000s, it didn't take long for tech-savvy entrepreneurs to realize that the cameras in these powerful little portable computers could be used to take photos of the eye and perform vision tests. Since then, several companies have built telemedicine

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platforms around smartphones, taking advantage of their small size, portability and low cost to expand the possibilities of vision care, both in the field and in the eyecare practice or retail store.

## Smart Vision Labs

Smart Vision Labs (SVL) brings basic eye exams to those who might not otherwise have access. With two products, the New York-based company offers value to doctors and hospitals, as well as optical shops and opticians.

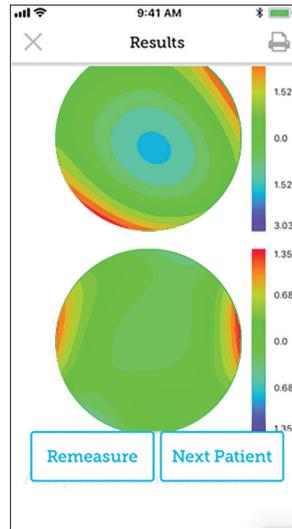
The SVOne device can be leveraged as an accurate portable auto-refractor helping health professionals access remote locations, move easily in the field, and save space in their practice. The company has placed 500 auto-refraction devices in the U.S., according to a company spokesperson.

SVL's second offering is a telemedicine-capable version that allows any trained individual to administer a three-point exam, collect patient data, and transfer that information to the cloud where our remote pool of licensed doctors can issue timely prescriptions. There are currently 110 telemedicine-capable SVL devices being used in the U.S., the company's spokesperson said.



A patient at Top Opticians Mobile Vision having her vision tested with Smart Vision Labs' autorefraction system.

"This web-based telemedicine solution benefits so many players," said Yaopeng Zhou, CEO and co-founder of SVL. "Shops can increase capture rates and revenues, remote doctors can increase their reach, local doctors can focus on



SmartVision Labs uses wavefront technology to detect higher order aberrations.

the U.S., and the company is expanding into the Asia Pacific region, according to Zhou.

"Our customers see our device as a solution for prescribing as well as a way to differentiate from the intense competition," he said. "Many of our customers are also using the SVOne to bring vision exams to folks who have not been able to see well, whether the portability allows the technician to administer the exam in 'safe spaces' for customers, or enables easy transport to multiple locations."

Currently, insurance does not pay for Smart Vision Labs' telemedicine exam, but the exam is extremely affordable at \$25, and many optical shops find creative ways to defer the cost.

## EyeNetra

EyeNetra pioneered the use of smartphones in telehealth. The company, which began as an MIT-spinoff, offers a lightweight, compact refraction system that enables customers to build their own telehealth models, with their own providers, procedures, software, and legal framework behind it. EyeNetra offers a mobile clinic kit containing three small, portable vision testing devices: the Netra autorefractor; Netropter, a handheld phoropter and trial lens kit and Netrometer,

a digital lensometer.

About 85 percent of EyeNetra's customers use the devices for mobile refractions and the rest use them to create new exam lanes inside an existing clinic or optical store, according to CEO and founder Vitor Pamplona.

"The beauty of the state of vision care today is that anyone can build their own fully-functioning tele-health system, using from state-of-the-art tools like EHR-enabled AI-based voice assistants, blockchain storage and crypto vision benefits all the way down to the most basic one-on-one patient coaching approaches," said Pamplona. "Software is cheap. Technology is cheap. The



EyeNetra's mobile clinical kit consists of, top to bottom, the Netra autorefractor; Netropter, a handheld phoropter and trial lens kit; and Netrometer, a digital lensometer.

field is indeed booming, but in a very diverse and decentralized way. We don't see one major player on telehealth today. Telehealth companies are disrupting each other just like e-commerce is disrupting the traditional industry." ■





## What's Next for Ocular Telemedicine?

Ocular telemedicine is heading toward mainstream acceptance, but some barriers remain. VM asked some of the key players in OTM to assess the current state of the market, and offer their views about its growth prospects in the near term.

“We see two models emerging. One is the satellite model, where a doctor practices in an urban location but is able to serve patients in rural markets through telehealth. The other is the office productivity model, where a doctor adds a Telehealth lane to handle overflow patients and walk-ins. This also frees up the doctor to devote more time providing medical services.”—**Greg Lechner, 2020Now**



“ECP’s are conservative. They’re not early adopters of new technology. They’re concerned about limitations with respect to the quality of images that are transmitted by some telemedicine systems, and because of that they’re concerned about making the wrong diagnosis.”—**Moshe Mendelson, Eyecare Live**

“The only barrier for ECPs is their acceptance of new remote technology which delivers the quality of an in-person eye exam coupled with an enjoyable patient experience.”—**Howard Fried, OD, DigitalOptometrics**

“We’ve seen growing recognition and acceptance of the at-home vision testing concept from both consumers and eyecare professionals. What was once thought of as a crazy idea is gradually gaining widespread acceptance.

“But continued growth will require a paradigm shift. Consumers and ECPs have had virtually the same dynamic for decades. While the benefits of adopting and partaking in telehealth are plenty, the effort of shifting a paradigm is difficult. It requires consumers and ECPs to recognize that some procedures usually done in an office visit can be achieved from home; that there isn’t one set of magic numbers, for example to correcting vision with glasses or contacts; that screening vision more frequently than the recommended annual or bi-annual office visit can have significant advantages for the patient and the doctor. If you’ve built a career around the old paradigm, you’ll likely resist movement to the new one.”—**John Serri, EyeQue**

“Government payers and private insurers are moving towards more telehealth and will need to address reimbursement, licensing, and malpractice issues before we can have widespread acceptance.

“Eyecare providers have mixed feelings about ocular telemedicine. Some are worried about being replaced or losing patients while others see the potential for a large influx of new patients in need of their services. There is no doubt that those in the eyecare space will need to adapt to a changing practice model.

“Investors in the world of ocular telehealth are unsure of what market will emerge. This un-

certainty stems from a lack of a comprehensive testing solution, an unproven reimbursement model, and lack of market studies demonstrating public acceptance and adoption. What we do know is that this emerging market is massive and those who choose wisely will be highly successful.”—**William Mallon, MD, GlobeChek Enterprises**



“The push back we’ve seen to date comes from optometrists.

Despite that, telehealth is the here and now, and is not going anywhere. We appreciate the early adopters—open minded health care providers and business folks who understand and embrace this trend, leveraging our technology to improve the services they offer.”—**Yaopeng Zhou, Smart Vision Labs**

“The ECP’s main challenge today is to decide where they want to go considering the overabundance of options they have to add value to their services right now. The uncertainty of growth is the main barrier. That being said, the field is reacting really well. ECPs are always trying something new. There’s always an experiment happening in every small practice, from cost-reducing alternatives to brand new offerings. It’s a good time to be in the industry.”—**Vitor Pamplona, EyeNetra** ■