

# REFRACTION REBOOT

How new technology is reshaping refraction's 'manifest' destiny



SPECIAL FEATURE



Advanced technologies are improving the accuracy, efficiency and speed of the eye exam and refraction process. But potential game changers—such as virtual refraction, low cost, smartphone-based systems and online refractive eye exams—are starting to fundamentally redefine “refraction.” Find out why refraction is no longer just a matter of “better or worse” as new tools and techniques expand the range of possibilities for both eyecare practitioners and patients.

BY ANDREW KARP / GROUP EDITOR, LENSES + TECHNOLOGY

NEW YORK—Imagine if you went to a hospital for surgery and the anesthesiologist asked you to breathe into a chloroform-soaked rag. No doubt you'd be shocked by such primitive, Civil War-era medical technology.

Yet no one bats an eye when they encounter another mid-19th century medical technology: the Snellen chart. When used in conjunction with a manual phoropter, an instrument developed nearly a century ago, it provides a simple metric of how well the patient can see and prescribes the basic optical correction.\*

This subjective method for testing visual acuity—the manifest refraction—remains the cornerstone of

the comprehensive eye examination. In fact, 95 percent to 98 percent of refractions are still done with a manual phoropter or refractor, according to Paul Karpecki, OD, FAAO, a prominent optometric practitioner, educator and author who serves as clinical and education conference advisor for *Review of Optometry*.

Why has the old technology endured? The reason is simple, said Karpecki: “It's very accurate.”

Yet newer technologies for both objective and subjective refractions are quickly gaining ground. Electronic phoropters and other types of advanced refraction systems are being utilized by a growing number of eyecare professionals, either in addition to or in

place of manual phoropters. Autorefractors and wavefront aberrometers are increasingly used in pretesting.

Even manual phoropters are being updated with features that allow them to connect with other diagnostic devices and easily import measurement findings into EMR systems. These technologies are making refractions more efficient and patient friendly, while providing additional layers of clinical data and, in some cases, more accurate measurements.

At the other end of the spectrum, a new class of lower cost, portable devices has been developed for measuring visual acuity and vision screening. Some make use of easily accessible smartphone technology, which make them particularly valuable in developing countries that lack full-service vision care providers.

In addition, two potentially disruptive refraction technologies are emerging. The first, which will be introduced later this year, is an in-office virtual refraction system through which the patient can view photo-

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## Refraction:

The test performed during an eye exam to determine the eyeglass lens powers needed for optimum visual acuity. An **automated refraction** uses an instrument that does not require the patient to respond. A **manifest refraction** is the manual way to determine the best lenses, by placing various lenses in front of the patient's eyes and asking, “Which is better, lens A or lens B?” Source: *All About Vision*

\* American Optical introduced the “Phoropter” in 1928. Today, Reichert Technologies, part of Ametech, Inc. holds the trademark to the Phoropter brand.

## Refraction: Going Beyond ‘Better or Worse?’

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graphic images projected onto a special mirror instead of looking through a phoropter at a Snellen chart.

The second one, which is still in development, is an online refractive eye exam that patients can self-administer anywhere. This DIY approach, which is already generating much discussion within the optical industry—would allow patients to test their own vision, generate a prescription that would be authorized by an ophthalmologist and purchase eyeglasses online—all without any face to face contact with an ophthalmologist or optometrist.

Clearly, refraction is in a state of flux, as new technologies redefine this fundamental testing process for both eyecare professionals and consumers. A close look at how these technologies are being used provides insights into how the eyecare field is changing.

### The Drive Toward Efficiency

A major reason that eyecare professionals are investing in new refraction technology is the need to operate their practices more efficiently, which in turn leads to growth and greater profitability.

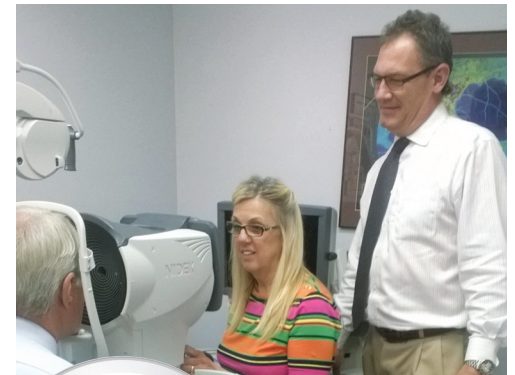
“Outside forces such as HIPAA, EHR (electronic health records), meaningful use requirements, and the advent of ACO’s (accountable care organizations) controlling patient access are forcing practices to become more efficient,” observed Tim Petito, OD, manager of professional relations for Marco Ophthalmic, a leading supplier of diagnostic equipment. “Doctors have to see patients in the same or less time and absorb less reimbursement.”

To meet this need, Marco and other manufacturers have developed refraction instruments with more automated features. As a result, some practices can now delegate the refraction process and data collection to technicians, with the optometrist or ophthalmologist analyzing the data, making decisions about the patient’s prescription when necessary, and confirming the final refraction.

“Doctors are looking at ways to speed up their sub-



*Dr. Arthur Medina says Vmax Vision’s PSF Refractor, pictured here, allows him to ask patients fewer “which is better” questions.*



*Dr. Tad Kosanovich and technician Donna Thompson perform an autorefractive exam with Marco’s OPD-Scan Wave before using the Epic 5100 workstation (far left) for a subjective refraction.*

jective refraction process but not sacrifice any quality in their final refraction,” noted Bob Gibson, vice president of marketing at Topcon Medical Technology. “We see a lot of doctors connected to EMRs and large practices with lots of lanes increase their work flow by automating the vision tester or phoropter. When they transcribe their final refraction, they no longer have to type it into the EMR, so there’s a digital transfer of data. If you eliminate one transcription error a month, it pays for the phoropter.”

### Phoropter Evolution

Although most ECPs still use manual phoropters, a growing number are also using electronic phoropters and other advanced refraction systems to capture additional layers of diagnostic information. Some are even using these new instruments instead of their manual predecessors.

“This area of the market only represents about a 5 percent penetration of the phoropter business, but it’s growing incredibly fast,” said Dr. Karpecki.

Among the most advanced refraction systems on

the market are the Epic 5100 workstation from Marco, Topcon’s CV-5000, the PSF Refractor from Vmax Vision, the iProfilor Plus from Carl Zeiss Vision and the Huvitz HDR-7000 digital refractor from Coburn Technologies. Although these multifunctional systems offer different combinations of features, all are designed for maximum efficiency and accuracy. Some also share an important advantage, Dr. Karpecki noted: “By pushing a single button you can help patients see the difference between their last Rx and their current Rx.”

Another key benefit offered by some of these advanced phoropters is their ability to measure acuity as accurately as .05 diopters, according to Dr. Karpecki.

“It’s gotten to the point where lens processing technologies, because of free-form, can make more precise prescriptions,” he explained. “The technology of making the lens has caught up to the level of precision of the measurements that these instruments can make.”

The cost of these units is offset fairly quickly, Dr. Karpecki said. “As you become more efficient you’re

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## DigitalVision Systems Goes Beyond the Phoropter

Unlike companies that have concentrated on modernizing the phoropter, DigitalVision Systems (DVS) has developed a refraction system that does away with the device entirely. For the past several years, the Atlanta-based company has been developing the VisionOptimizer, which it pointedly describes on its website as “a virtual refracting platform for diagnosing vision disorders and procuring customized eyeglasses that will provide better vision and viewing comfort than conventional eyewear procured using error-prone phoropter measurements.”

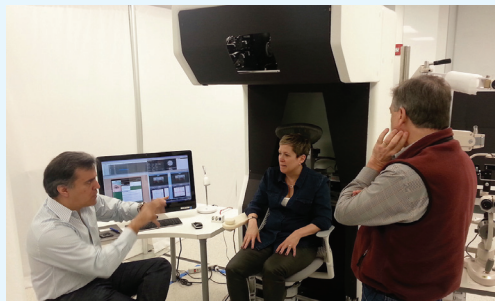
DVS was founded by Keith Thompson, MD, an internationally recognized refractive surgeon and entrepreneur/inventor with expertise in physiological optics. Among its board members are LensCrafters founder Dean Butler and noted optical entrepreneur/inventor David Chute.

Since 2009, Thompson and the DVS team have been developing the VisionOptimizer through a collaboration with Georgia Tech Research Institute’s (GTRI) Electro-Optical Systems Lab (EOSL), a leading developer of advanced optical technologies for the Department of Defense and industry. In the fourth quarter of this year or in early 2015, optical retail chain National Vision plans to install VisionOptimizers in some of its Atlanta area stores.

“The VisionOptimizer replaces the exam chair and phoropter with a chair and tower,” said Thompson. “It’s easy to retrofit into any standard exam lane.

“The system is virtual in the sense there are not any bulky refraction devices stuck in front of patient’s face,” Thompson said. “It has refraction elements above the patient’s head, and a ‘viewpoint’ mirror across the room that patients will have a clear view of. The optics are projected into the viewport mirror, and the patient looks into the mirror and sees various images. It doesn’t block their peripheral vision. We can show them a Snellen chart, or images such as sports or a night scene.”

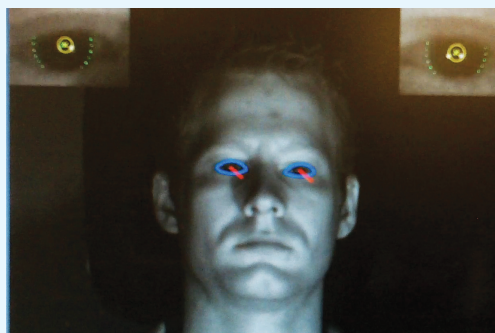
In addition to performing highly accurate refractions, the VisionOptimizer can effectively demon-



*Dr. Anne-Marie Lahr of Hoya Vision Care tries out a prototype of DVS’s VisionOptimizer at the Georgia Tech Research Institute in Atlanta. With her are Jose Garcia, head of the DVS’s engineering team (l) and company CEO Keith Thompson.*



*The VisionOptimizer can demonstrate photochromic, polarized and anti-reflective lenses, as well as progressive lenses and other designs.*



*An eye tracking technology is used to determine the patient’s head position in 3D space and their position of gaze.*

strate progressive lenses and allow the patient to virtually compare different corridor designs. The system has an eye tracking device that is driven by two cameras that are just below the viewport mirror. The mirror moves under the direction of the tracking system, allowing the patient to have a stereoscopic view while freeing them to sit in a normal posture instead of having to sit still, as they would with a phoropter.

“We can determine where the patient’s head position is in 3D space, and their position of gaze,” said Thompson. “If the patient is wearing a progressive design, we would know what portion of lens they are looking through.”

The VisionOptimizer can also demonstrate photochromic, anti-reflective and polarized lenses. “We can put the patient on a beach and show them the benefits of photochromics in operation,” said Thompson.

Thompson said DVS partnered with several major lens manufacturers during its recently concluded alpha trials, and plans to expand its roster of partners as it prepares for a roll-out with National Vision.

National Vision’s CEO and president, Reade Fahs, said there are several reasons why DVS’s VisionOptimizer appeals to him. “It’s more accurate, it gives a more refined prescription than a manual phoropter,” said Fahs. “And it’s less frustrating for the consumer, because they’re not having to say if lens number one or two is better, when they may not be sure. With this, there’s no number two. There’s a dial on the side of chair, and you just turn the dial until your vision is perfect, and press down until you lock it in.”

Fahs added that he thinks the VisionOptimizer would make an optometrist more productive, especially in a high volume practice. It would also allow for better presentation of added-value lens options to higher-end clientele.

“It’s just plain cooler, it’s fun,” he said. “It feels modern, as opposed to feeling old fashioned. My feeling is when I look at something like this, I ask myself, ‘Would the world be a better place if this were available?’” ■



## New Technologies Offer Greater Efficiency, Better Accuracy

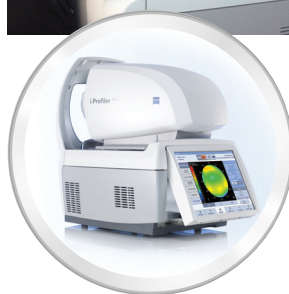
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going to end up seeing a lot more patients,” he noted.

One of the most innovative systems is the PSF Refractor. It was introduced several years ago by Vmax Vision, a relatively new player in the refraction market. Described by Vmax Vision as “a complete refraction lane-in-a-box,” it provides a 20-foot effective distance, eliminating the need for practices to have a 16 to 20 foot exam lane and increasing the practices’ working capacity and revenue without the need to create more space.

The PSF Refractor uses Point-Spread Function (PSF) to measure patients’ subjective visual response to a point source. The system enables the correction of higher-order aberrations, resulting in refractions that are up to five times more precise than with a phoropter and measuring to .05D accuracy, according to Vmax Vision.

Complementing the PSF Refractor are Vmax



*Dr. Barry Toyzer says his patients tell him that the Zeiss iProfiler and iScription system produce more “comfortable” prescriptions.*

Vision’s Enception lenses, which are premium free-form progressive and single-vision lenses that are designed to incorporate the patient’s lifestyle and individualized fitting data. The system also comes with voice-guided instruction software which directs the patient through each refraction test, a feature that significantly reduces training time ensuring a consistent quality of testing, according to Vmax Vision.

Arthur A. Medina, OD of Medina Eye Care in San Antonio, Texas is a fan of the PSF Refractor, which he said has some fundamental advantages over manual phoropters.

“Although the basic design of the phoropter is simple, using it proficiently requires general understandings of the basics of geometrical optics and how to apply these principles to the task at hand,” said Dr. Medina. “In order to obtain reliable, repeatable data with a phoropter, technicians must first learn optical

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## Opternative Explores the Online Option

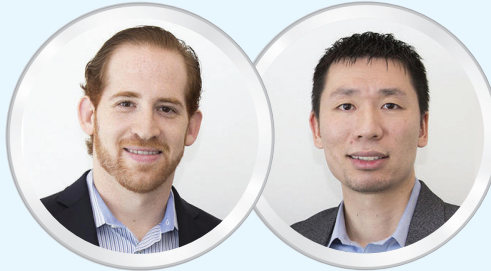
Ever since online eyeglass sales began, optical industry observers have wondered when online refraction would follow. But although eyewear e-tailers now offer simple technology that lets people measure their own PD, being able to accurately measure one's own visual acuity using an online test is more technically challenging.

The first company to attempt it is Opternative, a Chicago-based start-up founded by Steven Lee, OD and Aaron Dallek, an entrepreneur who has co-founded a printer cartridge sales and recycling company and a carbon information management software company. The two partners have created a test, also called Opternative, which they describe as “the world's first online refractive eye exam to deliver a valid prescription.” They plan to launch it this summer.

Dallek and Lee would not reveal the details of how the exam works, in part because they are still fine tuning it based on feedback from a study they are currently conducting with 500 to 1,000 users. However, they said the test has “a sophisticated algorithm on the back end that is based on very sound optics and science.”

The test is monocular, according to Dallek, who presented Opternative at VM's 2014 Global Leadership Summit. “We specify how far the user should be from their computer, and we have ways of verifying that. For each part of the prescription we are able to identify axis, sphere, cylinder.”

Opternative is also developing a clinical study to



*Opternative founders Aaron Dallek (l) and Steven Lee, OD.*

determine the efficacy of the Opternative exam versus a traditional refraction. The study is registered with the National Institute of Health and will be reviewed by the International Review Board, Dallek said.

To ensure that performing online refractions works within the laws of each state, Opternative plans to use its web-based technology along with authorization from a licensed ophthalmologist to provide customers with a prescription within 24 hours. However, some optometrists are alarmed at the prospect of online refraction. On March 17, the American Optometric Association issued a statement warning consumers about possible risks associated with online refractive eye exams.

“Such online sites tout convenience. But any alleged advantages come with risks,” the AOA cautioned, adding that online tests are no substitute for an in-person comprehensive eye exam by an optometrist or ophthalmologist.

“We believe that claiming to have performed an eye exam without physically examining a patient is offering misleading information and may contribute to a patient believing—incorrectly—that his or her eye health needs have been met,” AOA president Mitchell T. Munson, OD said in the organization's statement.

Dallek and Lee claim that their intent is not to eliminate an in-person exam, but simply to provide a convenient way for people to get a refraction in between regular visits to either their optometrist or ophthalmologist.

Although Opternative's initial vehicle is online, Dallek and Lee said they are also developing a professional version of their exam. “It's designed in a way to help improve access for their population, and improve the overall experience for the patient. Our goal is to help them make their practice more efficient, which would save them time and money. The most important thing is engaging their patients. The average eye exam is every 2.2 years. How do you engage these people? Is there a way you can ping them, and say ‘Hey, take your refraction at home but come in for a comprehensive eye exam.’”

On a broader scale, Opternative's goal is to improve the overall experience of providing eyecare to an underserved population both in the U.S. and around the world. “There are more than 50 million people in the U.S. who have never gotten an eye exam,” Dallek noted. ■

## Improving Patients' Exam Experience

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terminology such as accommodation, adjusting the spherical component, the axis and the Jackson-Cross cylinder technique. As formal optical training is required to acquire this level of comprehension, very few optometrists have attempted to train their staff on utilizing it, other than for very simple spherical

components over contact lenses.”

An important benefit of the PSF Refractor is that using it is not dependent on formal training, and training can be conducted entirely within the practice, Dr. Medina said. He noted that on average, a staff person can become proficient in the use of the PSF Refractor after performing 10 to 15 exams, which is significantly

less than the six months average training time required for learning to operate the phoropter.

“Although the PSF Refractor is technically automated, the subjective response remains crucial,” Dr. Medina observed. “Therefore, it is important to delegate the test to staff members who are able to listen

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## Compact Systems Save Space in Exam Rooms

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carefully to the patient's subjective response, who are able to determine patient's comprehension of the verbal request and to get a strong sense of how reliable the patient's response is. At the same time, by reducing the number of 'which is better' questions that it requires, the PSF Refractor reduces the scope for errors which arise due to inaccurate patient's responses.

"The PSF Refractor has an immediate 'wow' factor that I have not seen with other instruments in optometry in a very long time," said Dr. Medina. "The last time I saw it was when we first started doing lasik, which was a big industry turn. After experiencing it, patients leave my office knowing that they have been exposed to the latest, most sophisticated and most eloquent technology available. They are making a variety of different comments, referring to the ease with which it determines the acuity, the shorter time required and its ergonomics. The most characteristic comment I get is: 'I sure am glad I don't have to tell you which was better—one or two.'"

Although Vmax Vision is a newcomer to the refraction field, Marco is well-established. The Epic 5100 workstation, which combines an electronic refractor, auto refractor/keratometer, chart projector, auto lensmeter and motorized table, is Marco's flagship refraction system. It uses half the space of a traditional lane, requiring an area of only five-by-six feet, which frees up more rooms for other procedures.

Tad Kosanovich, OD of Englewood Eyecare and Optical in Englewood, Fla., has been using the Epic 5100 for seven years. He said it has helped his medically-oriented practice, which is located in an area with a big geriatric population, become more efficient.

"Using the Epic system has resulted in significant time savings, which affords me more face to face time for dealing with a patient's chief complaint," said Dr. Kosanovich. "The time savings allows me to see even more patients per day."

In Englewood Eyecare and Optical's preliminary



*Topcon's CV-5000S features a small optical head to enhance patient communication and comfort.*

exam room, a technician uses a Marco OPD-Scan unit mounted on the Epic to perform automated refraction, simK, corneal topo and wavefront analysis. After the technician takes these automated measurements, he slides the OPD-Scan to the side and then rotates the Epic's phoropter into place to perform a subjective refraction. All the objective and subjective data is then dumped into the practice's EMR.

"After analyzing all that information, I will touch the manual phoropter less than half the time," said Dr. Kosanovich. "And the times when I do use it are shorter. I'll use it to make a small refinement to obtain a final prescription."



*The Hurvitz HDR-7000 digital refractor, distributed by Coburn Technologies, is the centerpiece of a complete digital refraction system.*



*The VX 55 from Visionix lets users digitize their manual phoropter.*

Dr. Kosanovich's patients are impressed by the Epic 5100. "When they have a refraction, they know we're on cutting edge of the most recent technology," he said. "A lot of older folks have had dozens of eye exams over their lifetime, so they have something to compare it with. That's the biggest benefit, from a practice-building perspective. From a business perspective, the small footprint maximizes the square footage in that preliminary room, and that allows me to have more high tech equipment in that space."

Another compact system, Carl Zeiss Vision's iProfil Plus, combines an ocular wavefront aberrometer, autorefractometer, Atlas corneal topographer and keratometer. But the iProfil Plus' most distinguishing feature is that it links to Zeiss's iScript technology, which combines the subjective refraction with ocular wavefront aberrometry data, creating an individualized prescription to 1/100th of a diopter. Integrated with a Zeiss spectacle lens, iScript technology offers better night vision, as well as improved color and contrast perception, according to Zeiss.

Those benefits are important for many patients at The Eye Doctors in Havertown, Pa., particularly those who are older. "When I ask patients, 'How's your night driving?' that gets the discussion going," said the practice's optometrist, Barry Toyzer, OD. Dr. Toyzer said

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## Vision Testing, On the Go

A new class of low cost, portable refraction devices that run on specialized apps and software is adding a new dimension to the field of vision testing. These products, some of which are available now and others that are soon to be released, are attracting interest from non-profit organizations, educators and pediatric vision professionals. Here's a look at some of the latest products in this emerging category.



*EyeNetra's Netra-G uses hybrid technology that combines elements of objective and subjective refraction.*

### EyeNetra

EyeNetra's first product, Netra-G consists of a smartphone that snaps into the back of a special binocular viewing device. Used together with EyeNetra's proprietary app, the low cost system can generate accurate sphere, cylinder, axis and PD measurements, according to EyeNetra.

The Somerville, Mass.-based company, which spun off from MIT Media Lab, has completed clinical testing of Netra-G with New England College of Optometry, LV Prasad Eye Institute and Lotus Eye Hospital in India. Ramesh Raskar, PhD, associated professor at MIT MediaLab, discussed EyeNetra's technology at VM's 2012 Global Leadership Summit. It is currently ramping up more clinical trials and pilot tests in preparation for a U.S. launch soon. Among its business advisors are health care entrepreneur and former MIT Media Lab chief Frank Moss and Warby Parker co-founder Neil Blumenthal.

"We've shown that our device performs like any top tier autorefractor," said EyeNetra co-founder and COO David Schafran. He said Netra-G uses hybrid technology that combines elements of objective and subjective refraction. "It's objective because we're

shooting wide at discrete angles," he explained. "We have the customer do an alignment test at each meridian. An algorithm calculates refractive error. It's subjective because the customer is the one aligning the line. They see unique images. The test is only based on their perception of when they think the line is aligned correctly, not how we think it's aligned."

Schafran believes there is a global opportunity for EyeNetra, which has also developed a device that tests for cataracts. "Our goal is to empower customers with better eye tests," he said.

Although EyeNetra plans to market the Netra-G to consumers, the company advises that the device must be used under guidance from an eyecare professional.



*Smart Vision Lab's Smart Autorefractor is an aberrometer with a wavefront sensor.*

### Smart Vision Labs

Smart Vision Labs, a New York-based start-up, has developed a pocket-sized autorefractor device called the Smart Autorefractor.

"The Smart Autorefractor is an aberrometer with a wavefront sensor that can convert wavefront measure-

ments into a prescription," said Marc Albanese, who co-founded the company with Yaopeng Zhou, PhD. "Our test is completely objective," he explained. "We create an image of the wavefront by creating local measurements. We divide the eye into quadrants, which we can then reconstruct into a full picture of the eye. From that we can derive a prescription."

Although it is not yet on the market, the Smart Autorefractor has already attracted notice for its innovative features. In a contest sponsored by Verizon, Smart Vision Labs won the first prize of \$1 million in the health care category.

Albanese, who has a background in biomedical engineering, electronics as well as an MBA, said he and Zhou are working on a number of different prototypes and will be conducting clinical trials in the U.S. soon, including one with a local university. The company is also looking to test the Smart Autorefractor in various developing countries. "There is a massive international need for vision measurement," Albanese noted.



*Peek consists of a mobile app and hardware that clips onto a smartphone.*

### Peek

Peek (Portable Eye Examination Kit) is a smartphone-based system that can be used to conduct comprehensive eye examinations, even in remote settings. Easy to use, affordable and portable, Peek allows general health workers and eyecare practi-

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## Vision Testing, On the Go (cont'd)

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ners to diagnose eye diseases and provide a means for managing and monitoring the treatment of patients, anywhere in the world.

“When people work to improve health care, they often look at the latest developments in health care to improve from within,” said Dr. Andrew Bastawrous, an ophthalmologist and research fellow in international eye health at the London School of Hygiene & Tropical Medicine who is a member of the Peek team.

“We are taking an alternative approach by looking at different industries to utilize what already exists elsewhere. If Peek lives up to its potential we hope people around the world can benefit. And with the fast-paced advances in mobile technology, this innovation will continue to get better and better automatically as mobile phones improve.”

The Peek system consists of a mobile app and hardware that clips onto a smart phone. The system currently has the following applications:

- Patient record with geo-tagging
- Visual acuity
- Visual field testing
- Color vision testing
- Contrast sensitivity testing
- Lens imaging for cataract
- Retinal imaging
- Image grading

The Peek researchers are working on several other applications including an autorefractor, visual field testing, front of the eye imaging and a suite of pediatric-centered examination tools. They are planning on performing a range of studies and are open to suggestions and collaborations.

### PediaVision

Spot is a handheld binocular autorefractor from PediaVision that is being used by a growing number of ophthalmology and optometry practices. A port-



*PediaVision's Spot is a handheld binocular autorefractor.*



*The compact, lightweight 2Win Refractometer is fully automated, runs on batteries and offers printer and PC connectivity.*

able, lightweight, Wi-Fi-enabled device, Spot measures monocular or binocular refractions, eye alignment, pupillary distance and pupil size. The device's combination of patent-pending optics and processing algorithms makes these procedures as simple as using a camera, providing a comprehensive, reliable analysis in seconds, according to PediaVision.

Among the device's fans is Donna Norwood, the ophthalmologic technician at the Hunkeler Eye Institute in Overland Park, Kan. She particularly appreciates the device's quick and non-invasive nature, which requires minimal cooperation from patients.

“We use it on our most difficult patients,” said Nor-

wood, referring to patients with medical conditions that cause them to respond badly to the close proximity required by normal autorefractors, e.g., senior citizens with Parkinson's disease. “When the other autorefractors are introduced to patients with Parkinson's, their shaking gets worse,” Norwood explained. “With Spot, I can get out of the patient's space and do the test from about three feet across the room.”

### 2Win

The 2Win Refractometer is a point-and-shoot instrument that produces more complete reports of a patient's visual system than traditional vision measurement equipment, according to Adaptica, the Italian company that developed the device.

The 2Win Refractometer is effective for use with infants, children, the elderly and patients who cannot cooperate because it is less invasive and requires a shorter use time than conventional equipment. In addition to checking all parameters of every visual function, the 2Win enables early detection of refractive errors.

Adaptica recently released its version 3.0 software for 2Win. “Version 3.0 of the 2Win software makes it even easier to measure the vision of a moving or distracted patient—and the accuracy has improved as well. We also have made it easier for the software to deal with ambient lighting in a dimly lit room,” said Gianluigi Meneghini, CEO of Adaptica.

Key benefits of the 2Win include its light weight, full automation, battery operation, printer and PC connectivity. The report produced after the 7-second test covers automatic refraction measurement, pupil diameter and distance, and the direction of the patient's gaze—all without the need for dilation drops.

The 2Win is in use throughout the world. More usability and connectivity features are under development, according to Adaptica. The product is available in the U.S. through M31USA, Adaptica's San Jose, Calif.-based accelerator, and worldwide through Adaptica's international distribution network. ■



## New Systems Bring the ‘Wow Factor’ to Refraction

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his patients report that Zeiss lenses made from the iScription technology enhance their depth perception and may subtly improve their color perception as well as their sense of visual comfort.

“I’ve had patients say, ‘Doctor, this is most comfortable prescription I’ve ever had.’ It seems like they’re seeing more naturally, with less effort. This generates more patients and builds the practice,” said Dr. Toyzer.

Dr. Toyzer began using the iProfilor plus three years ago. “What attracted me was the concept of high definition optics. Once I got comfortable with it, I found I was getting very accurate refractions,” he said.

Rather than see a Snellen chart or point spread function display, patients see a picture of a hot air balloon when they look into the iProfilor plus. “I ask them to look at the stripes of the balloon,” explained Dr. Toyzer. “While they’re looking at the target, the machine

bounces a wavefront of light off of their retina, through the patient’s optics and back out through their eye.”

Dr. Toyzer said his patients like using the iProfilor Plus because “it’s a very whizbang piece of technology.” As he noted, “It’s quick, and very little effort is involved on their part. It’s good with patients who are not very communicative or who may be a little apprehensive about the exam process.”

Dr. Toyzer takes the reading from the iProfilor Plus and puts it into his phoropter. “The iProfilor Plus gives me a more accurate starting point for a subjective refraction,” he said. “It also saves me time because it cuts right to the chase. The device gives me an indication of how reliable that reading is. For nine out of ten eyes, the patient will agree.”

Another leading player in refraction technology is Topcon Medical Systems. The company introduced its top of the line CV-5000S Automated Vision Tester about three years ago. The seventh generation system’s feature set includes fast lens rotation and a small optical head to enhance patient communication and comfort. The CV-5000S provides a complete, 21-point refraction and features the KB-50S One Dial Controller with a 10.4” color touch-screen display. Complete connectivity allows data to be sent automatically to every CV system throughout the office and populated into the EMR.

Topcon recently launched the “Topcon Online University” training system, featuring its CV-5000S Automated Vision Tester, the first in a series of

online training modules. “The CV-5000S Online Training Program is designed for technicians, optometrists, ophthalmologists, and other eyecare professionals that are getting started with the CV-5000S Refraction System,” said Topcon’s Bob Gibson. “Through a combination of narrated videos, graphics and step-by-step instructions, the system highlights the key features and operating procedures of the system.”

The newest contender in the automated refraction category is the Huvitz HDR-7000 digital refractor, distributed by Coburn Technologies. The centerpiece of Huvitz’s complete digital refraction system, the HDR-7000 can network with the Huvitz’s auto ref-keratometer, auto lensmeter, chart devices and a PC. Key features include a choice of 18 visual acuity test charts, 26 vision test charts and up to 35 user-defined unit test charts that support the most advanced eye test process; a dual cross cylinder lens supports a fast and convenient astigmatic test; automatic occlusion and convergence functions and independent PD adjustments for right and left eyes.

Even manual phoropters are going high tech. Visionix recently introduced a new type of digital phoropter, the VX 55, that combines the simplicity and comfort of a manual phoropter with technological advances that allow for connectivity among diagnostic devices in the practice and easy importation of measurement findings into EMR systems. Users can digitize their manual phoropter and control the entire refraction process from a tablet, increasing efficiency and making refractions quicker and easier. There is little to no learning curve with the interactive tutorial guide screen and familiar interface, according to Visionix.

Despite the advantages of these advanced systems, the manual phoropter still has some utility in the modern eyecare practice.

“There are times when you have to measure binocularity, fixation disparity, eye alignment, and you’d still want a phoropter, although for the most part you can still obtain those measurements through other methods,” noted Dr. Karpecki. ■