A SUPPLEMENT TO

Ophthalmology MANAGEMENT

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Using a Digital Image Management System to Facilitate Conversion to EMR

Learn how physicians are using the EyeRoute ophthalmic image network system to display, manipulate and analyze patient data to improve diagnosis and treatment decisions.

By John Parkinson, M.D.

Going Digital Makes a Great Impact in Daily Practice

The EyeRoute system allows you to analyze patient data fast, which would be difficult or impossible to do using film or paper.

Implementing an integrated digital image network can revolutionize the way you practice and provide patient care. At Four Corners Eye Clinic in Durango, Colo., we've been using the EyeRoute ophthalmic image management system (Anka Systems Inc./Topcon Medical Systems Inc.) for the past several years. Before implementing the system, we'd been considering how we might convert to electronic medical records (EMR). We realized fairly quickly that converting to EMR would present challenges. The charting functions of the EMR packages we looked at weren't very user-friendly. Also, it was clear we'd have a difficult time getting the four doctors in our practice to agree on a product.

However, when we became aware of the EyeRoute ophthalmic image management system, we had no problem agreeing to purchase it. While we would've been able to get images from our diagnostic equipment into an EMR system, our ability to manipulate, display and analyze data and images would've been limited.

With the EyeRoute, we're able to integrate images and reports from various diagnostic instruments into a single, secure digital environment. This is important because I specialize in glaucoma and do a fair amount of retina care. The ability to efficiently access and view patients' past and present visual fields, OCT scans and other test results has an enormous, positive impact in daily practice.

Furthermore, EyeRoute was a great step toward EMR. We have extensive medical records on many patients, and the longer we use EyeRoute, the easier the conversion will be to full EMR. Here, I explain how I use EyeRoute to facilitate efficiency and provide quality patient care every day.

Instant Access

In our office, we have a 20-inch, high-resolution monitor on each exam room counter. Before I walk into the room, a technician accesses the patient's file so that the tests performed that day are ready for viewing. When a file isn't open, the screen is either locked for HIPAA compliance purposes, or we run one of several educational videos for the patient to see. As soon as I walk into the room, I click on the patient's test results so we can review the findings together. If at any time I also want to view the patient's past test results, I simply click on what I want to see and it appears.

Our EyeRoute system is structured so that we can scan images into the system. For example, we can scan old 35-mm optic disc photographs, so they're instantly available to me, along with all of the data imported directly from our instruments. We also can scan Polaroid photographs or other information we receive from other doctors' offices. And we can scan printed results from our corneal topographer right into the system. Finally, we can add external photos, such as those related to ptosis and blepharoplasty, from the memory card of a digital camera.

Viewing and Analyzing Patient Data

Having all of a patient's test results at my fingertips via EyeRoute is a real time-saver. Just as important, it allows me to view patient data in a variety of ways. For instance, I can access a basic screen that lists all of the patients I've seen in one day. Or, I can search for a particular patient by typing any three letters of the first or last name. Clicking on the patient's file displays a list of all images in the EyeRoute sys-

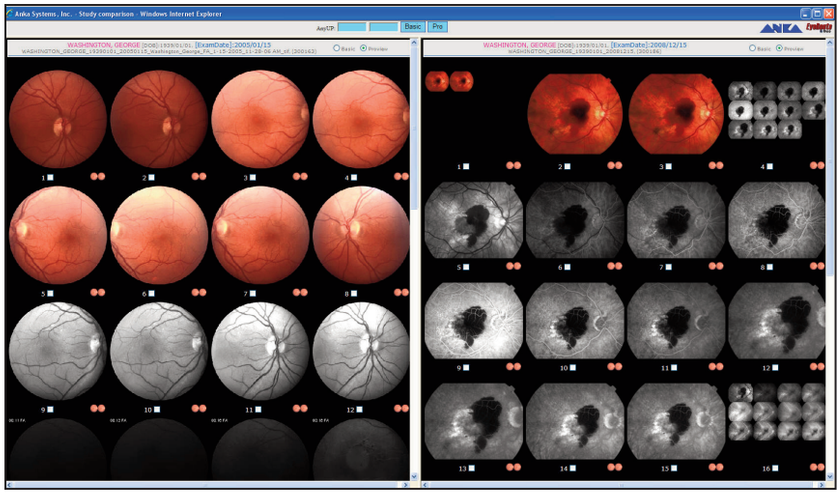

Figure 1. EyeRoute allows the physician to compare data over time in several different ways. This view shows a patient's fundus photographs taken several years apart.

Figure 2. The multi-exams function (shown here) is a useful way to compare test results over time.

tem for that patient. At a glance, I can see which tests have been done, when they were done and for what tests the patient is due.

The following are some of the many ways I use EyeRoute to view and analyze patient data.

■ **View multiple images at once.** In the upper right hand corner of the screen, I can click on an icon to simultaneously view any two or any four of a patient's images.

■ **Compare test results from different visits.** There are several different ways to look at data over time, which is one of the strengths of the EyeRoute system. For example, with a few clicks of the mouse, I can view a patient's fundus photographs from an exam in 2005 on the left side of the screen and fundus photographs from an exam earlier this year on the right (**Figure 1**).

■ **Magnify images.** Clicking on the magnification tool enables me to zoom in on any portion of an image. I often use this feature with my glaucoma patients to look for changes in the contour of blood vessels on the optic nerve or to closely examine signs of retinal pathology.

■ **Contrast enhancement.** This feature is especially helpful when I want to take another look at one of the older photographs that I've scanned into EyeRoute. Even if the image quality isn't ideal, I can use the contrast tool to get a clear view.

■ **Compare test results over time.** Clicking the "multi-exams" button is another useful way to compare test results over time. I often look at visual fields this way. I click multi exams to access all of a patient's visual field results for both eyes. I can hit the "single pan" button, which allows me to scroll through any of the tests to compare the right eye over time and the left eye over time. I can look at the grey scale and the statistical plots as well. I also can use multi exams to compare different tests over time (**Figure 2**), such as fundus photographs, OCT scans and angiograms.

■ **Compare baseline to subsequent tests.** The new Humphrey GPA (glaucoma progression analysis) software (Carl Zeiss Meditec) merges nicely with EyeRoute's capabilities. The analysis software enables me to view all of a patient's previous visual fields on one screen. With this information imported into EyeRoute, I can click to show the right or left eye, keeping the baseline test on the left, which shows the mean deficit of all fields that have been performed in the past. Then, by simply clicking the right side, I can view today's visual fields and all previous fields up to that point. It's a great tool for showing patients whether or not there's been glaucomatous progression.

■ **Correlate two different testing modalities.** Another view I use can place fluorescein angiograms

Figure 3. In the exam room, the physician can use the EyeRoute to easily view a selected sampling of a patient's fluorescein angiography and OCT scans over time.

on the same screen with OCT scans, so I can determine how the findings correlate.

■ **Sampling over time.** Many of our patients with age-related macular degeneration have had multiple injections of anti-vascular endothelial growth factor agents. In these cases, it's helpful to use EyeRoute to access their last four tests, such as OCT scans and fluorescein angiograms, and view them on the same screen. I can show patients how they've responded to treatment with regard to the amount of macular edema, subretinal or sub-RPE fluid present. It also may be useful to know how the current test compares with previous tests. The simple way to do that is to skip a few tests by clicking the box for each of the tests I want to see, creating a kind of random sampling over time (**Figure 3**).

■ **Historical view.** To get a complete historical view, simply click the multi exams button. This displays all of the tests that we've performed for the patient. But remember that on most exam dates, more than one scan from each test was sent into EyeRoute. So if I designate a certain number of columns per line, I can see that number of scans, from every exam through time, across the screen. This shows me in an instant how the patient's condition has progressed over time.

■ **Designate key images.** I use this function when I see patients by clicking to "designate and save" only the most important images. Then, when I search all of the data over time, only the key images come up. By doing this, I build a repository of key images and eliminate those that aren't important for future patient care. It's a simple and effective way to clean out the database.

As you might imagine, it would be very difficult to do this kind of work with a paper or film system, but the EyeRoute makes it easy.

Other Useful Capabilities

I've also found the EyeRoute system to be a great team-building tool for our referral relationships. I can save all of the images from EyeRoute as jpeg files and e-mail them, or cut and paste pictures to be used in letters that I send to referral sources. Even more helpful, when I want a referring doctor to be involved in a patient's care, I simply use the EyeRoute interface to assign the doctor's name to the case as a referring provider. Then, I can assign the doctor a password and user ID, so he can access our server — whether he has the EyeRoute system or not — and review the patient's test results. Referring doctors enjoy the ability to share test results with their patients in their practices as well. Likewise, if I need to refer a patient to another doctor, rather than packaging printouts of OCT scans, angiograms and other test results, I can give the doctor a password, and he can access the patient's data quickly and easily from his own practice. The response to this has been great.

Ready for the Future

Our practice is completely delighted with the EyeRoute system. Every doctor, from the youngest to the oldest, is using it.

In addition, once we're ready to make the move to full EMR, what we have in place already will be a major benefit. By adding only an electronic charting and note-taking component, we'll have an efficient, functional EMR system that will probably cost less than some of the EMRs we'd priced previously. **OM**

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By Jeffrey P. Wick, M.D., M.S.

Integrating Digital Images And Reports

EyeRoute can improve the efficiency of your practice and help you and your staff prepare for a transition to EMR.

As the partner in our practice who has a background in medical informatics, I've been leading our efforts to update our information systems (IS). We're a large practice, a regional ophthalmic provider with 15 doctors on staff, who serve more than 75,000 patients a year. We have one main eyecare center in Tyler, Texas, and four satellite offices. We're full-spectrum ophthalmologists, providing general, pediatric, oculoplastic, glaucoma, refractive and retinal care. We have a substantial amount of patient information to oversee, so we wanted to implement technology that would allow us to manage that information as efficiently as possible.

When we began exploring our options, we determined that all IS projects should be evaluated by three criteria. New technology should improve patient care, save money by increasing efficiency, or fulfill a regulatory requirement. Specifically for our practice, we wanted the ability to efficiently disseminate patient information, particularly ancillary testing and imaging results, within our group. Because we have so many subspecialists, our patients often see different doctors in different places. We were constantly shuttling records from one site to another. We also wanted to be ready for an eventual conversion to full electronic medical records (EMR). And we wanted a system that would enable us to more easily meet future reimbursement-related government requirements.

Benefits of the EyeRoute

Once we set our goals and researched available solutions, we chose to implement the EyeRoute ophthalmic image management system (Anka Systems Inc./Topcon Medical Systems Inc.). The EyeRoute is an open system that integrates images and reports from various ophthalmic instruments into a single, secure, digital environment in a HIPAA-compliant manner. The EyeRoute is compatible with more than 20 different types of instruments from various manufacturers, including digital fundus cameras, perimeters, optical coherence tomographers, optic nerve analyzers, ultrasonography devices, the IOL Master (Carl Zeiss Meditec) and wavefront aberrometers. The EyeRoute also can interface with most EMR packages. The system consists of PC hardware, a Microsoft SQL database and networking technology bundled together.

For our practice, the EyeRoute offers several benefits:

- **Instant access.** We can view, organize, edit and transport patient images from anywhere (remote office, home and on the road) via Internet Explorer. The system also will work with other standard Web browsers, such as Mozilla Firefox.
- **Increased efficiency.** By providing easy access to old and new patient images, EyeRoute eliminates the need for paper versions of test results. Therefore, we reduce the time spent searching through paper charts to locate specific test results. Our doctors are self-sufficient, which frees technician time. We can easily copy and paste images and reports into PowerPoint and Word documents. Also, EyeRoute seamlessly integrates with EMR, which will be our next IS project.
- **Enhanced communication.** We can give consulting and referring doctors instant access to patient images. In addition, we can improve patient education and compliance because we can easily show patients their actual test results, past and present, in the exam room. This offers patients a tangible visual image that helps provide an understanding of their condition.
- **Elimination of paper-chart problems.** We no longer risk misplacing images and reports or filing paper tests

EyeRoute at a Glance

With the EyeRoute, ophthalmology offices can deploy a high-quality digital image management system at an affordable price. The basic system consists of capture stations, viewing stations, central patient records and central storage (**Figure 1**). The entry-level configuration allows ophthalmology departments to capture studies from multiple diagnostic instruments, store them on a central network, view them from multiple locations and back them up to DVD for disaster recovery.

Additional modules can be added to increase the system's functionality and automation capability:

- EyeRoute-Web allows instant access to patient and image data from virtually anywhere.
- EyeRoute-CSG automatically retrieves images from ophthalmic capture stations for viewing in a standard Web browser.
- EyeRoute-DICOM enables electronic communication with DICOM-compatible systems.
- EyeRoute-HL7 provides flexible communication with hospital information systems.

The EyeRoute enables ophthalmic physicians and staff to view, organize, edit and transport patient test and imaging results, saving money, increasing productivity and improving patient management. Furthermore, because EyeRoute performs functions that most electronic medical records packages don't, it's the key to realizing the benefits of office computerization.

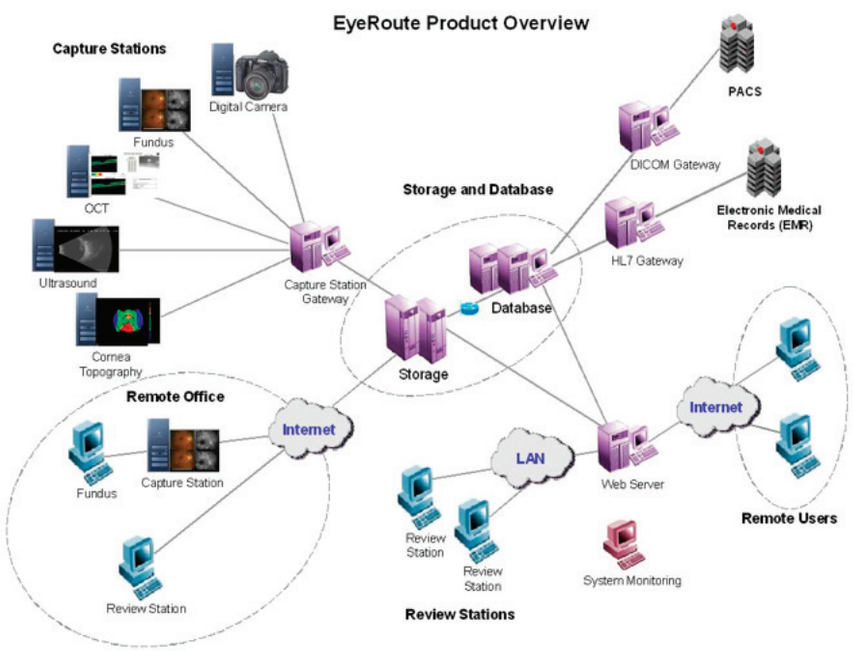

Figure 1. The EyeRoute ophthalmic image management system automatically integrates images and reports from various ophthalmic instruments into a single, secure digital environment.

For more information about the EyeRoute ophthalmic image management system, contact Topcon Medical Systems Inc.:

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in the wrong patient chart. EyeRoute automatically files tests electronically, using multiple patient identifiers, such as last name, date of birth, etc.

■ **A solid investment.** EyeRoute is compatible with most diagnostic instruments, so the past investments of the practice remain intact. Furthermore, the system will enhance and simplify future IT endeavors, such as our planned migration to EMR. Now that we've adopted the EyeRoute, we're definitely better prepared to implement full EMR.

■ **Fast return on investment.** EyeRoute quickly frees physicians and technicians to spend more time with patients, which improves our bottom line. The practice also saves on paper and ink cartridges.

■ **Improved patient care.** Doctors in all of our offices have access to all of the ancillary testing information they need, whenever they need it. Also, they can easily compare tests from different time periods, enabling them to make better diagnosis and treatment decisions.

Implementation in our Practice

Before we implemented EyeRoute in our practice, we wanted to know how we'd get data into and out of the system. Getting data into the system is quite simple. First, the Topcon team takes care of the installation behind the scenes, which doesn't interfere with the practice. After installation, technicians simply press a button when they use the testing equipment, and the data is automatically exported to EyeRoute. Training is available to gain an understanding of the system's features, but because the system is so intuitive, all of our doctors and staff were able to use it right away.

How to get data out was a more important consideration. In other words, how would the doctors and staff access the system? Central viewing stations, terminals in every exam room or mobile laptops are all feasible options. We decided the best solution was to have a dual-screen display in each exam room (**Figure 2**). In each room, we have a laptop computer on the desk, and it's

integrated with a large, ultra high-definition monitor. The monitor is mounted on the wall. The physician views the patient's EyeRoute images on the laptop. At the same time, the patient sees what appears on the laptop on the large monitor. So the physician and the patient both have a clear view of the images, but they can remain face-to-face throughout the visit. We also have integrated visual acuity testing that's set up in the same manner.

Patients are very impressed by this setup. Instead of canned photos or a canned explanation, they can see their own personal test results. As I mentioned previously, this enhances patient education and compliance.

We use our setup in another way that's been effective. While patients wait in the exam room, we play customized slide shows on the large monitor. This is an excellent way to convey information about our services, such as our optical shop, LASIK, oculoplastics and our new diagnostic hearing care. We anticipate that this type of internal marketing will yield a large return on investment with EyeRoute.

I've been with EyeCare Associates for 5 years, and I can't think of any equipment or advertising effort that's yielded as many compliments from patients as the EyeRoute and our dual-screen display. We'd buy it for this reason alone, even without all of the other benefits.

Image Management Before EMR

A question that arises for practices that want to upgrade their computer systems is why not proceed directly to EMR. We gave this a great deal of thought, and we decided that implementing an electronic image management system first was the way to go.

Our thinking was this: Within our practice, and most practices, IS can be divided into three segments: front and back office applications, such as scheduling and accounting; electronic charting, which is essentially EMR; and document and image management. Often, document and image management is considered part of EMR, but in reality the two are different. Most electronic charting software isn't designed to perform document and image management, involving ancillary testing, such as visual fields and fundus photographs, which are critical in ophthalmology. We'd like electronic charting and image management to integrate, but they don't. They're different products, and the companies that design and support them are different. The importance of document and image management to our daily operations and patient care made it a priority for us.

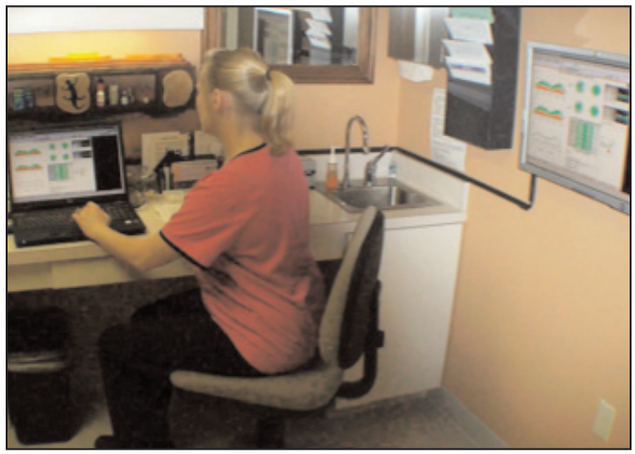

Figure 2. A technician at EyeCare Associates of East Texas uses the EyeRoute ophthalmic digital image management system to view a patient's test results. The patient can see the results on a large ultra high-definition monitor (right). The dual-screen display is just one way practices can use EyeRoute.

Furthermore, in my experience dealing with IS projects, electronic charting technically is easy, but extremely difficult from an organizational and political standpoint. The inertia that must be overcome is substantial. For example, practices often find that some doctors, many times the most productive ones, don't want to change their practice patterns to adopt EMR. On the other hand, electronic document and image management is the opposite. The interface issues make it technically difficult, but it's much easier for the staff and doctors to accept. EyeRoute, for example, was installed without disrupting the practice. Doctors and clinical staff didn't have to change the way they practiced, and they saw the benefits right from the start. When we analyzed the situation, it was clear that implementing image management before EMR made sense.

The Right Move

Adopting the EyeRoute system was a positive step for our practice. Overall, it's been very easy to use. It's been robust, efficient and secure, and we haven't experienced any problems. The fact that it can interface with so many different ancillary testing devices, as well as most EMR packages, makes it a cost-effective, smart investment now — and for the future. **OM**

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