

Electronic Medical Records for Ophthalmic Technicians

BY KYLE H. SMITH, MD

HISTORICAL BACKGROUND

After hundreds of years of recording medical information on paper with techniques that have evolved very little since the invention of the fountain pen, the world is changing radically. The first electronic medical record (EMR) systems appeared in the 1970s but, until recently, remained less efficient than traditional paper records and were adopted by only a small percentage of eye care practices. Although the speed of a handwritten record is still difficult to replicate, modern technology now enables medical personnel to record and store digital data efficiently, cheaply, and with exceptional reliability and security. Most eye care practices in this country are now using an EMR system or are planning to implement one in the near future. This trend is partially driven by the federal government's financial incentives that are designed to encourage EMR adoption by all health care providers. This effort to modernize our health care system seeks to reduce overall costs and improve the quality of care provided to patients by minimizing the duplication of services and by facilitating communication between providers.

TECHNOLOGY

The dozens of EMR systems (also called *electronic health records*) available for eye care practices today differ significantly in their underlying technology. No two systems are engineered in exactly the same manner. All modern systems, however, fall into one of three basic categories:

Client-Server Systems

The majority of EMR systems currently available use a "client-server" model. A server is simply a powerful computer designed to store a large amount of data. In an office setting, multiple computers, known as "clients," are linked directly to one or more centralized servers located in the same facility. A copy of the software application (EMR) resides on each individual client as well as the server, but all of the data are stored on the server.

Web-Delivered Systems

Many server-based systems now use the Internet to allow users to access the application and data remotely. The application (EMR) and all patient-related data reside on a centralized server that may be located anywhere in the country. Doctors and technicians in the medical office connect to the server through the Internet. The advantage of this model is that practices are not required to purchase and maintain expensive server infrastructure. The downside of this approach is that web-delivered (also known as *web-hosted*) EMR systems are typically retrofitted client-server applications that were not originally engineered to run across the Internet. Consequently, EMR systems that are web-delivered require more Internet bandwidth and may feel less nimble and responsive to the user.

Web-Based Systems

Most of the newest EMR systems are specifically engineered to run over the Internet. These systems make use of recent advances in technology that allow the application to run directly within an Internet browser with extremely low bandwidth requirements. The data reside on a series of servers in a remote location. Large "server farms," often referred to as *the cloud*, house hundreds or even thousands of servers that are linked together to provide increased efficiency, redundancy, safety, and reliability. All truly web-based EMR systems are also "cross-platform." This means that users are free to use any type of computing device (desktop, laptop, or tablet) and any operating system (Windows, Mac OS, Android, etc.) when working with the EMR.

EMR COMPONENTS

The EMR allows users to enter and view clinical information about a patient. The user interface is that critical portion of the EMR that users actually see on the computer's monitor. A well-designed user interface provides the user with tools for efficient and intuitive data entry and presents information to the user in a format that allows for rapid assessment of the clinical situation. In addition to this

basic functional requirement, an EMR should work in harmony with other software components to provide the user with an efficient and effective fully digital environment for patients' care. These other components are as follows.

Practice Management System

The business side of a medical practice is primarily managed through the practice management (PM) system. This is a software application that manages patients' appointments, billing, and accounts receivable. The PM system sends patient demographics and appointment data to the EMR. Then, at the completion of a patient encounter, the EMR sends coding data back to the PM system for billing. Some software systems combine the EMR and PM systems into one seamlessly integrated package. Others use a strategy of integration wherein disparate EMR and PM systems communicate through an interface.

Equipment Interfaces

A typical glaucoma practice uses multiple sophisticated diagnostic technologies, including visual field analyzers, optical coherence tomography (OCT), digital photography, and many others to care for patients. The information derived from these devices is critical to the quality care of patients and must be readily accessible to the physician during the encounter. The medical record must then permanently and securely store the data for future reference. With paper charting systems, this information is simply printed and placed in the patient's chart. EMR systems that rely on electronic data storage require a different strategy. Some systems rely on scanners to create digitized images of the printed material that are later uploaded to the EMR. This is somewhat time consuming and results in nothing more than an image of the clinical data. More sophisticated systems use a digital interface that directly links the diagnostic equipment to the EMR. This interface transfers the clinical information to the proper location within the EMR for viewing and permanent storage.

Image Viewing System

Most diagnostic devices in a glaucoma practice generate images that provide meaningful information for patients' care. These digital images (OCT, visual fields, etc.) are displayed for the user by an image viewing system. This is a software application that allows the user to view and manipulate an image (zoom in and out), apply annotations or notes to an image, draw on an image when appropriate, and view multiple images simultaneously. Some EMR systems have an image viewing system seamlessly integrated into the application, whereas others interface with a separately purchased product. The combination of images shown in Figure 1 demonstrates the value of an efficient image viewing system for the glaucoma physician. The doctor can quickly toggle through disc photographs from prior encounters to look for evidence of disease progression while correlating those images with OCT scans or visual field examinations.

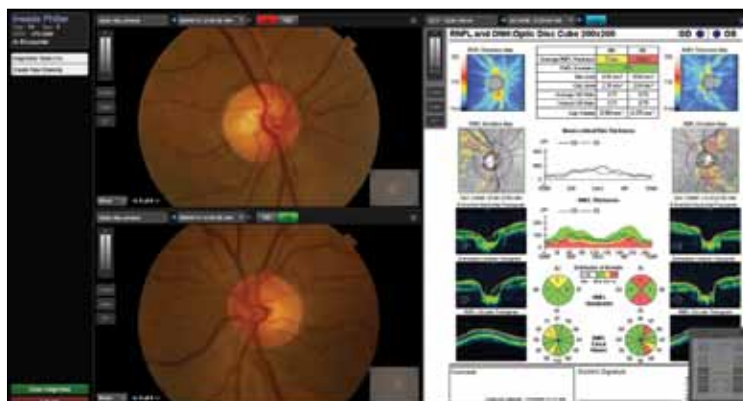


Figure 1. An EMR system combines images efficiently for viewing by the physician.

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Electronic Prescription

Modern EMR systems significantly improve patients' care through the electronic transfer of medication and allergy information. Virtually all EMR products accomplish this by interfacing with an e-prescribe vendor that has access to a national database of medical prescription and allergy data. The e-prescribe vendor feeds information from the national database to the EMR through an Internet connection. Doctors then electronically submit new prescription information from the EMR directly to the appropriate pharmacy through the e-prescribe vendor. These systems give doctors more accurate information about their patients and reduce human error in the prescribing process. Electronic prescribing is especially valuable for a glaucoma practice in light of the large number of glaucoma medications prescribed or refilled on a daily basis.

EMR—NOT JUST AN ELECTRONIC PAPER CHART

Novice users might suppose that an EMR is just an electronic version of the paper charts medical practices have been using for decades. In reality, the differences are profound because EMR systems introduce many concepts and principles that are unique to the digital environment.

Open and Closed Encounters

EMR systems clearly define the parameters of a patient's visit to the eye doctor. The patient encounter begins when a user electronically opens a new encounter for the patient. Every data element entered in the record from that point forward becomes part of that encounter. Users may enter data as long as the encounter remains "open." Once the

visit is concluded and the encounter is electronically “closed,” the EMR prevents additions or changes to the record. This is a legal rather than a technical constraint. Most systems do allow the creation of an “addendum,” if necessary, after an encounter has been closed.

Copy Forward

Most patients’ visits in a typical glaucoma practice are “follow up” or established patient encounters. Every technician knows that much of the data that must be recorded for each clinical visit does not change significantly from one visit to the next. This is one area where EMR systems dramatically improve efficiency, because the EMR automatically pulls much of that information forward from the prior encounter and inserts it into the current encounter. This usually includes problem lists, medications and allergies, past medical and surgical history, and family and social history. Some EMR systems also allow users to “copy forward” the previous examination data into the current examination. Although this feature is remarkably efficient and saves considerable time, every user should exercise extreme caution with this feature. The medical record is a legal document and must accurately reflect the information derived, or at least verified, during the present encounter.

Data Summaries

Most EMR systems have the capacity to assimilate data from multiple encounters and create a meaningful summary of that data for analysis by the doctor. This is particularly useful for the glaucoma patient, because the doctor must critically analyze the progression of the disease over time. The most commonly encountered example of this type of functionality is the intraocular pressure (IOP) graph (Figure 2). The EMR automatically collects and graphically displays a patient’s IOP readings from every prior encounter. Almost any data element (visual acuity, refraction data, pachymetry, etc.) can be tabulated and displayed in summary form. EMR systems that present doctors with this type of summary data significantly enhance the efficiency and quality of patients’ care.

Coding

Every eye care practice relies on proper coding at the conclusion of an encounter in order to generate a bill for services rendered. The coding process is exceedingly complex with thousands of possible combinations of procedural codes, diagnostic codes, and modifiers. Most EMR systems employ some form of coding “engine” that analyzes the data entered during the encounter. The engine then generates a coding suggestion to guide the doctor toward



Figure 2. EMR systems automatically display the IOP readings from each and every one of a patient’s visits.

a proper code. Coding engines coupled with an EMR system can increase coding accuracy, maximize revenues, and reduce the risk of inadvertent overcoding.

The Audit Trail

Medical offices that utilize paper charts require users to sign or initial entries in the chart so that others can tell who recorded that information. EMR systems require each individual user to log in with a password before reviewing or entering data. The user’s identity is then automatically linked, along with the date and time, to every data element entered throughout the encounter even though this linkage process may be invisible to the user. This information becomes a permanent part of the medical record’s “audit trail.” Technical personnel can retrieve the data when necessary.

THE OPHTHALMIC TECHNICIAN’S ROLE IN EMRs

Ophthalmic technicians interact with EMR systems throughout the course of most patient encounters. Consequently, every technician must become familiar with the user interface and data entry strategies of the EMR system in order to record patients’ data quickly and efficiently. No technician can do that without a thorough knowledge of the EMR system being used. Although some EMR systems are more challenging to learn than others, even the best designed, most intuitive systems still require the investment of time by a potential user. Most EMR vendors provide some form of training environment that allows users to practice while utilizing data from fictitious patients. Focused practice with simulated patient encounters prior to “going live” with real patients is time well spent. An ophthalmic technician who is comfortable with the EMR system can focus on patients’ care rather than on a computer screen. A well-trained, efficient, and productive technician is an enormous asset to any eye care practice, especially when the practice is embracing the future by transitioning to a modern EMR system. ■