Computer Business Systems and Internet Resources

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A computer won't make you organized. You must be organized to effectively use one.

Anonymous

The computer is no better than its program.

Elting Elmore Morison *Men, Machines and Modern Times*

The evolution and growth of computers and computing power has been exponential over the past 60 years. Early machines occupied whole building floors, requiring special atmospheric conditions and miles of cable to connect their various parts. They were capable of only performing simple arithmetic computations. Today's machines range from the giant mainframes, which control whole corporations to the desktop and laptop, as well as handheld devices, which can guide you anywhere in the world and perform advanced functions that were only dreamed of 30 years ago. It is difficult to imagine life in the contemporary world without a computer and the Internet. The advent of personal computers and decreasing costs have made them accessible and available to even the smallest business.

The use of computers and computer systems has become commonplace in optometric practice, just as it has permeated health care and small business in general. The range of uses for these systems can be as limited as word processing on a single personal computer to as extensive as the paperless office on a multiuser system, with data from ophthalmic instruments and practice management systems fully integrated. This chapter describes the various roles and functions of personal computers in contemporary optometric practice. Specific patient management, business management, inventory management, and time management applications are discussed. In addition to in-office uses of the personal computer the Internet opens the world for users. The Internet provides both a portal for patient interaction with a practice and the opening of a world of information to the optometric practice.

USE OF THE PERSONAL COMPUTER

The Internet has expanded practice capabilties in the area of patient interaction. Whether developed by individual practices or assisted by industry, practice Websites have become the standard rather than an exception. The use of Websites by optometric practices allows practitioners to enhance communication with patients and prospective patients before they come into

the office and also allows practitioners to give patients in the office a way of obtaining more information about various services or products that the practice provides. Many companies in the ophthalmic industry offer free support for Website development. Product distributors offer personalized sites to allow patients to order products, particularly contact lenses, as though they were communicating directly with individual offices. Using the Internet, allows office computers to enhance and expand communication between practitioner and patients, prospective patients, and potential referral sources. The merger of word processing with stored data allows a computerized office to send personalized letters to all these sources, permitting the office to market itself in ways that a noncomputerized office either cannot offer or can offer only with the expenditure of significant time and expense. The widespread use of e-mail allows communication with patients in ways that never existed before. E-mail allows for the rapid dissemination of information to patients and for patients to communicate with the office 24 hours a day, 7 days a week. With the increased use of the Internet, the office must consider speed of access. A broadband connection to the Internet is a necessity in today's world.

The Internet has also enhanced capabilities in the availability of information. Researching specific topics related to ophthalmic conditions, diagnosis and treatment are readily available to the user. Some sites require membership, but the vast majority are free to the user.

The Internet presents some risks. The pathway to this world of information also becomes a pathway for individuals with less than honorable intentions to cause inconveniences to the office that is using and integrating computerized systems. Internet security is critical. There are a number of software security vendors who offer various levels of protection. If one is going to be connected to the Internet, security is extremely important. Software "firewalls" attempt to prevent direct invasion of a computer by malicious software. Virus and "spyware" detection programs are also a necessity for any computer or computer network connecting to the Internet.

A growing area of Internet use is in telemedicine. A search of the Internet using "ophthalmic telemedicine" will yield numerous sites offering equipment needed to explore and use this new methodology, as well as sites to which one might connect to actually use the technology. This is an area of heavy experimentation by federal and state government agencies, as well as many universities. The University of Texas has been very active in this arena for a number of years. It permits immediate access to experts and specialists from even the most remote of areas. At the University of California, Berkeley, School of Optometry Dr. Jorge Cuadros, a Berkeley Optometry informatics researcher, developed EyePACS (Eye Picture Archive Communication System), which is a web-based system that allows people with limited access to health care to get diagnoses on the web from an eye clinician across the state or country. The main focus of EyePACS is identifying complications from diabetes, the leading cause of blindness in the US for people 20 to 74 years old. In many cases these people are poor rural workers who don't have access to regular eye exams. EyePACS focuses primarily on California's Central Valley indigent populations, where diabetes is common. During checkups at small local clinics, non-physician technicians can take photos of the retina and put the images on the web where Cuadros and others examine them. Occasionally the photos show problems other than diabetes, such as glaucoma, retinal tears or holes that can lead to retinal detachments, or ocular tumors. Cuadros set up physicians with accounts and passwords in EyePACS, which he set up as a license-free imaging web application, so that they could capture and transmit digital retinal images to himself and retinal specialists.

The personal computer has revolutionized optometric office management in the same way it has revolutionized all small businesses. Computers save time by performing many of the functions that used to be performed manually, and they also have expanded the capabilities of the optometric office to manage large amounts of data.

Patient demographic information, such as name, address, telephone number, date of birth, and recall date, has been expanded by computerization to include diagnoses, insurance information, spectacle and contact lens prescription information, e-mail addresses, and various marketing information. A noncomputerized office has to create and maintain a separate file for each patient and when information is needed, it must be retrieved manually. The computerized office can store, obtain, and analyze information with the stroke of a few keys, which greatly expands the practice's ability to retrieve and sort the information desired.

Financial management has been enhanced in the computerized office, from simple tracking of accounts receivable to accurate up-to-date summaries of the financial health of the practice and projections of future practice growth with changes in fees, addition of equipment, or use of ancillary personnel. Budgeting expenses and tracking office expenses to the budget are easier to set up and monitor by computer, which allows the optometrist to self-monitor daily, weekly, monthly, or quarterly without having to wait for an accountant's report.

Computerized inventory management includes the tracking of ophthalmic materials, such as frames and contact lenses, which allows for more efficient purchasing of these items by the practice. With the advent of frequent replacement and disposable contact lens wear programs, inventory management has become increasingly more important. The use of laser scanners and bar codes on these items by the optical industry makes inventory control even easier. Reorder points may be established and driven by computerized processes freeing staff to simply review orders rather than preparing them in detail.

Computers also can be used for the management of patients. Equipment, such as automated refractors, corneal topography units, automated lensometers, anterior and posterior segment cameras, scanning laser ophthalmoscopes, and visual field analyzers, can be linked to personal computers to store pertinent data and to assist in the interpretation of data, creating a "paperless" office environment. The use of computers in areas, such as contact lens design, low-vision care, and vision therapy, has allowed optometrists to provide better, more efficient care to patients. Optometrists who are online have access to discussion groups and thus can acquire information on patient management, developments in clinical care, and ophthalmic products. Digital images of anterior segment disorders, retinal pathology, and corneal topography maps can be saved, stored, compared, and e-mailed for consultation with laboratories and specialists in neighboring communities or across the country. Numerous patient education programs are available for access by patients in the reception area to educate and increase their awareness of services and new material technology.

SPECIFIC PRACTICE MANAGEMENT SYSTEMS

In the not too distant future the first generation of optometrists will be coding and billing through an entirely electronic process. Some existing practices will be behind the technology curve and will continue to code and bill on paper but it will not be that way for long. The federal government is providing stimulus money of up to $84,000 for practices that deploy electronic medical record systems by the year 2011. With this massive paradigm shift taking place, paper claims will likely cease to exist in the foreseeable future.

While it is important to know the diagnostic medical codes discussed in Chapter 35, it is also important to consider what one will actually do with those codes. Optometrists will enter them into a computer system and then rely on that system to calculate fees, process billing, and store patient records. It is more critical than ever for an optometric practice to have software and hardware platforms that work in harmony and add value to the business through increased efficiencies.

There are two major software components to an electronic coding and billing system. Practice Management Software (PMS) handles everything from patient scheduling to inventory control. As it relates to coding, optometrists will rely on PMS software to process codes for ophthalmic materials. The second software platform, Electronic Medical Records (EMR)

allows the doctor to enter and process diagnostic medical codes. The hardware system will consist of workstations, servers, and networking equipment.

There are many companies that license practice management software. Some licensing companies like Eyefinity/Officemate, MaximEyes, Practice Director, MedFlow, MediNotes, and Compulink also market companion software for electronic medical records (EMR). There are many software solutions to choose from so it is important to research this carefully. The optometrist will need to select the system that works best for his or her practice with minimal maintenance or performance issues.

Because of the size and complexity of these programs, it is always challenging to make an existing hardware system adapt a new PMS/EMR platform. When possible it is best to select the software first and then build a new hardware system based on the software requirements. Either way the optometrist will likely need to consult with experts to build an optimal system.

Here are some questions to consider when evaluating a PMS/EMR software package:

- How many clients does the company serve and how long has it been in business?
- Do you know other doctors who use the system and can attest to the functionality of the software's efficiency, reliability, and ease of use?
- Does the software company specialize in optometric practices?
- What are the license fees per location and per work station?
- What are the maintenance and training costs?
- What are the security features?
- How is data backed-up? And, how often? What are the associated costs for back-up systems?
- How well will the EMR software interface with other office technology? For example, will refracting equipment automatically populate examination fields in the EMR?
- Will the EMR software help prevent coding and billing errors?
- Does the PMS/EMR platform simplify billing to third party insurance companies?
- Does the software package allow for custom template design?
- What impact do the custom templates have on the automatic coding features included within the EMR program?

Applications to consider in the optometric office should include patient information as part of overall electronic medical records, insurance, finances, inventory control, type of service information, ophthalmic materials tracking, referrals, payroll, appointment scheduling, recall, marketing, and communication.

Patient Information

Computerization allows all pieces of information about individual patients to be stored in one place. Information about patients can be categorized, sorted, and identified based on

any one of the pieces of information that have been collected. For example, computer storage makes it possible for practitioners to analyze the demographics of a practice. A practitioner considering a move to another location might want to analyze the patient population by zip code or address so that the most geographically desirable location for the move can be identified. Another application is marketing. Practitioners can perform internal marketing through the use of newsletters or other literature targeted to selected computer-generated groups of patients. Combining the use of demographic and marketing information allows the practitioner to know which newspapers might be best to place advertising information to reach the largest number of patients in the practice. The practitioner can use this information to market externally (see Chapter 27).

Typical patient information stored on a computer might include name, address, date of birth, telephone number, e-mail address, insurance information, referral source, the individual responsible for payment of fees, examination date, recall date, reason for recall, diagnoses, contact lens type, contact lens service agreement information, spectacle lens information, frame information, and account information (Figure 20-1).

This information can be accessed, retrieved, sorted, and reviewed through the use of a computer. For example, the office might want to inform all patients with high myopic refractive errors about a new type of lens material. Without a computer, retrieval of this information would require considerable staff time because individual patient files would have to be reviewed. With a personal computer, a list of the appropriate patients can easily be compiled, and mailing labels, letters, or e-mails can be sent to each patient, with minimal staff time and effort.

Electronic Medical Records

Electronic medical records (EMRs) will become the standard in the health care community. Government funding sources will be requiring them in the near future. They have the benefit of being easly read and should reduce errors caused by illegible records and prescriptions. Although the problem of illegible prescriptions by optometrists has not been identified as a serious problem, readibility will be important as optometry moves more and more into the medical realm of ocular treatment. EMRs force standardization within a practice and allow easy summarization and data tracking. A variety of EMRs are offered by software vendors. EMRs, which have fixed formats that cannot be modified, are the most rudimentary. Some software providers permit almost unlimited capability in customizing examination records of a practice down to the level of each individual doctor in a practice. With flexibility comes complexity in design and implementation. Often, a professional will be required to create highly customized EMRs. A sample of one such complex EMR can be seen in Figure 20-2. Note the tabs at the top of the record allowing access to various areas containing specific, specialized data. Tabs can be added or eliminated as needed for a specific visit.
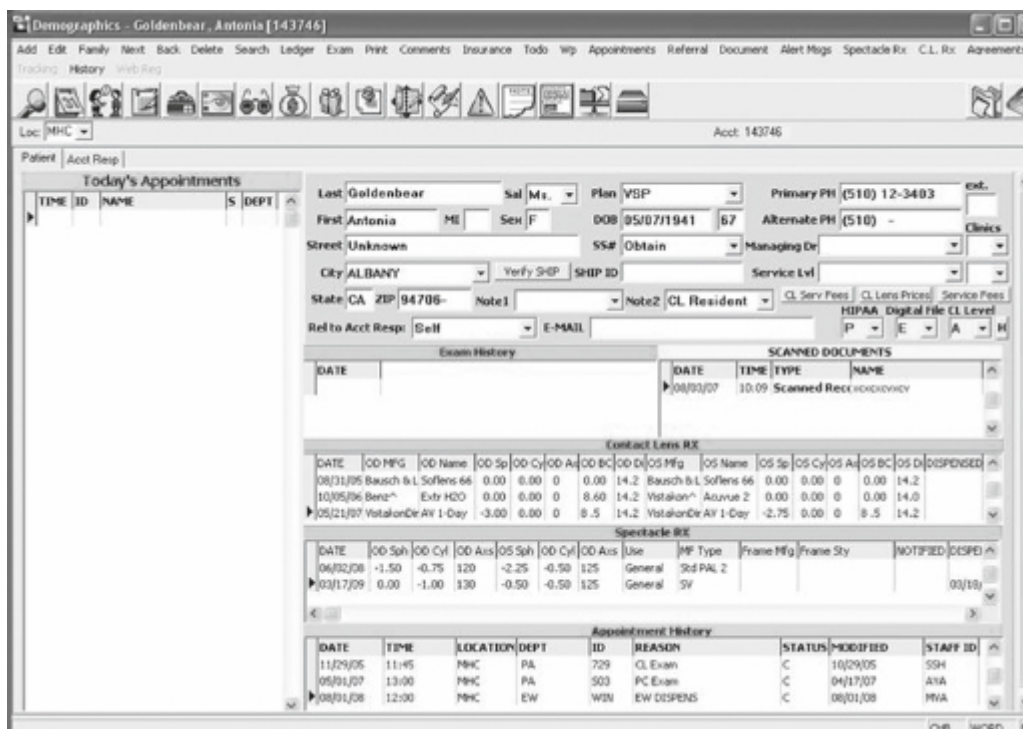
FIGURE 20-1 Patient information screen with information to be collected on each patient. This information can later be selectively retrieved. Patient data also can be sorted by various pieces of information. (Courtesy Compulink Business Systems, Westlake Village, CA.)
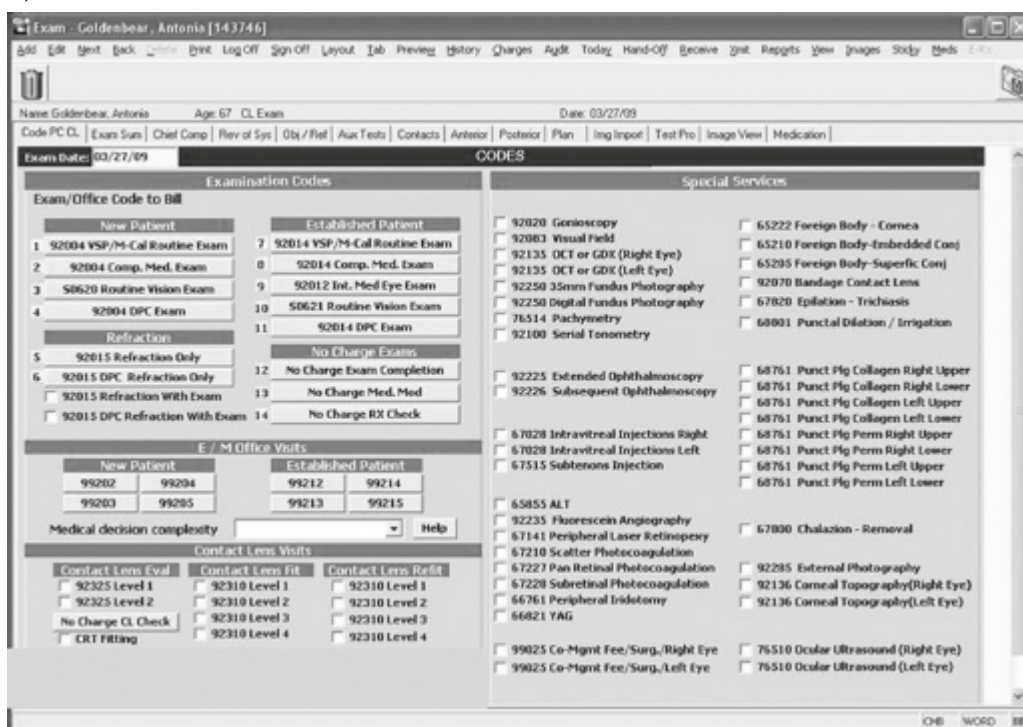

FIGURE 20-2 Electronic medical record. (Courtesy Compulink Business Systems, Westlake Village, CA.)

Insurance Information

In addition to allowing insurance information to be listed with other patient data, a computer system permits office personnel to more efficiently process and keep track of insurance payments. Many software programs print standard patient insurance forms, and most transfer information electronically (e.g., for Medicare patients, Vision Service Plan [VSP] subscribers). These procedures can hasten the reimbursement process and thus improve the office's cash flow. Many insurers

insist on electronic claim submission via the Internet as a condition of participation in their managed care plans. VSP currently offers an interface in which orders for materials can be placed directly from an office computer system along with the service claim.

As more and more optometric patients obtain insurance coverage from third-party insurance plans, it will become necessary to monitor when payments are due from individual payers and to track third-party payment schedules.

Many insurers now allow electronic filers to tap into their computer network to determine the status of claims being processed. Computerization also allows for easier and more efficient communication with third-party payers by permitting the use of standardized letters and forms.

Financial Information

Computerized billing and tracking of accounts receivable enables a practice to more efficiently bill and collect money owed to the practice. Charges for services rendered are entered in the office's practice management software with a breakdown of monies due from the patient and payments due from insurance companies. A receipt is printed for the patient at the time of the visit, and an insurance claim form is generated for the insurance company. Any balances due are applied to the patient and insurance company ledger for billing and tracking on a monthly basis. Many software programs allow the office to set payment schedules for patients. The computer will calculate interest charges and add them to a preprinted receipt that the patient is to return to the practice when money is due (Figure 20-3).

Tracking of accounts payable is made easier through computerized programs that act like a checkbook to record and categorize payments, write checks, and monitor accounts. Payment can be made electronically, saving the practitioner the time and expense of printing and mailing checks. These same programs also enable the office to obtain profit and loss statements as needed rather than having to wait for quarterly accounting reports. Budgets can be set up for the year, and expenses can be compared to the budget to allow the practitioner to more easily monitor cash flow and ensure available

funds for taxes, retirement accounts, and purchases of new equipment.

The financial productivity of an office can be determined by the day, week, or year; as needed, income can be tracked for tax purposes. The financial contributions of the practitioners and staff also can be determined, an essential capacity in offices where practitioner income is divided on the basis of productivity or where bonuses are paid to staff based on performance or office productivity.

Inventory Control

Many practitioners maintain large inventories of contact lenses on consignment in the office, so that patients can receive same-day service on replacement lenses or can be provided with lenses immediately after fitting. Management of inventories can be cumbersome without computerized inventory control. The computerization of inventory also makes it possible for the receptionist or contact lens technician to immediately tell a patient who is seeking a replacement lens whether the lens is in stock. The growing popularity of frequent replacement and disposable contact lenses places a much greater burden on inventory control. An efficiently run inventory control system can mean a substantial income savings for the practitioner.

Inventories of contact lens supplies and solutions also can be more effectively managed by computer. Many offices stock contact lens solutions for patients, and these solutions must be monitored for turnover rates and expiration dates. Determining when and how frequently solutions and other supplies must be repurchased can allow the office to take advantage of cost savings by buying supplies when they are discounted.

FIGURE 20-3 Sample patient ledger. (Courtesy Compulink Business Systems, Westlake Village, CA.)

Most practices invest a substantial amount of money in a frame inventory. Computerized management of frames can provide information such as when the frame was purchased, how long it has been offered for sale, how frequently similar frames are sold, and whether similar frames are still in inventory. Reports can be generated by frame type, manufacturer, and cost. These reports can be used to make purchasing decisions for the practice (Figure 20-4).

Employing barcodes can simplify the inventory process. Ophthalmic manufacturers code their products with "SKU" barcodes. Inventory management systems take advantage of this availability, easing the process of charging for materials and decrementing inventory counts. Using the industry standard barcodes also eases the process of taking physical inventories of stock on hand.

Type of Service Information Provided to Patients

As patients are seen in the office, the type of services provided will be keyed into the computer. Computerization allows the office to track the services provided to any patient on any given day (see Figure 20-2). This information is used to print a bill or insurance form for the patient at the time of the office visit. It also allows the office to keep track of the number of services provided and the income received by the practice from a particular service. The information also can be used to identify secondary services or specialized procedures and their use. Financial data can be used to allocate space and money for new equipment based on the amount of income generated by each procedure or service. For example, an optometrist who is considering the purchase of a corneal topographer but is not certain that it would be cost-effective would need to analyze

the number of contact lens services provided in an average month and determine the increase in revenue from the number of patients who would require this test to clearly project the financial feasibility of the purchase.

Ophthalmic Materials Tracking

Patient orders for contact lenses and spectacles must be monitored for delivery time. Because patients expect prompt dispensing of ophthalmic materials, a failure on the part of the practice to provide timely service can result in a dissatisfied patient who ultimately decides to go elsewhere for services and materials. Many ophthalmic laboratories now accept electronic transfer of information (via VisionWeb, Eyefinity, and so on), which can eliminate the time-consuming method of messenger or postal delivery. Computerization of this aspect of optometric practice also can aid in the more efficient payment of laboratory bills by enabling credits and invoices to be followed-up more easily (Figure 20-5). Most vendors now have their own Websites and allow ordering of materials 24 hours a day, 7 days a week on their Website. Websites also have been set up by various buying groups to allow purchasing of all contact lenses, frames, and office materials online. This is in addition to vendor or professionally developed and personalized Websites.

Referral Information

The life blood of professional optometric practice is patient referral. Whether from existing patients, other health care practitioners, or community contacts, referrals keep pumping new blood into a practice. Being able to properly recognize and thank each referral source will make it more likely that

FIGURE 20-4 Report of frame inventory, listed by manufacturer. (Courtesy Compulink Business Systems, Westlake Village, CA.)
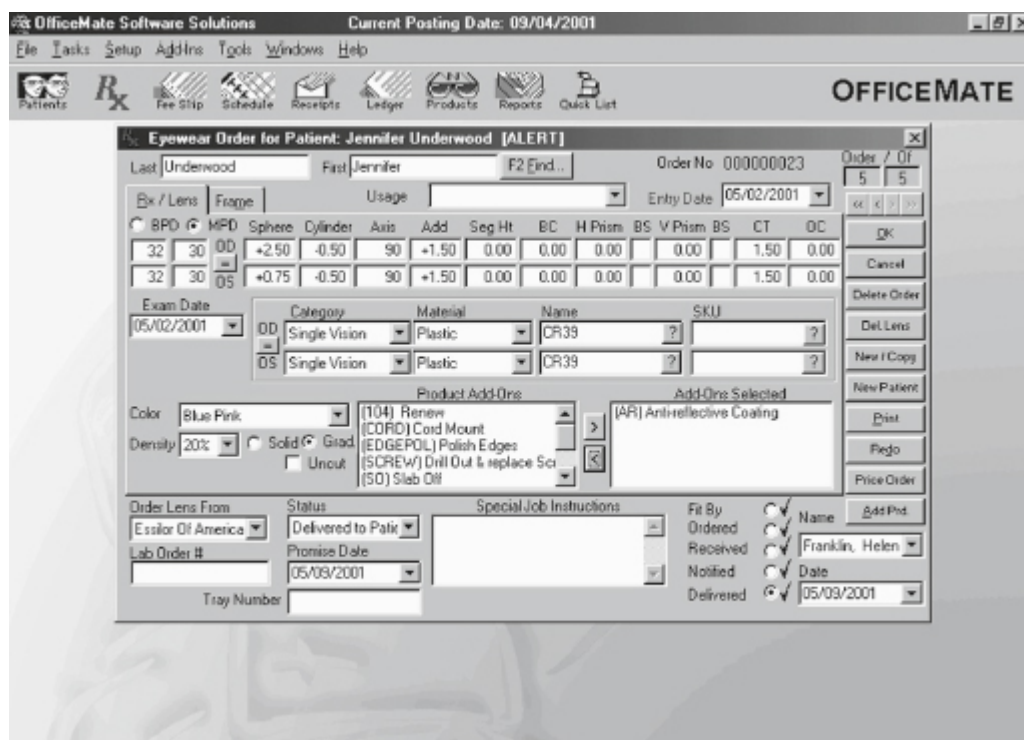
FIGURE 20-5 Tracking of ophthalmic materials orders. (Courtesy OfficeMate, Irvine, CA.)

these sources will continue to send new patients. Most practice management software programs facilitate the sending of thank you notices to a referral source. Many also will monitor the number of patients each referral source has contributed, as well as the income generated by each referral source. For referrals from other health care providers, reports can be generated to allow the referring practitioner to keep up-to-date on a patient's progress. Managed care plans require prompt communication between the optometrist and the primary care physician gatekeeper. This communication enhanced by practice management software programs is essential if the optometrist is to continue to receive referrals.

Payroll Information

As the number of employees in an optometric office increases, so does the time needed to handle payroll and tax reporting information. Computerization allows the office to calculate tax withholding, determine net salaries, and even print payroll checks. This information can be summarized and sorted by employees so that payroll taxes can be calculated quarterly as required. Information about employee salaries and tax withholding also can be printed on a year-end statement for use when completing tax returns.

Appointment Scheduling

A key element in practice management software systems designed for optometric offices is the appointment scheduler. In multipractitioner or multilocation offices, these systems can aid in more efficient use of time and can help to prevent improper scheduling. The use of ancillary staff in pretesting or assistants in contact lens training and vision therapy also can be more efficiently scheduled by computer. The computer

can allocate the proper amount of time for a procedure, assign patients to a given practitioner, locate available appointment dates and times, and allow the viewing of all of the patients' appointments at a glance. Many offices will make appointments for patients months and even a year in advance in a perpetual appointment recall system. Computerization of this system allows the office to efficiently keep track of the appointments made, confirm them in advance, and refill the time slots if patients do not respond to or cancel scheduled appointments. Some companies have set up sites on the Internet where patients have the ability to schedule appointments online, even after normal office hours.

Marketing

A computer will make it easier to carry out all levels of a marketing plan. The first step is to identify a need or problem such as the failure of many contact lens patients to renew their service agreements. The next step is to implement a marketing concept. For contact lens patients, a letter can be generated by the computer to remind these patients that regular contact lens care is needed to maintain ocular health. An invitation to renew the service agreement can be included, offering an incentive if renewal is obtained by a specific date. The key element of any marketing plan is an ability to monitor the success of the marketing effort; then the return on investment can be determined. The computer is used to track patients to whom the letter was sent and the number of patients who responded positively.

Communication

Computers can aid communication with patients in various ways. Many practices have their own Website as a means of external and internal marketing. Various optical suppliers,

managed care companies, and buying groups will help set up sites for practices doing business with them. Websites allow the practitioner to get information to the public about their practice and the services provided. Patients looking for optometrists who provide specific services can now search on the Internet for practices in a geographic area. A patient who has been seen in the office can be asked to view the practice's Website to obtain more information about specific services recommended.

Computerized patient history software, computerized report writing software, and computerized patient explanation software allow more efficient case presentation in the office. Patient history software allows patients to use touch-screen technology to provide ophthalmic and medical histories and to highlight reasons for visits, the desire for further information, and areas in which they have questions for the optometrist. This information is sometimes required by managed care plans and allows for more efficient use of staff and optometrist time. It also allows the staff to tailor treatment recommendations based on patient needs. Patient explanation software (Figures 20-6 and 20-7) aids the optometrist and staff in describing various vision and eye health problems graphically so that the patient is more likely to understand and comply with treatment recommendations. Report-writing software allows the optometrist to quickly design reports either to patients or referring practitioners describing the patient's symptoms, findings, and recommendations.

HOW TO GET STARTED COMPUTERIZING AN OFFICE

Computerizing an existing office is never an easy task. Too often practitioners decide to automate their office business functions to get organized. Unfortunately, one must be organized to make real use of a computer system. Understanding that limitation goes a long way toward achieving success with business computer systems. Expecting a computer system to provide organization from chaos is a recipe for failure.

Most business functions can now be computerized. Indeed, before selecting a software system or having one designed, one must define just what elements are required by the office and what items would be nice to have. Selection should be dictated by choosing the software that satisfies all of the "musts" and most of the "wants." If one is starting from scratch, it is never wise to select hardware before the software. The most desirable software may dictate an appropriate configuration of hardware. Include in any hardware decision room for growth and expansion. Many experts recommend selecting hardware to support 50% more than current perceived needs. Use of the computer will only increase as an office and the individuals involved become more familiar with the enhanced capabilities.

The actual procedures used can depend on the software system chosen. Certain software companies will load patient and accounting information into the system so that the office is "up and running." This is the preferred method when converting from one software system to another. This process will

FIGURE 20-6 Use of patient explanation software. (Courtesy Eyemaginations, Towson, MD.)
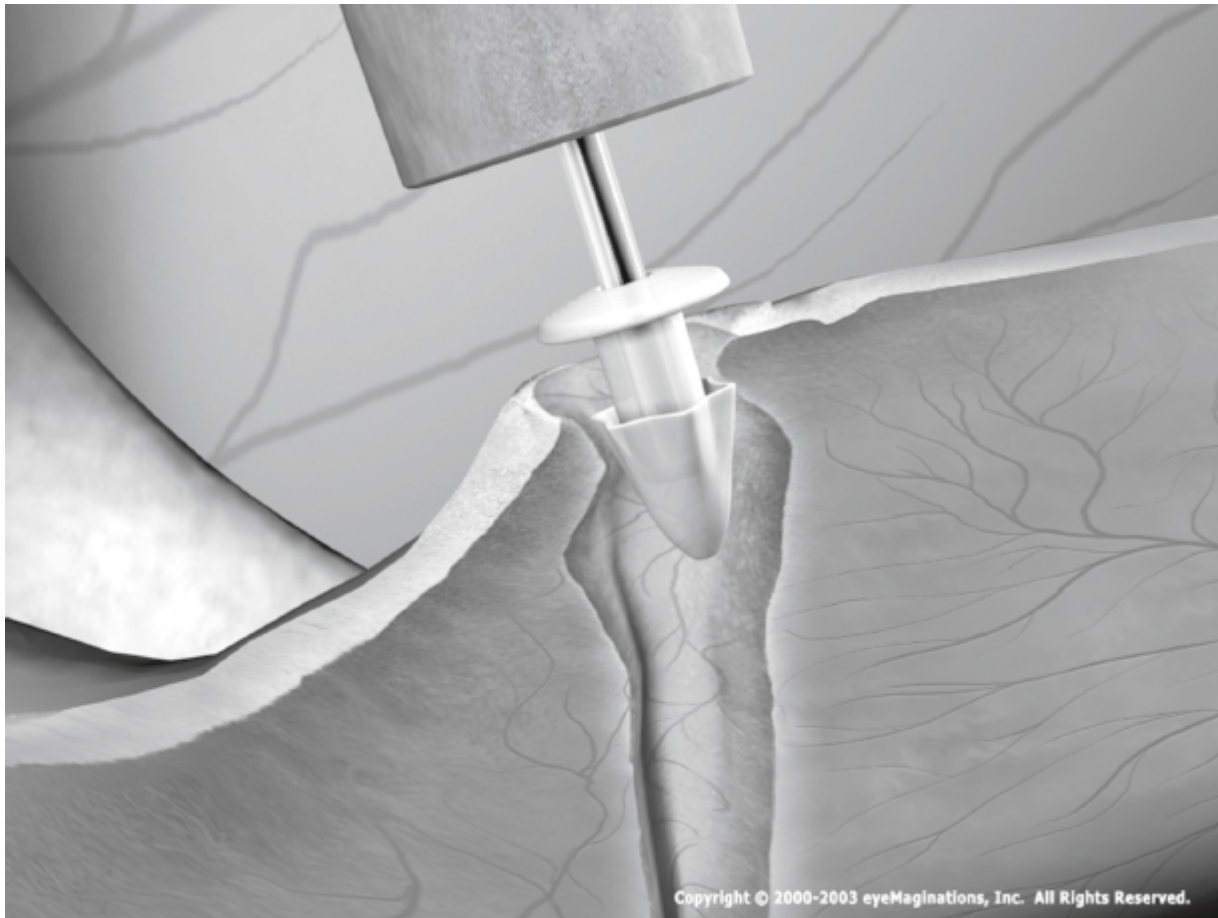
FIGURE 20-7 Example of patient explanation software for punctal plugs. (Courtesy Eyemaginations, Towson, MD.)

cost more initially but can save money in the long run because staff time will not be required to enter information into the computer system. The office also will be fully functional on the computer for standard monthly procedures such as recall appointments and billing of accounts receivable. New patients will be added to the system as they come into the office.

Other software systems allow the office staff to enter data regarding patients with outstanding balances so that billing can be computerized from date of installation. Information on patients to be recalled is entered into the system monthly, requiring additional staff time before recall notices can be mailed. Full data on these patients are entered as they return to the office. For new patients, data are entered at the initial visit.

Some offices prefer to enter patient information as patients return for care or when they are seen for the first time. This approach can require the least amount of additional staff time, but it has the disadvantage of delaying the computerization process because the staff has to go through both a computerized list and a noncomputerized list when sending recalls, bills, or other patient correspondence. Another disadvantage of this process is that more than one system must be understood by staff and used concurrently. As normal turnover occurs in an office, new personnel must be trained in more than one system, often complicating office management and efficiency. If the average patient visits the office once every 2 years, it will be at least that long before the office will be fully computerized. Even then, all patients will not have been converted.

Despite the initial disruptions to office procedure, computerization can benefit an office of any size. Smaller offices that seem

to function quite efficiently without computers can still benefit from the additional capabilities that computerization offers. Costs of hardware and software products have regularly decreased, even as computer technology continues to expand. There is no "perfect time" to make the decision to computerize. Software will be improved periodically, and hardware can always be upgraded. Waiting until computer technology is "perfected" only means delaying the tremendous advantages of computerization.

For new offices, computers should be included as initial equipment in much the same way as a phoropter and ophthalmoscope. The use of the computer in marketing, report writing, and patient communication will aid in the development of the new practice. The cost of computerization will be spread out during the lifetime of a practice loan in the same way as other optometric equipment.

Regardless of the chosen approach to the computer age, staff and doctor training are critical elements. Overlooking the indoctrination of all staff is a recipe for disaster. Staff buy-in is very critical. It is always wise to include staff in the decision process. It allows them to have some ownership in the direction taken. Nothing can guarantee the likelihood of failure as much as a staff who resent the move.

Selecting Computer Software

For the computer novice, the use and applications of office computers can be discussed with fellow practitioners, experts in the field, and office staff of colleagues. Vendors from various companies can be found at large and at continuing education

seminars. Salespeople should be able to demonstrate the capabilities of software. Information can be obtained about the support the company offers, what is included in the price of the software, and how often upgrades are provided and at what, if any, cost. Many companies offer demonstration videotapes of their software; these allow a practitioner who does not own a computer to get a feel for the capabilities of the software. Initially, using the new software will not be as simple as it appears in a demonstration. Practicing with the product and experience are necessary to use it with the dexterity exhibited by the sales demonstration.

For the employee who is not a novice and who has access to a computer, demonstration disks will give a more realistic demonstration of the ease of operation of the software. These demonstration disks typically allow the entry of data on a small number of patients or can be used for a specified period.

For the experienced computer user, testing a product in the office can be valuable. Many experienced users decide to purchase a nonoptometric, commercially available database program. Such programs usually are less expensive than optometric software but require considerable time to program. The experienced user can use the software to customize a program that suits the particular needs of the office.

Prioritizing Use

Once the possible applications of software are understood (musts and wants), it should be determined how the computer will be used in the office. The initial investigation of a software package should reveal its strengths and weaknesses. In addition, knowing the functions that the computer must handle, along with the priority of functions, should assist the practitioner in making the software choice. For example, a program that is strong on inventory control will offer little benefit for an optometrist in a nondispensing practice. Most independent optometrists will find that a software program strong in patient information storage, billing, patient communication, and inventory control will meet all their needs. Separate modules or separate software products can be obtained for more advanced patient communication, accounting, financial planning, and web design. Some software packages come with all of these functions integrated.

Planning where the computer (or computers) will be located is essential in allowing for the full utilization of the computer program. It also will help determine the functions that will take priority on the computer. For example, personnel in an office with a sole computer that is located on the receptionist's desk will find it difficult to use the computer for inventory assessment and control by staff in the dispensary. Identifying the priorities for computer use will assist in the effort to establish hardware requirements and help to determine the number and location of computer workstations. Internal wiring must be planned for to allow for the networking of computer stations. The need for an independent server and the placement of the server are decisions that must be made in conjunction with the computer consultant. Any hardware and software should allow for expansion if the needs of the office change.

Knowing the Software Company

The software system should be "user friendly." Since the office staff will be the primary users of the system, the software should be designed with simple on-screen menus and explanations. This capability eliminates the need for extensive retraining every time a new staff person is hired. It also eliminates the new staff member's need to refer to a manual when using the computer for a waiting patient.

Support for software can be provided in various ways. Some companies use a 900 telephone number, for which advice is billed at a per minute rate. Other companies offer a yearly support fee, paid in advance, that allows the user to call for unlimited assistance. Many companies insist that the user purchase a telephone modem, which allows support personnel to view any problems on their own computer screens and make corrections or adjustments.

Upgrades of hardware and software systems must be considered as a regular expense of doing business. As technology improves, these updates ensure that software is kept current. A company that issues regular updates, stands behind its products, and is investing in research for new products will produce a more satisfactory relationship than a company which does not.

Hardware Requirements

The hardware requirements described here are for currently available optometric software. Hardware usually can be purchased from the software vendor or separately from a local hardware vendor. Internet vendors such as Dell Computers also provide an alternative for hardware purchases. Be aware that software and hardware service and response time for service can be critical when an entire practice depends on a computerized system.

Most optometric software runs on Windows-based operating systems. The software will specify the processing chip needed, the suggested speed of operation, the operating system, hard disk capacity, random access memory, and external disk requirements. Most software vendors recommend an Internet-based, off-site backup system. Vendors who work with optometric software vendors provide the easiest most compatible backup systems. Peripheral hardware, such as internal fax modems and CD-ROM, are now standard on most computers. Networking requirements include software and hardware connections to allow multiple-user stations. Remote software allows access to the computer system by the practitioner from home or a satellite office. Printer types include ink jet or laser printers. The type of printer can be determined by the software system chosen and the type of correspondence used. Ink jet printers allow office personnel to print forms in various colors and are generally the least expensive to buy. Laser printers are quicker and do not cause smudging of the ink if handled too soon. They may be more expensive to purchase initially but are generally less expensive to run. Color laser printers are available and costs are coming down for this product.

Hardware options include larger monitors, flat screen monitors (which take up less desk space), and laptop or notebook computers vs. desktop models.

The computer workstation should be designed to provide maximum comfort and efficiency. Chairs should have proper back support and adjustable seats. Monitors should be placed slightly below eye level and should have antiglare screens. Keyboards should have wrist rests and should be adjustable so that the operator can reduce strain on upper back and neck muscles. The noise level of the printer should be considered and it may have to be placed away from areas where conversations are held with patients or where telephones are located.

The time spent on the computer by staff members should be regulated if possible. If one person has specific responsibility for data entry, work periods should be limited and periodic breaks provided.

CLINICAL APPLICATIONS FOR COMPUTERS

Computers are beginning to have applications beyond those that provide standard office management. As technology improves, the potential for increased clinical use will expand. Some of the current software options include the following:

Report writing. This application allows the office to compile a full range of patient, referral source, and other practitioner reports by entering information from the patient examination.

Dispensing. Software availability includes a computerized display of lifestyle dispensing options; the ability to show patients their appearance with various frame shapes, sizes, and colors; and frame availability by manufacturer and distributors. New products take the computerized image of a patient's face and design an optically correct pair of spectacles with the proper eye-face-spectacle relationship. This can be done in the office or via the Internet.

Electronic Medical Records (EMRs). Faced with pending government requirements, all health care practitioners will need to develop and use EMRs for claims submission and for ease of audit. A variety of precoded systems are available with varying degrees of complexity and levels of integration with other software. Stand-alone programs are probably the simplest to install and use, but using the output in conjunction with accounting and other office functions is more complicated. EMRs integrated into office software from which billing and claims processing can be accomplished offer much more utility to the user than the stand-alone programs in the long run. When evaluating a product, do more than simply watch a demonstration. A hands-on test by the probable user is far more revealing. Flexibility in additions and modifications to the EMR software and format is also a valuable feature. Most practitioners will want more and different items than those initially included with the software.

Differential diagnoses and therapy. Software programs exist to analyze and store data for various diagnostic tests. These data can be used for determining the course or effectiveness of therapy. Today, most visual field instruments come with statistical software packages that analyze visual field defects, determine the probabilities of such defects, and compare multiple fields on the same patient. Software also exists to transfer and compare findings on various automated devices. Computerized nerve fiber layer and optic nerve analysis is now commonplace

so that minute changes, not visible to even the most experienced retinologist, can be detected. This capacity can allow for more rapid diagnoses and treatment of conditions such as glaucoma. Databases also exist to help practitioners determine the differential diagnosis of pathologic conditions. Modems and communications software hold the promise of being able to transmit patient data, findings, or images to another location for immediate consultation.

Pharmacology. Current software allows a practitioner to enter the name of ocular or systemic medication taken by a patient and to obtain a list of ocular and systemic side effects or contraindications. The information can be entered from a case history and printed for the practitioner before the patient is examined. This information also can be printed and given to the patient to take home as a reminder.

Vision therapy. Computer programs offer practitioners the ability to treat various binocular, oculomotor, and visual perceptual deficits. These programs are often highly motivating for younger patients because of their resemblance to computer games. Vision therapy programs replace older instrumentation that is no longer made and allow for easier quantification of patient progress during therapy. For practices that offer in-office training, computer therapy programs allow increased flexibility by not requiring the constant supervision by the optometrist or therapist.

Contact lenses. Computers can aid in the design of rigid contact lens and specialty lens parameters. Corneal topography can be analyzed using photokeratography. This technique promises to allow more precise measurement of the cornea– contact lens relationship and of corneal changes that occur over time. Corneal topography software allows practitioners to determine how a particular contact lens might fit a patient's eye and can refine the lens design and fitting process, allowing for less trial and error.

Telemedicine. With the addition of minimal additional equipment, an office can move into the world of telemedicine. Numerous sources provide for the entry into this realm of medicine. Having expert consults available in real time will enhance the ability of a practice and practitioner to provide the most appropriate care at the time it is needed.

Low vision. Computers can be used as low-vision devices for the partially sighted and as aural word processing devices by the blind population. Various manufacturers produce computers that can be used with standard software to magnify the computer image to any level for the partially sighted; contrast and illumination also can be controlled. Talking computers are available to interface with standard software and enable blind patients to perform word processing and database management.

Personal digital assistants (PDAs). These handheld devices can be used in conjunction with standard computer software to allow the optometrist to have examination room access to information such as differential diagnoses, pharmacologic side effects of systemic drugs, and potential side effects of ophthalmic medications. Many current cell phones offer functions equivalent to a PDA. These products allow the consolidation of many elements on one device. With the consolidation of functions comes the increased risk of loss of data if a PDA failure should occur.

CONCLUSION

Computer applications have produced dramatic advances for both business and personal use. In the optometric office of the future, the computer will be one of the most important pieces of equipment used because it has the potential to manage both the business and professional care aspects of the practice. Because of this versatility of use, optometrists must understand and be prepared to apply computer technology to the wide array of business and patient care needs faced in private practice. EMRs will become the standard for documentation and the archiving of patient health information. Government agencies will provide the driving force by requiring EMRs for the reimbursement of the delivery of services.

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