

CHAPTER 3

INFORMATION TECHNOLOGY AND MANAGEMENT

Knowledge is power.

—Iman Ali Talib

LEARNING OBJECTIVES

- Assess the information technology needs of the medical practice.
- Consider the challenges of applying information technology in the medical practice.
- Recognize when to receive outside help on information technology issues.
- Articulate meaningful use and other regulatory requirements.

INTRODUCTION

We have all experienced the advantages of the digital world. It influences how we listen to music, how we pay our bills, how we conduct commerce, and how we learn and collect information. The information technology (IT) system is the backbone of the modern medical practice and is essential to supporting its operations and clinical functions. Virtually every aspect of the practice is potentially enhanced by the use of IT. Knowledge and information are power, and that power allows the practice to serve its patients as well as the community in a more precise and effective way than it could without IT capabilities.

Information technology in medical practices varies widely, from simple practice management systems (PMSs) to sophisticated longitudinal healthcare enterprise information systems, which may integrate a number of entities and functions (Nelson and Staggers 2018). Some electronic systems serve as health information exchanges (HIE), which connect organizations in a region or healthcare system (discussed in more depth later in the chapter).

For our purposes, the terms *digital* and *electronic* are used interchangeably, as are *information technology* and *electronic records*. Exhibit 3.1 illustrates the purpose and characteristics of an electronic system in the medical practice. Notice that the modern system is intended to service multiple stakeholders, so its design must be usable for a variety of purposes to enhance all stakeholders' performance. A system that does not fulfill these expectations will not be used, a situation that has plagued the digital transformation of medical practices.

PERFORMANCE

One of the biggest barriers to the acceptance of IT systems in medical practices is the performance of the system. How reliable is the system? How much of the time is it up and running? Unreliable systems encourage practices to maintain parallel paper systems "just in case," which is ultimately a waste of time and resources and should be avoided by implementing the most reliable IT systems available.

EXHIBIT 3.1

What IT Systems
Should Do

For Whom?	Patients Providers Support Staff
For What Purpose?	Patient Care Documentation Research Picture Archiving and Capture Other Ancillaries Communication Decision Support
What Characteristics Should They Have?	Usable Specific Secure Smooth Flow Implementable Scalable

A related issue is whether use of the system adds steps to a process previously performed manually. The practice needs to determine if these additional steps are worth the value added by the system. Additional tasks can increase the time needed to perform the functions of the practice and may increase employee frustration and reduce acceptance of the IT system if they do not add clear value.

To paraphrase a theme from the 1951 movie *The Day the Earth Stood Still*, it is easy to be impressed with the technology. The practice manager and governing body need to analyze the performance of the IT systems with great care and attention before making purchasing decisions. The focus should be on bringing value to the practice and its patients, which in turn depends on the selection and proper implementation of the right system for the practice (Cryts 2016).

INTERFACE

Simply put, the IT user interface is how individuals interact with the information technology systems. It is the connection between the human beings and the technology, and it is critical to the successful implementation of any information system.

The easier the IT system is to use, the more likely it will be accepted by the stakeholders. Providers often complain that the old paper way was faster. What this sentiment does not take into account is that more people than just the provider were involved in completing the old process, and the total effort expended may have been greater than the provider realized. With that said, protecting and supporting the productive capacity of the clinicians is essential because they are the primary limiting factor for the productivity of any medical practice.

The interface with other systems inside and outside of the practice is an important consideration as well, with interoperability, or the ability to communicate with the other systems, being a critical element. Does the practice intend to connect with hospital systems, payer systems, regional health information networks, or other vendors and service providers? The answer to this question greatly influences the IT system the practice should choose.

EDUCATION AND TRAINING

Education and training are essential to the proper implementation and use of the IT system; however, the value of these activities is often underappreciated by medical practices. As a result, inadequate resources are devoted to having all members of the practice properly educated on the use of the system. This lack of training leads to frustration and, of course, the inefficient implementation of the IT system.

A carefully devised plan for the education and training of practice members is essential to the successful implementation of any IT system. Developing such a plan is often

difficult, however, because devoting time to education and training takes away from the time available for clinical activities. As illustrated in exhibit 3.2, the initial loss of productivity that inevitably occurs with new systems may be regained, and productivity improved, as the use of the system becomes routine.

Protecting the physicians' time has always been an important issue for the medical practice. Although no concrete evidence has emerged at this point indicating that electronic records improve clinical productivity, they are essential to the administrative and operational side of the practice. One way to maximize the time of physicians and improve their productivity is to employ scribes. Scribes are individuals who help collect information for the physician by attending patient visits and taking notes from the history and physical and any other discussion that takes place. They then enter the data into the patient's electronic record, eliminating that step for the physician. The scribe has become a familiar member of the care team.

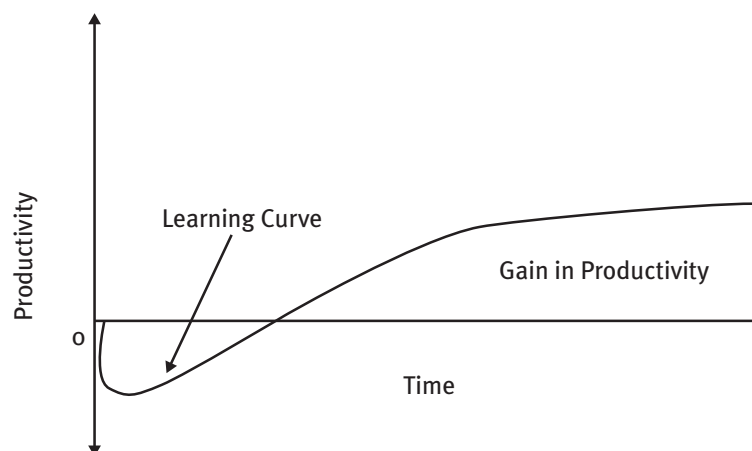
Health Insurance Portability and Accountability Act (HIPAA)

Legislation covering many aspects of patient privacy and the sharing of private health information.

MEANINGFUL USE

The Health Information Technology for Economic and Clinical Health Act (HITECH) was passed as part of the American Recovery and Reinvestment Act of 2009. HITECH provides significant provisions for medical practices intended to encourage a more rapid adoption of electronic health information systems than was occurring prior to the act's passage. It also includes provisions to enhance enforcement of the **Health Insurance Portability and Accountability Act (HIPAA)** and requires practices to engage in the meaningful use of electronic health information systems in a series of three stages (GPO 2009).

EXHIBIT 3.2
The IT Learning Curve



The term *meaningful use* refers to the IT capabilities practices adopted for providing care and engaging patients. The three stages of meaningful use are as follows (HealthIT.gov 2013):

1. Patient access
2. Patient–provider messaging; educational resources; and information gathering, such as the ability of the system to upload data from home monitoring devices
3. Self-management tools and electronic reporting on the patient care experience

As can be seen in exhibit 3.3, stage 1 begins the electronic records implementation effort with a focus on capturing and sharing data. Stage 2 focuses on establishing criteria for advanced clinical processes, and stage 3 looks at improving outcomes. Stage 3 is of

			EXHIBIT 3.3 Meaningful Use Initiative
Stage 1: Meaningful Use Criteria Focus on Data Capture and Sharing	Stage 2: Meaningful Use Criteria Focus on Advanced Clinical Processes	Stage 3: Meaningful Use Criteria Focus on Improved Outcomes	
Electronically capturing health information in a standardized format	More rigorous health information exchange (HIE)	Improving quality, safety, and efficiency, leading to improved health outcomes	
Using that information to track key clinical conditions	Increased requirements for e-prescribing and incorporating lab results	Decision support for national high-priority conditions	
Communicating that information for care coordination processes	Electronic transmission of patient care summaries across multiple settings	Patient access to self-management tools	
Initiating the reporting of clinical quality measures and public health information	More patient-controlled data	Access to comprehensive patient data through patient-centered HIE	
Using information to engage patients and their families in their care		Improving population health	
Timeline: 2011–2012	Timeline: 2014	Timeline: 2016	

Source: Adapted from HealthIT.gov (2013).

particular significance because it requires the meaningful interaction of patients with the provider using electronic means and encourages the practice to focus on improving the population's health.

Practices were expected to have achieved stage 3 by 2016.

HITECH has indeed provided the needed impetus for accelerating the use of electronic health information systems in medical practices and moving practices from stand-alone IT systems to fully integrated systems, as shown in exhibit 3.4.

A general mental model of the information management process is illustrated in exhibit 3.5 in terms of the policies, processes, and goals of the organization. It shows the continuum of information to knowledge as data are collected and processed to create a knowledge base that can be used for decision making and operations.

EXHIBIT 3.4

Continuum of IT
System Integration

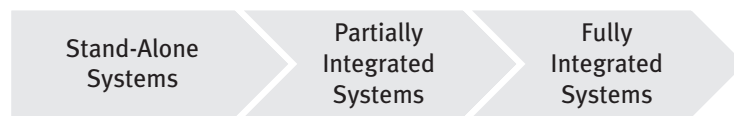
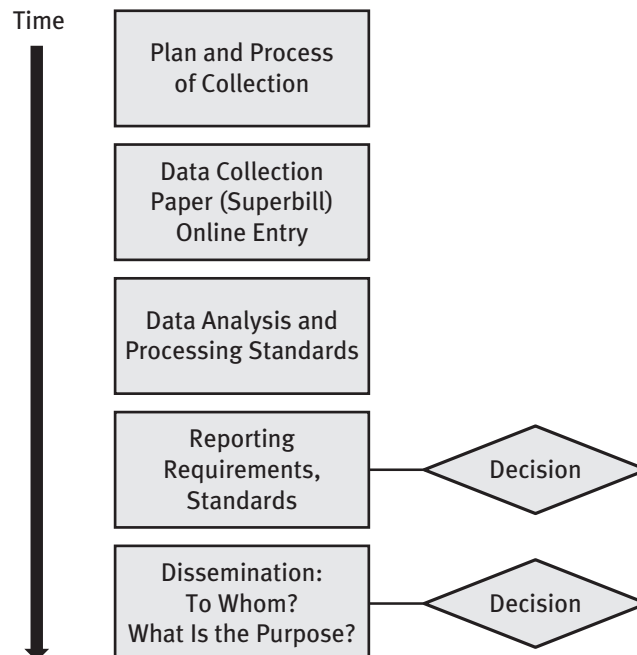


EXHIBIT 3.5

Data Collection,
Processing, and
Reporting



PRACTICE MANAGEMENT SYSTEMS

An important part of the overall IT system for medical practices is the PMS. PMSs perform the following functions (AMA 2016):

- ◆ Capture patient demographics
- ◆ Schedule appointments
- ◆ Preregister patients for upcoming procedures (including insurance eligibility and benefits confirmation)
- ◆ Determine the patient's financial responsibility to facilitate payment collection at the point of care
- ◆ Maintain lists of insurance payers
- ◆ Perform billing tasks
- ◆ Generate administrative reports

PMSs also can perform the aggregation of large data sets over time, which allows the practice to take a broad view of important management and healthcare issues. This process is difficult, if not impossible, using paper record systems.

Because data management is an important component of effective medical practice operations, practice managers require some knowledge about what it is, when it is used, and for what purpose it is used. Data management is a vast field, a thorough understanding of which may be beyond the scope of most practice management generalists. Suffice to say here that data management focuses on ensuring that the practice properly maintains and makes available the data needed to operate the practice effectively and efficiently. It is a database management function, sometimes referred to as a data warehouse, that allows the practice to store vital information in an interactive and retrievable format, thus facilitating the creation of custom reports.

Some important functions of data management include the following:

- ◆ *Decision support*—This function assists practices in justifying the business case for actions. For example, a multispecialty practice may consult a report generated by the data management system to determine whether to hire a geriatrician on the basis of the number of patients older than age 65 seen in the practice. Similarly, a practice manager may notice a trend in the data showing the increased ordering of a particular procedure and decide to purchase a new piece of equipment to accommodate the increase in demand.

Dashboard

Similar to a car's dashboard, provides a medical practice integrated and consistently presented operational data for decision making.

Analytical

Decision-making style in which the decision maker gives careful consideration to the uniqueness of situations. This style is typically used when tolerance for ambiguity is high and decision makers are rational in their thinking.

- ◆ *Business intelligence*—This attribute of data management takes the data available in the practice from its information and data systems and converts it into information that can be used in developing strategic plans or to provide better service to patients. For example, a practice may glean an opportunity from the business intelligence gathered on the zip codes of the patient base for a possible location of a new practice satellite office.
- ◆ *Creation of metrics for improvement and **dashboards** for tracking progress*—By analyzing the raw data of the practice, data management tools can compile a relevant series of metrics and create dashboards that help practice leaders evaluate the performance of the practice.

Modern PMSs should include **analytical** tools that assist with these and more processes. Exhibit 3.6 illustrates a typical data collection, processing, and reporting structure. In developing these systems, practices must be sure to consider how the system will function and what it is expected to produce before purchasing the system.

OTHER IMPORTANT SYSTEMS IN THE MEDICAL PRACTICE

Some additional electronic systems in the medical practice that comprise IT and management functions are the following:

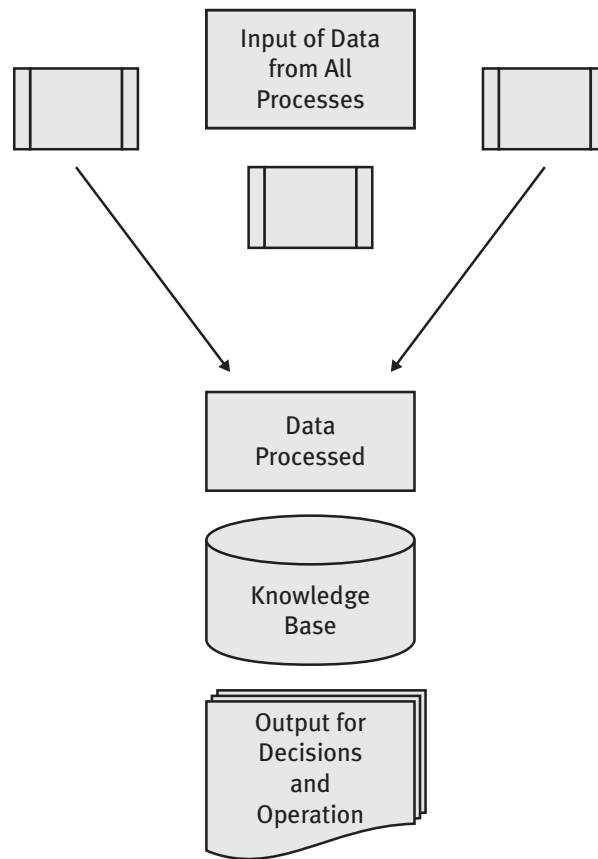
- ◆ Medical records
- ◆ Laboratory testing and results
- ◆ Imaging, sometimes referred to as picture archiving and communication systems
- ◆ Human resources
- ◆ Accounting
- ◆ Financial management

One could argue with great success that the patient medical record is the most valuable and important document in the medical practice. With that in mind, we focus on describing the medical records system in this section.

MEDICAL RECORDS

The maintenance and safekeeping of a patient's medical record is the principal function of the medical records unit. The records contain the proof of what activities were undertaken,

EXHIBIT 3.6
Information
Management
Model



by whom, how they were done, why they were necessary or appropriate, and where they were performed. In addition, medical records capture a plan for future care.

Most medical practice records contain the following information:

- ◆ Physician notes, including a treatment plan and treatments provided
- ◆ Operative notes related to surgical procedures
- ◆ Laboratory test orders and results
- ◆ X-ray test orders and results
- ◆ Documentation of any **ancillary services** provided or indicated, such as laboratory or audiology services

Ancillary services

Range of services provided to support the work of a primary physician, classified into three categories: diagnostic, therapeutic, and custodial.

- ◆ Communications from other providers in the form of letters, copies of records, and so on
- ◆ Patient's hospital records, such as discharge summaries, operative notes, and copies of test results from the hospital
- ◆ Consultative reports, which describe the background, evaluation, and plan for the care of the patient
- ◆ Any treatment plans other than those documented in the physician notes, including goals to be achieved as through a rehabilitation plan
- ◆ Patient's demographic information
- ◆ Patient's insurance or health plan information
- ◆ Patient's upcoming appointments with the practice or related appointments with another provider
- ◆ Past and current diagnoses
- ◆ Patient's allergies
- ◆ Patient's medication list
- ◆ Physician orders
- ◆ Patient's home health or hospice care information
- ◆ Follow-up indicated for the patient
- ◆ Nurse's notes
- ◆ Patient's self-care status
- ◆ Patient's disabilities and impairments
- ◆ Patient's equipment requirements
- ◆ Patient's nutrition details
- ◆ Therapist notes
- ◆ Social service agency notes

Patient Records Completed Through Clinical Content Integration

One of the great challenges of medical records management is completeness because patient records come from so many sources. Practices should consider opportunities to join local,

regional, and national HIEs to gain access to more complete and accurate information from other participating practices, thereby helping to ensure that patients receive improved service and care.

HIEs are just part of the movement toward increasing the completeness of patient records through clinical content integration. Healthcare systems are integrating practices that are not owned but are affiliated, providing them access to critical patient clinical information.

The term *health information exchange* refers to an organization of reliable and interoperable electronic health-related information sharing conducted in a manner that protects the confidentiality, privacy, and security of the information. Currently, regional health information organizations (RHIOs) are the most common form of HIE organization. A RHIO governs the exchange of health information between so-called healthcare stakeholders within a defined geographic area. The goal of this exchange is to improve healthcare for people in the community (Jones and Groom 2017).

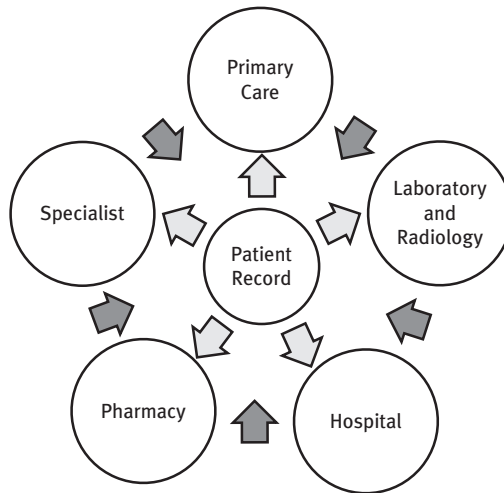
RHIOs typically include a range of participating healthcare provider entities as well as other health stakeholders, such as payers, laboratories, and public health departments. They are often managed by a board of directors composed of representatives from each participating organization. For a RHIO to be established, stakeholders in the proposed RHIO must reach consensus on what information can be shared among different participating entities. In addition, prior to exchanging information, the entities need to sign data use agreements. Because the capacity to effectively store and manage clinical data electronically is a prerequisite for participating in an HIE, RHIOs often offer programs to assist affiliated providers with health IT adoption at the institutional level (AHRQ 2017).

These exchanges employ nationally recognized standards for interoperability and security (HealthIT.gov 2014a, 2014b). Medical practices that participate in these exchanges have wider access to not only patient data but population health information as well.

Population health management is a healthcare approach that focuses on improving healthcare outcomes for an entire group or population. The concept of population health takes a broad view of patient care by emphasizing engagement of physicians, other providers, and the patient. The idea is not to reduce the quality of care for the individual but rather to broaden the scope of care to consider the larger group as well as the individual.

Data are essential for population health management, as they inform the medical practice about the health status of the community. If a practice does not understand the status of its patient group, it will fail to know whether its health improvement efforts work. Take, for example, the A1c levels of a group of diabetic patients. The A1c level is a measure of how well the patient's diabetes is controlled. To measure the effectiveness of a care strategy for diabetic patients, the practice must be able to compile an aggregate measure of the A1c level for the entire group of patients under its care or in the population.

HIEs allow a medical practice to integrate patient information from multiple provider sources, as illustrated in exhibit 3.7.

EXHIBIT 3.7Health Information
Exchange

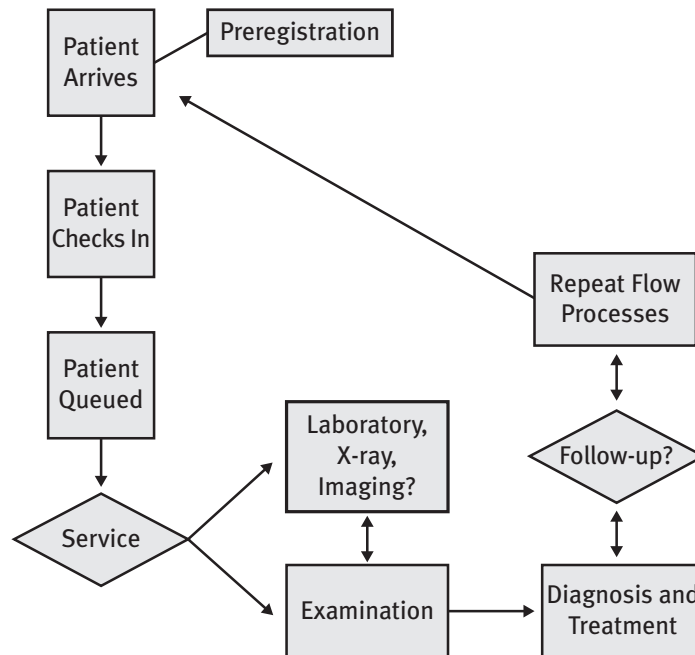
The Wisconsin Health Information Exchange, known as WISHIN, provides a good example of how an HIE can be organized and work for the benefit of medical practices and their patients. The exchange connects more than 1,000 providers and, in addition to health data sharing, offers a platform for practices to conduct research and focus on health issues that are of particular interest to the region (WISHIN 2013).

THE PATIENT FLOW PROCESS AND IT'S ROLE

The effective practice carefully considers process flow issues. Many processes can be improved using digital technology: Consider the example in exhibit 3.8, which illustrates a simple process flowchart for a patient visit. Each of these processes can be enhanced with digital technology, and each step may provide opportunities for improvement, as discussed in chapter 10. In this case, reminders, decision points, and standardization of procedures are enhanced with the digital technology.

THE NEED TO STANDARDIZE PROCESSES IN A PRACTICE

As illustrated by the flowchart in exhibit 3.8, applying digital technology to procedures requires careful attention to process standardization for each activity to function effectively. This requirement has been a barrier to technology adoption by the healthcare industry because it can only be effective if the practice standardizes its processes. That standardization involves a learning curve that, in the short run, will reduce the efficiency of the operation

EXHIBIT 3.8
Patient Flow
Process

and therefore its productivity. Practices often find this side effect untenable and are unwilling to invest the time and financial resources needed to make the conversion. However, the short-term disadvantages of adoption are often outweighed by the long-term gains. Exhibit 3.2 earlier in the chapter illustrates this phenomenon.

INTEROPERABILITY

As defined by the Healthcare Information and Management Systems Society (HIMSS 2016), “Interoperability means the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities. There are three levels of health information technology interoperability: 1) Foundational; 2) Structural; and 3) Semantic.” The following explanation of each level is adapted from HIMSS (2016):

1. *Foundational* means there is the ability for data exchange to occur between one information technology system and another without data interpretation. Albeit an oversimplification, data interpretation is a term that describes the conversion of data from one computer language to another.

2. *Structural* interoperability is a type of data exchange that allows movement of healthcare data from one system to another such that the clinical or operational purpose and meaning of the data are preserved and unaltered. It ensures that data exchanges between information technology systems can be interpreted at the data field level. This is known as syntax.
3. *Semantic* interoperability is the ability of two or more systems to exchange information in a usable way. This level of interoperability supports the electronic exchange of patient summary information among caregivers and other authorized parties via potentially disparate EHR systems and other systems to improve quality, safety, efficiency, and efficacy of healthcare delivery.

Initially, most of the IT systems in medical practices were stand-alone systems with little integration. For example, practices used separate systems for laboratory activities, radiology functions, patient records, and administrative processes via the practice management system. These systems were often created by different vendors using different computer languages, protocols, and procedures, resulting in a lack of interoperability. That made it virtually impossible or, at best, very expensive for the systems to talk to one another. This lack of interoperability reduced the effectiveness of EHRs and thus further reduced practices' satisfaction with these products.

More modern systems tend to use common computer languages and standardized interfaces, which allow for greater interoperability.

VALUE-BASED CARE AND IT

A modern IT system is essential if a practice wishes to participate in value-based care (CMS 2017). The ability to provide value-based care depends on a practice having contemporaneous (real-time) data for its patient base on the care provided, the outcomes achieved, and the costs incurred from practice operations. This level of data acquisition simply is not realistic with a manual system; manual data capture is difficult, inaccurate, time-consuming, and costly.

POPULATION HEALTH

For most of the US healthcare system's history, the provision of care has focused on the individual patient. Although this aim is clearly a very important and necessary goal that still needs to be pursued, it is insufficient for healthcare in the new era. Taking good care of individual patients must be accompanied by a focus on the care of an entire population of patients. Population health management reflects second-curve medicine (HRET 2013; see also chapter 1).

Population health management is a process by which patient data are collected from multiple sources, compiled into the patient record, and accessed by providers to inform them of the population's health status. Metrics are such an important aspect of population health management that practices may be putting their business at risk in terms of reimbursement if they ignore value-based measures. And of primary importance, a practice that cannot measure the outcomes it seeks to achieve will not be able to measure the improvements its innovations are creating.

In short, having well-developed IT systems in place is essential to effective population health management.

PRACTICAL ASPECTS OF MEDICAL PRACTICE INFORMATION SYSTEMS

In this section, we discuss several practical issues surrounding IT in medical practices, including system selection, installation failure, the cloud, governance, and privacy and security.

SELECTING A SYSTEM FOR THE PRACTICE

When considering electronic systems for the medical practice, whether purchasing cloud services (discussed later in the section) or hosting servers on site at the practice, practice leadership must address the following questions for successful implementation:

- ◆ How usable is the system? A major complaint of clinicians about electronic systems is that they are not user-friendly or intuitive and therefore are disruptive to workflow. The practice leader must be sure to ascertain the ability of the system to adapt to the unique needs of the users.
- ◆ How customized is the system to the practice? The capabilities of the system should closely match the needs and expectations of the practice, and the system should fit seamlessly into the practice structure. Achieving such compatibility may require the development of special templates for different specialties by a consultant or vendor.
- ◆ How compatible is the system's operation with the natural workflow of the practice? Disruption of workflows can be a major impediment to implementation and may decrease practice efficiency if attention is not paid to this detail early on.
- ◆ How deployable is the system? System launch requires careful planning to be sure that the system can be integrated into the practice with minimal disruption to its operations. Another important consideration is the amount of training needed for staff to properly use the system. Most medical practices

are busy environments, and large blocks of time to devote to training can be difficult to schedule.

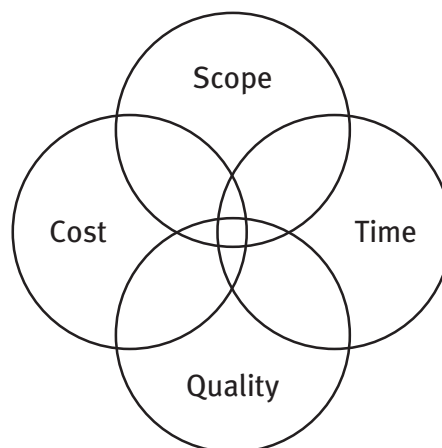
- ◆ Is the system scalable? In other words, can it grow and adapt with the practice to keep up with the demands of an increasing workload? Determining scalability at the beginning of the selection process helps prevent the need to find new systems in the future as a practice grows.

STEPS IN THE SYSTEM SELECTION PROCESS

The selection of an IT system for the medical practice demands a disciplined project management approach. Exhibit 3.9 illustrates the constrained relationships among scope, time, cost, and quality that typically develop when any project is undertaken. All projects require an optimization of their scope, the time required to complete them, and the quality (value or cost could be substituted here) of the desired outcome. The larger the scope, the more the project will cost or the quality will be reduced, and the longer it will take to implement. Similarly, as scope decreases, cost is reduced, and quality increases, and the time to implement may decrease. These rules may be simple, but they are critical to consider in the planning of a project such as information systems implementation. Many IT projects undertaken in medical practices have failed because practice leaders failed to account for the relationships among scope, quality, cost, and time to implement. For example, medical practices often fall victim to the fierce urgency of now and rush to complete a project, risking the long-range goals of the project.

EXHIBIT 3.9

The Constrained Relationship in Project Management



The system selection process, whether for a practice management system, an EHR, or another IT system, requires the completion of several important steps.

- Step 1. Consider the need for outside independent expertise. IT is a rapidly changing field and requires a level of expertise that may not be available in the practice. The leadership should consider obtaining outside independent expertise before undertaking a major selection process for an IT product. In this process, however, it should emphasize the importance of independence to prevent conflicts of interest that may be present if the outside expert is affiliated with the vendor of the IT system being implemented.
- Step 2. Conduct a needs assessment. This step should involve members from every department and service area of the practice. Focus on the outcomes desired and the problems the practice is attempting to address by implementing an IT solution.
- Step 3. Develop a list of must-have criteria. Be sure the practice has a way to measure the success of the project prior to system selection; developing a list of criteria will help make that a reality.
- Step 4. Find appropriate comparables. Medical practices vary widely in the services they offer, their size, and many other characteristics. Seek advice from practices that are similar to yours to help establish criteria that may be useful in the selection process. This step offers the practice manager and other leaders an opportunity to discuss the project with individuals in similar circumstances who have previously gone through the process.
- Step 5. Develop a list of potential vendors. Checking with industry contacts, leaders at the comparable practices, and professional organizations may be useful for creating this list. Consider attending information system trade shows as an effective way to gain firsthand knowledge of the marketplace.
- Step 6. Develop a request for proposal (RFP). The RFP helps standardize the responses from the vendors, making comparisons straightforward. In addition, requesting specific information contained in the RFP will ensure that the vendors respond to the needs of the practice and that the must-haves are being addressed.
- Step 7. List the top vendors who seem to offer the best solutions for the practice.
- Step 8. Interview each vendor on the list of top candidates. This step provides practice leadership the opportunity to receive clarification on any

questions that arise from responses on the RFP and can offer a sense about the vendor's reliability and expertise.

Step 9. Negotiate a contract with the vendor of choice. This contract should pay careful attention to the scope of the project, including the following elements:

- ◆ Specific features that are included in the products and services to be provided
- ◆ The price to be paid and the terms of payment
- ◆ The timeline for delivery of the agreed-on products and services
- ◆ Any penalties for failure to deliver as scheduled
- ◆ Guarantees and other warranties for the products and services
- ◆ Any future promise of services and support

Information system contracts should be as specific as possible to prevent misunderstandings related to the installation of the system and any follow-up service. IT projects in medical practices are notorious for going over budget, falling behind schedule, and in general being frustrating to execute.

Step 10. Prepare for implementation. This is a critical step in the process because time must be set aside for training staff and testing the system. Alternative operating scenarios will need to be used during the implementation process. Preparation for implementation also includes thorough discussions with all members and stakeholders in the practice to be sure they understand the implications of the implementation process. IT projects tend to be very disruptive, so a comprehensive, understandable, and convincing presentation about the nature of the implementation and potential consequences is essential.

Step 11. Implement the new system. Following the plan that has been constructed for implementation is a key to success in this step, as is frequent communications with all stakeholders as implementation proceeds.

Step 12. Reflect on the project. Projects rarely go completely according to plan, and important lessons always come from reflecting on the ways the project rollout varied from expectations. One way to conduct a meaningful reflection on the project is to gather all the key players in the implementation of the project in a structured meeting that adheres to the following guidelines:

- ◆ Establish the purpose and background of the meeting so participants understand it is not intended to assign blame but to share lessons that can be applied to future projects.
- ◆ Establish ground rules and guidelines for the meeting process. These guidelines include asking attendees to be open and honest, encouraging everyone in the meeting to participate, reducing external distractions by turning off cell phones and other devices, maintaining an atmosphere of confidentiality, and keeping the discussion on target. If unrelated issues arise during the discussion, defer them to another forum (and be sure to follow up as promised).
- ◆ Ask the following questions:
 - What went well with the implementation?
 - What would we do again for future projects?
 - What did not go well, and what did we learn that we can improve on?
 - Specifically, what would we do differently for future projects?
- ◆ Summarize the discussion and any follow-up measures that arose.
- ◆ Thank the participants for their involvement, and let them know how future information regarding the meeting will be communicated.

COMMON REASONS FOR INSTALLATION FAILURES

Much of the success of an installation of a new electronic system depends on the attentive leadership and governance of the project. Leadership typically takes the form of a steering committee that includes the practice leadership and physician representation. The committee determines measurable goals and the best means for system testing, including pre- and post-live measurements to assess success.

Leadership is responsible for establishing reasonable expectations of what will likely occur in the process as well as what the result of the implementation will be. One good way to develop these expectations is to ask the stakeholders what success will look like to them once the system is implemented. If the expectations of the stakeholders seem unrealistic or beyond the scope of the project, these discrepancies should be resolved before the project proceeds.

Complicated and intricate interfaces can be difficult to implement and manage. However, such innovations as voice recognition technology have improved greatly, providing convenient and efficient interfacing with the IT system, especially the EHR. Thus, advanced technology should not be dismissed merely because it is complicated and difficult to implement.

CLOUD COMPUTING AND THE MEDICAL PRACTICE

The impact that the Internet has had on the medical practice would have been difficult to imagine 30 years ago. And it will continue to have a major, largely unforeseen, influence in the future. One such impact that has emerged is the use of cloud computing, sometimes called software as a service (SaaS).

Cloud computing allows virtually every aspect of medical practice IT services to be performed “on the cloud.” *The cloud* is a generic term that refers to the ability to access services and computing power through a service provider via the Internet without maintaining the hardware and software on-site at the practice. The practice must still maintain equipment by which to access the Internet and to input to or download information from the cloud, but the amount of equipment needed is greatly reduced from that needed for a stand-alone system, or a system that is primarily maintained by the practice. Obviously, cloud computing carries many potential advantages and disadvantages. Some advantages are the following:

- ◆ *Reduced cost.* The cost of cloud computing can be significantly lower than the cost involved in maintaining the software, hardware, and related services in the practice. Cloud services often use the latest hardware and software available, which are usually difficult for small and medium-sized practices to afford.
- ◆ *Increased security.* The physical and cyber security of the practice’s IT systems have become an increasing area of concern for most practices. Moving practice IT functions to the cloud reduces the chance of a physical loss of IT assets and may reduce the probability of cyber threats.
- ◆ *Twenty-four/seven service availability.* Most cloud computing services operate on a round-the-clock basis.
- ◆ *Backup.* Reputable cloud service companies offer sophisticated backup services to prevent data loss due to catastrophic IT failures.
- ◆ *Scalability.* Cloud services may be much more scalable than traditional IT systems.

- ◆ *Expertise.* Most small and medium-sized practices do not have the IT expertise on-site that is available with a cloud computing service.
- ◆ *Flexibility.* Although most cloud services require a service contract of a specified length, the commitment to any cloud service may be less than the commitment the practice makes when buying the equipment and software and hiring the necessary expertise to operate it.

Disadvantages include the following:

- ◆ *Variable reliability of the Internet.* Cloud services depend on an Internet connection, and that connection can be a primary point of failure for a medical practice's IT systems. The practice must consider the reliability of its Internet service provider as well as its routers when making the decision to use cloud-based computing services.
- ◆ *Potential for cloud service provider errors.* Cloud service providers are not perfect. Data may be lost. The company might go out of business or its performance quality might be lower than expected. All these types of issues must be considered, and a thorough understanding of the consequences of SaaS gained, before committing to a cloud-based service.
- ◆ *Lack of function compatibility.* If the practice does not switch all its IT systems to the cloud-based service, will all the IT functions still be compatible? The practice needs to determine which, if not all, services will be transferred to the cloud, assess the provider's services for compatibility issues, and plan for service gaps before committing to moving to the cloud.
- ◆ *Negative or skeptical stakeholder temperament toward the cloud.* Some people simply are not comfortable with the idea that their data and important business functions are being handled remotely by a cloud service. **Attitudes** are a rather intangible consideration, but they should be discussed with practice stakeholders to gauge comfort level (Torrieri 2011; Moumtzoglou and Kastania 2014).

Attitude

Mental state indicating level of readiness.

IT GOVERNANCE

Successful adoption of an IT system for a practice requires well-structured IT governance. Forming this structure is the first step in going digital.

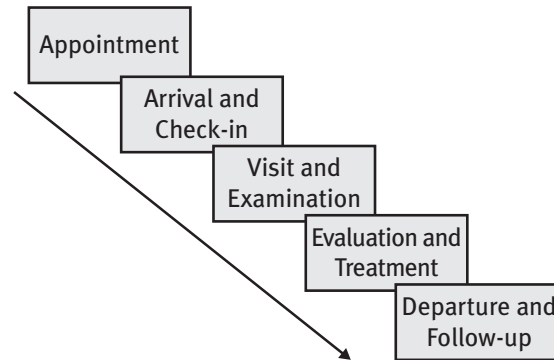
IT governance frames the expectations for the practice for how the IT systems being considered will enhance the operations and bring additional value to patients. Like

all practice decisions, IT system implementation must be guided by the mission, vision, and values of the practice.

A readiness assessment of the practice should be conducted to analyze how the practice is organized. In this process, each of the following elements should be honestly and realistically assessed (HealthIT.gov 2016):

1. Is adequate support in place for the investment and training in IT systems by the governing board of the practice?
2. What administrative processes are employed by the practice?
3. Are these administrative processes streamlined and documented? (An example is shown in exhibit 3.10.)
4. Are clinical workflows in the practice well understood and documented on flowcharts?
5. Are data collection and reporting processes in the practice well established and documented?
6. What is the level of computer literacy and comfort with IT of practice staff and physicians?
7. Does the practice have access to reliable and adequate IT infrastructure, such as high-speed Internet connectivity?
8. Does the practice have sufficient financial capital to purchase new or additional hardware?
9. Do any clinical priorities need to be considered, such as diabetic care, morbidity from obesity, and other chronic disease? (In specialty practices, a registry is often helpful in following patients with particular diseases or those that have undergone special procedures. A disease registry is a tool and process for tracking the clinical care and outcomes of a specified patient population. Registries are used to support care management of these groups of patients. For example, a disease registry might track all patients with diagnoses of heart disease or diabetes.)
10. Does the practice have specialty-specific requirements?

One of the biggest challenges in introducing medical practices to modern information management systems has been the slow adoption rate. IT adoption in practices has lagged other areas of the healthcare industry for a number of reasons, including the following:

**EXHIBIT 3.10**

Simple Process
Flowchart for a
Patient Visit

- ◆ *High cost.* Physicians have long demonstrated efficiency in their ability to use paper records. The cost and inconvenience of conversion have been major impediments to implementing information management systems in the practices.
- ◆ *Issues surrounding change management.* Although much more efficient than paper records, the adoption curve for an information management system requires changes in process flow and the adoption of new skills. Practitioners are often reluctant to embrace these kinds of changes.
- ◆ *Lack of interoperability.* Many early medical record systems were proprietary, which often made interconnectivity among systems difficult to achieve, limiting the usefulness of the technology. In addition, the companies that offered these systems were often small and prone to leaving the market, either through merger and acquisition or by going out of business. As a result, practices were left with systems that could not be maintained and therefore had limited usefulness. Although this situation has greatly improved in recent years, the concern lingers and should be considered when evaluating any IT system.

SYSTEM SECURITY AND PRIVACY

The concern for security and privacy in the healthcare environment has never been greater than it is today. According to Gemalto (2015), a cybersecurity analyst firm, 34 percent of cyber breaches taking place in the first half of 2015 occurred in healthcare institutions. Although little information is available about specific breaches related to medical practices, this trend represents an area of great concern. Practices must be vigilant to safeguard their

data not only to protect the integrity of the practice but also to ensure the privacy of the patients. The biggest issue related to the breach of healthcare data is identity theft; however, new threats have emerged, including the use of ransomware, whereby malicious software is implanted in the computer system that denies access to the data in the system until a ransom is paid to the hackers. Blackmail is another potential problem.

Whatever the specific threat, most patients do not want their personal information shared with others. In one notable case, Anthem's systems were hacked and as many as 130 million patient records may have been compromised (McCann 2015).

HIPAA violations are also on the rise. As exhibit 3.11 illustrates, the steady increase in HIPAA violations reported and resolved for the years 2003 through 2012 has coincided with the increase in electronic records. Note that the number of investigations resulting in corrective action has also increased, from 17 percent in 2003 to 36 percent in 2012. The most common sources of complaints, according to these data, are impermissible access and disclosure (HHS 2016).

These data are an indicator that, although malicious hacking is a serious source of compromise for healthcare systems, violations of HIPAA and similar data breaches are

EXHIBIT 3.11
HIPAA Violations

Year	Investigated: No Violation		Resolved After Intake and Review		Investigated: Corrective Action Obtained		Total Resolutions
Partial Year 2003	79	5%	1,177	78%	260	17%	1,516
2004	360	7%	3,406	71%	1,033	22%	4,799
2005	642	11%	3,889	68%	1,162	21%	5,693
2006	897	14%	4,128	62%	1,574	24%	6,599
2007	727	10%	5,017	69%	1,494	21%	7,238
2008	1,180	13%	5,940	63%	2,221	24%	9,341
2009	1,211	15%	4,749	59%	2,146	26%	8,106
2010	1,529	17%	4,951	54%	2,709	29%	9,189
2011	1,302	16%	4,466	53%	2,595	31%	8,363
2012	979	10%	5,067	54%	3,361	36%	9,407

Source: HHS (2016).

more commonly because of careless behavior of individuals in the practice. Some of these behaviors include the following (Zabel 2016):

- ◆ Lacking or not enforcing Internet use policies.
- ◆ Not encrypting sensitive information. All information sent through the Internet should be encrypted to prevent malicious use of practice or patient information.
- ◆ Not training people properly on Internet security. This training should be a standard part of new employee orientation, and refresher training should occur on a regular basis.
- ◆ Using weak passwords, sharing passwords, or writing passwords in locations where they can be easily found. Another problem related to passwords is that many users fail to change them on a frequent basis.
- ◆ Clicking on malicious links (known as phishing) and knowingly or unknowingly providing access to cyber criminals.
- ◆ Not having rule-based access. Everyone working on the practice computer system should be given access based on their need to know specific information and on their roles and responsibilities. Failing the establishment of these measures, if a breach occurs, most access to the system should be limited to some extent.
- ◆ Having inadequate firewall, malware, and virus protection. A firewall is a network security system designed to prevent unauthorized access to or from a private network. Firewalls and other preventive programs can limit the potential for unauthorized access as well as the introduction of malicious software into the practice's IT systems. They can be software based, hardware based, or a combination of both.
- ◆ Failing to regularly monitor systems for failure. All IT systems in the practice should be checked regularly for the possibility of breaches, malware, and other malicious activity.

DISCUSSION QUESTIONS

1. What are some of the important purposes of an electronic records system?
2. Discuss some of the reasons that implementing electronic records in a medical practice is so difficult.
3. What is meant by the term *meaningful use*, and what are its components?
4. What are some important considerations for project management in the implementation of an information system?
5. What are some key steps in selecting a medical record system for the practice?

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