Chapter One

1

History and Evolution of Electronic Health Records

Learning Outcomes

After completing this chapter, you should be able to:

- Define electronic health records
- Understand the core functions of an electronic health record as defined by the Institute of Medicine
- Discuss social forces that are driving the adoption of electronic health records
- Describe federal government strategies to promote electronic health record adoption
- Explain why patient visits should be documented at the point of care
- Explain why electronic health records are important
- Describe the flow of medical information into the chart
- Compare the workflow of an office using paper charts with an office using an electronic health record
- Contrast inpatient and outpatient charts
- Discuss patient registration and appointment scheduling

History of Electronic Health Records

The idea of computerizing patients' medical records has been around for years, but only in the past decade has it become widely adopted. Prior to the **electronic health record (EHR)**, a patient's medical records consisted of handwritten notes, typed reports, and test results stored in a paper file system. Today paper medical records are used in fewer healthcare facilities. The transition to electronic health records is well underway.

Institute of Medicine (IOM)

Beginning in 1991, the **IOM** (a division of the National Academies of Sciences, Engineering, and Medicine) sponsored studies and created reports that led the way toward the concepts we have in place today for electronic health records. Originally, the IOM called them *computer-based patient records*.[1] During their evolution, EHRs have had many other names, including *electronic medical records*, *computerized medical records*, *longitudinal patient records*, and *electronic charts*. All of these names referred to something intended to replace the paper chart. In 2003, the IOM chose the name *electronic health records*, or EHR, because "health" means "a state of well-being," and the goal of computerizing medical records is to improve the delivery of safe, quality care focused on patients' health.

The IOM report[2] put forth a set of eight core functions that an EHR should be capable of performing. The influence this report had on the development of EHR cannot be overstated. The eight core functions listed here became determining factors in the evolution of EHR, and the ability to perform these functions is the criteria by which EHRs are judged.

The eight core functions are as follows:

Health information and data This function provides a defined data set that includes such items as medical and nursing diagnoses, a medication list, allergies, demographics, clinical narratives, and laboratory test results. Further, it provides improved access to information needed by care providers when they need it.

Result management Computerized results can be accessed more easily (than paper reports) by the provider at the time and place they are needed.

- Reduced lag time allows for quicker recognition and treatment of medical problems.
- The automated display of previous test results makes it possible to reduce redundant and additional testing.
- Having electronic results can allow for better interpretation and for easier detection of abnormalities, thereby ensuring appropriate follow-up.
- Access to electronic consults and patient consents can establish critical links and improve care coordination among multiple providers, as well as between provider and patient.

Order management **Computerized provider order entry (CPOE)** systems can improve workflow processes by eliminating lost orders and ambiguities caused by illegible handwriting, generating related orders automatically, monitoring for duplicate orders, and reducing the time required to fill orders.

- CPOE systems for medications reduce the number of errors in medication dose and frequency, drug allergies, and drug–drug interactions.
- The use of CPOE, in conjunction with an EHR, also improves clinician productivity.

Decision support Computerized **decision support** systems include prevention, prescribing of drugs, diagnosis and management, and detection of adverse events and disease outbreaks.

- Computer reminders and prompts improve preventive practices in areas such as vaccinations, breast cancer screening, colorectal screening, and cardiovascular risk reduction.

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[1] R. S. Dick and E. B. Steen, *The Computer-based Patient Record: An Essential Technology for Health Care* (Washington, DC: Institute of Medicine, National Academy Press, 1991, revised 1997, 2000).
[2] Ibid.

Electronic communication and connectivity Electronic communication among care partners can enhance patient safety and quality of care, especially for patients who have multiple providers in multiple settings that must coordinate care plans.

- Electronic connectivity is essential in creating and populating EHR systems with data from laboratory, pharmacy, radiology, and other providers.
- Secure e-mail and web messaging have been shown to be effective in facilitating communication both among providers and with patients, thus allowing for greater continuity of care and more timely interventions.
- Automatic alerts to providers regarding abnormal laboratory results reduce the time until an appropriate treatment is ordered.
- Electronic communication is fundamental to the creation of an integrated health record, both within a setting and across settings and institutions.

Patient support Computer-based patient education has been found to be successful in improving control of chronic illnesses, such as diabetes, in primary care.

- Examples of home monitoring by patients using electronic devices include self-testing by patients with asthma (spirometry), glucose monitors for patients with diabetes, and Holter monitors for patients with heart conditions. Data from monitoring devices can be merged into the EHR, as shown in Figure 1-1.

Courtesy of Javier Larrea/age fotostock/Getty Images

Figure 1-1 Data from the digital spirometer transfers to the EHR.

Administrative processes and reporting Electronic scheduling systems increase the efficiency of healthcare organizations and provide better, timelier service to patients.

- Communication and content standards are important in the billing and claims management area.
- Electronic authorization and prior approvals can eliminate delays and confusion; immediate validation of insurance eligibility results in more timely payments and less paperwork.

- EHR data can be analyzed to identify patients who are potentially eligible for clinical trials, as well as candidates for chronic disease management programs.
- Reporting tools support drug recalls.

Reporting and population health Public- and private-sector reporting requirements at the federal, state, and local levels for patient safety and quality, as well as for public health, are more easily met with computerized data because it

- eliminates the labor-intensive and time-consuming abstraction of data from paper records and the errors that often occur in a manual process.
- facilitates the reporting of key quality indicators used for the internal quality improvement efforts of many healthcare organizations.
- improves public health surveillance and timely reporting of adverse reactions and disease outbreaks.

Later in this chapter, we will discuss initiatives by the U.S. government to encourage the development of healthcare information technology. The IOM definitions of core functions influenced and were adapted into the strategic framework developed by the government. Subsequent chapters will refer back to these eight core functions as you learn to use the EHR functionality that evolved to meet them.

Computer-based Patient Record Institute (CPRI)

Another early contributor to the thinking on EHR systems was the **Computer-based Patient Record Institute (CPRI)**, which identified three key criteria for an EHR:

- Capture data at the point of care
- Integrate data from multiple sources
- Provide decision support

Health Insurance Portability and Accountability Act (HIPAA)

The **Health Insurance Portability and Accountability Act (HIPAA)**, which will be covered in Chapter 11, did not define an EHR, but perhaps the HIPAA Security Rule broadened the definition. The Security Rule established protection for *all* personally identifiable health information stored in electronic format. Thus, everything about a patient stored in a healthcare provider's system is protected and treated as part of the patient's EHR. HIPAA also standardized transaction formats for several Administrative Processes identified in the IOM report.

EHR Defined

In *Electronic Health Records: Changing the Vision*, authors Murphy, Waters, Hanken, and Pfeiffer define the EHR to include "any information relating to the past, present or future physical/mental health, or condition of an individual which resides in electronic system(s) used to capture, transmit, receive, store, retrieve, link and manipulate multimedia data for the primary purpose of providing healthcare and health-related services."[3]

The core functions defined by the IOM and CPRI suggest that the EHR is not just what data is stored, but what can be done with it. In the broadest sense, *Electronic Health Records are the portions of a patient's medical records that are stored in a computer system as*

[3]Gretchen Murphy, Kathleen Waters, Mary A. Hanken, and Maureen Pfeiffer, eds., *Electronic Health Records: Changing the Vision* (Philadelphia: W. B. Saunders Company, 1999), 5.

well as the functional benefits derived from having an electronic health record. EHRs focus on and promote the total health of the patient.

Social Forces Driving EHR Adoption

Visionary leaders in medical informatics had been making the case for the EHR for a long time. However, the combination of several important reports caught the public's attention and set in motion economic and political forces that drove the transformation of our medical records systems.

Health Safety

The IOM published a report that stated the following: "Healthcare in the United States is not as safe as it should be—and can be. At least 44,000 people, and perhaps as many as 98,000 people, die in hospitals each year as a result of medical errors that could have been prevented, according to estimates from two major studies.

"Beyond their cost in human lives, preventable medical errors exact other significant tolls. They have been estimated to result in total costs (including the expense of additional care necessitated by the errors, lost income and household productivity, and disability) of between $17 billion and $29 billion per year in hospitals nationwide. Errors also are costly in terms of loss of trust in the healthcare system by patients and diminished satisfaction by both patients and health professionals.

"A variety of factors have contributed to the nation's epidemic of medical errors. One oft-cited problem arises from the decentralized and fragmented nature of the healthcare delivery system—or 'non-system,' to some observers. When patients see multiple providers in different settings, none of whom has access to complete information, it becomes easier for things to go wrong."[4]

Over a decade later, the IOM reported[5] medical errors still occurring routinely, citing a study of 10 North Carolina hospitals over a 5-year period that found approximately 18 percent of patients were harmed by medical care, with 63 percent of those cases being judged as preventable. These findings were reinforced by a nationwide study revealing that one in seven Medicare patients suffered harm from hospital care, with an additional one in seven suffering temporary harm from care-related problems that were detected in time and corrected; 44 percent of these errors were found to be preventable.

In the report conclusion, the IOM committee recommended ten actions to achieve the best care at lower costs. Five of them involving EHR were:

- Improve the digital infrastructure capacity to capture clinical, care delivery process, and financial data,
- Streamline and revise research regulations to improve care, promote the capture of clinical data, and generate knowledge.
- Accelerate integration of the best clinical knowledge into care decisions through clinical decision support.

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[4]Linda T. Kohn, Janet M. Corrigan, and Molla S. Donaldson, eds., *To Err Is Human: Building a Safer Health System* (Washington, DC: Committee on Quality of Healthcare in America, Institute of Medicine, 1999).
[5]Mark Smith, Robert Saunders, Leigh Stuckhardt, and J. Michael McGinnis, eds., *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America* (Washington, DC: Committee on the Learning Health Care System in America, The National Academies Press, 2012).

- Offer patient-centered care involving patients and families in decisions regarding health and health care, tailored to fit their preferences.
- Improve continuity of care by coordination and communication within and across organizations.

Health Costs

The 1999 IOM report got the attention of the press and public. It also got the attention of 150 of the nation's largest employers who sponsored employee health insurance programs and had become frustrated by the increasing costs of health insurance benefits for which they had little or no say about the quality of care. Following the release of the IOM report, these employers formed the Leapfrog group.

A study by the Center for Information Technology Leadership found more than 130,000 life-threatening situations caused by adverse drug reactions alone. The study suggested that $44 billion could be saved annually by installing computerized physician order entry systems in ambulatory settings.

Leapfrog created a strategy that tied purchase of group health insurance benefits to quality care standards. It also promoted computerized provider order entry (CPOE) as a means of reducing errors.

Changing Society

Changes in the way we live have also made paper medical records outdated. In an increasingly mobile society, patients relocate and change doctors more frequently, thus needing to transfer their medical records from previous doctors to new ones. Additionally, many patients no longer have a single general practitioner who provides their total care. Increased specialization and the development of new methods of diagnostic and preventive medicine require the ability to share exam records among different specialists and testing facilities.

The Internet, one of the strongest forces for social change in the past two decades, has also affected healthcare. Consumers became accustomed to being able to access very sensitive information securely over the web. They ask, "If I can bank online securely; if I can trade stocks and see my brokerage account; if I can check in for my airline flight and print my boarding passes; why can't I see my lab test result online?"

The World Wide Web also gave patients unprecedented access to medical information and research. There are literally millions of health-related pieces of information on the web. Patients are arriving at their doctors' offices armed with questions and sometimes answers. Medical information previously unavailable to the average consumer is now as easy to access as searching Google™ or WebMD®.

In response medical offices created interactive web sites (portals) to allow patients to view their records, make appointments, or request prescription renewals. In a number of states it is even possible for patients and doctors to conduct medical visits via the Internet. These are called E-visits and will be discussed further in Chapter 10.

The increased capabilities of smart phones and other mobile devices to track and store heart rate and other personal fitness data as well as to link to devices that measure respiration rate, blood pressure, and blood glucose levels provide a wealth of self-generated patient health data. The challenge is how to integrate that data into the provider's decision-making process.

Group Discussion Topic: EHR News

1. The topic of EHR is frequently in the news. Describe something you have read or seen on the web or television about EHR.

Forces Driving EHR Evolution

The response to the IOM report on the rate of preventable medical errors was swift and positive, within both the government and private sectors. Almost immediately, President Bill Clinton's administration issued an executive order instructing government agencies that conduct or oversee healthcare programs to implement proven techniques for reducing medical errors and creating a task force to find new strategies for reducing errors. Congress appropriated $50 million to the Agency for Healthcare Research and Quality (AHRQ) to support a variety of efforts targeted at reducing medical errors.

President George W. Bush followed through by establishing the **Office of the National Coordinator for Health Information Technology (ONC)**, under the U.S. Department of Health and Human Services (HHS), to "develop, maintain, and direct the implementation of a strategic plan to guide the nationwide implementation of interoperable health information technology in both the public and private healthcare sectors that will reduce medical errors, improve quality, and produce greater value for healthcare expenditures."[6]

President Barack Obama identified the EHR as a priority for his administration and signed into law the **Health Information Technology for Economic and Clinical Health (HITECH) Act**, which promoted the widespread adoption of EHR.[7] Note that the HITECH Act is contained within the American Recovery and Reinvestment Act (ARRA); therefore, you may see it referred to by the ARRA designation as well.

Office of National Coordinator for Health Information Technology

David J. Brailer, M.D., Ph.D., the first National Coordinator, acted quickly. Ten weeks after his appointment, the ONC delivered a framework for strategic action outlining 4 goals and 12 strategies for national adoption of health information technology.[8] The document outlined a vision for consumer-centric and information-rich healthcare derived from the widespread adoption of health information technology and set a 10-year time frame for that to happen.

Strategic Framework

The framework as first published listed four major goals and a corresponding set of strategies. These were:

1. Inform Clinical Practice
2. Interconnect Clinicians
3. Personalize Care
4. Improve Population Health

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[6]President George W. Bush, Executive Order #13335, April 27, 2004.
[7]H.R. 1 American Recovery and Reinvestment Act of 2009, Title XIII Health Information Technology for Economic and Clinical Health, February 17, 2009.
[8]*The Decade of Health Information Technology: Delivering Consumer-centric and Information-rich Healthcare* (Washington, DC: U.S. Department of Health and Human Services, July 21, 2004).

Federal Health IT Strategic Plan

In June of 2008, the ONC published an update to the strategic framework called the *Federal Health IT Strategic Plan*.[9] (IT is an acronym for information technology.) The plan had two goals, patient-focused healthcare and population health, with four objectives under each goal. The themes of privacy and security, **interoperability**, IT adoption, and collaborative governance recur across the goals, but they apply in very different ways to healthcare and population health.

Achievement of the eight objectives was tied to measurable outcomes, describing 43 strategies that needed to be done to achieve the objectives. Each strategy was associated with a milestone against which progress could be assessed. The plan included a set of illustrative actions to implement each strategy.

The HITECH Act

In 2009 the federal government passed the HITECH Act,[10] which showed that it firmly believed in the benefits of using EHR. The act encouraged widespread adoption of EHR by authorizing the **Centers for Medicare & Medicaid Services (CMS)** to make incentive payments to doctors and hospitals that use a certified EHR. These incentives were intended to drive adoption of EHR in order to reach the goal of every American having a secure EHR. To achieve this vision of a transformed healthcare system that health information technology can facilitate, this Act included three critical short-term prerequisites:

- Clinicians and hospitals must acquire and implement **certified EHR** in a way that fully integrates these tools into the care delivery process.
- Technical, legal, and financial supports must be in place to enable information to flow securely to wherever it is needed to support healthcare and population health.
- A skilled workforce must be able to facilitate the implementation and support of EHR, exchange of health information among healthcare providers and public health authorities, and the redesign of workflows within the healthcare settings.

Providers who implemented and proved **meaningful use** of a certified EHR prior to 2015 were eligible for incentives. This meant a practice adopting an EHR was actually paid more than a practice continuing to use paper charts.

After 2015, Medicare began to administer financial penalties for physicians and hospitals that do not use an EHR. These involve reducing the provider's payments by 1 percent per year for up to five years.

Strategic Plan Updates

The HITECH Act requires the ONC, in consultation with other appropriate federal agencies, to update the Federal Health IT Strategic Plan at regular intervals. The HITECH Act requires that the update include specific objectives, milestones, and metrics with respect to the following:

1. The electronic exchange and use of health information and the enterprise integration of such information.
2. The use of an EHR for each person in the United States.

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[9] *Federal Health IT Strategic Plan (ONC): 2008–2012* (Washington, DC: U.S. Department of Health and Human Services, Office of National Coordinator, June 3, 2008, pp. iii–iv).
[10] H.R. 1 American Recovery and Reinvestment Act of 2009, Title XIII Health Information Technology for Economic and Clinical Health, February 17, 2009.

3. The incorporation of privacy and security protections for electronic exchange of an individual's individually identifiable health information.
4. Establishing security methods to ensure appropriate authorization and electronic authentication of health information and specifying technologies or methodologies for rendering health information unusable, unreadable, or indecipherable.
5. Specifying a framework for coordination and flow of recommendations and policies under this subtitle among the Secretary, the National Coordinator, the HIT Policy Committee, the HIT Standards Committee, and other health information exchanges and other relevant entities.
6. Methods to foster the public understanding of health information technology.
7. Strategies to enhance the use of health information technology in improving the quality of healthcare, reducing medical errors, reducing health disparities, improving public health, increasing prevention and coordination with community resources, and improving the continuity of care among healthcare settings.
8. Specific plans for ensuring that populations with unique needs, such as children, are appropriately addressed in the technology design, as appropriate, which may include technology that automates enrollment and retention for eligible individuals.

In compliance with the HITECH act, the ONC issued Strategic Plan updates to cover the period 2011–2015, and a subsequent update for the period 2015–2020.

The 2015–2020 plan "focuses on advancing health information technology innovation and use for a variety of purposes; however, the use of health IT is not in itself an end goal. The work described in this Plan aims to modernize the U.S. health IT infrastructure so that individuals, their providers, and communities can use it to help achieve health and wellness goals."[11] The 2015–2020 plan framework has four goals and 13 objectives:

Goal 1: Advance Person-Centered and Self-Managed Health

- Objective A: Empower individual, family, and caregiver health management and engagement
- Objective B: Foster individual, provider, and community partnerships

Goal 2: Transform Health Care Delivery and Community Health

- Objective A: Improve health care quality, access, and experience through safe, timely, effective, efficient, equitable, and person-centered care
- Objective B: Support the delivery of high-value health care
- Objective C: Protect and promote public health and healthy, resilient communities

Goal 3: Foster Research, Scientific Knowledge, and Innovation

- Objective A: Increase access to and usability of high-quality electronic health information and services
- Objective B: Accelerate the development and commercialization of innovative technologies and solutions
- Objective C: Invest, disseminate, and translate research on how health IT can improve health and care delivery

[11] *The ONC-Coordinated Federal Health IT Strategic Plan: 2015–2020* (Washington, DC: Office of National Coordinator for Health Information Technology, 2015).

Goal 4: Enhance Nation's Health IT Infrastructure

- Objective A: Finalize and implement the Nationwide Interoperability Roadmap
- Objective B: Protect the privacy and security of health information
- Objective C: Identify, prioritize, and advance technical standards to support secure and interoperable health information and health IT
- Objective D: Increase user and market confidence in the safety and safe use of health IT products, systems, and services
- Objective E: Advance a national communications infrastructure that supports health, safety, and care delivery

Meaningful Use of a Certified EHR

The HITECH act specifies the following three components of Meaningful Use:

1. Use of certified EHR in a meaningful manner
2. Use of certified EHR technology for electronic exchange of health information to improve quality of healthcare
3. Use of certified EHR technology to submit clinical quality measures (CQM) and other such measures selected by the Secretary of Health and Human Services

The key terms here are *certified EHR* and *meaningful use*. What is a certified EHR, and how is meaningful use determined?

Certified EHR

Under the CMS EHR incentive programs, eligible health care providers must adopt and meaningfully use a "certified EHR" that has been certified by an ONC Authorized Certification Body (ONC-ACB). To synchronize the two regulations, the ONC published the Health Information Technology: Initial Set of Standards, Implementation Specifications, and Certification Criteria for Electronic Health Record Technology Final Rule[12] on the same date as the CMS Final Rule. The following year HHS established through ONC a permanent certification program for health information technology.[13] The purpose of the certification program was to reduce the financial risk for the provider by ensuring that if they used an EHR certified by the ONC-ACB it would be capable of meeting the meaningful use performance requirements.

The ONC certification criteria represent the minimum capabilities an EHR needed to include and have properly implemented in order to achieve certification. The criteria do not preclude developers from including additional capabilities that are not required for the purposes of certification.

Meaningful Use and Clinical Quality Measures

CMS officially published the Electronic Health Record Incentive Program Final Rule July 28, 2010, which finalized the incentive program and defined the criteria for determining "meaningful use."[14]

Requirements for meaningful use incentive payments were implemented over a multi-year period, in three stages. Stage 1, spanning the years 2011 and 2013, set the baseline

[12]U.S. Department of Health and Human Services, 45 CFR Part 170; Final Rule, July 28, 2010.
[13]U.S. Department of Health and Human Services, 45 CFR Part 170; Establishment of the Permanent Certification for Health Information Technology, Final Rule, January 7, 2011.
[14]U.S. Department of Health and Human Services, 42 CFR Parts 412, 413, 422, and 495; Final Rule July 28, 2010.

for electronic data capture and information sharing. Stage 2 began in 2014 and retained the core requirements and menu structure for meaningful use objectives established in Stage 1. Although some Stage 1 objectives were either combined or eliminated, most of the Stage 1 objectives became core objectives under the Stage 2 criteria. Stage 3, in 2016, strengthened the core objective "to protect patient health information" through the implementation of appropriate technical, administrative, and physical safeguards.

The meaningful use requirements for hospital and eligible professionals (EPs) differ. The table in Figure 1-2 combines the Meaningful Use Objectives for Eligible Professionals from Stages 1, 2, and 3. The table cell color helps associate the meaningful use objectives to the goals of the strategic plans (discussed above) listed in the first row of the table.

Figure 1-2 Table of Meaningful Use Objectives for Eligible Professionals.

Eligible Professionals Meaningful Use Objectives

Improve Quality, Safety, Efficiency	Engage Patients & Families	Improve Care Coordination	Improve Public & Population Health	Ensure Privacy & Security of PHI
EPs Core Objectives (all must be met*)			**Menu of Additional Objectives (EPs choose from list)**	
Use computerized provider order entry (CPOE) for medication, laboratory and radiology orders			Record electronic notes in patient records	
Generate and transmit permissible prescriptions electronically			Imaging results accessible	
Record demographic information			Record patient family health history	
Record and chart changes in vital signs			Identify and report cancer cases to a state cancer registry	
Record smoking status for patients 13 years old or older			Identify and report specific cases to another specialized registry	
Use clinical decision support to improve performance on high-priority health conditions			Submit electronic syndromic surveillance data to public health agencies	
Provide patients the ability to view online, download, and transmit their health information				
Provide clinical summaries for patients for each office visit				
Protect electronic health information created or maintained by the Certified EHR Technology through implementation of appropriate technical, administrative, and physical safeguards				
Incorporate clinical lab-test results into Certified EHR Technology				
Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach				
Use clinically relevant information to identify patients who should receive reminders for preventive/follow-up care				
Use certified EHR technology to identify patient-specific education resources.				
Perform medication reconciliation				
Provide summary of care record for each transition of care or referral				
Submit electronic data to immunization registries				
Use secure electronic messaging to communicate with patients on relevant health information				
*Exclusions are provided for objectives outside of the normal scope of a provider's clinical practice.				

A key core requirement is to report **Clinical Quality Measures** (CQM). CMS uses **clinical quality measures** in a variety of quality initiatives that include quality improvement and public reporting. ONC certified that electronic health record (EHR) technologies are capable of accurately calculating the electronic clinical quality measure results. Four federal agencies—the Agency for Healthcare Research and Quality (AHRQ), CMS, the National Library of Medicine (NLM), and ONC—define the CQM components comprised of definitions, measure logic, data elements, and value sets.

The purpose of clinical quality measures is to help meet the strategic goals of improving patient health. An example of this is the requirement to record patients' tobacco use status and counsel patients on tobacco cessation methods. Chapter 9 will cover recording clinical quality measures in the EHR.

EHR Adoption After HITECH

At the beginning of the 21st century, adoption of electronic health records among physicians was moving slowly. In the past decade, EHR adoption among hospitals and physicians has grown substantially, especially since the passage of the HITECH act.

"From 2010 (the earliest year that trend data are available) to 2013, physician adoption of EHRs able to support various Stage 2 meaningful use objectives increased significantly,"[15] as shown in Figure 1-3.

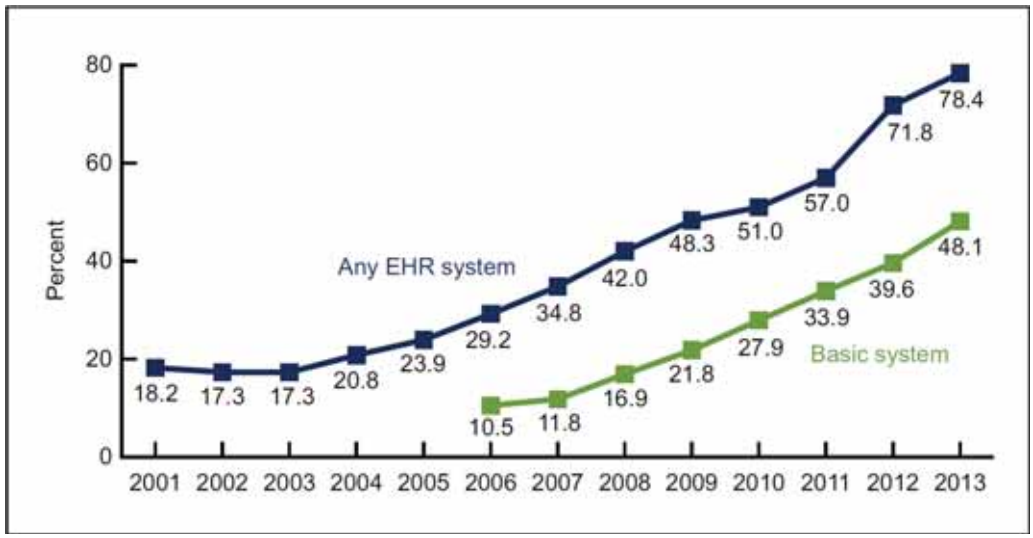

Figure 1-3 Percentage of office-based physicians in the United States with EHR systems, 2001–2013.

"In 2013, 59 percent of hospitals and 48 percent of physicians had at least a basic EHR system, respective increases of 47 percentage points and 26 percentage points since 2009, the year the HITECH Act was signed into law. Moreover, there is widespread participation among eligible hospitals and professionals in the CMS EHR Incentive Programs. As of June 2014, 75 percent (403,000+) of the nation's eligible professionals and 92 percent (4,500+) of eligible hospitals and CAHs had received incentive payments."[16]

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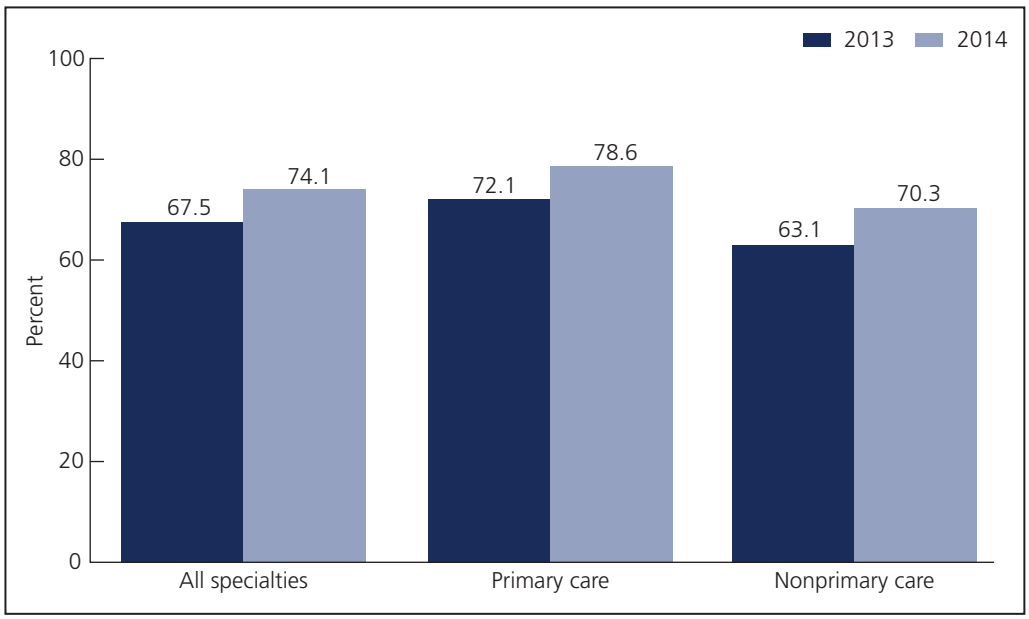
[15]Hsiao C.-J., and Hing E. Use and characteristics of electronic health record systems among office-based physician practices: United States, 2001–2013. NCHS data brief, no. 143. Hyattsville, MD: National Center for Health Statistics. 2014. http://www.cdc.gov/nchs/data/databriefs/db143.htm

[16]2014 Report to Congress on Health IT Adoption and HIE, The Office of the National Coordinator for Health Information Technology (ONC) Office of the Secretary, U.S. Department of Health and Human Services, Washington, DC, 2014.

Figure 1-4 Office-based physicians with a certified electronic health record system, by physician specialty: United States, 2013–2014



Adoption of certified EHR systems by office-based physicians increased from 2013 to 2014. In 2014, 74.1% of office-based physicians had a certified EHR system, up from 67.5% in 2013 (as shown in Figure 1-4). The HITECH Act of 2009 gave eligible physicians monetary incentives to adopt a certified EHR system and may be one of the reasons for the continued rise in physician adoption of these systems.

The percentage of physicians with a certified EHR system ranged from 58.8% in Alaska to 88.6% in Minnesota.[17]

Why Interoperability Is Important

An ONC report to Congress states: "(EHR) progress has laid a strong base for health IT adoption and created a growing demand for its interoperability that not only supports the care continuum, but also supports health generally."[18]

Historically, a patient's medical records consisted of handwritten notes, typed reports, and test results stored in a paper file system. A separate file folder was created and stored at each location where the patient was examined or treated. X-ray films and other radiology records typically were stored separately from the chart, even when they were created at the same medical office.

These are some of the drawbacks to paper records: Handwritten records often are abbreviated, cryptic, or illegible. When information is to be used by another medical practice, the charts must be copied and faxed or mailed to the other office. Even in one practice with multiple locations, the chart must be transported from one office to another when a patient is seen at a different location than usual. Paper records are not easily searchable. For example, if a practice is notified that all patients on a particular

[17]Jamoom EW, Yang N, Hing E. Adoption of certified electronic health record systems and electronic information sharing in physician offices: United States, 2013 and 2014. NCHS data brief, no 236. Hyattsville, MD: National Center for Health Statistics. 2016. http://www.cdc.gov/nchs/data/databriefs/db236.htm
[18]2014 Report to Congress on Health IT Adoption and HIE, The Office of the National Coordinator for Health Information Technology (ONC) Office of the Secretary, U.S. Department of Health and Human Services, Washington, DC, 2014.

drug need to be contacted, the only way of finding those patients is literally to open every chart and look at the medications list.

Certainly, improved legibility, and the ability to find, share, and search patient records are strong points for an EHR. There are additional benefits from an EHR that take the practice of medicine to levels that cannot be achieved with paper records. Four examples of these are health maintenance, trend analysis, alerts, and decision support. These will be covered in more detail in Chapter 2. There are additional criteria, however. The IOM report calls for *electronic communication and connectivity among care partners,* and the second goal of the ONC strategic framework is to *interconnect clinicians*.

"Despite progress in establishing standards and services to support health information exchange and interoperability, practice patterns have not changed to the point that health care providers share patient health information electronically across organizational, vendor, and geographic boundaries. Electronic health information is not yet sufficiently standardized to allow seamless interoperability, as it is still inconsistently expressed through technical and medical vocabulary, structure, and format, thereby limiting the potential uses of the information to improve health and care. Patient electronic health information needs to be available for appropriate use in solving major challenges, such as providing more effective care and informing and accelerating scientific research."[19]

In Chapter 2 we will discuss the structured data EHR as well as standardized codified medical vocabulary the ONC report says is necessary to support the exchange of healthcare data between provider systems and which supports improved patient and population health.

The need for EHR and better connectivity between EHR systems is demonstrated in the Real-Life Story: Where's My Chart?

Group Discussion Topic: When the Chart Is Lacking

After reading the Real-Life Story: "Where's My Chart?" discuss the following:

1. What are the dangers to the patient of a provider who does not have access to paper charts?
2. What is the likelihood of the second incident of the pulmonary embolism being overlooked?
3. How would the patient care have been improved if the various EHR systems had been able to exchange patient records electronically?

Documenting at the Point of Care

Another item noted in the ONC report was the need for practice patterns to change. A goal of using an EHR system is to improve the accuracy and completeness of the patient record. One way to achieve this is to record the information in the EHR at the time it is happening. This is called **point-of-care documentation**. In a physician's office, this means completing the encounter note before the patient ever leaves the office. In an inpatient setting, this means that nurses enter vital signs and nursing notes at bedside, not at the end of their shift.

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[19]2014 Report to Congress on Health IT Adoption and HIE, The Office of the National Coordinator for Health Information Technology (ONC) Office of the Secretary, U.S. Department of Health and Human Services, Washington, DC, 2014.

Real-Life Story

Where's My Chart?

A 63-year-old man went to his doctor's office in Kentucky complaining of chest pains and tightness in his chest. He was immediately transferred to the local hospital, where a stress test and cardiac catheterization confirmed he had had a heart attack. He was hospitalized overnight.

Early retirement from his stressful job as well as a regimen of exercise, diet, beta blockers, aspirin therapy, and other medications proved successful. He moved from Kentucky to Florida and tried unsuccessfully to have his medical records concerning the previous heart attack transferred to his new doctor in Florida. The ECG and stress tests were repeated in Florida. Finally, after two years, the records from Kentucky arrived.

In subsequent years, he moved twice more but, wiser now, he took copies of his medical records with him. He continued a normal and active life until age 77, when he slipped in his workshop and broke his right knee. With his leg in a cast he was less active; a blood clot formed and broke free.

Three weeks after he broke his knee, he went to the doctor's office with what he described as very severe flu symptoms, extreme fatigue, a bad cough, and sharp pains in his back when he moved or coughed. The doctor sent him to the emergency room, where he was diagnosed with a pulmonary embolism in the lower lobe of the right lung. He was hospitalized and put on a therapy of blood thinners.

At age 79, he was continuing to lead an active lifestyle, but he was experiencing occasional sharp brief chest pain and brief dizziness. His doctor scheduled a stress test and cardiac catheterization at a cardiac center connected to the hospital. A blockage was discovered and a double bypass surgery was performed at the same hospital. The patient tolerated the surgery well and recovered quickly.

However, one of the veins used in the bypass operation had been harvested from the leg that had the previous broken knee. Three weeks after he was discharged, he passed out and fell. He was taken by ambulance to the ER at the same hospital where he had had his surgery and where he had been hospitalized for the previous pulmonary embolism. Here is what happened:

- When the ambulance crew arrived at the house, they took a medical history from the patient and his wife. They gave him oxygen and transported him to the hospital.
- When the ambulance arrived at the hospital, the nurses and ER staff again took a medical history from the patient and patient's family.
- The patient's primary care physician had a complete medical history of the patient, including copies of his records dating back to his heart attack in Kentucky, but the hospital system was not connected with the physician's office system.
- The patient reported that he had just had surgery at the same hospital only three weeks before. The hospital system surely had his medical history, but the ER was on a different system and the two systems lacked the capability to exchange data. ER doctors did not have electronic access to the records.
- Although the ER was in the same hospital as the cardiac lab, again the systems were different. ER doctors did not have electronic access to those records, either.
- The patient told the ER staff he thought the symptoms felt similar to his previous experience with a pulmonary embolism, but even though the ER was in the same hospital where the patient had been hospitalized for a pulmonary embolism two years before, the ER doctors did not have access to the records from his previous hospitalization.
- A CAT scan was ordered based on patient history of the embolism provided by a family member, not his medical record.
- After waiting in the ER for 14 hours, he was hospitalized with two pulmonary embolisms, one in each lung.

Seven days later, the patient was discharged from the hospital. He has fully recovered and is doing fine.

This is not the story of poor medical care or a bad hospital. The hospital is affiliated with a major teaching hospital and is as good as or better than most. This story illustrates the importance of the ONC goal for interoperability to electronically exchange and integrate health information to provide better patient care. The lack of timely copies of existing records often causes tests to be reordered or the obvious conditions to be overlooked. Electronic records are better, more accessible, but even the most sophisticated systems do not necessarily have the infrastructure in place to communicate with other EHR systems even, as in this case, within the same healthcare system!

Using a point-of-care EHR, when the visit is complete, the note is complete. The clinician can then provide not only patient education materials for patients to take home, but also can actually print a copy of the finished note. Giving patients a copy of the notes from that day's visit is one of the core Meaningful Use Objectives required of eligible professionals by CMS. Providing a summary of the visit helps patients remember the key elements of their treatment plan. They also will have a clearer understanding of their condition as well as information on any tests that may have been ordered or performed.

Leading physician experts on EHR, Allen R. Wenner, an MD in Columbia, South Carolina, and John W. Bachman, an MD and professor of Family Medicine at the Mayo Medical School in Rochester, Minnesota, wrote concerning outpatient practices: "Documenting an encounter at the point of care is the most efficient method of practicing medicine because the physician completes the medical record at the time of a patient's visit. Dictation time is saved and the need for personal dictation aides is eliminated. Thus, point-of-care documentation is less expensive than traditional dictation with its associated high cost of transcription. In addition, the physician can sign the note immediately.

Patient care is improved because the patient can leave with a complete copy of the medical record, a step that stimulates compliance. The delivery process is improved with point-of-care documentation because referrals can be accomplished with full information available at the time that the referral is needed. For these benefits to occur, the clinical workflow changes to improve efficiency, increase data accuracy, and lower the overall cost of healthcare delivery."[20]

John Bachman has formulated what he refers to as Bachman's Rule and Bachman's Law. These are defined as follows:

Bachman's Rule: "A patient who has a copy of a note is impressed by the fact that all the information they provided and were given is included for them to review. It also is useful in that it has immunizations prevention information and instructions. Outcome studies have shown it to be helpful in compliance and improvement of health; crossing the Quality Chasm."

Bachman's Law: "A clinician who gives a patient a copy of their note has all their work complete. Consequently there is no dictation, rework, signing, or any activity of maintaining the administrative workflow. This saves a great deal of money and means the workflow systems are extremely efficient."

Underscoring Bachman and Wenner are the CMS regulations for meaningful use,[21] which require eligible professionals to provide clinical summaries to patients each office visit.

The availability of information from the EHR during the patient visit is an invaluable tool in counseling and patient education. The clinician has access to graphs, medical images, test results, and anatomical drawings, all of which are useful in explaining something related to the patient's condition or in illustrating an upcoming procedure. Using a Tablet, the clinician in Figure 1-5 is able to document the encounter while with the patient.

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[20]Allen R. Wenner and John W. Bachman, "Transforming the Physician Practice: Interviewing Patients with a Computer," Chap. 26 in *Healthcare Information Management Systems: Cases, Strategies, and Solutions*, 3rd ed., ed. Marion J. Ball, Charlotte A. Weaver, and Joan M. Kiel (New York: Springer Science+Business Media, Inc., 2004), 297–319. Copyright © 2004 Springer Science+Business Media, Inc., New York.

[21]U.S. Department of Health and Human Services, 42 CFR Parts 412, 413, 422, and 495; Final Rule July 28, 2010.

Courtesy of Monkey Business Images/Shutterstock

Figure 1-5 A clinician documents the visit while with the patient.

As stated earlier, adopting an EHR may change the way doctors work. Experience has shown that patients react favorably to the use of a computer during the exam, especially when they are part of the process, able to see the screen, and able to participate in the review of their information. However, Wenner and Bachman describe three types of patient–physician relationships:[22]

1. The doctor is paternalistic, telling the patient what to do.
2. The doctor gives the patient information and the patient decides what to do.
3. Patients and doctors share information to determine the best plan for given conditions.

Figure 1-6, provided by Dr. Wenner, lists the stages of change resulting from adoption of an EHR. Wenner and Bachman believe patients will help the physician when they are given some degree of control, as reflected in points 2 and 3.

Figure 1-6 Stages of change in EHR adoption.

Stages of Change in EHR Technology Adoption			
Stage	Technology Adoption	Medical Records	Medical Practice
Stage I	Do it the old way	The paper chart used and viewed as an historical document by physicians	Health care providers are the center of healthcare
Stage II	Adopt technology but continue to do it the old way	Transcribing dictation onto paper, using the EHR for data storage only managed by staff	Providers continue to dominate medical decisions and maintain all healthcare data
Stage III	Change the workflow to leverage the technology Paperless medical office	Use EHR at the point-of-care with providers and patients participating to allow real-time continuity of care	Patients and providers will share decision making as healthcare information is available to both

[22]Ibid.

The EHR system strives to improve patient healthcare by giving the provider and patient access to complete, up-to-date records of past and present conditions; it also enables the records to be used in ways that paper medical records could not. The sooner the data is entered, the sooner it is available for other providers and the patient. Chapters 2–12 will explore how data is entered in the EHR and focus on ways EHR systems speed up data entry, enabling clinicians to achieve point-of-care documentation in real time.

Flow of Clinical Information into the Chart

Whether medical records are paper or electronic, the clinician's exam notes are usually documented in a defined structure, historically organized into four components:

- Subjective
- Objective
- Assessment
- Plan

Charts in this format are referred to as *SOAP notes*; the acronym represents the first letters of the words *subjective*, *objective*, *assessment*, and *plan*. These four basic components are frequently subdivided into additional sections. For example, history and symptoms are two sections under subjective. Another example is the problem-oriented format, which subdivides the assessment component by diagnosis (problem) and groups treatment plans under each problem. Still, the overarching structure may be thought of as following the SOAP format.

To better understand the functional benefits of EHR, let us compare the workflow in a medical office using paper charts with a medical office using an EHR system.

Workflow of an Office Using Paper Charts

Follow the arrows in Figure 1-7 as you read the following description of a workflow in a primary care medical practice using paper charts.

1. An established patient phones the medical office and schedules an appointment.
2. The night before the appointment, the patient charts are pulled from the medical record filing system and organized for the next day's patients.
3. On the day of the appointment, the patient arrives at the office and is asked to confirm that insurance and demographic information on file is correct.

   The patient is given a clipboard with a blank medical history form and asked to complete it. The form asks the reason for today's visit and asks the patient to report any previous history, any changes to medications, new allergies, and so on.
4. The patient is moved to an exam room and is asked to wait.

   Subjective—The patient is asked to describe in his or her own words what the problem is, what the symptoms are, and what he or she is experiencing.

   A nurse or medical assistant measures the patient's height and weight, takes vital signs, reviews the form the patient completed, and may ask for more detail about the reason for the visit, which usually is called the *chief complaint*. The vital signs and chief complaint are written on a form that is placed at the front of the chart along with the updated patient form.

Figure 1-7 Workflow in a medical office using paper charts.

5 The clinician (doctor or other licensed healthcare provider) enters the exam room and discusses the reason for the visit and reviews the symptoms.

Objective—The clinician performs a physical exam and makes observations about what he or she finds.

Assessment—Applying his or her training to the subjective and objective findings, the clinician arrives at a decision of what might be the cause of the patient's condition, or what further tests might be necessary.

Plan of Treatment—The clinician prescribes a treatment, medication, or orders further tests. Perhaps a follow-up visit at a later date is recommended. A note will be made in the chart of each element of the plan.

6 If medications have been ordered, a handwritten prescription will be given to the patient or phoned to the pharmacy. A note of the prescription will be written in the patient's chart.

The doctor marks one or more billing codes and one or more diagnosis codes on the chart and leaves the exam room.

7. If lab work has been ordered, a medical assistant will obtain the necessary specimen and send the order to the lab.
8. The clinician creates the exam note from memory, either handwriting in the chart or dictating the subjective, objective, assessment, plan, and treatment information.
9. When the patient is dressed, the patient will be escorted to the check-out area. The patient may be given education material or medication instructions.

   If x-rays or other diagnostic tests have been ordered at another facility, the office staff may call on behalf of the patient and schedule the tests.

   If a follow-up visit has been indicated, the patient will be scheduled for the next appointment.
10. If dictated, the encounter notes are later transcribed and returned to the clinician to review before being permanently stored in the chart. The completed chart is reviewed by a billing coder to determine the codes for medical billing.
11. If lab, x-ray, or other diagnostic tests have been ordered, the results and reports are subsequently sent to the practice either by fax or on paper a number of days later. When received, they are filed in the patient's chart and the chart is sent to the clinician for review. They are reviewed by the clinician, and then re-filed in the paper chart.
12. The paper chart is filed again. Note that the chart may have to be pulled and re-filed each time a new document, such as the transcription or lab report, was added, which required the clinician's review.

One obvious downside to paper charts is accessibility. If the patient chart is needed for a follow-up visit or by another provider, it is possible that it has not been returned to the file room while it is pending dictation or while the provider is reviewing test results.

Workflow of an Office Fully Using an EHR

Follow the arrows in Figure 1-8 as you read the following description of a workflow of a patient visit to an office that fully uses the electronic capabilities that are available in EHR systems today, including patient participation in the process and the capabilities of the Internet.

1. An established patient phones the doctor's office and schedules an appointment.

   Internet alternative: Patients are increasingly able to request an appointment and receive a confirmation via the Internet by visiting the practice portal.
2. The night before the appointment, the medical office computer electronically verifies insurance eligibility for patients scheduled the next day.
3. On the day of the appointment, the patient arrives at the office and is asked to confirm that the demographic information on file is still correct.
4. A receptionist, nurse, or medical assistant asks the patient to complete a medical history and reason for today's visit using a computer in a private area of the waiting room. The patient completes a computer-guided questionnaire concerning his symptoms and medical history.

   Internet alternative: Some medical practices' portals enable patients to complete the history and symptom questionnaire via the Internet before coming to the office.
5. When the patient has completed the questionnaire, the system alerts the nurse or medical assistant that the patient is ready to move to an exam room.

Figure 1-8 Workflow in a medical office fully using an EHR.

The nurse or medical assistant measures the patient's height and weight and records it in the EHR. Using a digital device, vital signs for blood pressure, temperature, and pulse are recorded and wirelessly transferred into the EHR.

6 *Subjective:* The nurse or medical assistant reviews with the patient the patient-entered symptoms and history. Where necessary, the nurse or medical assistant edits the record to add clarification or refinement.

The clinician enters the exam room and discusses the reason for the visit and reviews with the patient the information already in the chart.

7 *Objective:* The clinician performs the physical exam. The clinician typically makes a mental provisional diagnosis. This is used to select a list or template of findings to quickly record the physical exam in the EHR.

The EHR presents a list of problems the patient reported in past visits that have not been resolved. The clinician reviews each, examining additional body systems as necessary, and marks the improvement, worsening, or resolution of each problem.

Assessment: Applying his or her training to the subjective and objective findings, the clinician arrives at a decision of one or more diagnoses and decides if further tests might be warranted.

8. *Plan of treatment:* The clinician prescribes a treatment and/or medication; in addition, the clinician may order further tests. The EHR decisions support and Clinical Quality care features may recommend preventive care screening tests, provide patient education and counseling materials, or present evidence-based research on the patient's condition.

   If medication is to be ordered, the physician writes the prescription electronically. The prescription is compared to the patient's allergy records and current drugs. The physician is advised if there are any contraindications or potential problems. The prescription is compared to the formulary of drugs covered by the patient's insurance plan, and the physician is advised if an alternate drug is recommended (thereby avoiding a subsequent phone call from the pharmacist to revise the prescription). The prescription is then transmitted directly to the patient's pharmacy.

   A built-in function of the EHR suggests the correct evaluation and management code used for billing based on the findings documented in the encounter. The billing code is confirmed by the physician and automatically transferred to the billing system.

   When the visit is complete, so is the exam note. The physician signs the note electronically at the conclusion of the visit.

9. If lab work has been ordered, a medical or lab assistant will obtain the necessary specimen and the order is sent electronically to the lab.

10. *Patient education:* Because of the efficiency of the EHR system, the physician has more personal time with the patient for counseling or patient education. In many systems the provider can display and annotate pictures of body areas for patient education, and print them so that the patient can take them home.

    When the patient is dressed, he or she is given patient education material, medication instructions, and a copy of the exam notes from the current visit. Allowing the patient to take away a written record of the visit meets CMS requirements and enables better compliance with the doctor's plan of care and recommended treatments.

    Internet alternative: The patient may also have access to his health records through the practice's secure Internet portal.

11. The patient is escorted to the checkout area.

    If x-rays or other diagnostic tests have been ordered at another facility, the office staff may call on behalf of the patient and schedule the tests.

    If a follow-up visit has been indicated, the patient will be scheduled for the next appointment.

12. If lab tests were ordered, the results are sent to the doctor electronically, are reviewed on screen, and automatically merged into the EHR.

    If radiology or other diagnostic reports are sent to the practice electronically as text reports, they are imported into the EHR and can be reviewed by the physician.

Accessibility is not a problem in the EHR system because there is no chart to re-file. Multiple providers can access the patient's chart, even simultaneously; for example, a physician could review the previous lab results before entering the exam room, even if the nurse was currently entering vital signs in the chart.

Group Discussion About Workflow

Having compared the two workflow scenarios, we see the immediate advantages of the EHR for the patient and clinician. Think about the workflow of the office that used paper charts (refer to Figure 1-7 if necessary.) Answer the following questions about the first workflow:

1. What was the medical assistant, nurse, or clinician doing at the time of the patient interaction?
2. Could they have recorded this data in a computer?
3. Could they have saved time later?
4. Could the data be entered by someone other than the person seeing the patient?

   The patient completed a form concerning any previous history, any changes to medications, new allergies, and so on.
5. Could the patient have used a computer, or could the form have been designed to be read by a computer?
6. Could the patient have completed the information before the visit?

   The nurse or medical assistant recorded various health measurements (vital signs) in the exam room.
7. Could the nurse or medical assistant have recorded the chief complaint or the vital signs in a computer instead of on a paper chart?
8. Were any of the instruments used capable of transferring their measurements to a computer system?

   During the physical exam, the clinician made observations and an assessment. This was later dictated from memory, subsequently transcribed by a typist, and finally reviewed and signed by the physician.
9. Is the time it would take to record the observations and assessment in the exam comparable to the time it takes to dictate and review the transcribed notes later?

   The clinician prescribed medications and ordered tests.
10. Would the time spent entering the prescriptions on a computer justify the benefits of electronic prescribing?
11. Are results available electronically from laboratories that the medical practice uses?
12. Would ordering a test electronically improve the matching of results to orders when the tests were completed?

Inpatient Charts versus Outpatient Charts

The previous figures illustrated the differences between two medical offices, one using a paper chart and another using an EHR. The differences between a hospital using a paper chart and a hospital fully using electronic records are even more significant. However, there are also differences in the type of chart each facility uses and overall workflow process. In this section we are going to compare both.

Although some patients are admitted to the hospital through the emergency department or by transfer from another facility, most patient admissions begin in the

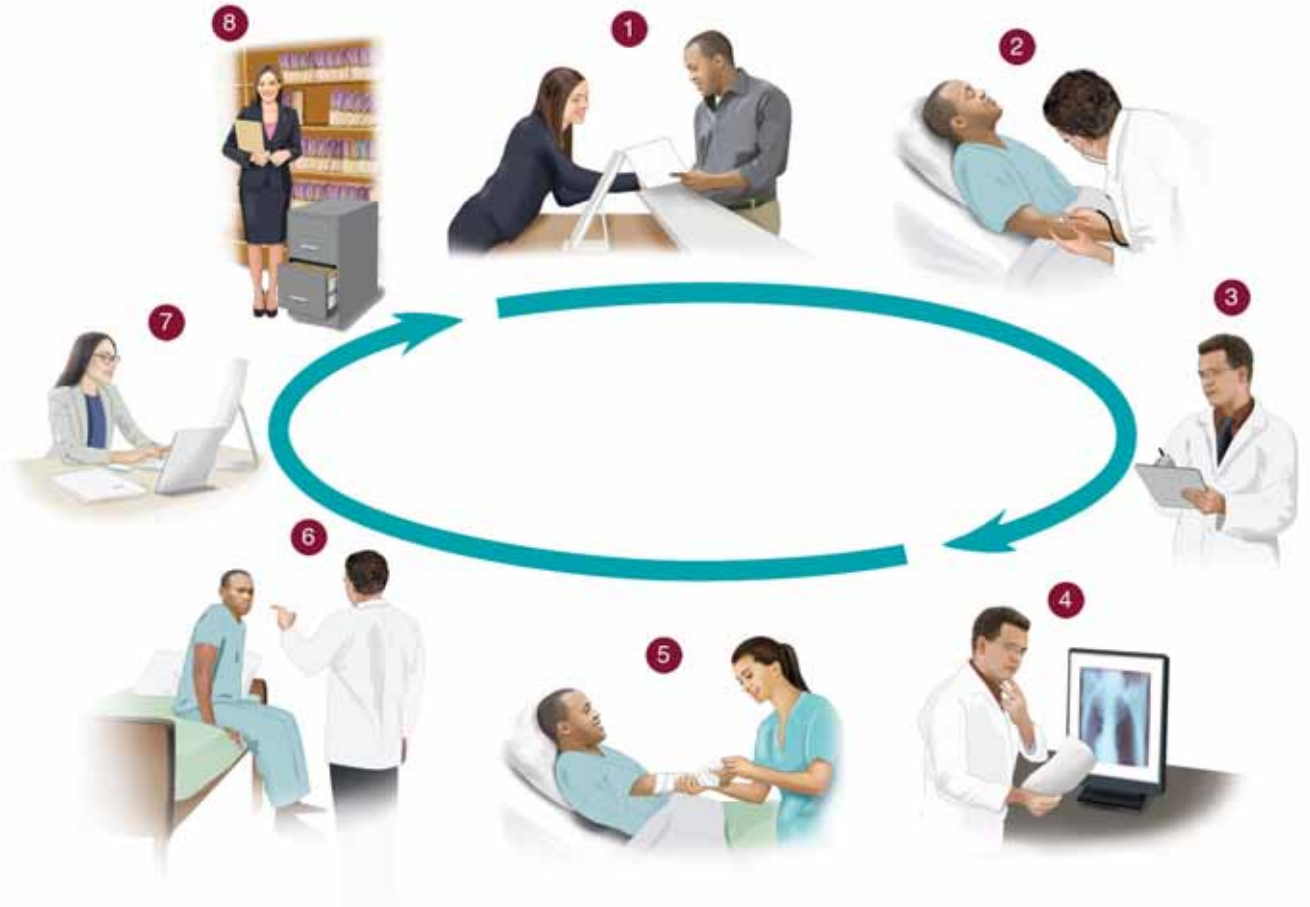

Figure 1-9 Flow of an inpatient from admission through discharge.

registration department. As depicted in Figure 1-9, the steps involved in an inpatient admission and discharge include the following:

1. When the patient arrives, patient demographic and insurance information is collected or updated, and an account is set up for the patient stay. Even if the patient has been an inpatient previously, a new account is created (although previous patients will use their existing medical record number).
2. An admitting and/or attending doctor is assigned to the patient. In some facilities this is a hospitalist, a physician who works full-time in the hospital. A physician is required to perform a complete history and physical on an inpatient within 24 hours of the admission. In an outpatient facility, no such time limit is imposed on when or what type of physical is performed.
3. The doctor orders tests, medications, and procedures.
4. The doctor reviews the results of tests and diagnostic procedures when they are ready.
5. Nurses provide most of the patient care, administer medications, take samples for tests, measure vital signs, perform nursing assessments and nursing interventions, and enter nursing notes into the chart.
6. When a patient leaves an inpatient facility, there is also a formal discharge process. Normally, the physician performs a final examination of the patient and writes a discharge order. Discharge does not necessarily mean the patient goes home. Patients may be discharged to a skilled nursing facility or a rehabilitation facility

for further care. Patients who leave without a doctor's order are discharged AMA (against medical advice).

7. Following discharge, the Health Information Management (HIM) department examines the patient's chart to determine if it has any missing or unsigned documents (called chart deficiencies). Once the chart is complete, it is given to a professional coder to determine the proper billing codes.
8. In a facility using paper charts, the last step is to file the chart.

There are also several significant differences in the content and purpose of a patient chart used in an acute care facility and that used by a medical office: the amount of information gathered about each patient and the number of individuals who will need access to it. Figure 1-10 highlights some of the differences between inpatient and outpatient charts.

Figure 1-10 Contents typical of acute care versus ambulatory patient charts.

Outpatient	Inpatient
Most physician offices have a single chart for the patient. Notes for each visit, test results, and any other reports are added to the chart.	A hospital chart for an episode of care includes all data for a specific stay. Previous hospitalizations are unique episodes of care linked by the patient's medical record number.
The quantity of data in an outpatient chart is relatively low by comparison.	The quantity of data in an inpatient chart is likely to be much larger.Vital signs are taken and nurses' notes are added numerous times per day; dietitians, respiratory therapists, and other providers add to the chart; there are typically many more orders for labs, medications, and so on.
The central element in the chart is the physician's exam note.	Physician exams tend to be brief; the main focus of the chart is the physician orders and nurse's notes indicating the patient's response.

In an ambulatory setting such as a physician's office, the patient visits the physician's office a number of times over a period of months or years. Although items produced outside each visit, such as lab results and consult reports, are also integrated into the patient's chart, the most important element of the outpatient chart is the doctor's notes about each visit. The clinician reviews previous notes on each subsequent visit, using them to follow up on past ailments and to measure the patient's progress in managing chronic problems.

The medical chart is primarily used by the clinician, nurse, and medical assistant, but is also used briefly by the administrative staff to prepare billings following each visit. The focus of the chart is the longitudinal care of the patient. As such, it usually contains all records of the patient's visits and any reports or results received from other providers.

The inpatient chart, however, focuses on the treatment of a specific ailment or condition for which the patient was hospitalized. Data are gathered more frequently during the inpatient's stay, resulting in a substantially large amount of information gathered during a short period of time. In most hospitals, a new episode chart or medical record is started for each hospital stay. Although records from previous hospitalizations are available for reference, they are not incorporated into the current episode chart, except as described in the admitting physician's history and physical notes.

Because a large number of caregivers are involved with the patient's stay in an acute care facility, there are a larger number of individuals with a legitimate need to access a patient's record than in an ambulatory care setting. These caregivers include not only nurses and physicians, but also other specialists that may consult on the case; radiologists, respiratory therapists, dietitians, and in many hospitals, even the hospital pharmacists have access to records when consulting with the ordering physicians about the medications being prescribed.

These differences between an acute care chart and a medical office chart are consistent whether the facility uses paper or electronic charts. However, another difference between the inpatient and outpatient EHR is the system itself. In most systems designed for physician's offices, the data typically is received and stored by the EHR software in a single electronic medical record system. Most hospitals have a large number of departments using computer systems from many different vendors. The hospital EHR may not necessarily merge the data from these systems into a single EHR. Often the hospital EHR allows the clinician to view data in these other systems through an interface but does not necessarily store the data in a single EHR.

Patient Registration and Appointment Scheduling

Although the subject of this book is Electronic Health Records, the first three elements in the preceding workflow diagrams involve software modules other than the EHR. These are the patient administration (or registration) module and the appointment schedule. If you have worked in a medical office, or previously taken a course in practice management, these functions may be familiar to you. While you will not be adding patients or scheduling appointments in this book, brief tutorials on these two functions may be helpful in understanding the overall workflow of a medical practice. Additionally, the registration and scheduling processes are fundamental. Nothing about the patient's care can be documented in the computer until the patient is set up, and except for emergency departments or walk-in clinics, the schedule is essential to ensuring the provider has sufficient time with each patient.

Patient Administration

Health information systems for both inpatient and outpatient facilities have a patient registration component used to add new patients to the system as well as to add or edit information about existing patients.

The patient registration process records demographic information about the patient as well as account and insurance information that will be necessary to obtain payment for the services rendered. Additional data may also be gathered to help the practice better serve the patient or meet certain reporting requirements. Some examples of additional data include the patient's ethnicity, preferred language, emergency contact information, and HIPAA privacy preferences.

In addition to adding patient demographic information, it is necessary to set up account and guarantor information, and, if the patient has health insurance, the policy information as well.

The module used to add and edit patient information will vary in appearance between different health information systems, but all registration systems gather the same essential data. In some medical offices a new patient may be partially registered to facilitate appointment scheduling, and the registration completed when the patient arrives for the appointment. Some practices also allow a new patient to register via a web portal. The concept of a web portal will be covered further in Chapter 10.

Tutorial Exercise 1A: Overview of a Patient Administration Module

In this tutorial you will observe how patient information is added and edited in a medical office practice management system. The Patient Administration demonstrated in the tutorial is from Greenway Health's SuccessEHS, an integrated EHR and practice management solution. Figure 1-11 shows an example of a paper form that is used to gather the patient and insurance information for the registration clerk.

Here are terms used in the tutorial with which you may not be familiar:

- **Patient account:** Each patient must have an account. The account is used to post charges and payments and to conduct billing and reporting. The account number is not necessarily the same as the patient ID or patient chart number.
- **Guarantor:** The person responsible for paying amounts not covered by insurance is called the guarantor of the account. In many cases, the guarantor is the patient. In other cases, the guarantor may be a parent or spouse. When the patient is not the guarantor, the name, address, and phone numbers of the guarantor must be recorded so they can be used for account billing later.
- **Health plan or payer:** A health plan may be a for-profit or not-for-profit insurance company, an employer self-insurance fund, or a government program such as Medicare. Health plans are sometimes also referred to as payers. Generally, the billing address and other information necessary to file claims are in a master file. The registration clerk usually just has to select the plan from a list, and the address fields are automatically completed.
- **Policy number or member number:** A unique ID is assigned by a health plan to each policy or by a government program to each participant. HMO plans sometimes call this the member number; other plans may call it the insurance ID. Some plans assign a unique member number to each dependent as well. Keeping accurate records of these IDs is vital to getting paid by the health plan.
- **Group number:** In many cases health insurance is obtained through an employer who has negotiated special rates and coverage. In such cases, the insurance card may include a group number. This number is used to further identify the policy and the benefits to which the patient is entitled.
- **Policy holder:** The primary person who is named on the health insurance card is referred to as the *subscriber, insured party, enrollee, member, or policy holder*.
- **Beneficiary:** The beneficiary is a person who is entitled to receive benefits from the plan. Plan coverage is not limited to the policy holder and frequently includes spouses and children. In some systems these are called *dependents*.

- **Assignment of benefits:** Nearly all medical claims are filed by the provider, not the patient. The patient, during registration, signs a document authorizing the plan to pay the doctor directly. This is called assignment of benefits. The patient also authorizes the provider to submit information to the insurance plan for claims, eligibility and other business purposes.

Case Study

John and Shirlee Colby are bringing their new baby, John, Jr., for his first visit to the pediatrician. Before being seen by the doctor, the new patient must be added to the system. The parents have completed the paper form shown in Figure 1-11.

Step 1

You will need access to the Internet for this exercise. Start a supported web browser program and follow the steps listed inside the cover of this textbook to log in to the MyHealthProfessionsLab for this course.

Step 2

Locate and click on the link **Exercise 1A**. This will open a video window.

Watch the video demonstrating the process of adding demographic information for a new patient.

Step 3

Answer the onscreen questions at the end of the tutorial.

When you are finished click the Submit Quiz button to complete Exercise 1A.

After completing the tutorial, think about how many of the patient data fields will be used by the EHR system. In addition to the patient's name and medical record number used for the chart, the date of birth will be used to calculate the patient's age at each encounter. Gender will determine gender specific components of the examination, recommended tests, and clinical quality measures. The patient's pharmacy data will allow for electronic transmission of prescriptions. Race and ethnicity are used to prompt clinicians to screen for health conditions found in certain population groups.

Patient and Provider Scheduling

Scheduling is central to a successful, smooth-running medical practice. With the exception of walk-in urgent care centers, most ambulatory care is delivered in scheduled patient appointments. The appointment schedule provides the framework for balanced and judicious scheduling of the provider's time. Enough time must be allotted for quality patient care, but the provider's time must not be wasted.

A typical patient encounter has several stages. The first part of the appointment consists of a medical assistant or nurse discussing the reason for the visit, past medical history, and measuring vital signs; the doctor comes in later. Where is the doctor during the first part of the appointment? With another patient, of course. From a scheduling perspective the two patients have overlapping appointments. This is called double booking.

However, patients are treated for many different reasons, and the time required of the doctor is not the same for all visits. Therefore, the type of appointment becomes a factor

PATIENT REGISTRATION FORM

PLEASE PRINT AND COMPLETE ALL ENTRIES

PATIENT NAME (FIRST - MIDDLE INITIAL - LAST)	ADDRESS		
John T Colby, Jr.	**2407 Grandview Avenue**		
CITY, STATE	**ZIP**	**HOME PHONE**	**CELL PHONE**
Mason, KY 41054-0001		**41054**	**859-555-5169**

DATE OF BIRTH	PATIENT SSN	GENDER	MARITAL STATUS
04/21/2015	555-55-5555	☒ Male ☐ Female	☒ Single ☐ Married ☐ Other_____
NICKNAME	**RACE – ETHINICITY**	**PREFERRED LANGUAGE**	**EMPLOYMENT STATUS** ☐ Fulltime ☐ Part-time
	White	**English**	☒ Not Employed ☐ Retired ☐ Student

PATIENT EMPLOYER NAME	PATIENT EMPLOYER ADDRESS (STREET ADDRESS - CITY - STATE - ZIP)	WORK PHONE

GUARANTOR/RESPONSIBLE PARTY INFORMATION — **PATIENT RELATIONSHIP TO GUARANTOR:** ☐ Self ☐ Spouse ☒ Child ☐ Other

NAME (FIRST - MIDDLE INITIAL - LAST)	ADDRESS (if different from patient)			
John T Colby	**Same**			
HOME PHONE	**WORK PHONE**	**SSN**	**BIRTH DATE**	**EMPLOYER**
859-555-5169		**000-00-2285**	**2/24/70**	**Home Depot**

INSURANCE INFORMATION

PRIMARY INSURANCE PLAN NAME	PLAN ADDRESS (STREET - CITY - STATE - ZIP)	PLAN PHONE
Cigna	**PO Box 182223, Mason, KY 40154**	

POLICY NUMBER	POLICY HOLDER NAME	DATE OF BIRTH	GENDER
HX0002285	**John T Colby**	**2/24/70**	☒ Male ☐ Female
GROUP NUMBER/ NAME	**HOLDER ADDRESS (STREET - CITY - STATE - ZIP)**	**PATIENT RELATIONSHIP TO HOLDER:**	
None	**Same as patient**	☐ Self ☐ Spouse ☒ Child ☐ Other	

SECONDARY INSURANCE PLAN NAME	PLAN ADDRESS (STREET CITY STATE ZIP)	PLAN PHONE

POLICY NUMBER	POLICY HOLDER NAME	DATE OF BIRTH	GENDER
			☐ Male ☐ Female
GROUP NUMBER/NAME	**HOLDER ADDRESS (STREET - CITY - STATE - ZIP)**	**PATIENT RELATIONSHIP TO HOLDER:**	
		☐ Self ☐ Spouse ☐ Child ☐ Other	

OTHER INFORMATION

PRIMARY DOCTOR	REFFERING DOCTOR	
Dr. Lora Jordan	**None**	
IN CASE OF EMERGENCY CONTACT	**RELATIONSHIP**	**PHONE NUMBER**
Shirlee Colby	**Mother**	**859-555-0947**

PREFERRED METHOD OF CONTACT (Check all that apply):	EMAIL ADDRESS	I WOULD LIKE A CODE TO ACCESS THE WELL CARE ONLINE PORTAL
☒ Home Phone ☐ Cell Phone ☒ Mail ☐ Email ☒ OK to leave message		☐ Yes ☐ No

ASSIGNMENT AND CONSENT FOR RELEASE OF INFORMATION

I hereby authorize my insurance benefits be paid directly to the physician/provider. I also authorize the physician/provider to release any information required in the processing of this claim and all future claims. I agree to be financially responsible for non-covered services. If my account is sent to a collection agency, I agree to pay all collection and attorney fees.

I acknowledge that I have been offered a copy of Well Clinic's HIPAA Privacy Policy and I understand that:

- Well Care Clinic and its employees are permitted to share/disclose my health information for purposes of my Treatment, obtaining Payment and for Operation of the clinic (hereafter TPO.)
- I may make a request in writing at any time to inspect and/or obtain a copy of my health information maintained at this facility as provided in the Federal Privacy Rule 45 CFR (164.524).
- If I wish to do so I may also designate a Personal Representative to act in my behalf in all matters regarding my Protected Health information.
- My records are protected and cannot be disclosed to a third party without my written Authorization except for TPO or when required by applicable federal and state laws governing the use and disclosure of protected health information.
- I may authorize the release of my information to Third Party by signing an Authorization request. A separate Authorization must be signed for each third party. Well Care Clinic is not responsible if the Recipient i authorize re-discloses my health information.

SIGNATURE OF PATIENT OR LEGAL REPRESENTATIVE	DATE	RELATIONSHIP IF SIGNED BY LEGAL REPRESENTATIVE:
John T. Colby	**2-10-2015**	**Father**

Figure 1-11 Example of paper patient information form used for patient registration.

in determining if appointments can overlap. How much of a resource's time is required for each type of appointment can be expressed as a percentage or "**percent effort**."

For example, appointment type A is 30 minutes long and requires 15 minutes of the doctor's time, or 50 percent effort. Appointment type B is 30 minutes long, but requires 20 minutes of the doctor's time, or 66 percent effort. Scheduling two overlapping type A appointments will not cause a problem. But scheduling appointments of types A and B at the same time would be a problem because the sum of the percent effort would require 116 percent of the provider's time. This is called overbooking.

As long as the cumulative percent for multiple appointments in the same time period doesn't exceed 100 percent the provider will be able to give sufficient time to each patient. The ideal schedule keeps the provider busy but not overcommitted. When a doctor is consistently overbooked, the doctor's schedule gets backed up, and the patients are kept waiting.

Another consideration is that not all providers work at the same pace, or perform exams in the same way. Therefore the percent effort can vary by provider even for the same type of appointment. Computerized scheduling systems assist the office in maintaining optimal schedules for all.

Not all appointments are with patients. Doctors have meetings, vacations, and personal appointments of their own. These are recorded in the schedule as *nonpatient* appointments. These have the effect of blocking the designated time and help make the scheduling person aware of times when the doctor is unavailable for patient appointments.

A typical scheduling module allows the user to view, schedule, and search for both patient and nonpatient appointments. It is also used to reschedule or cancel appointments and generate scheduling reports. It can also be used to check patients in or mark that a patient has arrived.

Tutorial Exercise 1B: Overview of a Scheduling Module

In this exercise you will learn about the Scheduling module and how to add patient appointments. The Appointment Scheduling module demonstrated in this tutorial organizes schedules in Appointment books. When the user opens an appointment book, they see the schedule for a particular resource such as a doctor. As you will see in the tutorial, however, appointment books can be opened in such a way that multiple schedules can be viewed side by side in columns.

Case Study

An appointment clerk in a multidoctor practice adds, cancels, and reschedules patient appointments and blocks time on the doctors' schedules for a meeting.

Step 1

You will need access to the Internet for this exercise. Start a supported web browser program and follow the steps listed inside the cover of this textbook to log in to the MyHealthProfessionsLab for this course.

Step 2

Locate and click on the link **Exercise 1B**. This will open a video window.

Watch the video demonstrating the process of scheduling patient appointments.

Step 3

Answer the onscreen questions at the end of the tutorial.

When you are finished, click the Submit Quiz button.

Now that you have seen patient registration, an appointment book, and how appointment schedules are managed, we will concentrate on EHR functions for the remaining chapters.

Chapter One Summary

Electronic Health Records are the portions of a patient's medical records that are stored in a computer system as well as the functional benefits derived from having an electronic health record.

The IOM set forth eight core functions that an EHR should be capable of performing:

- **Health information and data** Provide improved access to information needed by care providers, using a defined data set that includes medical and nursing diagnoses, a medication list, allergies, demographics, clinical narratives, laboratory test results, and more.
- **Result management** Electronic results for better interpretation, and quicker recognition and treatment of medical problems; reduces redundant testing and improves care coordination among multiple providers.
- **Order management** CPOE systems improve workflow, eliminate lost orders and ambiguities caused by illegible handwriting, monitor for duplicate orders, and reduce the time required to fill orders.
- **Decision support** Includes prevention, prescribing of drugs, diagnosis and management, and detection of adverse events and disease outbreaks.
- Computer reminders and prompts improve preventive practices in areas such as vaccinations, breast cancer screening, colorectal screening, and cardiovascular risk reduction.
- **Electronic communication and connectivity** Among care partners, enhances patient safety and quality of care, especially for patients who have multiple providers.
- **Patient support** For example, patient education and home monitoring by patients using electronic devices.
- **Administrative processes and reporting** Increases the efficiency of healthcare organizations and provides better, timelier service to patients.
- **Reporting and population health** Facilitates the reporting of key quality indicators and timely reporting of adverse reactions and disease outbreaks.

The CPRI identified three key criteria for an EHR:

- Capture data at the point of care
- Integrate data from multiple sources
- Provide decision support

The ONC created a strategic framework for achieving widespread adoption of EHR within 10 years.

The HITECH Act provides CMS incentives for providers to use a certified EHR.

ONC seeks to reduce the risk of EHR investment by establishing Authorized Testing and Certification Bodies to certify EHR systems.

A patient encounter document is organized into four components:

- Subjective
- Objective
- Assessment
- Plan

EHR systems strive to improve patient healthcare by giving the provider and patient access to complete, up-to-date records of past and present conditions.

Documenting at the point of care means the providers (clinicians, nurses, and medical assistants) record findings at the time of the encounter, not after they have left the patient.

Implementing an EHR requires changes in the way providers work, including the type of clinician–patient interaction the clinicians hope to achieve.

Before the patient encounter can be documented in an EHR, the patient must first be added to the system and in most practices scheduled. During patient registration the system automatically assigns a patient number. Patients are also assigned to an account. The account is used for charge and payment posting, and for billing.

The demographic portion of registration is divided into two sections, patient information and guarantor information. The guarantor is the person responsible for paying the account. The guarantor may be the patient, a spouse, a parent, or even an employer.

When the patient is not the guarantor, the name, address, and phone number of the guarantor must be recorded so they can be used for account billing later. The employer field on the demographic tab records the guarantor's employer. When the patient is not the guarantor, the patient's employer is recorded on the Additional Data tab.

Insurance information is recorded on the insurance tab and is used to submit claims, preauthorization, and determining eligibility.

The health plan, sometimes called the payer, is a third party who pays all or a portion of the patient's medical bill. Health plans include profit and not-for-profit insurance companies, government programs, and employer self-insurance funds.

Patients can have multiple insurance plans. The rank field is used to indicate which should be billed: primary, secondary, and so on.

The beneficiary is a person entitled to receive benefits from the plan. Some plans call beneficiaries members.

Health plans assign a unique ID to each policy and sometimes each member of a policy.

Employers or other groups negotiate special rates and coverage. A Group Name or Group Number assigned by the plan helps assure the patient receives these special rates.

The person who holds the policy or coverage is called the policy holder. In some cases (such as worker's compensation) the policy holder may be a nonperson such as a

corporation or business. Other terms used for policy holder include subscriber, insured party, enrollee, or member.

An assignment of benefits authorizes the health plan to pay the doctor directly. The patient also authorizes the provider to submit information to the insurance plan for claims, eligibility, and other business purposes. These authorizations may be part of the registration form or a separate document.

Scheduling is essential to keeping most ambulatory care practices running smoothly. Balanced and judicious scheduling of the provider's time must allow enough time for quality patient care without wasting the provider's time between patients. Since the provider is with the patient for only a portion of the typical patient encounter, offices often overlap the appointments of multiple patients. This is called double booking.

The amount of the provider's time required for each type of appointment can be expressed as a percentage. The tutorial called this the percent effort. Different appointment types have different percent effort. Double booked appointments can be scheduled unless the cumulative percent effort in a slot exceeds 100 percent. If this occurs, the user is warned. If the user overrides the warning, the slot is considered overbooked. An override code is required to overbook a time slot.

Testing Your Knowledge of Chapter 1

Step 1

Log in to MyHealthProfessionsLab following the directions printed inside the cover of this textbook.

Locate and click on Chapter 1 Test.

Step 2

Answer the test questions. When you have finished, click the Submit Test button to close the window.