

Chapter 8

Applications

Learning Objectives

- List and differentiate the types of application software commonly used in healthcare organizations.
- Discuss the evolution of medical documentation toward an electronic health record.
- Differentiate among software applications used in healthcare enterprises by describing functionality and end users.
- Distinguish between clinical decision support software and executive information systems.
- Understand the use of computer applications as tools for research and medical education.

“True” Electronic Health Record

- Electronic data capture for storage in a data repository.
- Patient demographics, data generated through diagnostic and treatment events, and results of treatment are captured and accessible by all applications in the enterprise information system.
- Data redundancy is eliminated as data are captured once and stored for access by all appropriate applications and users.

“True” Electronic Health Record

- Electronic data interchange (EDI) with oversight agencies and strategic partners
- EDI compliance with national information standards and code sets
- Clinical decision support
- Diagnosis and care management

Progress Toward the EHR

- Many healthcare organizations have developed computerized or electronic medical records (imaging and other digitizing approaches for communication and archiving).
- A few large systems have created an electronic patient record (integrated across organizations).

Progress Toward the EHR

- The electronic health record – all medical and health records related to an individual connected via a unique identifier no matter where the actual data reside – will not be realized until national information standards and code sets are well established.
- While many health data standards have been implemented, they are primarily technical in nature, and emerged from the information technology vendor groups.

Clinical Information Systems

- Clinical applications support diagnosis, treatment planning, and evaluation of medical outcomes across the continuum of care.
- A system may be designed to support activities related to a defined function, such as order entry, or an entire service area, such as the laboratory.

Laboratory Automation and Laboratory Information Systems

- One of the most common clinical computer applications
- Two primary functions
 - Automation of test processes
 - Processing of laboratory data
- Automation of test processing involves linking laboratory instruments directly to a computer.
- Signals from the test instruments are captured in (or converted to) digitized format for computer processing.

Integrated Pharmacy Systems

- Orders are transmitted to the pharmacy, where worksheets are generated, electronic patient profiles are updated, and dispensing labels are prepared.
- Such systems often include automatic updating of the drug inventory and automatic generation of patient charges from the medication orders.
- Data and information generated by the pharmacy system also may be linked with administrative systems to track medication errors, profile ordering practices, and prepare other cost and quality analyses used for performance management.

PACS

- A PACS involves online storage and rapid retrieval of images transmitted over communications networks to user workstations that can display both digital information and images.
- Benefits of PACS include
 - Faster turnaround of images and reports
 - Elimination of lost films
 - Reliable retrieval of archived films
 - Greatly reduced storage space requirements

Order Entry / Results Reporting

- Order-entry and results-reporting applications provide for efficient entry of orders for diagnostic tests and patient treatments and for subsequent reporting of test results to the ordering provider and the patient care unit.
- Often termed computerized physician order entry (CPOE) systems, these applications transmit physician orders to the appropriate clinical service units electronically.
- Results can be stored electronically for remote or workstation access, or printed for inclusion in a paper record.

Nursing Information Systems

- Stand-alone or integrated computer systems assist nurses in planning and delivering patient care, monitoring patients over the course of their treatment, and in managing the administrative aspects of the nursing or patient care unit.
- Administrative tools include financial management, staffing and resource allocation, scheduling, activity (care) planning and performance management reports.

Potential Advantages Point-of-Care Nursing Systems

- Overall cost reduction
 - Bedside patient information systems can result in fewer lost charges because information is entered immediately after completion of a patient care activity.
- Length of stay could be reduced because every patient service will be delivered faster and better.
- The point-of-care system permits more accurate logging of nursing activity, thereby producing better data on nursing staff productivity and costs related to patient diagnosis.

Management, Administrative, and Financial Systems

- Enterprise resources planning (ERP) systems are bundled applications that integrate operational information derived from financial, human resources, materials management, and other function-based areas into a single database used to achieve business management objectives.
- These systems connect inventory and facilities management, resource scheduling, accounting and financial management, and other business events in a real-time environment.

Administrative Applications Incorporated in an ERP

- Financial information systems
- Human resources information systems
- Resource utilization and scheduling systems
- Materials management systems
- Facilities and project management systems
- Office automation systems

Groupware

- Mobile computing using laptops and hand-held devices, wireless technology, and the Internet have changed the way people work together.
- Workgroups and teams can work collaboratively anywhere – in a conference room or in geographically separated offices – with full access to necessary programs and files.
- Audio and video conferencing allow real-time interaction among team members.
- The virtual office can be as productive as the traditional office.

Information Systems for Non-Hospital Healthcare Organizations

- As changes to payment models in the 1980s led to changes in delivery models during the 1990s, healthcare organizations other than hospitals began implementing information systems to manage clinical services and business operations.
- The vendor sector quickly began designing and marketing software products to meet the special information needs of these organizations.

Disease Management Information Systems and Software

- Designed to assist healthcare organizations in designing processes to provide quality care at the most reasonable cost possible.
- For the most part, they are disease specific and focus on high-volume, high-cost chronic conditions such as asthma, diabetes, and congestive heart failure.
- The typical approach is to involve patients in self-management of their condition and to create monitoring and feedback processes that encourage compliance with treatment plans.

Telemedicine

- Although telemedicine applications have increased in recent years, there are still issues related to reimbursement for remote services, state licensure of health professionals when the system crosses state borders, patient-privacy protection, and government regulation.
- Clinical outcome benefits achieved through various telemedicine applications differ, as do cost savings.

Computer Applications in Medical Research and Education

- Information systems and medical databases are used extensively to support biomedical education and research.
- Computerized patient records serve as the basis for epidemiological studies of a variety of diseases and their potential linkages to social and environmental factors.

Computer Applications in Medical Research and Education

- Support medical, dental, nursing, and allied health education using such techniques as computer-aided instruction (CAI) and patient-management simulation.
- Computers are an integral component of most medical research projects.
- Effective project design requires close collaboration among clinicians, biostatisticians, and information systems specialists.

Computer Applications in Medical Research and Education

- Some research projects would not be possible without the high-speed computational capabilities and data storage capacity of large computer systems.
- An excellent example is the Human Genome Project, which mapped all the genes of the *Homo sapiens* species.

Computer Applications in Medical Research and Education

- Microcomputer-based simulation programs are used to teach clinical problem solving.
- Students are presented initial cues and additional information on request as they proceed through a diagnostic process.
- Final diagnosis, patient management, and follow-up plans selected by the students are entered, and the system responds with a comparison to the “ideal” solution and critiques the process followed.