Types of EHR Systems: Acute Care Organizational and Departmental Systems, and Non-Acute Care Systems

Foundational Curricula:
Cluster 5: EHR Systems
Module 8: Working with Health IT Systems

Unit 2: Types of EHR Systems: Acute Care Organizational and Departmental Systems, and Non-Acute Care Systems
FC-C5M8U2

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Unit Objectives

• Describe the modular arrangement of the EHR, and identify specialized health information software applications and modules

• Identify what data is needed for specific functions and modules of health systems/electronic health records, including documentation, in the inpatient and ambulatory settings

• Describe the role that remote and network-linked technologies play in clinical practice
Modular Arrangement of the EHR

• Data can be organized by the specific functions and modules of EHRs

• There are three different levels of categorization in EHR. The largest level of organization in the EHR is called super-modules

• **Super-modules** are the first and largest level of organization within an EHR. There are the smaller components within the super-modules, known as **components/systems**, which are further divided into **modules**

• **Modules** are sometimes referred to as applications
Modular Arrangement of the EHR (Cont’d)

super-module

component

system

application

module

module

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Modular Arrangement of the EHR (cont’d)

• Examples of super-modules are:
  – Inpatient
  – Ambulatory (outpatient)
  – Patient portal
  – HIE (Health Information Exchange)
  – Management and Administration

• Examples of components/systems are usually departmentally based, but can also be categorized by a group of similar functions for users:
  – Laboratory
  – Pharmacy
  – Obstetrics
  – Nursing or physician documentation
Components of the Inpatient Super-Module

The inpatient EHR super-module has further subcategories that are known as components or systems, including:

- Clinical information system (CIS)
- Patient administration information system (PAIS)
- Pathology information system/Laboratory information system (PIS)/(LIS)
- Radiology information system (RIS)
- Operating room management information system (ORMIS)
- Emergency department information system (EDIS)
- Pharmacy information management systems (RxIS)
Clinical Information System (Component/Systems)

Common modules of documentation in the clinical information system (CIS) component of the electronic health records include:

- Patient demographics (also often part of the PAIS)
- Order entry
- Results reporting
- Medication prescribing and administration (includes allergies)
- Clinical work lists
- Problem lists
- Clinical notes, including:
  - Physician documentation
  - Nursing documentation
  - Allied provider documentation (nursing assistants, therapists, technologists, etc.)
- Vital signs monitoring/telemetry
- Clinical decision support
Common patient administration information system (PAIS) modules include the following data:

- Master patient index (MPI)
- Inpatient management
- Outpatient management
- Emergency management
- Operating room/theatre management
- Surgery waiting list management
- Medical records tracking
- Medical records coding
- Inpatient billing
- Reporting
Common pathology/laboratory information systems (PIS/LIS) modules include the following data:

- Pathology/laboratory request
- Specimen registration
- Request and specimen management
- Results reporting/clinical documentation
- Blood bank
- Pathology and laboratory data management reporting
- External results interfacing (inbound and outbound)
Common radiology information systems (RIS) modules include the following data:

- Radiology request registration
- Appointment scheduling
- Exam management
- Exam reporting/clinical documentation (frequently including voice-to-text dictation systems)
- PACS (picture archiving and communications system) integration
- Management reporting
- Image tracking
EHR/EMR Integration with Pathology and Radiology

• Electronic Health Records typically integrate more directly with Pathology and Radiology Information Systems by:
  − creating and storing request details in the Electronic Health Record then sending them via HL7 (Health Level Seven International) to the Pathology/Radiology Information System
  − storing request details in the Electronic Health Record sent via HL7 from the Pathology/Radiology Information System
  − storing pathology/radiology exam results in the Electronic Health Record sent via HL7 from the Pathology/Radiology Information System
  − storing radiology exam image information in the Electronic Health Record sent via a DICOM (Digital Imaging and Communications in Medicine) standard file from the PACS
Operating Room Information System

Common operating room information system (ORIS) modules include the following data:

- Scheduling
- Preoperative management
- Perioperative management
- Clinical documentation, including:
  - Preop
  - Anesthesia
  - Perioperative/Procedure description
  - Close and dress
- Post-anesthesia care unit (PACU) management
Common emergency room information system (ERIS) modules include the following data:

- Registration
- Triaging
- Patient Tracking
- Order Entry and Management
- Clinical Documentation, including:
  - Physician, nursing and ancillary notes
  - Assessment management
- Clinical decision support, including evidence-based guidance and drug-interaction tracking
- Acuity management
- Bed control
- Patient information and communications
Pharmacy Information System

★ Common pharmacy information system (RxIS) modules include:

– Prescription registration
– Routing medications
– Preparing and inspecting medications
– Tracking and reporting on medications, including IV and chemotherapeutic doses
– Dispensing medications and dispensary management
– Clinical decision support, including interaction checking
– Inventory control, including bar control management
– Management reporting

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The outpatient EHR can be broken down into the following four components:

- Pre-visit
- Clinical documentation
- Referrals
- Patient communications
Outpatient Components

The outpatient EHR components include the following modules/applications:

– Pre-visit:
  • Scheduling
  • Registration
  • Pre-authorizations

– Clinical Documentation:
  • Clinical notes, including:
    – Physician documentation
    – Nursing documentation
    – Allied provider documentation (medical assistants, therapists, technologists, etc.)
  • Order entry, including:
    – Lab, x-ray and therapy order entry
  • Electronic prescriptions
  • In-office procedure documentation
  • Results reviewing
  • Wellness and Immunization Tracking
  • Growth Charts

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Outpatient Components (cont’d)

⭐ – Referrals:

• Referral requests
• Referral communications and follow-ups
• Hospitalization summaries

– Patient communications:

• Care instructions
• Screening exams, visit and procedures
• Yearly examinations
• Visit reminders
• Results notifications

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More robust outpatient (ambulatory) applications can also include:

- Access to evidence-based guidelines and clinical decision support
- Evaluation and Management (E&M) Coding and Billing Assistance
Patient Management Systems

• **Patient management systems (PMS)** are software regulated as medical devices within the EU. Patient management systems acquire medical information from a medical device to be used in the treatment or diagnosis of a patient.

• PMS can also directly contribute to the treatment of the patient by performing analysis, or providing treatment or diagnosis. Thus the system can replace the decision and judgment of a physician:
  - Software for aiding in treatment or diagnosis of a patient (e.g. view images or other real time data) would be **Class I medical device**
  - A software adjunct to another medical device and is e.g. performing data manipulation, analysis or editing, image generation or other similar activities, (and some extra conditions) is a **Class II medical device**

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Virtual tools and technology for healthcare can be roughly divided into three categories:

- Health and wellness tools
- Virtual visits
- Remote monitoring

**Health and wellness tools** provide the patient with opportunities to take part in the care process

- includes technologies, devices and systems for self-monitoring and lifestyle management, such as Fit-Bits, health apps, etc.

**Virtual visits** provide telehealth and telemedicine opportunities that allow patients to be treated remotely, without a face-to-face visit with a healthcare provider or practitioner

- these type of visits reduce travel and other costs, save provider time, and decrease waiting time
Remote Monitoring

- **Remote monitoring** enables monitoring of patients outside of conventional clinical settings (for example, at home)
  - this can increase access to care and decrease healthcare delivery costs
  - incorporating RPM in chronic disease management can significantly improve an individual's quality of life
  - allows patients to maintain independence, can prevent complications, and can minimize personal costs.
  - provides interventions for high-risk care situations with patients already in the care process (e.g. chronic disease patients)

- Some virtual health tools and technologies can be patient management systems
Remote Technologies in Clinical Practice

- Remote monitoring for diagnosis, treatment and disease management enables virtual health technology
- Patients’ biometric parameters can be monitored remotely, but also with ingestible or wireless sensors
  - this provides even more possibilities for non-invasive (or non-noticeable) measurements
- Remote monitoring provides significant potential in monitoring of chronic disease patients, for example with diabetes, pulmonary or cardiac diseases
  - patient wellness can be monitored, and hospitalization days and clinic costs can be reduced
  - glucometer results, vital signs and other data and readings can be measured at home and transmitted to the physician’s office or hospital
  - data can be easily graphed, trended and monitored for significant alerts and findings that are outside of the normal range

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The Future of Virtual Healthcare

• Remote and virtual healthcare development takes more time than the development of consumer electronics, but it has and will increase rapidly as the background technology is improved.

• The current challenges of virtual technology are not in the technology itself, but more in ensuring the security of data and connections.

• Implantable (and digestible) sensors also require enhanced safety and quality assurance:
  – Knowledge of adverse effects and materials increase; thus the regulation and legislation is very strict.
Unit Review Checklist

- Described the modular arrangement of the EHR, and identified specialized health information software applications and modules (JN12)

- Identified what data is needed for specific functions and modules of health systems/electronic health records, including documentation, in the inpatient and ambulatory settings

- Described the role that remote and network-linked technologies play in clinical practice (JB14)
Unit Review Exercise/Activity

1. In which EHR/EMR system would you typically find the MPI? In which system would you find PACS? In which system module would you find the Blood Bank?

2. Activity: Look up at least three virtual health and wellness tools using an internet search engine. Which kind of devices can you find? Are they for the customer (patient) or the care provider?

3. What are the benefits of virtual and remote care/monitoring?
Unit Exam

1. Problem list and order entry would be typically found in which of the following information system modules?
   a. Laboratory information system (LIS) modules
   b. Pathology information system (PIS) modules
   c. Radiology information system (RIS) modules
   d. Clinical information system (CIS) modules

2. HL7 helps which two system modules store and display their requests and results more dynamically into the electronic health record (EHR)?
   a. LIS and RIS modules
   b. CIS and RIS modules
   c. PAIS and RxIS modules
   d. LIS and RxIS modules
3. The outpatient super-module can be broken down into which four components?

   a) Pre-admission, Hospital Course, Pre-Discharge, Discharge
   b) Admission Discharge Transfer, Clinical Documentation, Referrals and Patient Communication
   c) Pre-visit, Clinical Documentation, Referrals and Patient Communication
   d) Pre-visit, Clinical Information System, Lab and Radiology Information System, Patient Information System

4. Which of the following describes a patient management system in the EU?

   a) A system that manages patients at the emergency room
   b) A system for electronic prescriptions for patients
   c) A system that can aid in the diagnosis and treatment of the patient
   d) A system that is used to manage patient financial accounts
5. Which of the following best describes virtual visits?
   a) include technologies, devices and systems for self-monitoring and lifestyle management
   b) provide opportunities that allow patients to be treated remotely
   c) utilize wired and office-based devices only
   d) require a face-to-face visit with a healthcare provider or practitioner

6. What type of patient care situation would not be suited to be monitored virtually or remotely?
   a) An acute fracture of the leg with the patient in the emergency room
   b) An ongoing, chronic stomach condition in a patient with a digestible sensor in place
   c) A cardiac patient without symptoms with a Holter monitor
   d) An elderly patient with diabetes on a home glucometer with transmission ability