

Electronic Health Record Systems

patient record, commonly referred to as the patient's chart, medical record, or health record.

Purpose of a Patient Record

purpose of a patient record is "to recall observations, to inform others, to instruct students, to gain knowledge, to monitor performance, and to justify interventions. have a single goal—to further the application of health sciences in ways that improve the well-being of patients, including the conduct of research and public health activities that address population health.

Electronic Health Record Systems We anticipate that it will carry all of person's health related information from all sources over their lifetime

The term electronic health record system (also referred to as a computer-based patient-record system) EHRs include information management tools to provide clinical reminders and alerts, linkages with knowledge sources for health care decision support, and analysis of aggregate data both for care management and for research.

Deference between Health Record And Paper-Based Record.

1- the EHR is flexible and adaptable Data maybe entered in one format to simplify the input process and then displayed in many different formats according to the user's needs. The entry and display of dates is illustrative. Most EHRs can accept many date formats, i.e. May 1, 1992, 1 May 92, or 1/5/92, as input; store that information in one internal format, such as 1992-05-01; and display it in different formats according to local customs. The EHR can incorporate multimedia information, such as radiology images and echocardiographic video loops, which were never part of the traditional medical record.

2-Inaccessibility is a problem with paper records. They can only be in one place and with at most one user at one point in time. In contrast, many users, including patients, can read the same electronic record at once.

3- EHR content more legible and better organized than the paper alternative and the computer can increase the quality of data by applying validity checks as data is being entered. The computer can reduce typographical errors through restricted input menus and spell checking.

degree to which a particular EHR achieves benefits depends on:

A-comprehensiveness of information :contain information about health as well as illness? Does it include information from all organizations and clinicians who participated in a patient's care?

B-Duration of use and retention of data :A record that has accumulated patient data over 5 years will be more valuable than one that contains only the last month's records.

C-Degree of structure of data: Narrative notes stored in electronic health records have the advantage over their paper counterparts in that they can be searched by word. EHR data require structured data. One way to obtain such data is to ask the clinical user to enter information through structured forms whose fields provide dropdown menus or restrict data entry to a controlled vocabulary

E-Ubiquity of access: system that is accessible from a few sites will be less valuable than one accessible by an authorized user from anywhere .

EHR system has some disadvantages.

1- It requires a larger initial investment than its paper counterpart due to hardware, software, training,).

2- take time to learn and to change works flows.

3-Computer-based systems have the potential for catastrophic failures that could cause extended unavailability of patients' computer records. However, these risks can be mitigated by using fully redundant components, mirrored servers, and battery backup

functional components for Electronic Health Record System are:

1-Integrated view of patient data

2.Clinician order entry

3.Clinical decision support

4Access to knowledge resources

5-Integrated communication and reporting

Integrated view of patient data :

goal of an EHR. However, capturing everything of interest is not possible because: (1) Some patient data do not exist in electronic form like hand-written data in old charts. (2)clinical data that do exist in electronic form but isolated external computer systems like office practice,radiology center, home health agency, nursing homes.(3) Even when electronic and organizational links exist, a fully integrated view of the data may be thwarted by the difference in conceptualization of data among systems from different vendors, and among different installations of one vendor's system in different institutions.important challenge to the construction of an integrated view is the lack of a national patient identifier in the United States. Because each organization assigns its own medical record number, a receiving organization cannot directly file a patient's data that is only identified by a medical record number from an external care organization. Linking schemes based on name, birth date and other patient characteristics must be implemented. Today, most clinical data sources and EHRs can send and receive clinical content as version 2.x Health Level 7 (hl7) messages. Large organizations use interface engines to send, receive, and, when necessary, translate the format of, and the codes within, such messages.

Clinician order entry:

the point at which clinicians make decisions and take actions, and the computer can provide assistance. This will reduce errors and costs .Orders collected directly from the decision maker can be passed in a legible form to the intended recipient without the risk of transcription errors.order entry systems pop up alerts about any interactions or allergies associated with a new drug order.

simple orders like “vital signs three times a day,” or very complicated orders such as total parenteral nutrition (TPN). Once a clinician order-entry system is adopted by the practice, simply changing the default drug or dosing based on the latest scientific evidence can shift the physician’s ordering behavior toward the optimum standard of care.

Clinical decision support:

the practice uses the batch list of patients generated by decision support to contact the patient and encourage him or her to reach a goal or to schedule an appointment for the delivery of suggested care. This is the only mode that can reach patients who repeatedly miss appointments. The best way for the computer to suggest actions that require an order is to present a preconstructed order to the provider who can confirm or reject it with a single key stroke or mouse click. decision support system from Intermountain Health Care that uses a wide range of clinical information to recommend antibiotic choice, dose, and duration of treatment. Clinical alerts attached to a laboratory test result can include suggestions for appropriate follow up or treatments for some abnormalities .

Access to knowledge resources:

Some EHR systems are proactive and present short informational nuggets as a paragraph adjacent to the order item that the clinician has chosen. EHRs can also pull literature, textbook or other sources of information relevant to a particular clinical situation through an Infobutton

Integrated communication and reporting:

the delivery of patient care requires multiple health care professionals and may cross many organizations; thus, the effectiveness, efficiency, and timeliness of communication among such team members and organizations are increasingly important. Therefore, communication tools should be an integrated part of the EHR system.

hospital, and the emergency room should all be linked together not a technical challenge with today’s Internet, but still an administrative challenge due to organizational barriers. Connectivity to the patient’s home will be increasingly important to patient-provider communication: for delivery of reminders directly to patients, and for home health monitoring, such as home blood pressure and glucose monitor.

EHR systems can also help with patient handoffs, during which the responsibility for care is transferred from one clinician to another, receiving clinician understand the patient’s problems and treatments.

Fundamental Issues for Electronic Health Record Systems

All health record systems must serve the same functions, whether they are automated or manual. From a user's perspective, the major difference is the way data are entered into, and delivered from, the record system.

Data Capture

EHRs use two general methods for **data capture**:

- (1) electronic interfaces from systems, such as laboratory systems that are already fully automated.
- (2) direct manual data entry, when no such electronic source exists or it cannot be accessed.

ELECTRONIC INTERFACES :

- Implantation on electronic interfaces between electronic health record (EHR) & existing electronic data sources: pharmacy system, laboratory system, home monitoring devices.
- Easier when organization owns EHR.

MANUAL DATA ENTRY

Data may be entered as :

1. Narrative free-text
2. Codes
3. Combination of both

CODING FOR :

- Diagnosis
- Allergy
- Medications

THE MAJOR ADVANTAGES FOR CODES ARE:

- Understandable data to computer
- Selective retrieve
- Clinical research
- Quality improvement

PHYSICIAN –ENTERED DATA

Physicians spend 20% of time in documentation

Physician notes can be entered into EHR via :

1. TRANSCRIPTION OF DICTATED OR WRITTEN NOTES

- Dictation w/ transcription is a common approach for entering narrative informations
- Speech recognition softwares offer an approach to dictating without cost or delay of transcription , however physician has to invest important time to find and correct errors

2. CLINIC SATFF TRANSFER OR CODING OF SOME OR ALL DATA BY CLINCIAN ON PAPER ENCOUNTER FORM

- Physician records informations on a structured encounter form then scanning or transcription.

3. DIRECT DATA ENTRY BY PHYSICIANS INTO EHR

- ADVANTAGES:
 - Immediate checking of entry for consistency with previous informations
 - Asking for additional details
 - Selection of specific menus
 - No scrolling of the list

- DISADVANTAGES:
 - Time consuming
 - Templates could not convey as clear as the patient stats and inaccurate informations.

WHAT TO DO ABOUT RECORDED DATA IN PAPER BEFORE INSTALLATION OF EHR?

- Interface EHR to available electronic sources and load this data for 6-12 months before EHR live.
- Abstraction of selected data such as key laboratories and active meds onto EHR prior to patient's visit
- Scan and store 1-2 years of old papers record which can be applied to any kind of documents, paper chart, handwritten records.

DATA VALIDATION

Because of the chance of transcription errors with the hand entry of data, EHR systems must apply **validity checks** scrupulously. A number of different kinds of checks apply to clinical data

1- **RANGE CHECKS:**

can detect or prevent entry of values that are out of range

2- **PATTERN CHECKS**

Verify the data have a required pattern (3 or 4 digits)

3- **COMPUTED CHECKS**

Verify values have correct mathematical relationship

4- **CONSISTENCY CHECKS**

Comparing entered data by detecting errors

5- **DELTA CHECKS**

Warn of unlikely and large differences between the values of a new result and of the previous observations

6- **SPELLING CHECKS**

DATA DISPLAY

Advanced web security features such as **Transport Layer Security (TLS)**—a revised designation for **Secure Sockets Layer (SSL)**—can ensure the confidentiality of any such data transmitted over the Internet.

HELPFUL FORMAT

- **Timeline graphs** → sparklines
- **Timeline flowsheet** → radiology image report + radiology impression
- **Summaries and snapshots**
 - Active allergies
 - Active problems
 - Active treatment
 - Recent observation
- **Dynamic search** to find a particular piece of information and to answer routine questions

Query and surveillance system can be used for:

- **Clinical care**
 - Periodic screening exams such as immunization, pap smear and mammogram
- **Clinical research** to identify patients who meet the eligibility requirements for prospective clinical trials
- **Quality reporting**
- **Retrospective studies**
- **Administration**

CHALLENGES AHEAD

- Users' information needs
- Usability
- Standards
- Privacy and security
- Costs and benefits
- Leadership

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Note: there is no chapter for lecture 4 (CPOE) in the book.