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Medical informatics 439

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Medical Informatics

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Lecture 3

Electronic Health Records

Objectives:

1-State the definition of electronic health records (EHRs).

2-Describe the limitations of paper-based health records.

3-Identify the benefits of EHR.

4- List the key components of an EHR.

5-Describe the benefits and challenges of computerized order entry and clinical decision support systems.

6-Enumerate the steps to adopt and implement an EHR.

Color index:

Main Text | Female Slides | Male Slides | Extra | **Important** | Dr's Notes | Golden notes | **Textbook**

Electronic Health Records.pdf

Introduction

There is no topic in health informatics as important, yet controversial, as the electronic health record (EHR).

In spite of fledgling EHRs being around for the past 35-40 years they are still controversial in the eyes of many.

In 1991, IOM recommended EHR as a solution for many problems in their book: "The Computer-Based Patient Record: An Essential Technology for Health Care". In that book they outline eight core functions all EHRs should have:

-Health information and data.

-Result management: Physicians should not have to search for lab, x-ray and consult results.

-Order management (CPOE).

-Decision support: providing alerts and reminders. E.g. reminds clinicians about drug-drug interactions and known medication allergies

-Electronic communication and connectivity: Communication among disparate partners include all tools such as secure messaging, text messaging, web portals, health information exchange, etc.

-Patient support: Recognizes the growing role of the Internet for patient education as well as home telemonitoring.

-Administrative processes and reporting: Electronic scheduling, electronic claims submission, eligibility verification, automated drug recall messages, automated identification of patients for research.

-Reporting and population health: reporting of immunization status and biosurveillance data to an electronic format.

-Experts suggest several future trends of EHR, including an increased reliance on cloud computing.

Electronic Health Records (EHR)

Figure 4.1: Relationship between EHR, PHR and EMR

1- Electronic Health Record	2- Electronic Medical Record	3- Personal Health Record
An **electronic record** of health-related information on **an individual** (They can be healthy not necessarily patients) that conforms to **nationally recognized interoperability** standards and that can be created, managed and consulted by authorized clinicians and staff **across more than one healthcare organization.** -EHR is a repository of electronically maintained information about an individual's health status and health care, stored such that it can serve the multiple legitimate uses and users of the record. -There is no a universal accepted definition of EHR.	"An electronic record of health-related information on an individual that can be created, gathered, managed and consulted by authorized clinicians and staff **within one healthcare organization.**" The difference between this & EHR is that this is for one health organization but EHR for more than 1. -EMR is A general term describing computer-based patient record systems.	"An electronic record of health-related information on an individual that conforms to **nationally recognized interoperability standards** and that can be drawn from **multiple sources** while being managed, shared and controlled **by the individual."** (The patient here is responsible for this record unlike EHR and EMR where the staff and the organization is responsible) هنا المريض يقعد يدور كل المستشفى عشان يجمع بياناته

438 notes

- EHR will handle information of both patients and healthy people.
- EHR is NOT a digital copy of a paper record.
- PHR will be controlled by the individual instead of hospitals or healthcare organizations.

Electronic Health Records

EHR Advantages (Why do we need EHRs)

1 Paper records are severely limited

Paper records: illegible handwriting, limits the ability to extract and use information, difficult to determine who has seen it, easy to destroy.
EHR: available off-site 24\7, identify eligible patient for research.

2 Need for aggregated data

cannot be done with paper, paper cannot integrated, we also need aggregated data because we can analyse it.

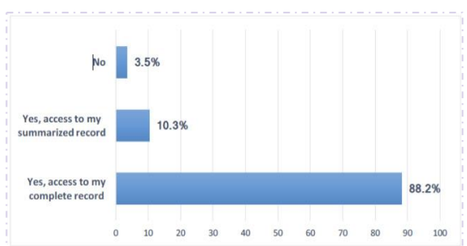
- Digital healthcare information can be integrated with multiple internal and external applications:
  - Integrate with health information organizations (HIOs).
  - Integrate with analytical software for data mining to examine optimal treatments.
  - Integrate with local, state and federal government.
  - Integrate with artificial intelligence.
  - Integrate with personal devices, such as activity monitors, glucose monitors, etc.

3 Need for improved efficiency and productivity

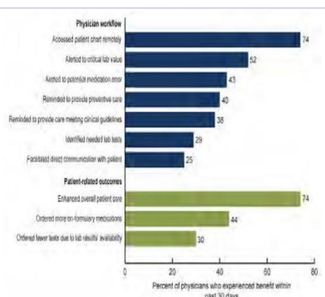
reduction in duplication of tests (because the data is there , so we can check whether the test was done for the patient or not) and prescription, reduce redundant administrative paperwork.

4 Public expectations

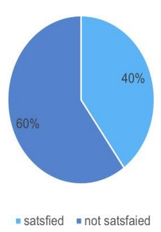
-fewer lost charts, faster refills and improved delivery of patient educational material. allow patients access to their records with multiple other functionalities such as online appointments.
-general public has a favorable view of the EHR.



Physician's perceptions of EHR benefit



-US study (2011)



-Saudi study (2014): 60% liked it.

5 Quality of care and patient safety

-Eases the collection of quality reports.
-improve patient safety through multiple mechanisms: (1) Improved legibility of clinical notes.(2) Improved access anytime and anywhere.(3) Reduced duplication.(4) Reminders and clinical alerts (for example a reminder that announces if relevant tests or preventive services are overdue).(5) Clinical decision support that reminds clinicians about drug-drug interactions, known medication allergies, cost and correct dosage of drugs.(6)Electronic problem summary lists (PSLs) provide diagnoses, allergies and surgeries at a glance.

6 Need for coordinated care

-Home monitoring (telehomecare) can transmit patient data from home to an office's EHR so that physician can check patient and make future suggestions.

7 EHR as a transformational tool

-Because it uses standardized health care (guidelines).
-The integration of data analytics with care has resulted in the improvement in standardization of care, care coordination of groups within a hospital or from different hospitals.

8 Financial savings

-Because it uses standardized health care (guidelines).
-However, medical and legal financial losses can happen during the transition between paper based systems and EHRs "implementation chasm".
-reduction in the need for transcriptionists with the advent of point and-click templating and voice recognition software, fewer callbacks from pharmacists requiring help to decipher physician handwriting. The labor costs of chart pulls are reduced.

9 Technological advances

Electronic Health Records

EHR Key Components

Location: Electronic Health Records

Home Folder

Key Components

1-Clinical decision support. (438) (Guidelines, reminders and alerts)	2-Results retrieval (lab and xray results)	3-Access via mobile technology.	4-Integration with physician and patient education.
5-Secure messaging. For communication between patients and office staff and among office staff.	6-Prior encounter retrieval.	7-Remote access from home.	8-Public health reporting.
9-Computerized physician order entry (CPOE).	10-Patient reminders.	11-Electronic prescribing.	12-Problem summary lists that includes: diagnoses, allergies, surgeries and medications.
13-Practice management software. scheduling software and patient portals that are embedded or connect with an interface of EHR.	14-Electronic encounter notes.	15- Integration with images (PACS). -a picture archiving and communication system (PACS) is a system that is used to capture those images.	16-Ability to scan in data. (438) An example of software that convert different type of documents into searchable and editable documents is OCR (optical character recognition).
17-Referral management.	18-Multiple input methods. (typing,dictation, voice recognition and templates).	19-Robust backup systems.	20-Ability to graph and track results. -Ability to create graphs or flow sheets of lab results or vital signs.
21-Ability to create patient lists.	**22-Ability to create registries.**	23-Privacy/security compliance with HIPAA standards.	24-Support for client server or application service provider (ASP) modes.

Files (629.9 KB Total) - 3 Folders

Message Box

Work Hard

OK

Electronic Health Records

Computerized Physician Order Entry (CPOE)

- **CPOE** is an EHR feature that processes orders for medications, lab tests, imaging, consults and other diagnostic tests.
- CPOE has many potential benefits:
  - Reduce Medication Errors
    - Although it reduces medication errors, the degree of benefit is not that optimistic. This is due to new errors that result from technology " e-iatrogenesis" these errors are more common in **outpatient** CPOE, because they are more in number.
    - Examples of medication errors that were overcome by the use of CPOE:

      the issue of illegibility that is associated with errors in ordering drugs with similar names, trailing zeroes,reduce under and over-prescribing,
  - Reduce costs
  - Reduce Variation of Care
    - (438) Specific guidelines that you follow to deliver standardized care.
- Unintended adverse consequences (= e-iatrogenesis)

Clinical Decision Support Systems (CDSSs)

Clinical Decision Support is any electronic or non-electronic system designed to **aid directly in clinical decision making**, in which characteristics of individual patients are used to generate patient-specific assessments or recommendations that are then presented to **clinicians for consideration.**

Types of CDSS	
1-Knowledge support	-Examples include: UpToDate, diagnostic (ICD-10) codes, and infobuttons (digital knowledge-based resources are being integrated with EHRs. For example, UpToDate has been embedded into several EHRs, and diagnostic (ICD-10) codes can be hyperlinked to further information or you can use infobuttons.Infobuttons are a HL7 standard and commonly used to link to important information).
2-Calculators	- Appropriate antibiotic dosing.
3-Flow charts and graphs	- To look at lab or vital sign trends over time. (Trending/Patient tracking)
4-Medication order support	- (438)To detect any allergies or drug-drug interaction and also proper dosing.
5-Reminders	- Remind clinician or patient about pending tests (yearly preventive health screening measures, Example: Mammogram)
6-Order sets	- Inpatient clinical practice guidelines for specific scenarios. -Order sets are groups of pre-established related orders that are related to a symptom or diagnosis. For instance, with just a few mouse clicks a provider may place an order set for pneumonia that might include the antibiotic of choice, supplemental oxygen, an order for a chest x-ray.
7-Differential diagnosis	- Software exists that helps clinicians analyze symptoms and signs, to arrive at a diagnosis.
8-Lab and Imaging decision support	-particularly those in training, physicians may order imaging studies that are either incorrect or unnecessary. That is why Appropriateness criteria was integrated into the EHR which lead to reduction in ordered lab tests.
9-Public health alerts	- Primarily infectious disease alerts for new outbreaks, e.g. MERS virus issues. -The EHR-based alert also hyperlinked to disease specific order sets for educational tips, lab and medication orders.

Electronic Health Records

EHR Registries

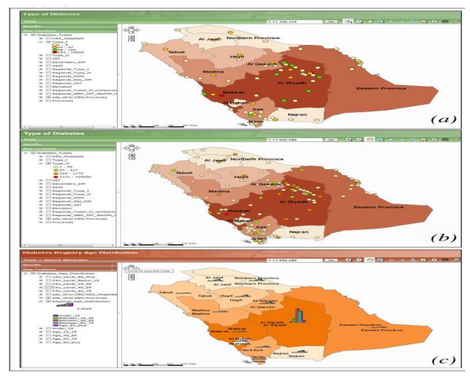
-An organized system that uses observational study methods to **collect uniform data** (clinical and other) **to evaluate specified outcomes for a population** defined by a particular **disease, condition, or exposure,** and that serves one or more predetermined scientific, clinical, or policy purposes.
(For example, you will collect data about diabetes so you can find the best way to treat your patients (clinical) but if you used this data to know how many patients are there so you can increase your staff to provide equal care for all then this (policy purpose).

-**Types** of EHR registries:

1. Chronic disease management registries
   e.g have all patients with type 2 diabetes in a registry for management purposes.
2. Public health registries:
   Reporting immunization, cancer and biosurveillance.
3. Research registries , ex:total hip replacement patients in a single registry they can evaluate and compare different outcomes with different prostheses.
4. Safety registries: (a reporting system)
   Reporting to e.g the FDA.
5. Quality registries:
   report Performance.

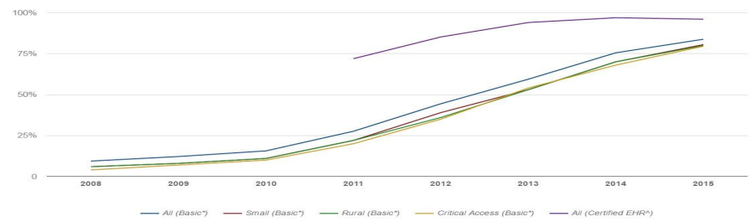
-Functions of EHR registries:
1- determining the natural history of diseases.
2- ensuring effectiveness,safety and quality.

- Example of the use of EHR registries: here they utilized the information from diabetes registry and GIS in decision making. **Geographic information system (GIS) maps demonstrating the diabetic patient distribution for:**
  - (a) type 1 diabetes
  - (b) type 2 diabetes at the country level
  - (c) the distribution of different age groups in all health sectors.



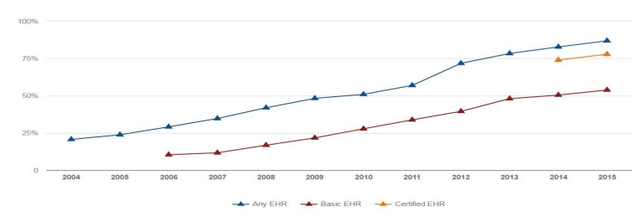
EHR Adoption

Inpatients EHR Adoption



Adoption of a certified inpatient EHR by non-federal acute care hospitals had risen from 72% in 2009 to 96% in 2015.

Outpatients EHR Adoption

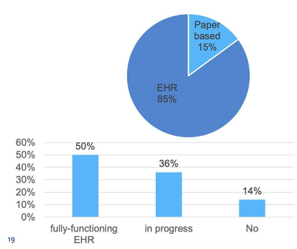


86% of OP (office-based care repondants) had an EHR ; 54% with a basic system (has core function) and 78% with a certified system (a specific organization in the us gives certification if EHR meets a certain criteria).

- **EHR adoption in Saudi Arabia**

  -Eastern Province study
  (Bah, Alharthi, El Mhalli, 2011):
  - Only **3 of 19** hospitals adopted EHR. They implemented the same EHR system which includes **three main modules; laboratory, radiology, and pharmacy.**

-Riyadh study (aldosari, 2014).



-85%of Riyadh hospitals had EHR and out of these (50% had fully-functioning EHR,36% in progress (meaning they had EHR for some modules only).14-15% didn't have EHR.

Electronic Health Records

EHR Adoption cont.

- **Implementing an EHR steps:**

1 Pre-implementation:
begins with deciding whether to purchase an EHR and ends with signing a contract with a vendor for a specific EHR.
-Decision of purchasing EHR.
-Workflow mapping (Aka: workflow analysis):
a detailed step-by-step description, typically utilizing a flowchart of how a process is accomplished.
For example, how are notes created or how are patient messages handled or how are prescription refills managed?

3 Post-implementation (maintenance):
remains in effect for the duration of EHR use.

2 Implementation:
-starts with the signing of the contract and ends with the go-live date.
-Experts in IT implementations often categorize facets of implementation into People (team), Process (tactics), or Technology issues.

-Team:
-Key people issues include leadership, change management, goal establishment and expectation setting. An implementation will have three key types of leaders: a project manager, a senior administrative sponsor, and a clinical champion.
clinical champion: a respected, supportive, influential clinicians (doesn't have to be a physician) that encourage other physicians to accept and utilize the system effectively.
Project manager: knowledgeable and experienced in managing a complex IT project.
a senior administrative sponsor: essential because an EHR implementation will affect nearly all aspects (departments) of a hospital.

-Tactics: It's the process, implementation. How will we use the EHR to redesign our workflows? What is our data entry strategy? Which data will we enter discretely, which will we scan and which (if any) will we leave out of the EHR? Who will do this data entry and when? Will we follow a big bang (all personnel/sites and EHR functions at once) or a phased implementation approach (certain user groups and/or certain sites/ departments and or certain EHR functions in sequential order)?
-Technology.

EHR Challenges

All the table's notes are from 438

1-Financial Brarries	• Most common one. • particularly for smaller or solo practices. • Multiple surveys report that lack of funding is the number one barrier to EHR adoption. • web-based application is a less expensive choice.
2-Physician Resistance	• Because workflow changes and indeed require clinicians to significantly alter the way they deliver patient care.
3-Loss of Productivity	• Because instead of meeting patients the physician spends her\his time training on how to use the EHR. • This is a period when physician champions can help maintain morale and momentum with a positive attitude.
4-Workflow Changes	• We have to use workflow analysis. (يتغير الروتين على عمال القطاع الصحي(اللي باقي ما تعودوا • Workflow analysis should be done before the implementation of EHR to determine optimal alterations to work flows to ensure uninterrupted and efficient patient care after implementation.
5-Reduced Physician-Patient Interaction	• No eye contact, so you can use tablet instead of PC and work on PC placement.

Electronic Health Records

EHR Challenges cont.

6-Usability issues	• Usability has been defined as the "Effectiveness, efficiency and satisfaction with which specific users can achieve a specific set of tasks in a particular environment". • Effectiveness is the ability to do things, Efficiency doing things with minimal resource waste. • Commercial EHRs might be different that healthcare environment. • The American Medical Informatics Association (AMIA) board has made a set of recommendations to enhance patient safety and quality of care by improving the usability of EHRs: -Recommendations for the academic informatics community emphasizing human factors research. -Policy recommendations include standardizing EHR systems and ensuring interoperability, establishing -Specific recommendations for EHR vendors include developing a common user interface style. -Recommendations for end users suggests adopting best practices for EHR system implementation. (use the best EHR one that has worked successfully for other hospitals and is certified).
7-Integration and interoperability issues	• Data standards such as HL7. (interoperability) • Perhaps the most interesting standard with interoperability ramifications is the HL7 standard (to solve CDSS interoperability issues) known as Fast Healthcare Interoperability Resources (FHIR). • Integration with genomic databases. • commercial EHR products require integration with existing software, other EHRs, registries, health information networks, and data warehouse.
8-Privacy concerns	• Hacking into EHRs could result in loss of privacy for thousands, rather than a single paper chart. • An important solution of security concern is using database or transmission encryption. • Users of EHRs must: -Provide physical and software security of data systems - Provide physical and software security of their network(s) including mobile and remote computing. - Provide access control with defined user roles, - Monitor and manage user behavior. - Have written security policies and procedures. - Have an effective disaster recovery plan.
9-Legal	• It is not known if EHRs will increase or decrease malpractice over the long haul. • E-iatrogenesis. **Potential risks:** -Clinical documentation. -Clinical decision support.
10-Inadequate proof of benefit	• In spite on many published studies, there is not adequate proof that EHRs improve quality of care.
11-Patient safety and unintended consequences	• Not only are studies suggesting improved patient safety mixed, there is evidence that new medical errors may occur (at least in the short term) with EHR use. • "E-iatrogenesis": medical errors due to technology (Over Dependent on technology can be challenging especially if we had system shutdown). • Reliability issues: You should have a backup plan when the system is shut down; paper based records for example.

Conclusions:

- Paper based health records are severely limited.
- In spite of many potential benefits of EHRs, multiple challenges are associated with adoption.
- Planning, training and strategizing about EHRs is more important than the actual EHR brand purchased.

Summary

Electronic Health Record (EHR)	An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be created, managed and consulted by authorized clinicians and staff across more than one healthcare organization.
Advantages	1- Paper records are severely limited. 2- Need for aggregated data. 3- Quality of care and patient safety. 4- Public expectations. 5- Need for improved efficiency and productivity. 6- EHR as a transformational tool. 7- Need for coordinated care. 8- Technological advances. 9- Financial savings.
Key Components	1- Clinical decision support 2- Results retrieval 3- Access via mobile technology 4- Integration with physician and patient education 5- Secure messaging 6- Prior encounter retrieval 7- Remote access from home 8- Public health reporting 9- Computerized physician order entry (CPOE) 10- Patient reminders 11- Electronic prescribing 12- Problem summary lists 13- Practice management software 14- Electronic encounter notes 15- Integration with images 16- Ability to scan in data 17- Referral management 18- Multiple input methods 19- Robust backup system 20- Ability to graph and track results 21- Ability to create patient lists 22- Ability to create registries 23- Privacy/security compliance 24- Support for client server or application service provider (ASP) modes
Computerized Physician Order Entry	is an EHR feature that processes orders for medications, lab tests, imaging, consults and other diagnostic tests.
Clinical Decision Support Systems	-Any electronic or non-electronic system designed to aid directly in clinical decision making. **Types:** Knowledge support, Calculators, Flow charts and graphs, Medication order support, Reminders, Order sets, Differential diagnosis, Lab and Imaging decision support, Public health alerts.
EHR Registries	-An organized system that uses observational study methods to collect uniform data (clinical and other) to evaluate specified outcomes for a population **Types:** Chronic disease management registries, Research registries, Safety registries, Public health registries, Quality registries
EHR Adoption	**Steps:** 1-Pre-implementation 2-Implementation 3-Post- implementation (maintenance)
EHR Challenges	Financial Brarries - Physician Resistance - Loss of Productivity - Workflow Changes - Reduced Physician - Patient Interaction - Usability issues - Integration and interoperability issues - Privacy concerns - Legal -Inadequate proof of benefit - Patient safety and unintended consequences

MCQs

1- Electronic medical record (EMR) is the main application of which of the following health informatics area?

A- Administration.
B- Clinical.
C- Education.
D- Research .

2- Why do we need export system in CDSS?

A- Preservation of knowledge.
B- Sharing of knowledge between clinicians.
C- Aid decision making.
D- Range checks.

3- Improving patient safety,quality and efficiency and reduce operating cost"are benefit of which of the following?

A- Big data.
B- CPOE.
C- Barcode Technology.
D- Patient portal.

4- "An organized system that uses observational study methods to collect uniform data (clinical and other) to evaluate specified outcomes for a population defined by a particular disease, condition, or exposure, and that serves one or more predetermined scientific, clinical, or policy purposes" is which of the following?

A-EHR Registries.
B-CPOE.
C-CDSS.
D-Electronic Health Record (EHR).

5-Which one of the following is an Pre-implementation step in EHR Adoption?

A- Technology.
B-Maintenance.
C-Workflow mapping.
D-Team.

6-Which one of the following is considered to be a legal EHR challenge?

A-Not known if EHRs will increase or decrease malpractice over the long haul.
B-Commercial EHRs might be different that healthcare environment.
C-Hacking into EHRs.
D-Not adequate proof that EHRs improve quality of care.

Answers key

1-B 2-C 3-B 4-A 5-C 6-A

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Lecture 3

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Abdulrahman Alswat

Mohamed alquhidan

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Ghaida Alassiry

Leena Almazyad

Rand AlRefaei

Shayma Alghanoum

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Thank you all..!<3