Chapter 4: Electronic Health Records

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Acknowledgement

* The original slides are from:
  * Robert Hoyt MD
  * Vishnu Mohan MD
* The chapter: chapter 4
* Book title: Hersh, W. R., & Hoyt, R. E. (2018). *Health Informatics: Practical Guide Seventh Edition*. Lulu. com.

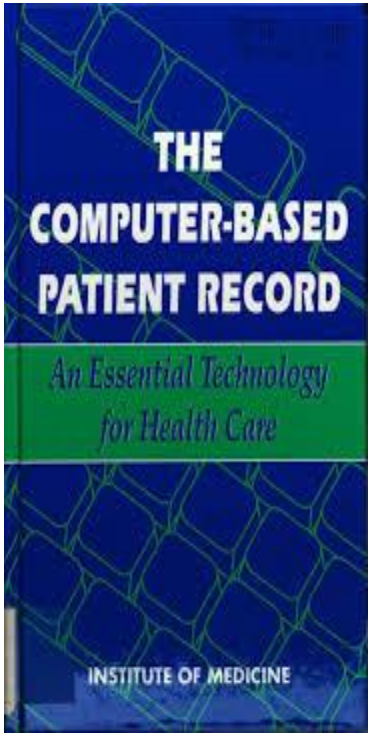
Learning Objectives

After reading this lecture the students should be able to:

* State the definition of electronic health records (EHRs)
* Describe the limitations of paper-based health records
* Identify the benefits of electronic health records
* List the key components of an electronic health record
* Describe the benefits and challenges of computerized order entry and clinical decision support systems
* State the obstacles to purchasing, adopting and implementing an electronic health record
* Enumerate the steps to adopt and implement an EHR

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.
  * *The Computer-Based Patient Record: An Essential Technology for Health Care.*



Definitions

* **Electronic Health Record:** "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**"

Definitions

* **Electronic Medical Record:** "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**."

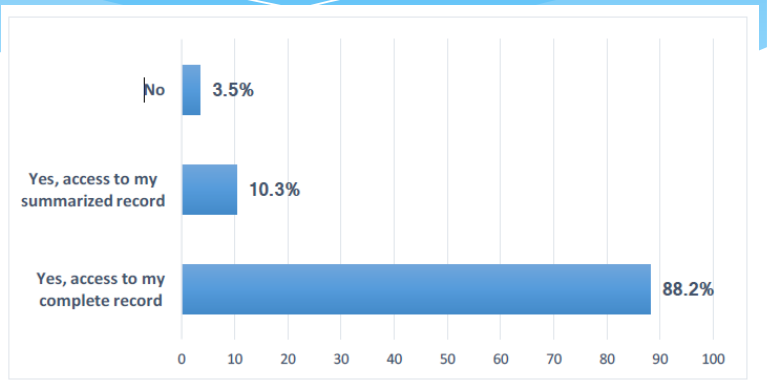
* **Personal Health Record**: "*An electronic record of health-related information on an individual that conforms to **nationally recognized interoperability standards** and that can be drawn from **multiple sources** while being managed, shared and controlled **by the individual.**"*

Why do we need EHRs?

* **Paper records are severely limited.**
* **Need for improved efficiency and productivity**
* **Quality of care and patient safety**

Why do we need EHRs?

* **Public expectations**
* **Financial savings**
* **Technological advances**
* **Need for aggregated data**

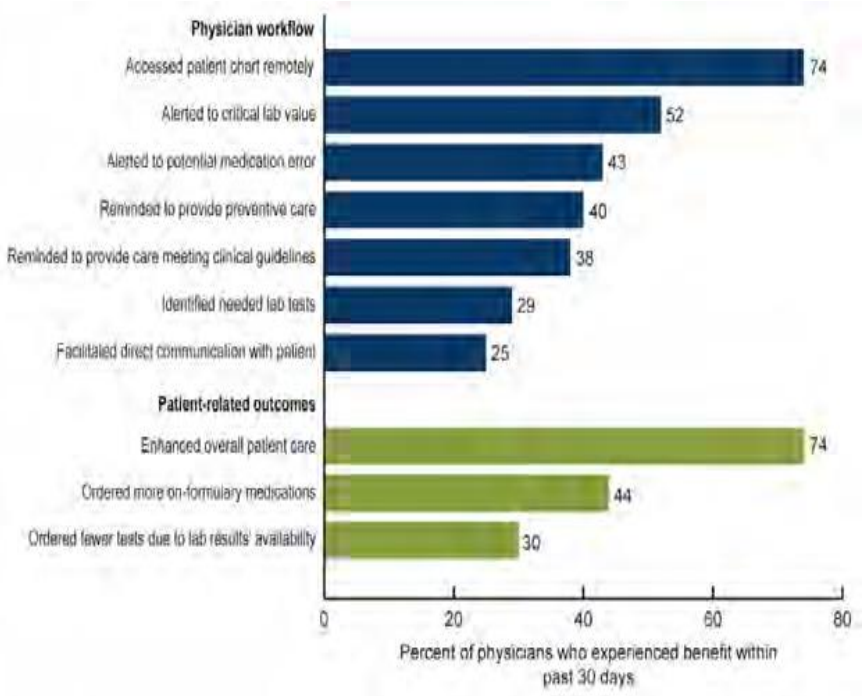


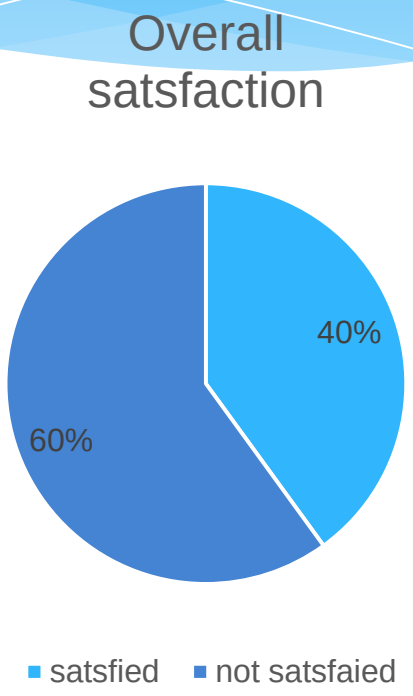
Reference: Almulhem, J. A. (2017). Layperson Perceptions and Attitudes Towards a National Electronic Health Record Introduction in Saudi Arabia.

Why do we need EHRs?

* **EHR as a transformational tool**
* **Need for coordinated care**

Why do we need EHRs?





Reference: Alharthi, H., Youssef, A., Radwan, S., Al-Muallim, S., & Zainab, A. T. (2014). Physician satisfaction with electronic medical records in a major Saudi Government hospital. Journal of Taibah University Medical Sciences, 9(3), 213-218.

Electronic Health Record Key Components

* Clinical decision support
* Secure messaging
* Computerized physician order entry
* Practice management
* Referral management
* Results retrieval
* Prior encounter retrieval
* Patient reminders
* Electronic encounter notes
* Multiple input methods
* Access via mobile technology
* Remote access from home
* Electronic prescribing
* Integration with images
* Integration with physician and patient education
* Public health reporting
* Problem summary lists

Electronic Health Record Key Components

* Ability to scan in data
* Ability to graph and track results
* Ability to create patient lists
* Ability to create registries
* Privacy/security compliance
* Robust backup systems
* Support for client server or application service provider (ASP) modes

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
  * Reduce costs
  * Reduce Variation of Care
* Unintended adverse consequences

Clinical Decision Support Systems (CDSSs)

* **Clinical Decision Support** : "*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:***
  * **Knowledge support**: UpToDate, diagnostic (ICD-10) codes, and *infobuttons*.
  * **Calculators**: appropriate antibiotic dosing

Clinical Decision Support Systems (CDSSs)

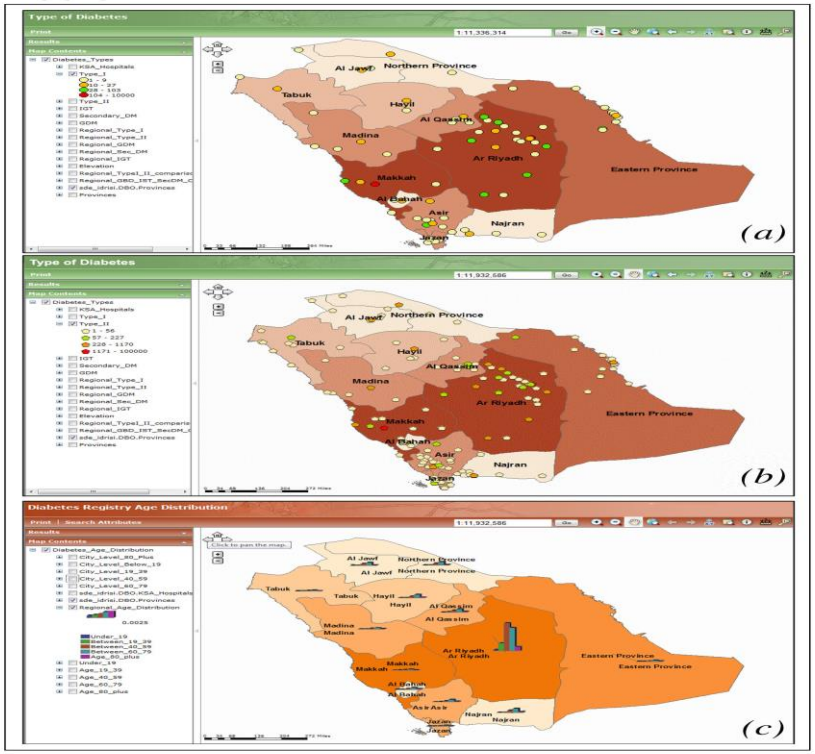
* **Types of CDSS (continued):**
  * **Flow charts and graphs**: to look at lab or vital sign trends over time
  * **Medication order support**
  * **Reminders**: remind clinician or patient about pending tests, etc.
  * **Order sets**: inpatient clinical practice guidelines for specific scenarios.
  * **Differential diagnosis**: software exists that helps clinicians analyze symptoms and signs, to arrive at a diagnosis
  * **Lab and Imaging decision support**
  * **Public health alerts**: primarily infectious disease alerts for new outbreaks, e.g. MERS virus

EHR Registries

* Definition: "*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*".
* **Types:**
  1. Chronic disease management registries
  2. Research registries
  3. Safety registries
  4. Public health registries
  5. Quality registries

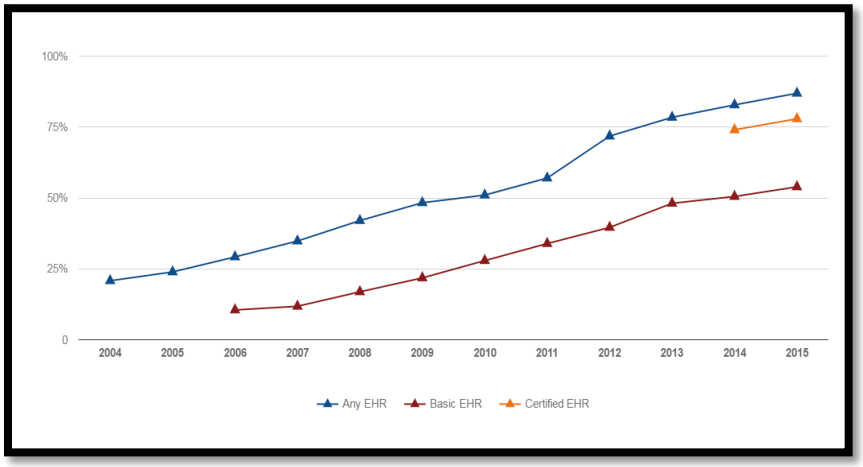
EHR Registries

* Geographic information system (GIS) maps demonstrating the diabetic patient distribution for
* (a) type 1 diabetes and (b) type 2 diabetes at th country level, and
* (c) the distribution of different age groups in all health sectors.

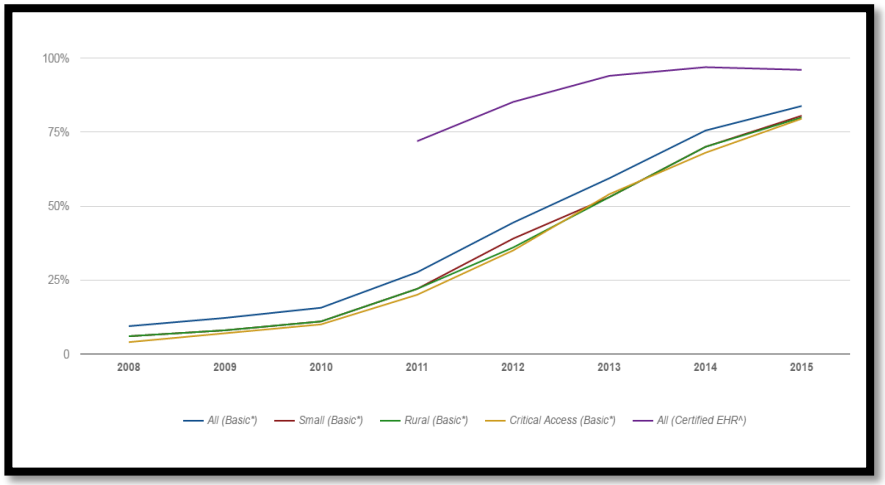


Reference : Al-Rubeaan, K. A., Youssef, A. M., Subhani, S. N., Ahmad, N. A., Al-Sharqawi, A. H., & Ibrahim, H. M. (2013). A Web-based interactive diabetes registry for health care management and planning in Saudi Arabia. Journal of medical Internet research, 15(9), e202.

EHR Adoption



Outpatient EHR adoption



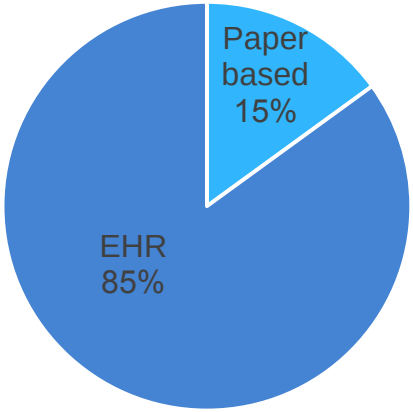
Inpatient EHR adoption

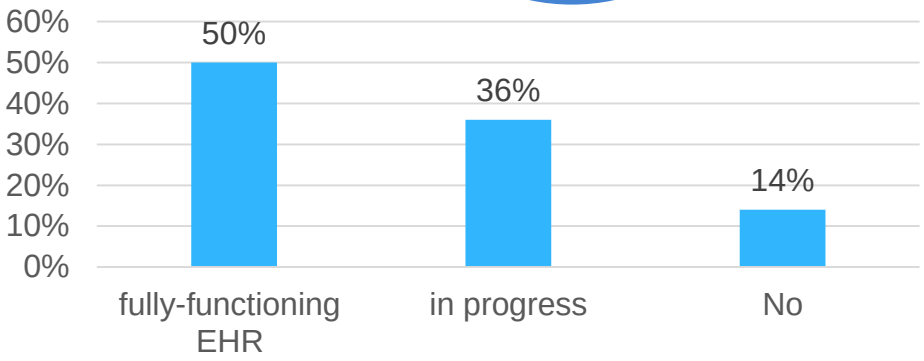
Reference: 1- Office of the National Coordinator for Health Information Technology. 'Office-based Physician Electronic Health Record Adoption,' Health IT Quick-Stat #50. dashboard.healthit.gov/quickstats/pages/physician-ehr-adoption-trends.php. January 2019.
2- office of the National Coordinator for Health Information Technology. 'Non-federal Acute Care Hospital Electronic Health Record Adoption,' Health IT Quick-Stat #47. dashboard.healthit.gov/quickstats/pages/FIG-Hospital-EHR-Adoption.php. September 2017.

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 (Aldosari, 2014).





EHR Challenges

* **Financial barriers.**
* **Physician resistance**
* **Loss of productivity**
* **Workflow changes**
* **Reduced physician-patient interaction**

EHR Challenges

* **Usability issues:**
  * "*effectiveness, efficiency and satisfaction with which specific users can achieve a specific set of tasks in a particular environment*".
  * Commercial EHRs might be different that healthcare environment.
* **Integration and interoperability issues:**
  * Data standards such as HL7

EHR Challenges

* **Privacy concerns:** hacking into EHRs could result in loss of privacy for thousands, rather than a single paper chart
* **Legal:**
  * It is not known if EHRs will increase or decrease malpractice over the long haul
  * e-iatrogenesis
  * Clinical documentation
  * Clinical decision support
* **Inadequate proof of benefit:** in spite on many published studies, there is not adequate proof that EHRs improve quality of care

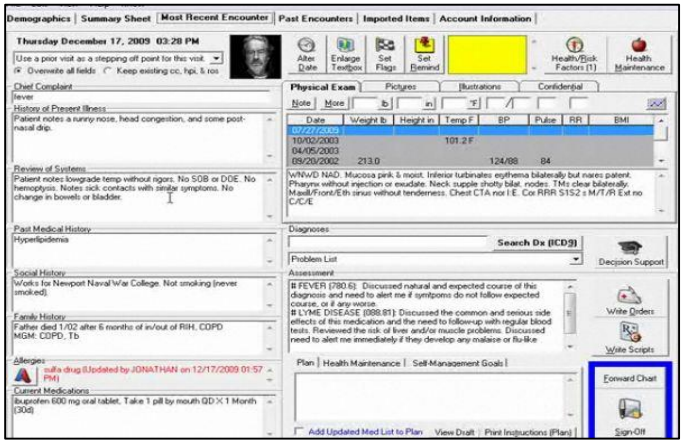
EHR Challenges

* **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
  * Reliability issues

Small EHR Example Amazing Charts

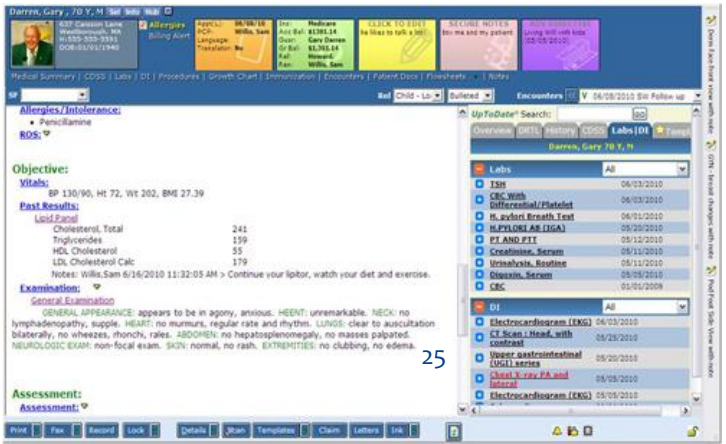
* Low cost that includes 3 month free trial
* Fully featured.
* #1 EHR for Ease of Use and #1 EHR for Satisfaction
* Available as a client or web based (ASP) model
* Appeals to small practices, particularly primary care



Reference: Medscape. (2016). Medscape EHR Report 2016: Physicians Rate Top EHRs. Retrieved 17 September 2019, from https://www.medscape.com/features/slideshow/public/ehr2016

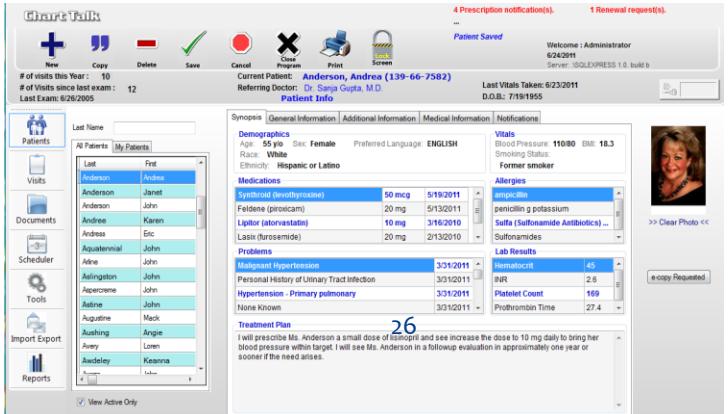
Medium EHR Example eClinicalWorks

* Medium priced for medium sized practices of multiple specialty types
* More clinician and patient features to include mobile and a health information exchange (HIE) solution



Large EHR Example
Epic

* Intended for very large practices such as Kaiser-Permanente
* Includes numerous innovations such as a comprehensive patient portal and several mobile solutions



Implementing an EHR Steps

Steps:

Pre-implementation:

* Decision of purchasing EHR.
* Workflow mapping

Implementation:

* *Team: clinical champion, project manager, a senior administrative sponsor.*
* *Tactics*
* *Technology*

Post- implementation

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