ELECTRONIC HEALTH RECORDS

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ELECTRONIC HEALTH RECORDS

- Purposes of Documentation
- History of Electronic Records
- Comparison of Electronic and Paper records
- Where we are now

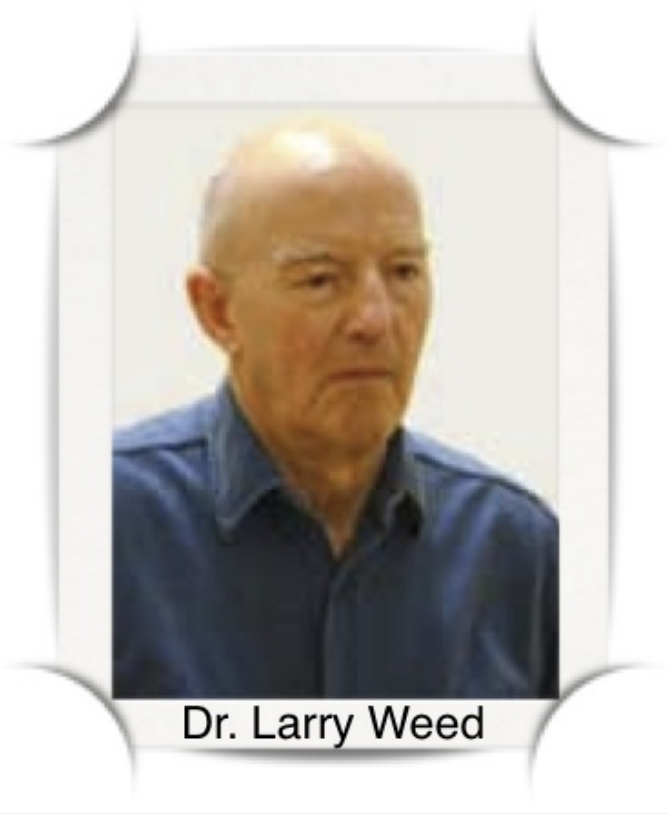
PURPOSES OF DOCUMENTATION

- Remembering what you did and why
  - Conveying that information to colleagues
  - Justifying Billing
  - Legal Defense
  - Data for Research

HISTORY

- Prior to 1960s, documentation was mainly a list of diagnoses and treatments

HISTORY - 1960S



- Larry Weed introduced the problem oriented medical record. SOAP format was born

DEVELOPMENT PARALLELED TECHNOLOGY

- 1970s – room filling computers with very limited capacity
  - First very limited records systems appeared
  - Billing preceded medical info
  - Terminals rare

DEVELOPMENT PARALLELED TECHNOLOGY

- 1980s – PC revolution
  - Large scale community based system concept
  - Master Patient Index
  - Required cooperation and joint funding
  - Billing systems thrived

DEVELOPMENT PARALLELED TECHNOLOGY

- 1990s – Graphical interfaces
  - PCs commonplace
  - Local networks, internet
  - Practice based electronic medical records
  - Institutional home grown systems
  - Integration with billing systems

DEVELOPMENT PARALLELS TECHNOLOGY

- 2000s – modern electronic health records
  - PCs in most personal offices
  - Memory and storage limits go away
  - Systems more robust – security, logging of activity, faster and more complex networks.
  - Integration of disparate systems
  - Young physicians have grown up with PCs

WHERE WE ARE NOW WITH OUR GOALS

- Remembering what was done and why
  - Legibility
  - Ease of search
  - Granularity of information
  - Misfilings
  - Lost charts

WHERE WE ARE NOW WITH OUR GOALS

- Conveying information to colleagues
  - Shared record within the organization and across sites
  - Letter templates, data extraction, automated test result

WHERE WE ARE NOW WITH OUR GOALS

- - Justifying billing
  - Automated note audits
  - Easier human note audits
  - Software suggested billing codes
  - Automatic inclusion of diagnoses addressed

WHERE WE ARE NOW WITH OUR GOALS

- Legal Defense
  - More complete records
  - Full audit – what was changed when
  - Reminders – preventive care
  - Reminders – diagnosis related

WHERE WE ARE NOW WITH OUR GOALS

- Data for research
  - Aggregate data by diagnosis, test, finding, etc.

DISADVANTAGES

- Learning curve
- Slower
- Security concerns
- Cost
- Upgrades and depreciation

ELECTRONIC MEDICAL RECORD (EMR)

- Legal record created in hospitals and ambulatory environments that is the source of data for the EHR.
- Single encounter/episode of treatment, no info from previous visits or to future visits
- Structured data (predefined format with discrete data
- Unstructured data (text report)
- Electronic imaging (ultrasonography, MRI)

EMR COMPONENTS

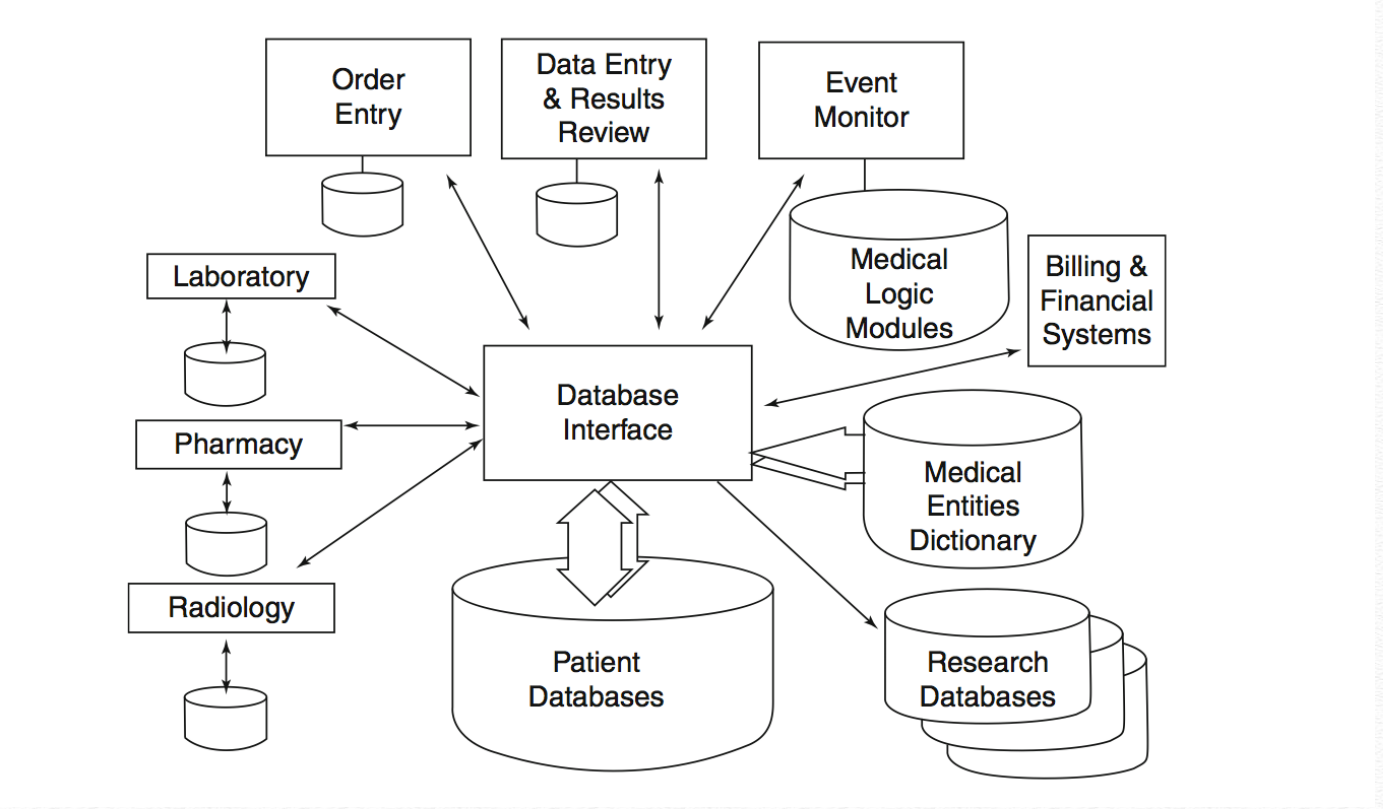
- Results reporting
- Data repository
- Decision support
- Clinical messaging and e-mail
- Documentation
- Order entry

COMPUTER-BASED PATIENT RECORD (CPR)

- Comprehensive lifetime record
- Attributes identified by the Institute of Medicine (IOM) provide the basis for today's understanding of the EHR

ELECTRONIC HEALTH RECORD (EHR)

- Longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting
- Interoperability standards to exchange info outside a single healthcare delivery system
- Supports other care-related activities directly or indirectly—evidence-based decision support, quality management, and outcomes reporting



Block Diagram showing multiple systems feeding into patient database. The Database Interface or Interface Engine may perform intelligent filtering, translating and alert functions (page 396, Shortliffe)

FUNCTIONAL COMPONENTS OF EHR

Integrated View of Patient Data

-Available at anytime anywhere

-Clinical Data has complexity and diversity

-Clinical Data requires different format and terminology

- Requires standards like HL7 to integrate the clinical data

-Local terminologies needs to be translated into standardised terminologies

FUNCTIONAL COMPONENTS OF EHR

Integrated View of Patient Data

-Interface Engine helps to become mediator for EHR to be connected to other vendor systems (Tracking system, Imaging system, Medication dispenser etc)

-Various views: Flowsheet, Chronological views, Summary Views

FUNCTIONAL COMPONENTS OF EHR

Clinical Decision Support

-Point of care : Assessments and Ordering Decisions

- **Protocols**
- **Access to Knowledge**
- **Standard documentations**
- **Reminders and Alerts**

FUNCTIONAL COMPONENTS OF EHR

Clinical Order Entry

-EHR should present relevant information at the time of ordering

-View Active Orders, allergy lists, latest guidelines

-Alert drug interaction

- How latest evidence can change ordering behaviour

FUNCTIONAL COMPONENTS OF EHR

- **Access to Knowledge**
  - At the time of making decision
  - Link up to references like Pubmed, Ovid, Uptodate
  - Able to review result and write notes with the availability of knowledge
  - Context sensitive i.e. latest guidelines for chemotherapy

GENERAL BENEFITS OF THE EHR

- Improved data integrity:
  - readable, better organized, accurate, complete
- Improved productivity:
  - access data whenever, wherever for timely decision
- Increased quality of care:
  - tailored views, “dash-board”
- Increased satisfaction for caregivers:
  - easy access to client data and related services

NURSING BENEFITS

- Decreased redundant data collection
- Allowed data comparison from prior visits
- Ongoing access, update record at bedside
- Improved documentation and quality of care
- Supported timely decision

HEALTHCARE PROVIDER BENEFITS

- Better/faster/simultaneous data access
- Improved documentation, reporting
- Prompted to ensure administration of treatments and medications
- Supported automation of critical pathways / workflows
- Improved efficiency: eligibility, early warning of status changes

HEALTHCARE ENTERPRISE BENEFITS

- Better record security
- Fewer lost records
- Instant notice of eligibility/procedure authorization
- Decreased need and cost for record storage, x-ray film, filing …
- Decreased length of stay due to waiting
- Faster turnaround for accounts
- Increased compliance with regulatory requirements

PATIENT BENEFITS . . .

- Decreased wait time for treatment
- Increased access/control over health information
- Increased use of best practices/decision support
- Increased ability to ask informed questions
- Quicker turnaround time for ordered treatments

. . . PATIENT BENEFITS

- Greater clarity to discharge instruction
- Increased responsibility for own care
- Alerts and reminders for appointments and scheduled tests
- Increased satisfaction and understanding of choices

- **Issue**: When a patient could access his/her own health information like in other online services ? (Pros, Cons)

DRIVING FORCES FOR EHR

- Compliance with regulatory and reimbursement issues
- Meaning Use to improve the quality of care

* DATA OWNERSHIP *

- Paper medical records are the property of the creators with full responsibilities: storage, accuracy
- Many providers share / update the same electronic data in many sites, who is the responsible owner in EHR?

* PRIVACY & CONFIDENTIALITY *

- The easy of data sharing by many people/facilities/agencies may compromise privacy and confidentiality of patient data
- "Access control": user-IDs, passwords, authorized access level (Create, Read, Update, Delete)
- Private encryption keys, biometric authentication
- "Electronic Signature": system automatically and permanently affixes user identification, date and time log to each entry

* DEVELOPMENT/MAINTENANCE COSTS *

- For a provider office: ~ $54,000.00
- For a hospital: ~ 5,000.000.00
- Not include annual maintenance cost
- Need “incentives”

* CAREGIVER RESISTANCE *

- EHRs are perceived as lacking essential features and awkward/inconvenience to use
- Some people have been unable / unwilling to use computers !
- Professionals don’t want to change their “familiar”, “traditional” practices
- Rather pay penalties than bear EHR implementing cost
- May even refuse patients
- Need “incentives”

FUNDAMENTAL ISSUES

- **Data Capture**
- Electronic Interfaces
- Data Entry
  - Structured (coded) vs. Unstructured (free text)
  - Standard coding
- Physician-Entered Data
  - Dictation and Transcription into EHR (Voice recognition system)
  - Structured encounter form - using OCR
  - Direct Entry

FUNDAMENTAL ISSUES

- **Data Validation**
  - Range checks- lower limit and upper limit (3.5-5.0 mEq/l)
  - Pattern checks- Hyphen, Alphanumeric, 3 digit
  - Compute check - mathematical relationship
  - Delta Check -large and unlikely differences between new value and previous observations
  - Spell check- check for typo

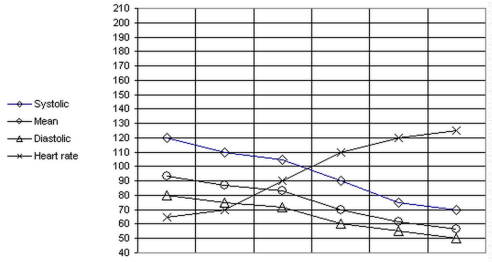
FUNDAMENTAL ISSUES

- **Data Display**
- Flowsheets of Patient Data
  - Like an Excel sheet
  - Report on Important Variables
  - Across time (every seconds, minutes, hours, weeks etc)

CHEMISTRY

TIME	1	2	3	4	5	6
Glucose						
Sodium						
Potassium						
Chloride						
Bicarbonate						
Urea						
Creatinine						
Calcium						
Magnesium						
Phosphate						
AST						
ALT						
ALP						
LD						
Bilirubin, Total						
Albumin						
Protein						
CK						
CKMB						
CKMB -						
Amylase						
Urate						

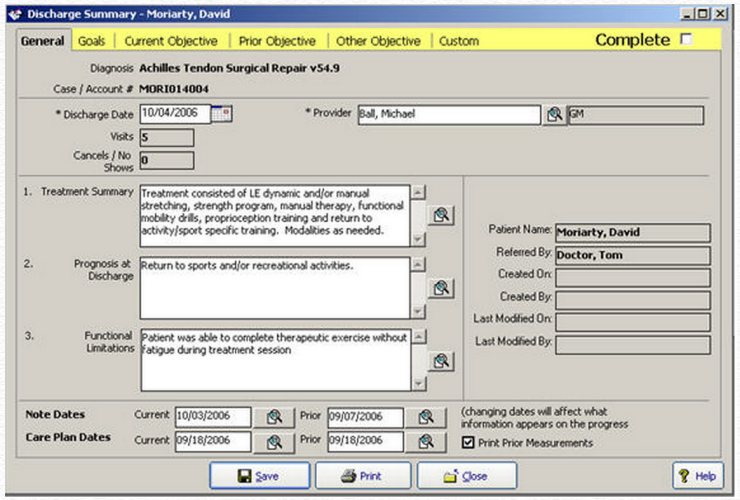
Time	1	2	3	4	5	6
Temperature Axilla (A)	37.2	38.0	38.5	39.1	39.3	39.5
Oral (O) Rectal (R) Core (C)	A	O	O	O	O	O
Heart Rhythm						



Respirations						
Pain Scale q4h & PRN						
KCL						
PAP						
RAP/CVP						
LAP/PCWP						
CO/CI						
SVR/PVR						
MAP						
AUG Diastolic						
(UEDP-AEDP)/(USRP-ASBP)						

FUNDAMENTAL ISSUES

- **Data Display**
- Summaries and Abstracts
  - Provide summary that best represent the data
  - System able to provide summary like an experienced clinician (i.e Discharge Summary etc)



http://www.quiccom/help/HTMLDocuments/EMR_Discharge.htm

FUNDAMENTAL ISSUES

- **Dynamic Display**
- Physicians often time do not find patient information (Tang, 1994)
- Searching capability
- Specialised view formats & graphical representations

FUNDAMENTAL ISSUES

- **Query and Surveillance Systems**
  - Clinical Care
    - Surveillance
    - Monitor patients with certain criteria
  - Clinical Research
    - For preventive care: Gestational Diabetes to Diabetes Type II
    - Clinical Trial (Prospective Study)
      - Find patients who meet eligibility
      - Tracking patients over time
      - Follow study protocol

FUNDAMENTAL ISSUES

- **Query and Surveillance Systems**
  - Retrospective Studies
    - Do case and case control comparison
    - Recall patients for further studies
  - Administrative
    - Understand practice patterns and resource utilisation
    - Administrator can make informed decision based on billing and clinical data

CHALLENGES AHEAD

- Users' Information Needs
  - Must be developed by physicians/collaboration closely with physicians
  - User needs and workflow
- User interface
  - Human & Computer Interaction (cognitive part)
  - Intuitive user interface
  - Interface for clinicians may not be the same as interface for other users
  - Focus on the interactions

CHALLENGES AHEAD

- Standards
  - Need for national standards for development, implementation and use of EHR
  - HL7 for messages transfer format
  - Dicom for radiology
  - LOINC for laboratory
- Legal and Social Issues
  - Legislation on standards
  - HIPAA - to protect confidentiality with appropriate laws and policies

CHALLENGES AHEAD

- Costs and Benefits
  - The upfront cost for infrastructure, software, hardware, training is high
  - In the long run, EMR & CDSS can reduce cost of patient care
- Leadership
  - Involved in planning, implementation and roll-out of EHR
  - Define standards in the organisation
  - Create social change
  - Encourage use of IT in health
  - Provide incentives

MEANINGFUL USE
(HIMSS ANALYTICS)

- http://www.himssanalytics.org/emram/emram.aspx

MEANINGFUL USE

- Meaningful use is using certified electronic health record (EHR) technology to:
  - Improve quality, safety, efficiency, and reduce health disparities
  - Engage patients and family
  - Improve care coordination, and population and public health
  - Maintain privacy and security of patient health information

MEANINGFUL USE …

- Meaningful use compliance will result in:
  - Better clinical outcomes
  - Improved population health outcomes
  - Increased transparency and efficiency
  - Empowered individuals
  - More robust research data on health systems
- Meaningful use sets specific objectives that eligible professionals (EPs) and hospitals must achieve to qualify for Centers for Medicare & Medicaid Services (CMS) Incentive Programs.

http://www.healthit.gov/providers-professionals/meaningful-use-definition-objectives

. . .MEANINGFUL USE

- Penalties imposed for failure to achieve Meaningful Use by 2015
- Stage 1: electronic capture and sharing health info in coded format, use it to track conditions and coordinate care (*Cf*. *Box 14-1,2*, *pp.281-282*)
- Stage 2: Ability to use HIT at the point of care
- Stage 3: improvement in safety, quality, efficiency and expanded HER functionality.

MEANINGFUL USE: CORE OBJECTIVES

15 Core Objectives

- Record demographics
- Record and chart changes in vital signs
- Computerized physician order entry (CPOE)
- E-Prescribing (eRx)
- Report ambulatory clinical quality measures
- Implement one clinical decision support rule
- Provide patients with an electronic copy of their health information, upon request
- Provide clinical summaries for patients for each office visit
- Drug-drug and drug-allergy interaction checks
- Maintain an up-to-date problem list of current and active diagnoses
- Maintain active medication list
- Maintain active medication allergy list
- Record smoking status for patients 13 years or older
- Capability to exchange key clinical information among providers of care and patient-authorized entities electronically
- Protect electronic health information

MEANINGFUL USE: MENU SET OBJECTIVES

10 Menu Objectives

* Drug-formulary checks
* Incorporate clinical lab test results as structured data
* Generate lists of patients by specific conditions
* Send reminders to patients per patient preference for preventive/follow up care
* Provide patients with timely electronic access to their health information
* Use certified EHR technology to identify patient-specific education resources and provide to patient, if appropriate
* Medication reconciliation
* Summary of care record for each transition of care/referrals
* Capability to submit electronic data to immunization registries/systems*
* Capability to provide electronic syndromic surveillance data to public health agencies*

MEANINGFUL USE MEASURES

* Eligible Professionals (EPs) must report on 20 of 25 Meaningful Use (MU) objectives with associated measures
  - Core set of 15
  - Menu set of 10

United States **EMR Adoption Model**[SM]

STAGE	2015 Q1	2015 Q2
Stage 7	3.7%	3.7%
Stage 6	22.2%	23.6%
Stage 5	30.8%	32.3%
Stage 4	13.6%	13.2%
Stage 3	19.7%	18.2%
Stage 2	4.3%	3.6%
Stage 1	2.2%	1.9%
Stage 0	3.5%	3.3%
	N = 5462	N = 5464

Data from HIMSS Analytics(R) Database 2015