Old and new challenges for the EHR

storing, modelling and sharing clinical information in the Genomic Era

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BIPMed: one year and forward

Brazilian Initiative on Precision Medicine

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Summary

Summary

Medical Informatics

Concept

"comprises the theoretical and practical aspects of information processing and communication, based on knowledge and experience derived from processes in medicine and health care"

(Van Bemmel, 1984)

Medical Informatics

Concept

"the rapidly developing scientific field that deals with the storage, retrieval and optimal use of biomedical information, data and knowledge for problem solving and decision making"

(Shortliffe & Perreault, 1990, p.20)

e-Health

Concept

"... not only "Internet medicine", but also virtually everything related to computers and medicine ..."

"An emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.´´

(Eysenbach, 2001)

Health Informatics

Applied Computer Sciences

$\times$

Life and Health Sciences

Health Informatics
Subfields of expertise

- Health Information Systems
- Computerized Medical Record
- Clinical Decision Support Systems
- Tele-health
- Bio-informatics
- Bio-signal processing
- Medical imaging systems
- Standards and terminology
- ...

Health Information

- Administrative data

- Clinical data

- Epidemiologic information

- Scientific information

Clinical information

- Poorly structured
- Complex hierarchies

- Many attributes
- Multi-valued attributes
- Composition attributes

- Narratives
- Images
- ...

EHR

Clinical information
Still challenging:

- Complex to model

- Hard to capture

- Costly to store

- Sophisticated to retrieve

Summary

Health Record

Definition

"a collection of clinical information pertaining to a patient's physical and mental health, compiled from different sources"

<div align="right">(Segen's Medical Dictionary, 2012)</div>

"a collection of documents ..."

"Any electronic or paper information recorded about a person for the purpose of managing their healthcare"

<div align="right">(Data Protection Act, 1998)</div>

"A comprehensive compilation of information ... also covering aspects of the patient's physical, mental, and social health that do not necessarily relate directly to the condition under treatment"

<div align="right">(Medical Dictionary for the Health Professions and Nursing, 2012)</div>

Health Record
A range of different documents

- Demographics
- History and Physical Examination
- Lab results
- Imaging
- Progress Notes
- Problems list
- Care plan
- Prescription
- Discharge summary

- Outpatient visits
- Admissions
- Procedures
- Consultations
- Referrals
- ...

Purposes

- Facilitates patient care

- Serves as a financial and legal record

- Aids clinical research

(Weed, Shortliffe)

Organization

- Time-oriented medical record

- Scattered notes $\times$ Patient-centered medical record

- Source-oriented medical record

- Problem-oriented medical record

Summary

EHR $\times$ EMR $\times$ CPR $\times$ etc ...

electronic
computerized
digital
integrated
automated

health
patient
medical
clinical

record
file
archive
registry

portal

personal
enterprise-wide
regional
national

database
data bank

Expectations

video

1961 Computerized Medical Records:

- Excerpt from a film on use of computers in healthcare.
- Filmed at Akron Children's Hospital.
- Pictured (speaking) is their president (at that time), Roger Sherman.
- This segment predicts great things for computers in medicine.
- https://www.youtube.com/watch?v=t-aiKlIc6uk

(ACMI 2008)

1961 expectations

- to relief nurses and doctors of some of their paperwork

- to have correlation of diseases wich we not have before

- to eliminate erros in medications and test wich would be harmful for the patient

Today's expectations
(mostly unsatisfied)

- to save money

- to save time

- to save paper

- to minimize errors

- to improve quality of care

Recent US iniciatives
Bush 2004

- Began a 10-year initiative to promote the EHR:

    "by computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care."

- ONCHIT budget $\approx$ 42 million dolars / year in 2005

Recent US iniciatives
Obama 2008

- As part of Barack Obama's health reform agenda was investing and expanding electronic health information technology.

- He promised to spend $ 10 billion per year over five years to

  "move the US health care system to broad adoption of standards-based electronic health information systems, including electronic health records"

- In 2009: Health Information Technology for Economic and Clinical Health Act (HITECH), a part of the 2009 stimulus package

- ONCHIT budget: 34.5 billion dolars invested so far

Recent US iniciatives
Obama package

- Meaningful Use

- Incentives

- Open standards

- Certification of software

Recent US iniciatives
Meaningful Use

- The use of a certified EHR in a meaningful manner, such as e-prescribing.

- The use of certified EHR technology for electronic exchange of health information to improve quality of health care.

- The use of certified EHR technology to submit clinical quality and other measures.

Summary

Brazilian initiatives

- *Projeto do Cartão Nacional de Saúde*
  National Health Card Project

- *Política Nacional de Informação e Informática em Saúde*
  Health Information and Informatics National Policy

- *Arquitetura e barramento dos sistemas de saúde*
  Health Information Systems Bus

- *Visão de e-Saúde para o Brasil*
  e-Health Vision for Brazil

- *Centerms: Centro Nacional de Terminologias em Saúde*
  Center for Health Terminology

- CMD = MDS

Systems

- CNS
- CNES
- e-SUS AB / PEC
- e-SUS Hospitalar
- AGHU
- SIGA
- ...

2016 Crisis

- Portaria nº 2.488, de 21 de outubro de 2011, define a Política Nacional de Atenção Básica, e estabelece que o Ministério da Saúde suspenderá o repasse de recursos ... quando ... não houver alimentação regular, por parte dos municípios e do Distrito Federal, dos bancos de dados nacionais de informação

- Em outubro de 2016 o ministro estabelece que cortará repasses em 60 dias para os municípios que não implantarem o prontuário eletrônico (PEC).

Summary

EHR

Current research

- Benefits, use, usability
- Interoperability, semantic modelling, archetypes
- Infraestructure and architecture
- Clinical research data sharing
- Automatic summarization, natural language processing
- EHR — Genomic DB integration
- ...

Near future EHR
Next generation?

- Not oriented by transactions
- Not oriented to documents
- Non-relational modelling or storage

- Information modelled using archetypes

- All-encopassing ...
- Intelligent ...

Near future EHR
All-encopassing

- All types of data and documents

- All times: across episodes of care
  $\rightarrow$ life-spam

- All places: across multiple sites, providers, regions
  $\rightarrow$ nation-wide

Near future EHR
Intelligent

- The DB view:
  - Data minning
  - Semantically interoperable

- The AI view:
  - Decision support
  - Knowledge management

- The internist view:
  - Attatched to the ways physicians think
  - Attatched to the ways physicians learn

- The consumer view:
  - Easy to use

Distant future EHR
Not so far?

An assistant or wizard:

- completely automated
- invisible
- friendly
- anthropomorphic
- intelligent
- omniscient
- omnipresent
- !!!

Thank you!

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