Health and Medical Information Systems - A Demanding Perspective

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Hospitals and Health Structures:

- Biomedical informatics are very complex: they cover a large spectrum of data and their internal structure is dense;

- Medical practice in an intensive information use environment. Physicians, nurses and other technicians need reliable and useful data sets to make correct diagnosis and, in result, deliver good clinical practice and patient care.
Hospital Departments

- Financial Department (billing)
- Personal Department
- Acquisitions & Store Department
- Emergency Room
- Equipment & Maintenance Department
- Laboratory
- Imagiology (PACS)
- Operating Room
- Pharmacy
- Patients Department (identification)
- Intensive Care Unit
- Ward Units

Clinical Information
Health Systems

Health Information Systems:

- Hospital Information Systems can be compared to systems supporting big multinational companies where there are small private systems installed in local branches coexisting with a central system receiving selected and specific information from the local ones.
Diverse Staff

- Doctors
- Nurses
- Administrative
- Technicians
- Dietitian
- Social Security Technician
- Psychologist

Patient
Health and Medical Information Systems - A Demanding Perspective

Hospitals and Health Structures:

- The usage of IT systems hasn’t been installed as a routine, highlighting the importance of mandatory implementation of deep organizational changes in the current methods of work.
Medical Practice: a continuous process of making decisions

KEY DECISION DATA
- Must be present
- Must be highlighted
- It may change with time
- ≠ "EVER", ≠ "ALWAYS"
Basic Concepts

- **Data**
  - Disconnected information
  - Aleatory distribution

- **Information**
  - Structured data

- **Knowledge**
  - Elaborated concepts based in structured data.
  - Decision basis
Basic Concepts

- **Data Collection**

- **Information System**

- **Knowledge**
Knowledge Acquisition Interactions in Medical Systems
Information Levels:

a. Individual Data
b. Population Level - Cohort
c. Macro Level (Regional, National)
Individual Data:

Electronic Medical Records Components

a. Demographic and Biometric
b. Symptoms/Problems
c. Numerical Lab values
d. Imaging Multimedia
Individual Data Characteristics:
Electronic Medical Records Components

- Time variant (data and data sources changes overtime)
- Non-volatile information: data must not be deleted or expunged from databases
- Inconsistent data: Important to analyse decision errors
Population – Cohort Level Data:

- Important to identify trends or outcomes such as adverse unknown events or epidemic infections;
- Needs nomenclature harmonization and systematization allowing data exchange (DICOM; HL7; CARDS)
Macro Level Data (Regional or National):

- Epidemiology, morbidity and mortality trends
- Data supporting healthcare policy decisions
- Impact monitorization and evaluation of policy decisions
Hospitals and Health Structures:

- People taking decision, the management staff, usually don’t see the overall problem. They are mainly worried with administrative data, budgets, staff management and financial problems. So, many times, they prefer a strong “controlling system” with poor or none clinical components.
Hospitals and Health Structures:

- The main objective is to develop a system which presents the right information, and help avoid confusion with unnecessary sensitive information.
Individual Data Characteristics:
Electronic Medical Records Components

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A Case Study
A case study: patient admission to ER (a badly developed system)

Admission cause: hillness!! 😞

Time Control: measured till seconds!

Several text free fields: lots of abbreviations, impossible to search, no highlights...

Exams prescription: only names, no results (there is no relations with the results storage system)
A case study: patient admission to ER
(a badly developed system)

Main diagnose: empty

Vital signs: no information at all

Time control: equal for every question, but still present in each

Lots of information with no clinical relevance and with no highlights
A case study: patient admission to cardiology dept
(system developed with a clinical approach)

On the first line: patient with an Aortic Valve Implant

Time control: measured in days

Pacemaker implant: brand, model and type

CRITICAL PATIENT
A case study: patient admission to cardiology service
(system developed with a clinical approach)

On the first line: patient with a Aortic Valve Implant

Clinical Summary

Pacemaker implant: brand, model and type

Time control: just day
A case study: patient admission to cardiology service (system developed with a clinical approach)

- Discharge Report
- Administrative Information (separated from clinical one)
- Most Important Information: Diagnose
- Clinical summary is automatically created
- Most important events
- Prescription summary

EASY & FAST TO UNDERSTAND
System developed with a clinical approach

- Information gathering based on standard questions
- All the answers are visible
- If “Other” then a free text field to explain
- The summary field is automatically created with the above answers (may be slightly corrected)
Medical Practice: a continuous process of making decisions

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Interaction
Health Systems

Health/Medical Information Systems:

- *Technical Issues*
Avoid “text free” fields

- Systems with many “text free” fields are not trustable
- “Text free” information cannot be processed: different people write the same information in different ways
- It only should be used to exceptional situations where automatic procedures cannot be used
How to avoid “text free” problems

• The standardization of possible values (“list of choices”) is the best solution.
• The range of values allowed must be well defined and cover all possibilities
• In case the range doesn’t cover all possibilities there must be a choice “Others” and this will trigger a “text free” explanation
Advantages of the “list of choices”

- The correct definition of the choices in the list will allow the standardization of the answer and the definitions of standard procedures.
- The use of standard procedures defined leads to:
  - Good Clinical Practice
  - Guidelines compliance
Advantages of the “list of choices”

• The analysis of the standard answers allows the creation of “default values”:
  – normal case
  or
  – most frequent case

• Default values increase input performance
The daily usage of Health Information Systems must be as simply as traditional methods: it must have immediate advantages.

Avoid systems that require more work now for a later return: people will not use them.
• To allow the shifting of users and a faster learning, the system must have a similar interface in all the different areas: similar actions must be done in the same way.
There are two types of users:

- Daily users: intent the best performance (use shortcut key, use codes for the information, etc.)
- Sporadic users: need help with the common actions (prefer mouse use, pull down menus options, etc.)
• Health Information must be available everywhere in the institution:
  – Bed side
  – Emergency room
  – Operating room
• Technology walks towards this: tablet pcs, iphones, etc.
Macro Level Data (Regional or National):

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A Case Study
Portuguese National Registry of Cardiovascular Diseases

- Basis for Strategic Decisions – Health Ministry
- Geographic indexation – national coverage
- Monitoring health system performance
Portuguese National Registry of Cardiovascular Diseases

Gathers information about:

- Human resources
- Technical equipment
- National spread of resources
- Benchmarking analysis
- Performance outcomes
Gathering information from different sources
National coverage
Geographic indexation
National spread of resources
Detail information of each Institution
Performance outcomes
Benchmarking analysis
Automatic data definition and acquisition
“The Ascent of Knowledge”