CITIZEN-ORIENTED HEALTH SYSTEMS AND SERVICES

SOFTNET 2016

These slides are from the panel on HEALTHINFO/INNOV, held on Tuesday, August 23rd in Rome, Italy.
Panel on HEALTHINFO/INNOV

- **Moderator**
  Lasse Berntzen, University College of Southeast, Norway

- **Panelists**
  - Toshiyo Tamura, Waseda University, Japan
  - Ludek Matyska, Institut of Computer Science, Masaryk University & CESNET, Czech Republic
  - Francois Allaert, Evaluation Chair ESC, University Dijon, France
  - Osamu Takaki, Gunma University Hospital, Japan
  - Emilio Luque, University Autonoma of Barcelona, Spain
  - Jorge de Jesús Lozoya Santos, Universidad de Monterrey, México
CITIZEN-CENTRIC HEALTHCARE

Lasse Berntzen
University College of Southeast Norway

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Citizen-centric healthcare

• It seems obvious that health systems and services should be citizen-oriented, but at the same time health systems and services are criticized for being the opposite.

• I would guess the degree of citizen-orientation varies. But let me start with some examples from my country (Norway):
Citizen-centric healthcare

• What is citizen-oriented health systems and services?
  • The right to choose a hospital
  • The right to choose a private alternative
  • The right to user controlled personal assistance
  • The cancer coordinator function
Citizen-centric healthcare

• But still, the health system and services has problems. You may have to wait to get examined, you have to wait for operations, and when you finally get into the hospital, you have to wait for the next test or the next consultation.
Citizen-centric healthcare

- I would guess the explanation has something to do with resource efficiency vs. flow efficiency.
- Resource efficiency has focus on utilization of resources – both technical and human.
- A consequence is waiting lines for the patients.
- Flow efficiency focus on the patient. Resources are put into use whenever needed. The patient is the most important. But it seems that the flow is not working very well in many situations.
Citizen-centric healthcare

- ICT may play an important role in making systems and services more citizen-oriented, but then designers and developers need a citizen-centric approach where citizens plays a role in design and development of the systems and services.
Citizen oriented health systems and services

Ludek Matyska
Masaryk University
Institute of Computer Science
and
CESNET, z.s.p.o.
User orientation

- Currently “average patient” oriented
- Individualization is needed
  - To go from “Average”, more data needed
- Closely connected with ICT:
  - Data generation
    - E.g. genomics (DNA sequencing)
  - Data collection
  - Data provisioning
    - Use for medical treatment
    - Use for further research
Data

- Primary collections (cohorts)
  - Need for long term data collection
  - Different aspects
  - Controlled environment
  - Personal data collection
    - Personal devices
- Genomics data
  - How much you need to precisely distinguish an individual?
- Data repositories sustainability
  - Private vs. state backed
Privacy

- The detailed data can be backtracked to the individual persons
  - Good is some treatment is found to be applied directly to the right person
  - Bad as the data can be misused (e.g. insurance policy)
- Also proper interpretation is needed
  - Banned paternity tests as an exercise in secondary schools
  - Proper reaction on a potential future threat (e.g. Angelina Jolie and breast cancer)
Privacy & Data

- Proper treatment of data necessary
- Data collection
  - Consent – general against a specific (UK vs. German approach)
- Data use
  - Access by the patient, physician and a researcher
Not only ICT implications

- Security
  - Data transmission and access control
- Privacy
  - Cross border issues
- Data treatment
  - Collection
  - Storage
  - Processing
  Who, where, when?
- Essential question: How we can help?
A FRAMEWORK FOR CITIZEN-ORIENTED ASSESSMENT OF MEDICAL SERVICES

Osamu Takaki
Gunma University Hospital
August 24, 2016
Our goal

• Development of a framework for *impartial and rational assessment of medical services in hospitals*

QI-framework

- A framework to define quality indicators (QIs) and to calculate QI-values based on medical databases.
Issue on spreading QI-framework in clinical practice

• We have not yet sufficiently spread our framework in clinical practice.

• Value of patients vs. Value of medical staff
Panelist: Emilio Luque
High Performance Computing for Efficient Applications and Simulation (HPC4EAS)
Computer Architecture and Operating Systems Department
University Autonoma of Barcelona (UAB), Barcelona, Spain

"Simulation as a source of data for unusual and unexpected situations in Health Services"

- The use of data mining techniques, based on real data provided directly by health services, provides new useful knowledge for decision-making but not always real data are available for all possible situations,

- Simulation provides parametrizable tools (simulators) allowing us to "replicate/create" any possible situation, becoming then the simulator in a "sensor" of "virtual-data", otherwise difficult or impossible to obtain from real systems.

- "Simulated-data" will expand "real-data", allowing us obtaining more reliable models and better predictions.
Our proposal, inclusion of the 5th V: Virtual data (simulation generated)

The promise of Big Data
- Data contains information of great value
- If you can extract those insights you can make far better decisions...but is data really that valuable?

“The greatest enemy of knowledge is not ignorance, it is the illusion of knowledge.”

Simulation as a sensor of the real world

Data from “Virtual Worlds”
Simulation as a sensor of the real world

Emergency Department Simulation

The ED Model (Components)

Kinds of agents
1) Active Agents
   - Patients
   - Companions of patients
   - Admission personnel
   - Sanitarian technicians
   - Nurses (Trauma, Emergency)
   - Doctors (Emergency, Specialists)

2) Passive Agents
   - Information system
   - Loudspeaker system
   - Pneumatic pipes
   - Tests services

Communication Model: 3 different types
- 1 to 1 (One-to-One)
- 1 to n Multicast
- 1 to Zone: individuals in Area (Restricted Broadcast)

The ED Model (Individual model)

Agent/Individual Model

State variables

<table>
<thead>
<tr>
<th>STATE Variables</th>
<th>Values</th>
<th>Observability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name/residency</td>
<td>Unique per agent</td>
<td>I</td>
</tr>
<tr>
<td>Personal details</td>
<td>Gender, Medical history (cardiology, pulmonology, neurological...), allergies (serious), Treatments that received (classified into therapeutic groups: bronchodilator, anti-inflammatory, etc.), Origin (national or immigrant)</td>
<td>I</td>
</tr>
<tr>
<td>Location</td>
<td>Entrance, Admissions, Waiting Room, Triage, Treatment Center</td>
<td>E</td>
</tr>
<tr>
<td>Action</td>
<td>Idle, Requesting information from &quot;ID&quot;, Giving information to &quot;ID&quot;, Searching, Moving-to-Vacant, Rating for ambulance</td>
<td>E</td>
</tr>
<tr>
<td>Physical condition</td>
<td>Healthy, Hemodynamics-Constant (MBI index of dependence)</td>
<td>E/N</td>
</tr>
<tr>
<td>Symptoms (patients)</td>
<td>Healthy, Cardiorespiratory arrest, severe/moderate trauma, hemorrhage, vomiting, diarrhea</td>
<td>E/P</td>
</tr>
<tr>
<td>Communication skills</td>
<td>Low, Medium, High</td>
<td>E</td>
</tr>
</tbody>
</table>

State Transition when interacts with other agents or time elapses

Agent/Patient Variable: arrival, stay, age, ... (1)

All together

Emergency Departments

The ED Model (Layout)

One Typical ED in Spain
e.g. Parc Taulí Hospital Emergency Service
Add two more technicians to laboratory room

Table 1: LoS and ED resources utilization with increasing arrival patient

<table>
<thead>
<tr>
<th>Daily arrival</th>
<th>Average LoS by acuity level (hour)</th>
<th>Average utilization of ED resources(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>361</td>
<td>10.83</td>
<td>10.30</td>
</tr>
<tr>
<td>397</td>
<td>10.84</td>
<td>10.90</td>
</tr>
<tr>
<td>416</td>
<td>11.66</td>
<td>11.28</td>
</tr>
<tr>
<td>436</td>
<td>11.87</td>
<td>11.73</td>
</tr>
<tr>
<td>456</td>
<td>11.71</td>
<td>12.09</td>
</tr>
</tbody>
</table>

Table 1: Two more doctors added to area A

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<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>496</td>
<td>10.89</td>
<td>11.01</td>
</tr>
<tr>
<td>516</td>
<td>11.12</td>
<td>10.86</td>
</tr>
<tr>
<td>535</td>
<td>11.26</td>
<td>11.31</td>
</tr>
</tbody>
</table>
Data provided by simulation: Justification

Staff configurations with an optimal average value of the Length of Stay (LoS) of patients in the ED

- 4; 428
  # STAFF = 5
  CONF 1: 2DS, 2NS, 1AS
  CONF 2: 2DS, 1NS, 2AS
  CONF 3: 2DS, 1NS, 1AS, 1AJ

- 9; 514
  # STAFF = 5
  CONF 1: 2DS, 1DJ, 1NS, 1AJ
  CONF 2: 4DJ, 2NS, 1AS

- 13; 790
  # STAFF = 7
  CONF 1: 1DS, 3DJ, 2NJ, 1AS

| Incoming Patients | 4 pat/h | 9 pat/h | 13 pat/h | 17 pat/h |
Data provided by simulation: Justification

Staff configurations with an optimal average value of the Length of Stay (LoS) of patients in the ED

<table>
<thead>
<tr>
<th>Incoming Patients</th>
<th>4 pat/h</th>
<th>9 pat/h</th>
<th>13 pat/h</th>
<th>17 pat/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>LoS (Ticks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Data provided by simulation: Justification

Staff configurations with an optimal average value of the Length of Stay (LoS) of patients in the ED

Incoming Patients

<table>
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<th>Patients per hour</th>
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<tr>
<td>4 pat/h</td>
</tr>
<tr>
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Staff configurations with an optimal average value of the Length of Stay (LoS) of patients in the ED

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<th>17 pat/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation value</td>
<td>4; 428</td>
<td>9; 514</td>
<td>15; 790</td>
<td>17; 3266</td>
</tr>
</tbody>
</table>
Data provided by simulation:

Justification

Incoming Patients

| Patients | 4 pat/h | 9 pat/h | 13 pat/h | 17 pat/h |

Data generated by simulation can be a more reliable source for predicting the behavior of the real system.
Influence of Ambulance Service for Departure

✓ (one way to relieve overcrowding in real situation);

<table>
<thead>
<tr>
<th>Ambulance response time model</th>
<th>Average LoS by acuity level (hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>current actual delay (mean=63 minutes)</td>
<td>13.23</td>
</tr>
<tr>
<td>50% of actual delay (mean=31 minutes)</td>
<td>12.70</td>
</tr>
<tr>
<td>without delay</td>
<td>12.04</td>
</tr>
</tbody>
</table>
Simulation of the MRSA propagation in the Emergency Department

Modelization: Transmission forms

Physical contact.
- Direct transmission → Active agent – Active agent
- Indirect transmission → Active agent – Passive agent – Active agent

Contact Propagation Model: Agents

Active Agents
- Admission personnel
- Doctor (S, J)
- Nurse (S, J)
- Auxiliary personnel
- Cleaning staff

Passive Agents
- Non-carrier
- Carrier
- Contaminated

Information system

Contact Propagation Model: HealthCare Staff

Prevention policies of the healthcare staff

The accomplishment level of the healthcare staff agents with the prevention policies is measured by the accomplishment factor (AF).

The three prevention actions that are evaluated in this research are:
- Handwashing
- Sanitizing hand
- Use of isolation material

Contact Transmission Model: How the MRSA propagates
Objective: To identify the influence of hand washing on the number of infected and colonized patients considering different values of effectiveness.

Parameters of Execution:

<table>
<thead>
<tr>
<th>Description</th>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation Time</td>
<td>Simul_Time</td>
<td>1440 hours</td>
</tr>
<tr>
<td>Average patient arrive per day*</td>
<td>Averag_Pat</td>
<td>398</td>
</tr>
<tr>
<td>Percentage transmission vector that arrive ED</td>
<td>Percen_TV</td>
<td>2%</td>
</tr>
<tr>
<td>Percentage of patient with predisposition to acquire MRSA</td>
<td>Percen_Predis</td>
<td>20%</td>
</tr>
<tr>
<td>Hand wash probability</td>
<td>HandW_Prob</td>
<td>100%</td>
</tr>
</tbody>
</table>

*The flow of patients has a probability distribution per hour, considering hospital data.

Output dates:

Table: Handwash Probability = 100%
Colonized and Infected Patients with a hand wash accomplishment of 100% and different values of effectiveness.
Simulation: Resultas Case Study A

Outputs dates:

Sensitivity to “Percent_TV” (Transmission Vector)

Influence of hand wash (HW) effectiveness in the number of colonized and infected patient with MRSA during the attention process at ED.
Citizen-oriented health systems and services

Panelist: Dr. Jorge de Jesús Lozoya Santos

Date: August 22, 2016

Rome, Italy
Health System and services—Citizen-oriented

• The right to be attended in any hospital on time and quality
• Health services
  – The right to be attended under any condition attempting against health
  – The right to choose the medical equipment
• Social services
  – The right to have and choose the kindergarten for the children of women with a job.
  – The right to have a retire assurance
  – The right to receive government support under dispaired situation for life
  – The right to have free medicine
Citizen-oriented Health System

Sector
- Public
  - Social security
  - Secretariat of Health, SESA
- Private

Money
- Government contribution
- Employer contribution
- Employee contribution
- Federal government contribution
- State government contribution
- Popular health insurance
- Recovery fees

Buyers
- Individuals
- Employers
- Private assurance

Providers
- Private providers
- Population able to pay

Users
- Workers of formal sector
- Relatives of the workers
- Retirees
- Self-employed, workers of informal economic sector and unemployed

Mexico Public Health System and services– Institution-oriented

• The right to be attended in an economic-status-based hospital

• Health services
  – According to the employment status
  – Expensive and low responsive treatments for most of the people
  – Medicine availability according to the institution and the provider relationship (do not care about people's needs and urgency)

• Social services
  – The right to have a kindergarten for the care of children for those women with a job (not always available).
  – The right to have a retire assurance (not enough)
  – Etc...
Current arrangements are failing to meet Mexicans’s health needs

DOI: http://dx.doi.org/10.1787/9789264230491-4-en
Finally

- **Expansion of service-exchange agreements** (or *convenios*) to let affiliates from one system use services from another.
- **Enforcement of information systems that monitor health care quality and that drive improvements across the health system.** This is to ensure that the new *convenios* become living and active agreements, rather than remaining dormant and unused.
- **Creation of a new Comisión to work across health insurance schemes and harmonise their care pathways, prices, information systems and administrative practices**

Without deliberate and carefully planned equalization of the benefits offered by each insurance scheme, Mexico will not achieve the fairer and more efficient health care system that the country needs.

DOI: [http://dx.doi.org/10.1787/9789264230491-en](http://dx.doi.org/10.1787/9789264230491-4-en)
Suggestions

• Development of a national standard of quality of service for Health System and Services
• Development of a national system of information for each person in the country

- Health of individuals requires more than health care, but also essential daily living functions.
- Social care informatics support is not yet well developed.
- A cross-disciplinary international group of experts could agree a common vision.