Role of Hospital ICT in a Changing Healthcare Paradigm and Ecosystem

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Global challenges faced by Health Care

- **Drivers**
  - Globalisation
    - 10% of the cost of a GM car produced in Belgium = HC coverage for US GM worker
  - Consumerism
    - More knowledgeable, demanding citizens
  - Changing Demographics & Lifestyle
    - Age, BMI,…
  - Diseases expensive to treat
    - Chronicity
  - New technologies and treatments
    - Personalized medicine,…

- **Inhibitors**
  - Budget constraints
    - Priorities?
  - Societal expectations
    - Healthcare as a public social right vs a pure market service
  - Lack of aligned incentives
    - Few incentives for collaboration, service transformation,…
  - Inability to balance ST/LT perspectives
    - Focus predominantly on ST
  - Inability to access and share information
    - There is a lot of data out there, but…

Current “paradigm” of Healthcare Delivery
The IHI Triple Aim

Population Health

Experience of Care

Per Capita Cost
Health Care expenditure follows GDP (in the western world)
HCE and Outcome

- HCE are very high, and many needs are met...
- Marginal increases will therefore cost more and more....
And how on earth will you improve this? (and at what cost, and ...do we want that?)

Life expectancy at birth
Exemple : societal expectations

- HC expenditure vs max avg age: a buck well spent???
Is there a limit on HCE growth?

Average annual growth rate of real Health Care Expenditure, per capita, 1997-2007

UK: 4.9  NZ: 4.5  NETH: 4.2  SWE: 4.1  OECD Median: 4.0  CAN: 3.8  AUS*: 3.8  US: 3.7  FR: 2.5  ITA: 2.4  NOR: 2.4  SWITZ: 2.3  GER: 1.7
YES, there is a limit on growth…!

- HCE spending in Europe in 2010 fell for the first time in decades!

<table>
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www.oecd.org/health/healthataglanceeurope.htm
Example: changing paradigms // cost

Access to patient information

Access to clinical knowledge

“ART”

1970

1990

2010

Clinical consensus

Individual clinical knowledge & experience

EBM (based on populations)

Personalized medicine (based on individuals)

“SCIENCE”
“Strange business model”…: Health-care or Sick-care?

- Zero/low risk
- At risk
- High risk

Active disease: < 20% of pop, > 80% of cost
( and >80% of this is spent during the last 12 months of life )
The Healthcare Reality

- Healthcare Costs
- Chronic Disease
- Life Expectancy

SPENDING VS LONGEVITY

T-30 YEARS  T-25 YEARS  T-20 YEARS  T-15 YEARS  T-10 YEARS  T-5 YEARS  TODAY
Life expectancy USA

- An average American reaches the age of 80, if...
  - He weares his seatbelt
  - Doesn’t have guns at home
  - Doesn’t smoke
  - Eats fresh veggies and fruits on a daily basis
  - Moves for 30 minutes three times a week
Life expectancy USA

- An average American reaches the age of 80, if…
  - He weares his seatbelt
  - Doesn’t have guns at home
  - Doesn’t smoke
  - Eats fresh veggies and fruits on a daily basis
  - Moves for 30 minutes three times a week

…but only 5 % of all Americans fulfill all five criteria……
One third of all cancers can be avoided if...

→ You don’t smoke
→ Eat healthy (daily fresh fruits and veggies)
→ Move enough
→ Moderately drink alcohol
→ Don’t lie in the sun too much
→ Keep your weight
Behaviour is the major contributor to your health

Impact

- Behaviour 50%
- Environment 20%
- Genetics 20%
- Medical care 10%
Health Care and (in)efficiency

- Deficiencies in contemporary health care
  - Upto 45% of patients do not receive recommended evidence-based care
  - Treatments are targeted to low-moderate risk patients rather than high-risk of preventable clinical events (risk-treatment paradox)
  - Upto 30% of administered tests, procedures and medications are unnecessary
  - Upto 50% of health care spending goes toward unnecessary bureaucracy, duplicative tests, and other waste
  - Upto 20% of patients are harmed by healthcare (which costs 30c/dollar to correct)
  - There are large and unexplained variations in quality and safety of care

Leading the Pack in Inefficiency

Quantifying Inefficiency

Note: Size of the bubble indicates value of the system in USD Billions.
Main reasons:

- 1. Overemphasis on expensive advances in medical technology that yield incremental improvements in outcomes with inadequate consideration to cost
- 2. Myopic focus on capacity for acute care to the detriment of wellness, prevention and population health strategies
- 3. The use of volume-based reimbursement models

Discrepancies between models, expenditures, and outcomes: room for improvements!

# hip implants/100,000

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<th># Hip Implants</th>
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<td>FR</td>
<td>208</td>
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<tr>
<td>UK</td>
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<td>ITA</td>
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</tr>
<tr>
<td>US</td>
<td>139</td>
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# knee implants/100,000

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<td>FR</td>
<td>95</td>
</tr>
<tr>
<td>ITA</td>
<td>65</td>
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</table>

Imaging fees / MRI scan, USD

<table>
<thead>
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<th>Imaging Fees</th>
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<tr>
<td>US</td>
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<tr>
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<td>CAN</td>
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<tr>
<td>FR</td>
<td>$436</td>
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<tr>
<td>UK</td>
<td>$179</td>
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Pharmaceutical spending per capita, adjusted for differences in cost of living

<table>
<thead>
<tr>
<th>Country</th>
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<tbody>
<tr>
<td>US</td>
<td>$878</td>
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<tr>
<td>CAN</td>
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<td>FR</td>
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<tr>
<td>GER</td>
<td>$542</td>
</tr>
<tr>
<td>ITA</td>
<td>$518</td>
</tr>
<tr>
<td>SWITZ</td>
<td>$454</td>
</tr>
<tr>
<td>SWE</td>
<td>$446</td>
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<tr>
<td>OECD</td>
<td>$446</td>
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<tr>
<td>AUS*</td>
<td>$421</td>
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<tr>
<td>NETH</td>
<td>$422</td>
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<tr>
<td>NOR</td>
<td>$381</td>
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<tr>
<td>NZ</td>
<td>$241</td>
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Current paradigm of HC delivery

- Sustained for decades, based on its own set of mutually reinforcing elements:
  - “vertical” organisation by specialty with independant private-practice physicians
  - Measurement of “quality” defined as process compliance
  - Cost accounting driven not by cost but by charges
  - FFS by specialty with rampant cross subsidies
  - Delivery systems with duplicative service lines and little integration
  - Fragmentation of patient population with no critical masses of patients with a certain condition
  - Siloed vertical IT systems around specialties

RISING COSTS & UNSATISFACTORY AND UNEVEN QUALITY DESPITE THE HARD WORK OF WELL-TRAINED, WELL-INTENTIONED CLINICIANS
“In Healthcare, the days of *business as usual* are over.”

ME PORTER, TH LEE
HBR 2013
It is time for a fundamentally new strategy

- Core: maximizing Value for Patients = achieving the best health outcomes (that matter to patients) at the lowest cost
- Move away from a supply-driven HC system organized around what physicians do toward a patient-centered system organized around what patients need
- Shift the focus from the volume and profitability of services provided, to the patient outcomes achieved
## How to maximize value for patients in the HC system

<table>
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<th>Volume-based</th>
<th>Value-based</th>
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<td>Payment</td>
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<tr>
<td>Incentive</td>
<td>Volume</td>
<td>Value</td>
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<tr>
<td>Focus</td>
<td>Acute episodes</td>
<td>Populations</td>
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<tr>
<td>Role of provider</td>
<td>Single episodes</td>
<td>Care continuum</td>
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<tr>
<td>Information</td>
<td>Retrospective</td>
<td>Real-time &amp; predicitve</td>
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<tr>
<td>Leadership style</td>
<td>Managerial divisional/</td>
<td>Thinking across</td>
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<tr>
<td></td>
<td>departemental thinking</td>
<td>organisation</td>
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</tbody>
</table>

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![IBM's Health and Economic Value Pyramid](image)
How to maximize Value for Patients in HC delivery (hospitals) (Porter & Lee)

- Organize into **Integrated Practice Units** (IPUs)
- **Measure Outcomes and Costs** for every patient
- Move to **bundled payments** for Care cycles
- **Integrate Care delivery systems**
- Expand **geographic reach**
- Build an **enabling ICT platform**
Principles reform Hospital Financing

Minister De Block, april 24th 2015

• 1. more efficiency and quality; reform, no budget cut
• 2. patient centricity; “the” hospital becomes a “hospital network”
• 3. justified financing: from “standard” (prospective fixed budget per admission) to “variable” (real cost)
• 4. award quality (PPP 2%)
• 5. transparent financing of specific tasks (e.g., academic)
6. simplification of rules and decrease of finance burden
7. fee’s remains doctor’s property but with more transparency on intellectual vs cost components, and with guaranteed co-ownership on utilisation
8. keep the strong points (accessability, portfolio, service level,...) and eradicate the week points (complex, volumedriven, fragmentation, financiering, inefficiency,...)
9. no big bang, step-by-step, pilot projects
10. concertation with all stakeholders
1. Organize into Integrated Practice Units (IPUs)

2. Measure outcomes and costs for every patient

3. Move to bundled payments for care cycles

4. Integrate care delivery across separate facilities

5. Expand excellent services across geography

6. Build an enabling information technology platform
Patients Are Expecting More

- Expecting more treatment options
- Demanding faster delivery
- Want it personalized
- Digital everything

GREATER RELIANCE on data and information technology
INTERNET OF THINGS TECTONICS

THE THINGS
- Life Safety
- Home Security
- Tags & Trackers
- Home Automation
- Automotive
- Communication
- Lifestyle & Ent.
- Wearables
- Fitness & Healthcare
- Industrial Infra.
- Toys

THE INTERNET
- App Marketplace
- Home Automation
- Controller/Hub
- IoT Operating Systems
- IoT Dev Framework
- Big Data/Analytics
- Dev Tools/CM
- Distributed App

CLOUD & PLATFORMS
- Google Play
- IFTTT
- Amazon
- Crestron
- HomeKit
- ELAN
- Control4
- Logitech

DATABASE
- Cloudera
- Rackspace
- DigitalOcean
- Amazon Web Services
- Google
- Windows Azure
- Mesosphere

STORAGE
- OpenStack
- Openfiler
- OpenNebula
- OpenStack

CPU
- Intel
- AMD
- ARM
- Qualcomm

SECURITY
- Cisco
- D-Link
- Netgear
- Ubiquiti
- Level 3

DNS
- Cloudflare
- Akamai
- Edgecast
- Akamai

POWER/BATTERIES
- VSP
- Axiology
- Bloom Energy
- Ericsson

DESIGN: MILLENNIAL DESIGN
SOURCE: CENTER ELECTRIC 2015
Health Data Problem Amplified

EXPLOSION OF DATA
665 TB
MANAGED ON AVERAGE
Healthcare applications
driving data growth

LACK OF INTEGRATION
UP TO 75%
Not available for view
from the EHR

CONNECTED DEVICES
16% BY 2020
OF DIGITAL UNIVERSE
Generating an
increasing amount of
data
A supporting ICT platform is an enabler

- Historically, health care IT systems have also been siloed (by department, by location, by type of service, by type of data, ...)
- Health IT systems therefore often complicate rather than support integrated, multidisciplinary care
- GIGA: IT is “just a tool”: automating broken service-delivery processes gets you more efficiency-broken processes...
…but an ICT platform can enhance Value…

- 1. If it is *Centered on Patients*
- 2. If it uses *Common Data definitions*
- 3. If it encompasses *All Types of Patient Data*
- 4. If the MR is *Accessible to All Parties* involved in care
- 5. If the system *includes Templates and Expert/Support systems* for medical conditions
- 6. If the system architecture makes it *easy to extract and share information*
Today’s Megatrends in EMR

Hospitals get “de-physical”
E-Health

Integrated Tool

Intelligent Coaching

Personal Health Record
Product – generations model for patient record

1st generation,  
- Scanned documents  
- Result server

2nd generation,  
Few structuration of information  
- Free text,  
- Coding for billing

3rd generation,  
- Structuration of the information  
- Alerts  
- Decision support

4th generation,  
- Workflow (working together)  
- Process automation,  
- Vocabulary engine

5th generation,  
- Optimisation of the care  
- Knowledge management

Source: « The 2007 Gartner computer-based patient record system generation model »
Product – today situation

1st generation
- ADT & Scanning
- « Collector »

2nd generation
- PACS
- Planning
- GE
- « Documentor »

3rd generation
- Emergency
- Tracking
- Order Entry
- Registration
- « Helper »

4th generation
- Nursing DSS
- Ordersets
- EWS
- CI
- « Colleague »

5th generation
- CDSS
- Clinical Path
- « Mentor »

New areas:
- Portals
- eHealth
- Mobile
- …

Source: «The 2007 Gartner computer-based patient record system generation model»
Clinical Work Station UZ Brussel
Global Architecture

Common Services
- authorization
- security
- communication

Outpatient
Inpatient
OR
ER

ADT  EMD  EVD  Drug  Planning  Order Entry  CDSS  Lab  IVF  Genetics
KWS @ UZ Brussel
Emergency department
KWS @ UZ Brussel
Continuous innovation

Mobility

CLINICAL DATA WAREHOUSE

Decision support
Medication Interaction
In-ambulance Telemedicine
Clinical Datawarehouse: structured data

UZ Brussel - Cohort Discovery

Navigate Terms | Find Terms

- ICD-10 (NCBO)
- UZB
  - Contact met patiënt
  - Demografische gegevens
  - Diagnosen, problemen & antecedenten: ICD-9
  - Invulformulieren
    - Anesthesiologie
    - CHVZ - Cardiologie
    - Consultatie Kinderen
    - Dermatologie
    - Diabetologie
    - Consultatie NIEUWE VERSIE
    - Fertilité
    - Gastro-enterologie
    - Interne Geneeskunde
    - Verloskunde en Prenatale Gsk
  - Labo resultaten
  - Medicatie
  - Orders en afspraken
  - Vitale Parameters
    - APGAR-Score
    - AVPU-Score
    - Beademing
    - Faeces
    - Fysieke
    - Glasgow Coma Schaal

Query Tool

Query Name:

Temporal Constraint: 
- Treat all groups independently

Group 1
- Dates: 
- Occurs > 0x: 
- Exclude: 
- Metformine
- eGFR (MDRD-IDMS) < 30

Group 2
- Dates: 
- Occurs > 0x: 
- Exclude: 

Group 3
- Dates: 
- Occurs > 0x: 
- Exclude: 

AND

one or more of these

AND

one or more of these

AND

one or more of these

Run Query | Clear | Print Query | 3 Groups | New Group

Query Status

- Neurologie
- Concepts
- Criteria
Smart Text Analytics: unstructured data analysis

Intelligent EHR Navigation

Patient Cohort Identification

Predictive Models

Population screening

Medical Coding
**Smart Text Analytics**

### Create a set with plugin

This plugin will return all iKnow Sibeles with a certain concept or set. Enter a concept OR an existing set. You can give more than one word, e.g., aspirin, strong.

<table>
<thead>
<tr>
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<th>Pattern</th>
<th>Set</th>
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<tr>
<td>angor</td>
<td>no pattern</td>
<td>input not based on a set</td>
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**Execute**

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<th>Spread</th>
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[Image: 65x59 to 188x87]
UZBrussel: eHealth Applications

- **GP Portal Amis**
  - Communication GP - Hospital
  - Full access to patient EMR
  - Multi media & Browser based

- **Patient portal**
  - Communication Patient - Hospital
  - Access to scheduling, medication
  - Improved link

- **Abrumet Portal**
  - Communication between EMR’s of different hospitals
  - 20 hospitals in Brussel
  - Under Test
e-Healthcare Ecosystem: Spheres of interest

PATIENT / CITIZEN
- Health Conscious
- Athletes
- Chronically Ill
- Young Mothers
- Elderly

Personal Health Record
- Patient Information
- HomeCare
- Fitness and Prevention
- Rehabilitation

HEALTH AUTHORITIES
- Disease Management
  - Financial Management
  - Epidemiologic
  - eID card management

PHYSICIANS/-NETWORKS/PHARMACIES
- Physicians
- Physician’s Office
- Pharmacies
- Radiology

Electronic Medical Record
- Teleconsultation
- Patient Integration
- eHealth Integration
- Networking of Physicians

Virtual Medical Record
- Hospital Networking
- Referrer Loyalty
- Patient Integration
- Telemedicine

HOSPITALS/-ASSOCIATIONS

Healthcare Professionals
"In the circle of life, connected consumerism is the new reality. Those businesses that don’t disrupt their own markets will find their markets disrupted for them."

In the end, complacency is a symptom of mediocrity and mediocrity is the result of a leadership organization that chooses not to lead, but instead, to manage how to be better or more efficient around “what is” and not “what should be” or “what’s next.”
…but never forget The Human Factor…