Assessing socio-economic and clinical benefits from eHealth solutions - approach and evidence

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BONN - BRUSSELS

[Image of Bonn landscape with cyclists and a river]

[Image of Brussels EU building]

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eHealth: an enabler for better health?
“For over thirty years, there have been predictions that the widespread clinical use of computers was imminent. Yet the ‘wave’ has never broken.”

eHealth has a history of more than 40 years of high-flying expectations and billions of euros invested in unsuccessful or only marginally ‘profitable’ ventures worldwide

“To date, HIT [health information technology] has been mostly the realm of enthusiasts. Practitioners have generally regarded EHRs as costly, cumbersome, and offering little help for tasks at hand.”
EHealth: an enabler for better health?

- The scope for **increase in demand** for health services seems unlimited.

- The scope for increase in **supply is restricted**.

- Evidence suggests that **eHealth has the potential** to support healthcare providers in meeting growing demand.

- However, what may be **technologically feasible**, or even desirable, **will not necessarily be economically viable or organisationally realised**.
Key elements of the “new” model of healthcare

- Focus on health, not on sick care
- Focusing on the idiosyncrasies of the individual citizen (personalised)
- Support & help at the point of need (home, mobility, community, abroad, ...)
- Meeting new challenges (chronic diseases, medico-technical progress causing an ageing population, ...)
- If in need of healthcare, supply of collaborative, integrated, seamless services across all health value system actors (including LT and social care)
- Support for optimal communication, sharing of data (from disclosure to access paradigm)
- From reactive to preventive to predictive medicine

*eHealth tools and systems have the potential to help us to finally realise this vision*
The EHR Impact Methodology
EC-commissioned study on the

*Socio-economic impact of interoperable electronic health record and ePrescription systems in Europe*

- Identification, analysis and evidence on 10 good practice cases
- Policy recommendations to foster their diffusion in Europe
- Follow-up to eHealth IMPACT study ([www.ehealth-impact.org](http://www.ehealth-impact.org)) analysing also 10 good practice cases

[www.ehr-impact.eu](http://www.ehr-impact.eu)
The eHealth IMPACT development process

- Development of a generic methodology, methods and tools for the economic evaluation of today’s eHealth applications
- Detailed evaluation of 2 (to validate the methodology) plus further 8 routine eHealth applications
- Synthesis, vision, and policy recommendations to encourage appropriate future eHealth investments
- Further case studies applying and developing the methodology
- Development towards an investment analysis method for realistically assessing the business perspective of investments in tomorrow’s eHealth services (Financing eHealth study)
How to make a reliable assessment of the future impact of concrete eHealth solutions?
Combine a strategic foresight analysis with an economic perspective:

Is eHealth worth it?
Is it going to pay?
Where to take the money from?
Account for the uncertainty of the future

Cash flow analysis
Affordability check
Risk analysis

Business case for new eHealth investment
Measuring the impact of eHealth – the approach

1. Identify scope and borders of an eHealth-supported routine service
2. Describe eHealth solution, measure its utilisation
3. Identify timeline
4. Estimate known and expected costs
5. Estimate benefits
6. Analyse data, adjust for optimism bias and contingency, perform sensitivity analysis
7. Review with research team and sites
8. Report on past and expected performance
Structure of an eHealth IMPACT assessment

- **A socio-economic perspective**
  - Benefits and costs - BCA analysis
  - All relevant stakeholders considered

- **Three analysis periods:**
  - Planning and development
  - Implementation
  - Routine operation
**Stakeholder analysis**

- Patients, carers, and other citizens
- Healthcare staff – professionals, teams
- Health service provider organisations
- Third parties
  - Insurance companies
  - Other payers
  - Governments
  - Public authorities
- **Not:** secondary/tertiary impacts
Estimating benefits

According to stakeholders:
- Citizens
- Healthcare provider organisations (HPO)
- Third party payers
- Others (if applicable)

Benefits - improvement of:
- Quality: five factors
- Access: spatial, social inclusion, other barriers
- Overall economic efficiency gains
Estimating benefits – *quality* of healthcare

- Better informed citizens and carers
- Information designed to streamline healthcare processes
- Improved timeliness of care
- Patient safety / risk management
- Improved effectiveness of care service
Estimating benefits to all stakeholders, e.g.

- **Citizens:**
  - Control over medical record, better information
  - More appropriate treatment (avoidance of unnecessary interventions, adverse events etc.)
  - Time savings - faster treatment and recovery

- **Healthcare Provider Organisations** (incl. GPs):
  - Improved effectiveness - better results of care
  - time saved – preparation, information search, more clients
  - reductions in avoidable errors, e.g. from illegible handwriting

- **Third party payers:**
  - Avoided unnecessary visits and examinations
  - Better and more targeted drug prescriptions
  - More transparency in the health system, quality control
Estimating costs

- **eHealth investment**
  - Direct investment and re-investment in ICT: hardware, software, licences
  - Changes to process and organisation: procurement, project management and change management, training

- **Operational costs of health service supported by ICT**
  - Internal costs – personnel, IT, management, marketing, back office support
  - Where applicable, costs to other stakeholders like third party payers (e.g. reimbursement fees)
Supporting Tools

- Assigning **monetary values** to benefits
  - Actual prices or proxies
  - Time savings and costs of Full Time Equivalent (FTE)
  - Willingness to pay approach
- **Adjustment for contingencies** for unaccounted costs and optimism bias
- **Time value of money**: Present value / discounted cash flow
- **Sensitivity analysis** (by overvaluing costs, undervaluing benefits) to test for robustness
Assigning monetary values to benefits and costs

**EHRI model building**

- **Data input**
- **Assumption schedules**

**Cost calculations**
- ~ for each stakeholder group
- ~ according to financial/non-financial spectrum
- ~ adjustment for contingencies & differences in the time value of money

**Benefit calculations**

**Cost summary**
- ~ for each stakeholder group
- ~ according to financial / non-financial spectrum

**Benefit summary**

**Data summary & net benefit**
- ~ for each stakeholder group

**Evaluation outcomes**

- Present value of annual costs & benefits
- Present value of cumulative costs & benefits
- Present value of cumulative net benefits
- Costs distribution among stakeholders
- Benefits distribution among stakeholders
- Costs distribution along financial/non-financial spectrum
- Benefits distribution along financial/non-financial spectrum
## Data summary sheet

### EHRI generic data summary

<table>
<thead>
<tr>
<th>Year</th>
<th>Citizens</th>
<th>HPOs</th>
<th>Organisation</th>
<th>3rd parties</th>
</tr>
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<tbody>
<tr>
<td>2002</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>2003</td>
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</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Estimated COSTS

- **Citizens**: £0 for all years.
- **Organisation**: £0 for all years.
- **3rd parties**: £0 for all years.


### Estimated BENEFITS

- **Citizens**: £0 for all years.
- **3rd parties**: £0 for all years.


### Net benefits


### Distribution of benefits

<table>
<thead>
<tr>
<th>Category</th>
<th>Citizens</th>
<th>HPOs</th>
<th>Organisation</th>
<th>3rd parties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Citizens</strong></td>
<td>40.47%</td>
<td>14.26%</td>
<td>18.51%</td>
<td>32.36%</td>
</tr>
<tr>
<td><strong>Doctors, nurses, other staff</strong></td>
<td>16.10%</td>
<td>63.85%</td>
<td>57.82%</td>
<td>32.05%</td>
</tr>
<tr>
<td><strong>Health provider organisation</strong></td>
<td>35.78%</td>
<td>13.48%</td>
<td>18.25%</td>
<td>33.30%</td>
</tr>
<tr>
<td><strong>3rd parties</strong></td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

**Base year: 2008; Discount rate: 3.5%**
Outlook: guiding longer-term research
Based on the ideas of the International Physiome project

**Virtual Physiological Human (VPH)**
The aim

**VPH constitutes effort towards**
multi-scale patient-specific models for

- Personalised healthcare solution
- Early diagnostics & Predictive medicine
- Understanding diseases for the first time and across several biological levels

The VPH research roadmap (2007)

www.europhysiome.org

developed by the EC project STEP
Not enough technology

- The technology in current clinical practice is clearly insufficient.
- The accuracy in predicting fractures is as low as 60%.
- Even if we see the drugs are not working we wait for the fracture, and only then surgically fix it.
Outlook: guiding longer-term research

- Moving from guidance to guidelines to pathways (within & across HCPs)
- Preparing detailed workflow plans
- Identifying clinical entry and end points
- Analysing impacts on all actors & stakeholders
- Development of an economic simulation model (Markov Chain approach)
- Comparison with options for new workflows and expected clinical outcomes from new eHealth solutions
- Undertake initial small trials
- Clinical trials
Summary empirical evidence
10 case studies

1) AOK Rheinland, Germany – GesundheitsCard Europa (GCE), access to healthcare abroad DE/NL/BE
2) Apoteket and Stockholm County Council, Sweden – eRecept, an ePrescribing application
3) City of Bucharest Ambulance Service, Romania – DISPEC tele triage and dispatch system
4) Institut Curie, Paris, France – Elios, a comprehensive hospital EPR system, and Prométhée, a sophisticated search meta-engine
5) IZIP, Czech Republic – a nationwide web based electronic health record
6) Kind en Gezin, Flanders, Belgium – Flemish vaccination database (FVD) and Vaccinnet, facilitating vaccination programmes for children
7) MedCom, Denmark – Danish Health Data & Messages Network
8) MedicalORDER® center Ahlen (MOC) and St. Franziskus Hospital Münster – supply chain optimisation, Germany
9) NHS Direct, UK – NHS Direct Online (NHSDO) information service
10) Sollefteå and Borås hospitals; Sjunet, Sweden – radiology consultations between Sweden and Spain
Summary results

eHealth needs a medium-term perspective
(average values form 10 sites)

- Year 4 – first year that annual benefits exceed costs, on average
- Year 5 – first year that cumulative benefits exceed cumulative costs

Key health policy message: eHealth can support more, better, and safer healthcare, within available resources
Average distribution of direct benefits from eHealth 1994 to 2008

- Citizens: 43%
- HPOs: 52%
- 3rd party payers: 5%

HPO: Health Provider Organisation
### eHealth benefits distribution range

<table>
<thead>
<tr>
<th></th>
<th>Max</th>
<th>Min</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizens</td>
<td>96%</td>
<td>1%</td>
<td>43%</td>
</tr>
<tr>
<td>HPOs</td>
<td>99%</td>
<td>4%</td>
<td>52%</td>
</tr>
<tr>
<td>Third party payers</td>
<td>53%</td>
<td>0%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Distribution depends heavily on the specific nature of the eHealth investment.
eHealth benefits distribution range

Estimated costs and benefits p.a. in a virtual health economy with 10 proven eHealth applications

Millions euro

- Present value of annual costs
- Present value of annual benefits

The Computerised Patient Record (CPR) at the University Hospitals of Geneva (HUG)

With support from

Prof. Dr. Christian Lovis
Head, Unit of Clinical Informatics,
University Hospitals of Geneva
About the University Hospitals of Geneva (HUG)

- Consortium of public and teaching state hospitals
- 9 major facilities at four campuses
- > 30 ambulatory facilities
- Community, primary, secondary and tertiary care
- > 48’000 inpatients and > 800’000 outpatients yearly
- > 2’000 beds
- > 5’000 care professionals,
- Annual budget of nearly 1.4bn CHF
About the Computerised Patient Record (CPR)

ICT before the EHRI case

CPR at HUG

- Admission, discharge, transfer
- Clinical documentation
- Medication
- Past orders (e.g. drugs, tests, care)
- Test results and images
- CPOE, decision support, information modules
- Individual modules at request (e.g. paediatric alerts)

Diogenes IT system

- Administration only

Scattered small development trials towards EHRs

EHRI case

Integration with currently separate system for nurses (DPIME)

- Storage of ECGs
- Introduction of vital signs
- Nursing chart
- Medical problems list

Beyond EHRI (ongoing/planned developments)

- Network with private hospitals and GPs in Geneva

Long-term eHealth vision

Integration into a national CPR system for Switzerland
Benefits from the CPR system at HUG

- **Citizens**
  - Patient safety
  - Time saving and avoided admissions
  - **Better care because of better informed carers**

- **Doctors & nurses**
  - Do not have to waste time looking for records
  - Lower exposure to risk – carers feel safer, less vulnerable
  - **Nurses do not have to chase doctors**
  - **Doctors do not have to guess while waiting for data**
  - Life made easier through integrated presentation of different reports
Benefits from the CPR system at HUG

- **Benefits to HUG**
  - **Time savings** – redeployment of resources:
    - Looking for records
    - Looking for colleagues
    - *Ward rounds*
    - Discharge letters
  - **Reduction in exposure to risk** due to better clinical governance
    - Critical information is always available where needed
    - Lower risk of errors when transferring patients across HUG sites
  - **Avoided admissions** – also for insurances
  - Reductions in number of tests
  - Extra income from better billing processes
HUG – cumulative economic performance (preliminary)
Foreword

The European Commission Directorate General Information Society and Media supported this important contribution to methods for advanced evaluation and the collection of reliable evidence. The information derived from 10 sites across Europe clearly shows that eHealth does matter, that it is well worth the investment, and can lead to very substantial benefits. An important lesson is that deployment of eHealth must be combined with appropriate changes in processes and organisation, and must be guided by appropriately skilled people.

I hope that this document will prove useful to all those with responsibility for health in Europe and will give courage to those who hesitate to invest in eHealth. The advice is simple: do not postpone innovation, but equally do not take a leap into the dark; take small steps, carefully, and be guided by evidence now available of the successes and failures of others.

Brussels, September 2005

Viviane Reding
European Commissioner
Information Society and Media

Healthcare is one of the most information-intensive sectors of European economies and can greatly profit from recent advances in information and communications technology. Given that the health sector currently represents other sectors in the use of this technology - eHealth - there is great potential for rapid, sustained growth.

The eHealth market is currently some 2% of total healthcare expenditure in Europe, but has the potential to more than double in size, almost reaching the volume of the market for medical devices or half the size of the pharmaceuticals market. However, unlike the products from these two other healthcare industries, eHealth applications are not yet routinely measured for their impact, benefits and safety.

This study shows across a wide range of eHealth applications, that clear evidence can be provided of the benefits of information and communication technology in routine healthcare settings. The benefits range from improvements in quality, and better access of all citizens to care, to reductions in unnecessary costs to the public purse. The methods used provide a way to more formal certification of eHealth in Europe and can support current efforts on both sides of the Atlantic to establish better certification mechanisms for electronic health record systems.
World Summit on the Information Society
Tunis 2005
The beneficial impact of eHealth
A European case study
Success factors
Success factors

- A vision, combined with a (highly) flexible (i.e. pragmatic, not a fixed) longer-term strategy
- Effective *clinical* leadership
- A step-by-step process approach that enables risk to be managed (solution tweaking)
- Effective ventures are a series of investments with an underlying *eHealth dynamic* (there is never *the* solution)
Success factors

- Effective applications meet concrete health(care) needs (i.e. not technology-driven)
- Successful applications are driven by multidisciplinary teams, with multidisciplinary people (usually guided by medical professionals)
- Strong focus on change management needs and resources
- Clinical research can offer firm foundations for benefits realisation (outcomes)
Conclusions and lessons learnt
Conclusions and lessons learnt I

- Challenges of socio-economic evaluation of eHealth: it is not an exact science (and not a detailed sociological or organisational behaviour / change study) – multitude of interrelated impact factors

- Comparability and representativeness of results
  - Different settings across many countries
  - Proven (not "average" performing) eHealth applications
  - No analysis of failures

- The health policy value of eHI findings:
  They demonstrate both the socio-economic viability and the potential of eHealth (but not RoI)
Conclusions and lessons learnt II

- Interoperability can be achieved, enabling integrated care
- **Business cases** necessary for all stakeholders
- You need **deep pockets & lots of patience**
  - up to ten years of sustained investment requires also sustained financing
- You need to **know what you will get**
  - quality, risk reduction, and efficiency; *not cash*
- You need to **know what can go wrong**
  - realistic risk management
Acknowledgements

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Further information:
European Commission
http://europa.eu.int/information_society/activities/health/index_en.htm
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