

eHealth for patient safety: towards a European research roadmap

Veli Stroetmann, MD PhD

empirica Communication & Technology Research, Germany

Strategic seminar

eHealth for Safety: Benefits of ICT for patient safety

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eHealth for Safety - Study overview I

EU Study on the Impact of ICT on Patient Safety and Risk Management in Healthcare

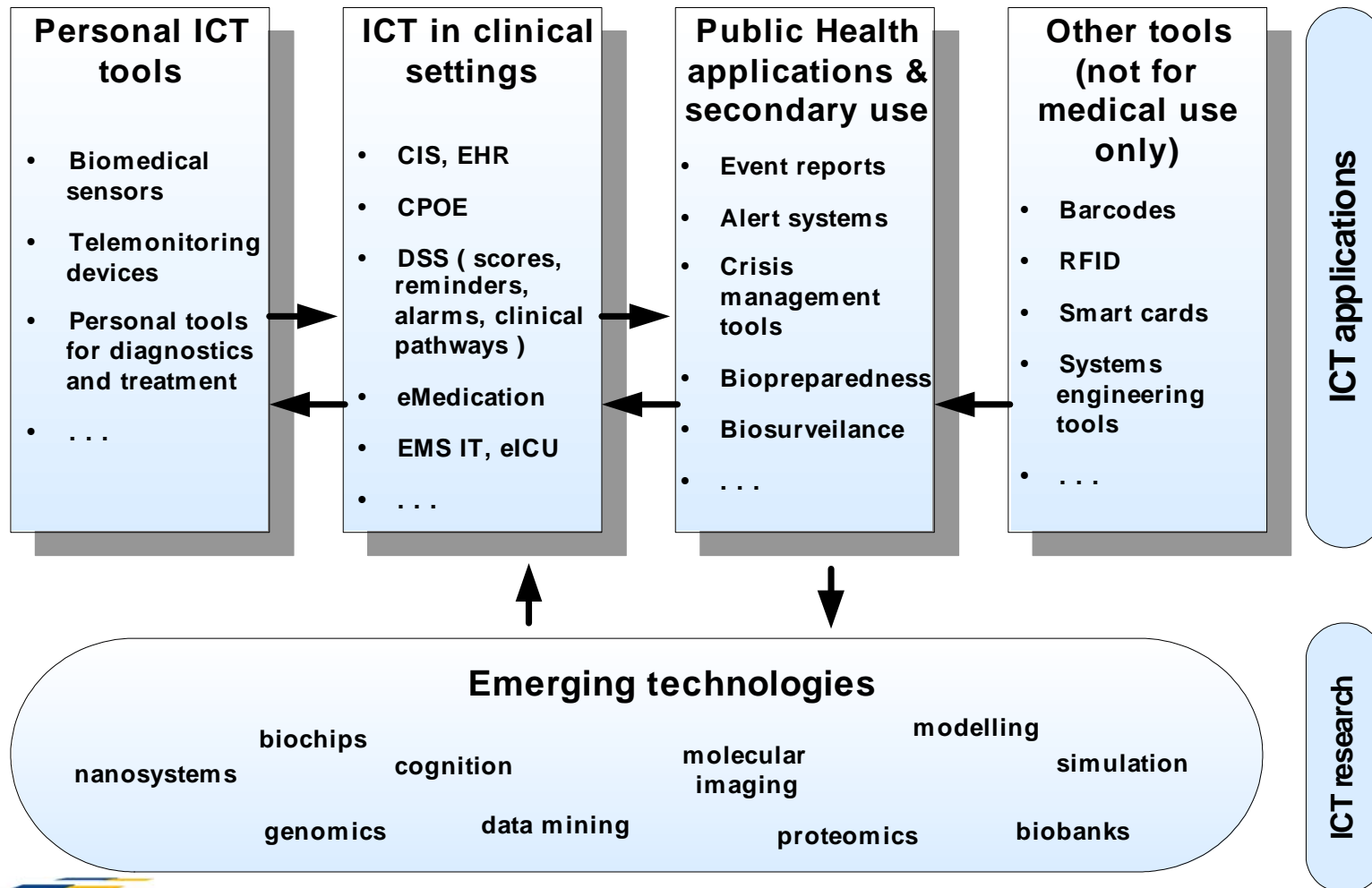
- **general information**

- start: January 2006, duration: 12 month
- consortium: *SYMBION* (France) – coordinator - and *empirica* (Germany)

- **strategic goals**

- Identification of **key topics, opportunities and challenges** for use of ICT in the domain
- **State of play** in the EU and globally
- **Good practice examples**
- Identification of priority **policy needs**
- Long-term **vision** and **roadmap for further RTD**

ICT in support of patient safety and risk management in healthcare



State of play I

Decision Support Systems (DSS)

- Relatively well known, go back to the 70's
- Hunt (1998) suggests **useful application for drug dosing, preventive care but not convincingly for diagnosis**
- Garg review (2002): about two thirds of DSS are effective
- Kawamoto et.al. (2005) review of 70 studies concludes that DSS significantly improved clinical practice in 68%.
- Ash et al (2004) identify instances where DSS can actually **foster errors** rather than reducing them

State of play I

Decision Support Systems (DSS) – cont.

The use of clinical DSS can

- improve the overall safety and quality of healthcare delivery, *but*
- may also introduce machine-related errors
- much debate about the potential for CDSS to harm patients, *but*
- there is *little research* to
 - identify the *nature* of such errors, or
 - quantify their *frequency* or *clinical impact*

Coiera et. al. (2006)

General requirements: fast response time, negligible downtime, easy access, well designed interfaces

State of play II

Computerized Physician Order Entry Systems (CPOE)

- Defined as a process whereby the instructions of physicians regarding the treatment of patients under their care are entered electronically and communicated directly to responsible individuals or services (FCG 2003)
- *Kaushal and Bates* (2003) analysis in four hospitals found a 55% reduction in serious medication errors
- **Potential dangers**
 - errors in the knowledge base of systems
 - *Han, Yong et.al* (2005) reported increased child mortality coincident with CPOE implementation

State of play III

Adverse (drug) event systems

- **Computerized adverse event systems** aim to monitor the occurrence of instances which could be adverse events and alert the clinician when certain indicators are present
- Most common adverse events: nosocomial infections and Adverse Drug Events (ADE)
- Most trials confirm a significant increase in number of ADEs reported (conventional reporting only records one ADE out of 20) (*Kuperman et.al* 2003)
- *Ghandi and Bates* (2003) report one study demonstrating **significant decreases in allergic reactions** and several studies confirming **improvements in response time** concerning lab results

State of play IV

National/regional incident/event reporting systems

- Accumulate patient data from a variety of local sources
- Can be used for biosurveillance, such as fast alert and pattern tracking in case of a bioterrorism attack or an epidemic outbreak
- Example: **AIMS** (Australia)
 - set up in 1987, initially only in the field of anaesthesia
 - until 1992, 2000 incidents collected and reviewed, leading to significant changes at the local and national level
 - 2000: AIMS-2; designed to be used across the entire spectrum of the national healthcare system by staff, patients and relatives as well as specialists, accessible on the web

Other tools, not for medical use only - Bar codes and RFID

- **Bar Codes** can help to **reduce administration and logistics errors**
 - real time updates allowing providers to **alter medications** and adjust delivery schedules
 - simultaneous access to the system at multiple sites, elimination of phone calls and paperwork
- **Radio Frequency IDentification (RFID)** used for:
 - security (e.g. access control)
 - medication administration, authentication and stocking (tracking of drug origin)
 - hospital equipment, supply tracking
 - patient tracking, tagging blood transfusions and medical alert implants
 - option for outpatient self-medication, e.g. for seniors

*research needed to solve problems with privacy and confidentiality
of patient data*

Some conclusions / observations

- *Integrated systems*, e.g. a combination of DSS, CPOE and alerting, are better accepted
- Systems should be:
 - designed with the end-users, the busy or poorly resourced clinicians, in mind
 - fast and displaying all relevant information in a coherent and easy to use manner

otherwise they will be rejected by the professionals and can even lead to more errors, not less

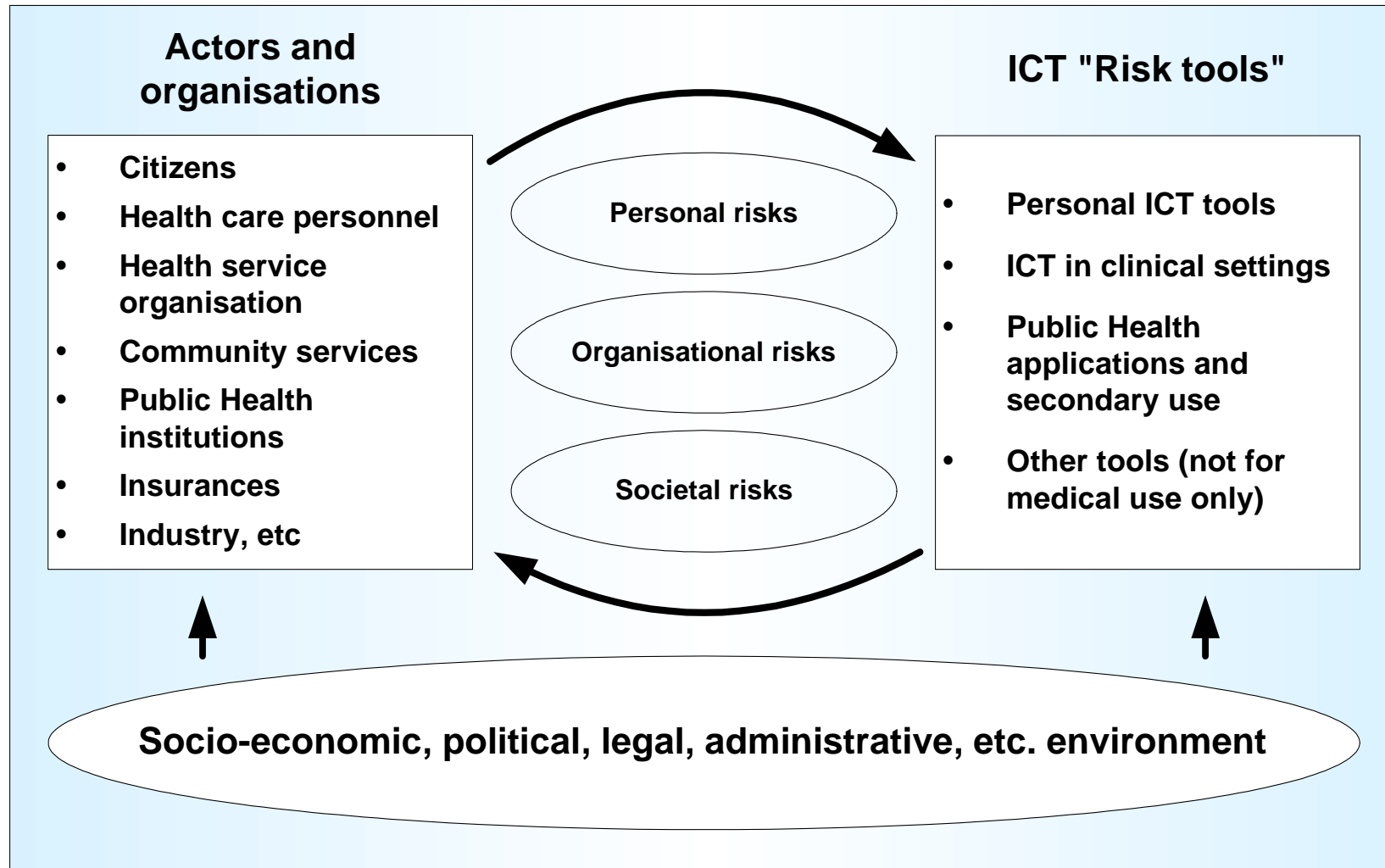
- A deeper understanding of the *“complex set of cognitive and socio-technical interactions”* is essential
- The *organisational culture*, including *barriers to reporting errors*, play a key role in the acceptance of electronic tools such as incident reporting systems - *Coiera et al (2006)*

Patient & health system (RTD) risk domain

To illustrate and delimit the *patient and health system risk domain*, an **initial model** to structure and identify relevant RTD fields and dimensions was developed. It

- will allow for different types of risks and ICT applications to be related to the corresponding meta categories
- may also direct research towards other innovative fields

Initial model of the risk domain



A multi-level approach to patient safety

- Improving patient safety through ICT is not only a technical issue
- A holistic approach incl. organisational & political factors is needed

Level	Component
Policy level (regional, national, European level)	<ul style="list-style-type: none"> • Patient safety policies • Implementation measures • Socio-economic and health policy framework conditions • Legal and ethical issues • Funding, clinical and economic evaluation
Organisational level	<ul style="list-style-type: none"> • Organisational structure and culture • Work processes • Change management • Training and learning
Technical & RTD level / applications	<ul style="list-style-type: none"> • Personal ICT tools, e.g., biomedical sensors • ICT in clinical settings, incl. EHR, DSS, CPOE • Public health applications & secondary use, e.g., event reporting, alert systems • Semantic aspects / ontologies • Emerging technologies

Research needs and opportunities I

- **Towards a *culture of safety* in eHealth**
 - health risk and patient safety aspects must be taken into account by **all** health ICT RTD
- ***Data mining* for improved patient safety**
 - applied to emerging Electronic Health Record (EHR) and clinical research databases to push forward knowledge of risks associated with patient characteristics and treatment patterns
- ***Ontology* of patient safety and risk management**
 - development of a common framework for modeling threats to safety and for exchanging information on patient safety issues

Research needs and opportunities II

- **Socio-economic and behavioural aspects**
 - how eHealth may *change the behaviour* of health professionals, care personnel, citizens to improve system safety
 - analysis of the impact of *medico-cultural, legal/regulatory* and *socio-economic factors*
 - certification procedures for Decision Support and Expert Systems
- **Monitoring & risk management of *large scale events***
 - strategies and ICT support for *preparedness* for pandemics or bio-terrorism attacks (e.g. epidemiological modeling of regional events)
 - a means to better inform and reach professionals and the public on a large scale and help adapt responses

Research needs and opportunities III

- **Mathematical modelling and simulation**
 - *disease modelling* & simulation, *virtual clinical trials*
 - simulation in education and training, *Virtual Reality (VR)*
- **Healthcare system risk models**
 - complex *systems models* incl. use of systems re-engineering techniques, Failure Mode Effects Analysis (FMEA), Hazard Analysis Critical Control Points (HACCP)
- **Health pathway risk models**
 - incl. predictive ability to identify potential risks

Thank you for your attention

Further information:



Communication & Technology Research, Germany
and *Symbion*, France (Coordinator)

patientsafety@empirica.com

www.ehealth-for-safety.org

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