ICT in support of patient safety – state of play, and research needs and opportunities

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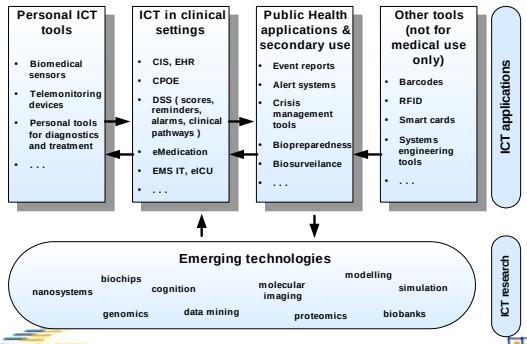
eHealth for Safety - Study overview

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 - & *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



Role of ICT in improving patient safety: some application fields & state of play

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

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

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 coincided with CPOE implementation

Choosing and implementing a CPOE system

- … is hard and should be done carefully, as the expense is high
- CPOE system should be from the same vendor as core systems
- It should interface well with underlying systems, be *fast*, user friendly, and facilitate provision of clinical decision support
- clinicians should be involved in selection process
- pilot in a clinical area with less workload
- provide 24/7 support to users for several weeks
- make use mandatory

after David W. Bates, 2002

CPOE evaluation framework at Geneva University Hospital

An evaluation framework is being developed, comprising

- **human-machine aspects**
  - **ergonomic aspects**
  - **safety points such as alerts**
- **process based problems - communication**

The goal is to support the choice and implementation of CPOE in good conditions

In addition, the safety perception is being evaluated

Christian Lovis, 2006

Role of ICT outside the medication area

- **Improving communication**

  e.g., ePaging - the computerised communication system can identify and page the professional on call (role based)
  - **treatment is more rapid, e.g., in case of critical lab results (*Kuperman*, 1999: may lead to lower mortality rate)**
  - **requires physician-on-call schedules, known responsibilities, traceability, etc.**

- **Remote monitoring of intensive care units (eICU)**

Bar codes

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**

RFID

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

Concept of Traceability at Geneva University Hospital

Traceability implies:

- bridging the gap between suppliers and consumers (hospitals, industry, ...),
- using codes (classifications, nomenclatures, ontologies, ...) in a structured EPR
- full interoperability, including semantics
- complete integrity in information chains
- constant link maintained between virtual information and real things like
  - unique patient ID
  - or, e.g., the link between the system and blood products

after Christian Lovis

Some observations I

- ***Integrated systems,*** **e.g. a combination of DSS, CPOE and alerting, are better accepted**
- **Systems should be:**
  - designed with 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

Some observations II

- 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)

Some examples

- from the *eHealth IMPACT* study:
  Institut Curie; DISPEC
- ePharmacy

Elios and Prométhée at Institut Curie

- Elios – a comprehensive Electronic Patient Record
  - Structured reports
  - Free text
  - Images
  - Access by all doctors involved in a patient's treatment
- Prométhée – a biomedical informatics search meta-engine
  - Answering questions across research databases, including Elios, which are not pre-specified
  - Instantaneous statistical analysis

Benefits from Elios and Prométhée

The faster access to comprehensive, accurate, timely clinical data, offers:

- Better preparation of consultation
- Real-time *clinical audit studies* to measure outcomes and control quality
- Real-time *organisational audit studies* to streamline workflow
- Faster compliance with new clinical guidelines and organisational protocols

Net economic benefits estimated at over €3m per year

Elios and Prométhée – factors of success

- Meeting concrete needs: effectiveness of providing information to clinicians
- Multidisciplinary teams, continuous involvement of clinicians in development, implementation, evaluation
- Clinical leadership: personal, not position power
- Pragmatic, step-by-step approach
- Vision, not a fixed long-term strategy
- Ongoing audit of the performance of new technologies
- Allow time for planning and development *but*
- Full scale implementation in short time and full use of ICT functionality

DISPEC – Emergency service

- A sophisticated, electronic emergency ambulance teletriage and dispatch system
- Introduced in 1996 by the City of Bucharest Ambulance Service
- Nature and severity of incident identified by trained personnel based on information received from the caller
- Best matching ambulance equipment and team identified by DISPEC (4 types of ambulances equipped with GPS)

Benefits from DISPEC

- The incidence of death per emergency decreased by >25%
- Handling of increasing number of emergency calls with shrinking financial and staff resources
- Dramatic drop in call to dispatch time
  - decrease in average time by about 30%
- Dramatic drop in time till arrival at emergency site
  - decrease in average time by approximately 35%

Net economic benefits estimated at €1.4m per year

ePharmacy at a London hospital

- A combination of:
  - ePrescribing
  - eDispensing using a robot system
  - eStockmanagement
  - eProcurement
- For outpatients and discharged patients (inpatients to be included in 2007)

Benefits from ePharmacy

- Fewer prescribing errors and discrepancies
- Fewer dispensing errors
  - down from 29.9 to 21.2 per 100,000 packs, a 29% gain
- Shorter response time for urgent prescriptions
  - from 37% within one hour to 89%
- Most dispensary staff redeployed to wards
- 50% of benefits go directly to patients

Annual net economic benefit – approximately €1.5m

A multi-level approach to patient safety

- **The case studies have shown that 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)	• Patient safety policies • Implementation measures • Socio-economic and health policy framework conditions • Legal and ethical issues • Funding, clinical and economic evaluation
Organisational level	• Organisational structure and culture • Work processes • Change management • Training and learning
Technical & RTD level / applications	• 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

Research needs I

- ***Evaluation of the impact*** **of technologies like**
  - **bar coding**
  - **computerized medication administration records**
  - **automated dispensing devices**
  - **smart pumps**
- **Evaluating the *impact of linking* all these technologies**
- **Surgical adverse events**
  - **almost half of all adverse events but little known about them**
  - **strategies focusing on team training, simulation, and improving communication especially likely to be successful**
- **Missed diagnoses**
- **Medication safety in outpatients**

after David W. Bates

Research needs II

- Towards a *culture of safety* in *eHealth*
  - health risk and patient safety aspects must be taken into account by all health ICT RTD
- *Ontology* of patient safety and risk management
  - a common framework for modeling threats to safety and for exchanging information on patient safety issues
- Socio-economic and behavioural aspects
  - how eHealth may *change the behaviour* of health professionals, citizens to improve system safety
  - analysis of the impact of *medico-cultural, legal/regulatory* and *socio-economic factors*
- Tools for collaborative, real-time team work
- Use of pharmacogenomics to avoid ADE
- Simulation in education/training, Virtual Reality

Thank you for your attention

Further information:

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