

Challenge 5

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Towards sustainable and personalised healthcare

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Challenges for European Health Systems

- **Pressure on healthcare systems**
 - Citizens' expectations for high-quality care
 - Increased prevalence of chronic diseases
 - substantial part of the overall healthcare costs
 - Demographic changes
 - more people will require prolonged care
 - Rising healthcare costs
 - faster than the economic growth itself
- **Require changes in the way:**
 - healthcare is delivered
 - medical knowledge is managed & transferred in clinical practice

Aims

- **Multidisciplinary research to support:**
 - Improved productivity of healthcare systems
 - patient care at the point of need
 - health information processing
 - Continuous and more personalised care solutions
 - informed & responsible participation of patients and informal carers
 - respond to the needs of elderly people
 - Prevention and prediction of diseases
 - save lives and avoid costly treatments
 - Higher patient safety
 - optimise medical interventions and prevent errors
 - Industrial leadership
 - European eHealth and medical imaging/devices industry
 - attract pharmaceutical research back in Europe

Additional Aims

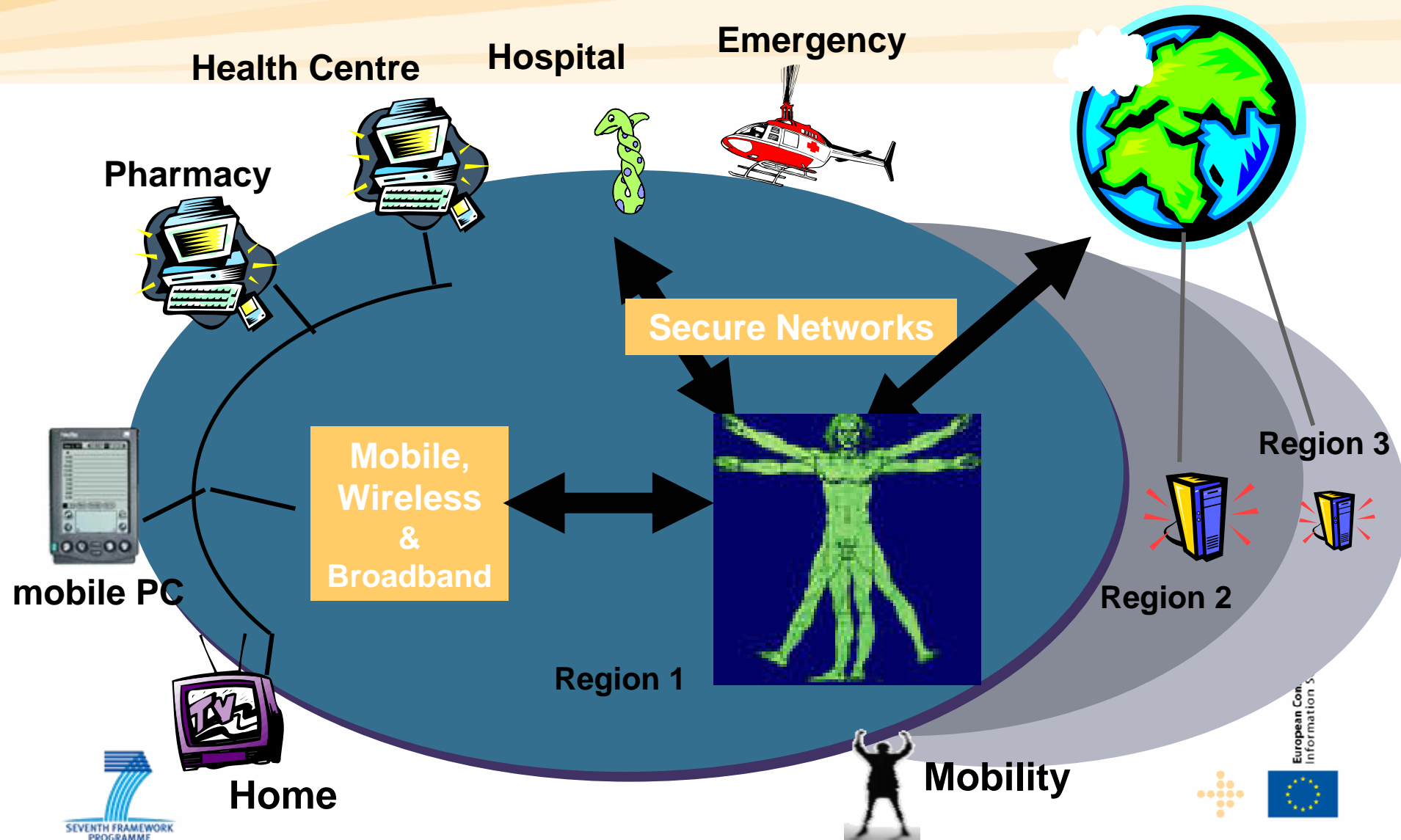
- **Integrated, holistic approach addressing:**
 - User needs
 - Technological development
 - Personal data security, confidentiality, privacy
 - Reimbursement
 - Legal framework
 - Validation
 - **quantitative** indicators of their added value and potential impact
 - Integration in healthcare processes
 - interoperability with eHealth systems
 - encourage changes towards new delivery models

Strategic Research Directions

- **Three main directions:**
 - Personal Health Systems
 - Patient Safety
 - Virtual Physiological Human

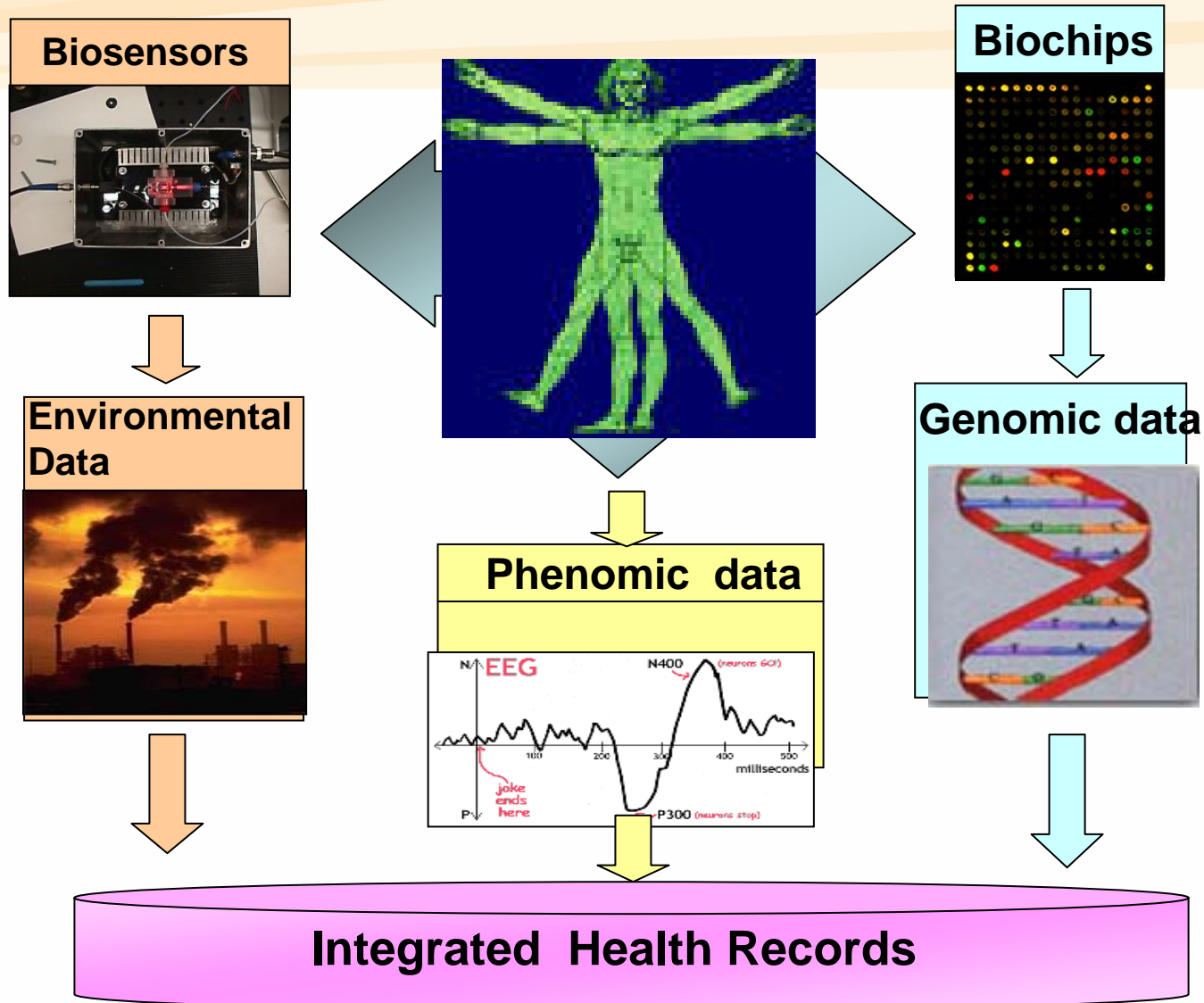
Current focus

Connecting individuals with Health Information Networks



Future plans

Towards full picture of individual's health status (Molecular Medicine)



Personal Health Systems

Key facilitators for:

- Continuity of care
- Preventive & personalised care
- Citizen-centred care
 - citizen empowerment
 - preventive lifestyle & early diagnosis
 - disease management
 - independent living for ageing society



Personal Health Systems

Benefits for all:

- health conscious who wish to stay fit
- healthy individuals at risk who wish to maintain normal health status
- chronically ill patients
- elderly persons or people in need, who want to live independently outside care institutions

In the form of:

- wearable
- implantable
- portable systems
- point-of-care systems



Personal Health Systems

Examples of FP6 projects

- **MYHEART** (<http://www.hitechprojects.com/euprojects/myheart/>)
Wearable systems (intelligent textiles) for prevention, early diagnosis and management of cardiovascular diseases
- **OFSETH** (www.ofseth.org)
Textiles with optical sensors for physiological monitoring
- **HEARTFAID** (www.heartfaid.org)
Knowledge-based platform for heart failure management
- **SMARTHEALTH** (www.smarthealthip.com) **and**
MICROACTIVE (www.sintef.no/microactive)
Point of care devices for cancer screening (breast, cervical and colorectal cancer)

FP7 Objective ICT-2007.5.1 – Personal Health Systems for Monitoring and Point of Care diagnostics

- **Focus on:**

- (a) Personalised (health status) monitoring**

- For people at risk or chronically ill
 - Wearable or portable/mobile ICT systems
 - Enable remote monitoring & care
 - Multi-parametric information (physiological; biochemical; activity, location, social and environmental context)
 - Intelligent systems to correlate multi-parametric data with expert biomedical knowledge
 - aid diagnosis
 - user support
 - Interoperable with electronic medical records

FP7 Objective ICT-2007.5.1 – Personal Health Systems for Monitoring and Point of Care diagnostics

- Focus on:

- a1) **Chronic disease management**

- intelligent closed-loop approaches
 - detect and assess trends and episodes
 - facilitate adaptive care
 - remote management, avoiding hospitalisation
 - promote doctor-patient interaction
 - potential for integration in the healthcare process

- a2) **Preventive monitoring for people at risk**

- identify evolving patterns/trends in health & lifestyle parameters
 - indicate elevated risks of disease development
 - reveal episodes at early stages
 - facilitate personalised guidance
 - encourage citizen compliance
 - prompt for early medical intervention



FP7 Objective ICT-2007.5.1 – Personal Health Systems for Monitoring and Point of Care diagnostics

- **Focus on:**

- (b) Point-of-Care diagnostics**

- Multi-analyte screening at primary care (GP offices)
 - Portable or handheld devices (based on LoC, microarrays, etc.)
 - Multiple tests (e.g. genome, proteome, metabolome levels)
 - Identify disease predisposition
 - Early diagnosis of diseases & their recurrence
 - Assistance to treatment
 - *dosage advice*
 - *suitability of drug use*
 - Significant advances in:
 - *sensitivity and specificity,*
 - *data processing, analysis and quality control*
 - Interface with hospital and laboratory information systems & electronic medical records

FP7 Objective ICT-2007.5.1 – Personal Health Systems for Monitoring and Point of Care diagnostics

- **(c) Additional Support Actions on:**
 - 1) R&D roadmap on Personal Health Systems**
 - emerging technologies and potential applications
 - user demand and business aspects
 - ethical and legal considerations
 - 2) Wireless transmission of health-related information**
 - reliability aspects
 - need for exclusive radio frequency bands?
 - 3) Interoperability of Personal Health Systems with other eHealth systems**
 - promotion and recommendations for continuous care

FP7 Objective ICT-2007.5.1 – Personal Health Systems for Monitoring and Point of Care diagnostics

- **When :** **Call 1**
- **Budget :** **72 M€ ***
- **Instruments:**
 - (a) **Personalised Monitoring : IPs**
 - (b) **Point of Care diagnostics : IPs**
 - **70.5 M€ for (a) and (b)**
 - (c) **Coordination and Support Actions: CSAs**
 - **1.5 M€ max for (c) [3 x 0.5 M€ max per topic]**

* subject to agreements on the 2007 and 2008 budgets

Patient safety – Dimension of the problem

- > 1 M. patients in US suffer injuries each year as a result of broken health care processes and system failures.
- > 1/2 of U.S. patients receive known “best practice” treatments for their illnesses and < 1/2 physician practices use recommended processes for care.
- 30 -40% of every dollar spent on health care in US, is spent on costs associated with “overuse, underuse, misuse, duplication, system failures, unnecessary repetition, poor communication, and inefficiency”

In Europe

- Department of Health in UK estimates that *1/10 patients admitted to NHS hospitals will be unintentionally harmed*
- Patient safety incidents cost the NHS in UK an estimated £2 billion a year in extra bed days, in addition hospital acquired infections add a further £1 billion to these costs.
- In the Netherlands, approx. 800,000 Dutch people over the age of 18 have been the victim of errors due to the inadequate transfer of medical information.

Advanced Risk assessment and Patient safety

FP6 - Projects related to Patient safety :

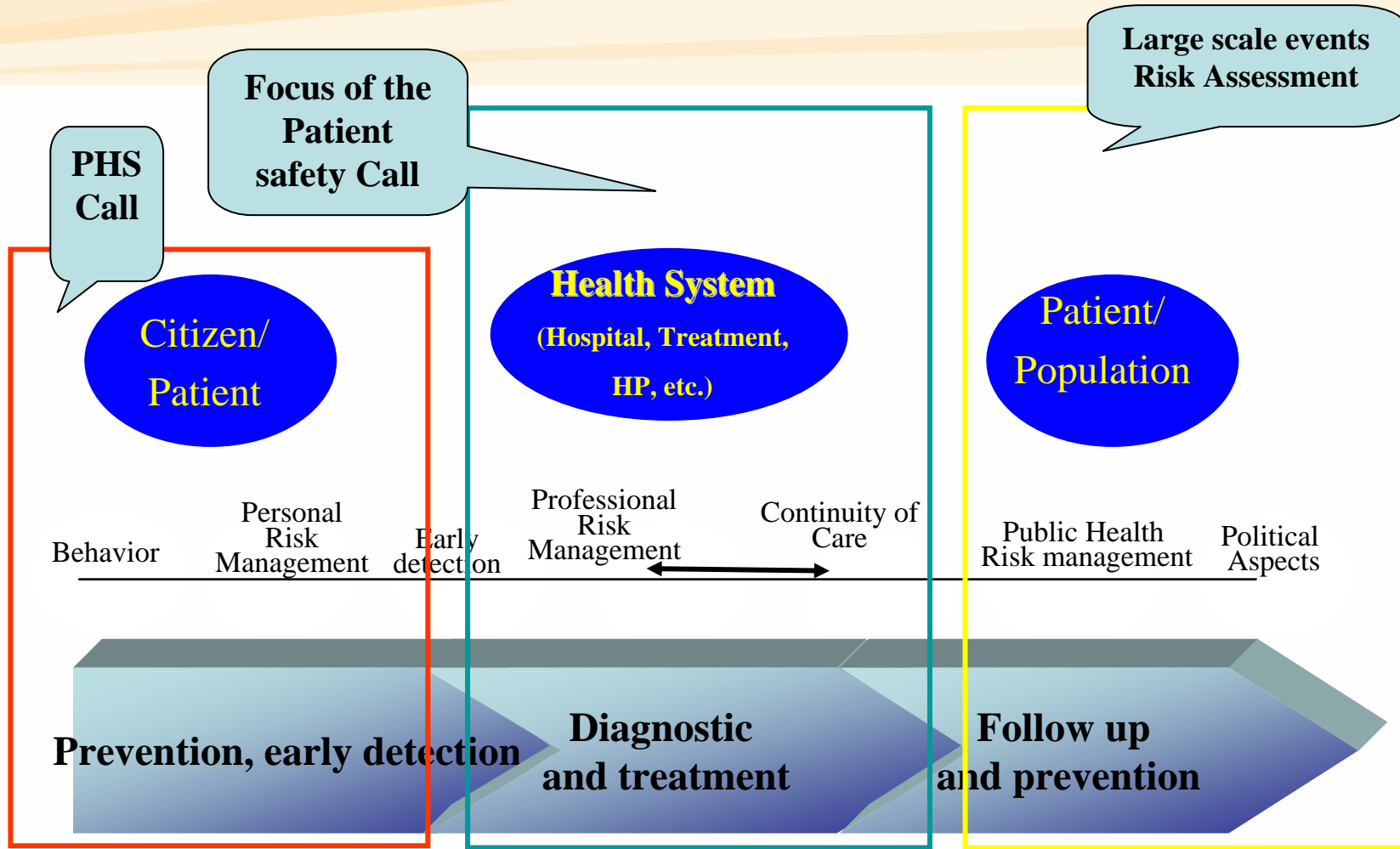
1) Research projects

- PIPS (Personalised Information Platform for life and health Services) <http://www.pips.eu.org>
- COCOON (Integrated Project aimed at supporting health care professional in reducing risk management in their daily practices) <http://www.cocoon-health.com/>

2) Study

Impact of ICT on Patient Safety and Risk Management in Healthcare (12 month, started January 2006) see <http://www.ehealth-for-safety.org/>

Advanced Risk assessment and Patient safety ICT-2007.5.2



Research proposed in ICT-2007.5.2

a) Advanced computerised adverse event systems:

- *Identification of common patterns in safety-relevant events beyond reporting nosocomial infections and/or Adverse Drug Events (ADE).*
- *New tools for prediction, detection and monitoring of adverse events and other relevant information.*
- *Based on innovative data mining and integration techniques of existing databases and specific applications.*
- *Emerging technologies like semantic mining should be explored through multimedia databases.*
- *Include validation leading to quantitative benefits.*

Research proposed in ICT-2007.5.2

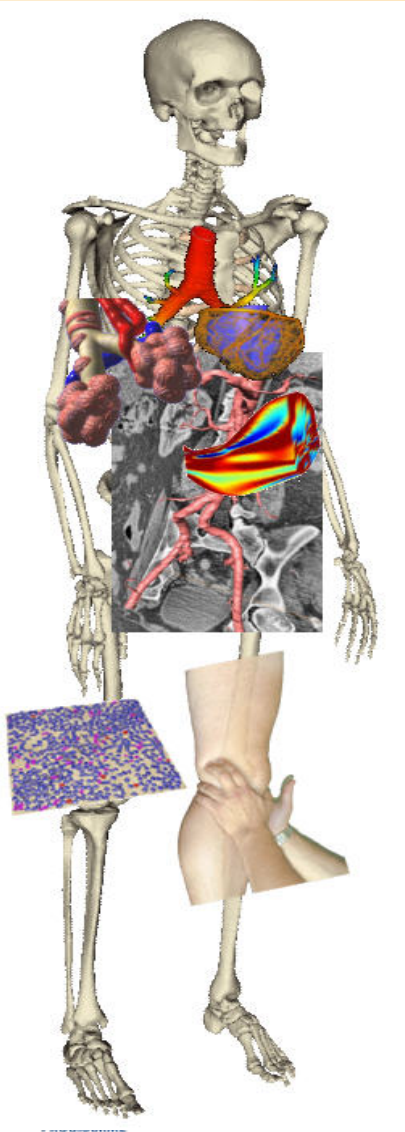
- b) One CSA - New risk prediction** for large scale local, regional or even global adverse health events (infectious outbreaks, bioterrorism):
- *new risk prediction, assessment and management tools for preparation, surveillance, support and intervention in case of large adverse health events.*
- c) Research activities** based on the collaboration between EU constituency and their Latin America counterparts in the area of patient safety

FP7 Objective ICT-2007.5.2 – Advanced ICT for Risk Assessment and Patient Safety

- **When :** **Call 1**
- **Budget:** **30M€ ***
- **Instruments:**
 - (a) CPs 26M€ (minimum 9M€ for IP and Minimum 9M€ for STREPs)
 - (b) 1 Coordination & Support Action max 1M€ for max 1 year
 - (c) CPs (STREP only) 3M€

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Virtual Physiological Human



- **Concept basis** Basis is the International **physiome** project *www.physiome.org*
- **Computer models of the human physiology**, which includes the interaction across temporal and spatial scales from molecules to cells, tissues, organs, up to the whole human body
 - **Patient specific model** from biosignals and images including molecular images

Technologies involved:

- **Data mining, knowledge discovery tool, semantic integration, databank, biomedical imaging, modelling, simulation and visualisation techniques, HealthGrid (infrastructure and tools)**

Virtual Physiological Human

VPH to model & simulate human physiology and disease-related processes - key facilitator for:

- **Personalised (Patient-specific) healthcare solution**
- **Early diagnostics & Predictive medicine**

FP7 Objective ICT-2007.5.3 - Virtual Physiological Human

- **Technical focus on:**

- a) Patient-specific modelling and simulation**

- Target: molecular, cell, tissue, organs or systems
 - Modelling & simulation of organs/systems targeting specific clinical needs.
 - Better understanding of the functioning of the organs
 - New insight into the response to physiological changes

- b) Data integration and knowledge extraction**

- Target: creation and formalisation of patient specific knowledge from multi-level integration of biomedical data
 - Requirement: open distributed health infrastructures and tools
 - Focus:
 - Coupling scientific research data with clinical/empirical databases
 - Image processing assessing disease evolution/presence

FP7 Objective ICT-2007.5.3 - Virtual Physiological Human

- **Application focus on:**
 - a) Patient-specific modelling and simulation & b) Data integration and knowledge extraction to be demonstrated on c) following clinical applications:
 - Medical simulation environments for surgery
 - Prediction of disease or early diagnosis (patient specific)
 - assessment of efficacy/safety of drugs

FP7 Objective ICT-2007.5.3 - Virtual Physiological Human

d) Integrating action (NoE):

- in multilevel modelling and simulation of human physiology
 - sharing of knowledge
 - multidisciplinary training programmes
 - reusable software tools

e) Coordination & Support Actions

1. Enhancing security and privacy in modelling and simulation addressing
 - patient data processed over distributed networks
 - use of genetic data
 - Trustworthy environment
2. International cooperation on health information systems based on Grid capabilities

FP7 Objective ICT-2007.5.3 - Virtual Physiological Human

- **When :** **Call 2**
- **Budget:** **72M€ ***
- **Instruments:**
 - (a-c) **CPs 62M€ (minimum 22M€ for IP and Minimum 22M€ for STREPs)**
 - (d) **Integrating action: NoE max 8M€**
 - (e) **Coordination & Support Actions: CSAs 2M€ max [2 X 1M€ max per topic]**

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Contact persons

- **DG INFSO Unit H1 – “ICT for Health”**
- **Personal Health Systems for Monitoring and Point-of-Care diagnostics – Loukianos Gatzoulis**
- **Advanced ICT for Risk Assessment and Patient Safety - Octavian Purcarea**
- **Virtual Physiological Human – Alessandra Martini - Joël Bacquet**

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