

Personal Health Systems (PHS)

Overview and Research Trends

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- Microsystems in medicine
- Biochiptechnology
- Biohybrid systems
- Neural prosthetics
- **Health telematics**
- Cryo-technology
- Stem cell research
- Medical ultrasound
- Laser medicine

Health Telematics

- ▶ eHealth
- ▶ Telemedicine
- ▶ eHome care and mobile healthcare
- ▶ Smart biomedical sensors and devices
- ▶ Semantic biomedical data integration and interoperability
- ▶ Biobank-DMS

■ Personal Health Systems

A key factor for a citizen centred healthcare

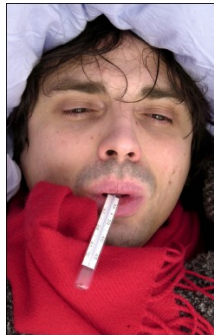
- Key facilitators for
 - ▶ Preventive and personalised healthcare
 - ▶ Citizen-centred healthcare and citizen empowerment
 - ▶ Preventive life style and early diagnosis
 - ▶ Self management of diseases and care
 - ▶ Independent and ambient assisted living for the aging society
- Advanced PHS solutions based on:
 - ▶ Smart sensors and actuators
 - ▶ Wireless communications
 - ▶ Intelligent algorithms
 - ▶ Modeling and simulation



- **Personal Health Systems in FP7:**
Innovation beyond the State-of-the-Art !
How to avoid to reinvent the wheel???



The evolution of Personal Health Systems



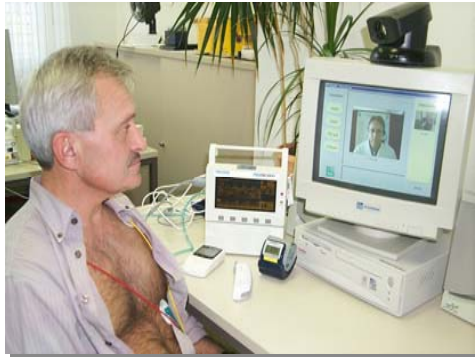
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■ The evolution of Personal Health Systems ...



... at Fraunhofer IBMT



1998
Telemedicine services
for stroke patients



2002
TOPCARE Homecare
Platform

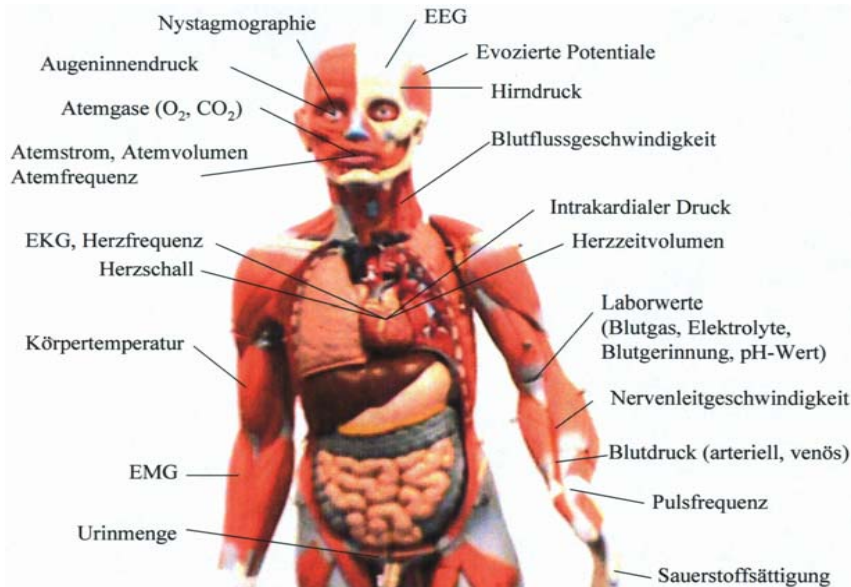


2006
Wireless telemonitoring
system with ECG Shirt

PHS and Physiological Health

Disease prevention, early diagnosis, management

- PHSs to determine the **physiological** health status of individuals
- Cardiovascular diseases, facts for Germany:
 - ▶ Cause of death No.1 (48% of all deaths), 300 000 heart attacks, 67 000 cases of sudden cardiac death, 250 000 strokes, 15 mill. cases of hypertension



- New quality of integrated mobile monitoring required
 - ▶ Multiparametric and intelligent
 - ▶ data fusion and event detection
 - ▶ auto adaptive
 - ▶ textile integrated

PHS and Physiological Health Stationary Telemonitoring Solutions



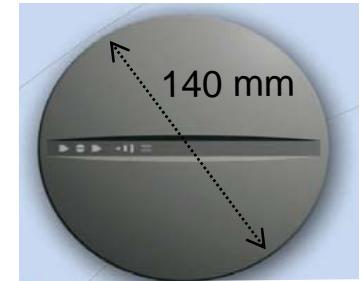
© FP5 project TOPCARE



Viterion Link
© Viterion TeleHealthcare



Patient Telemonitoring Set
© Philips

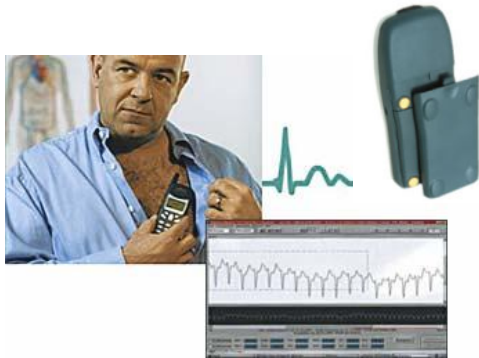


Wireless Telehealth Gateway
RTX3351, © RTX Healthcare



Multiparameter Monitoring System
WristClinic + MedicGate, © Telcomed

PHS and Physiological Health Mobile Telemonitoring Systems



vitaphone 2300, © Vitaphone



CoreBELT
© Coresience



eWatch
© Carnegie Mellon University, Pittsburgh
TU München



STATPATCH™ Wireless Holter Monitor,
© Telzuit Medical Technologies

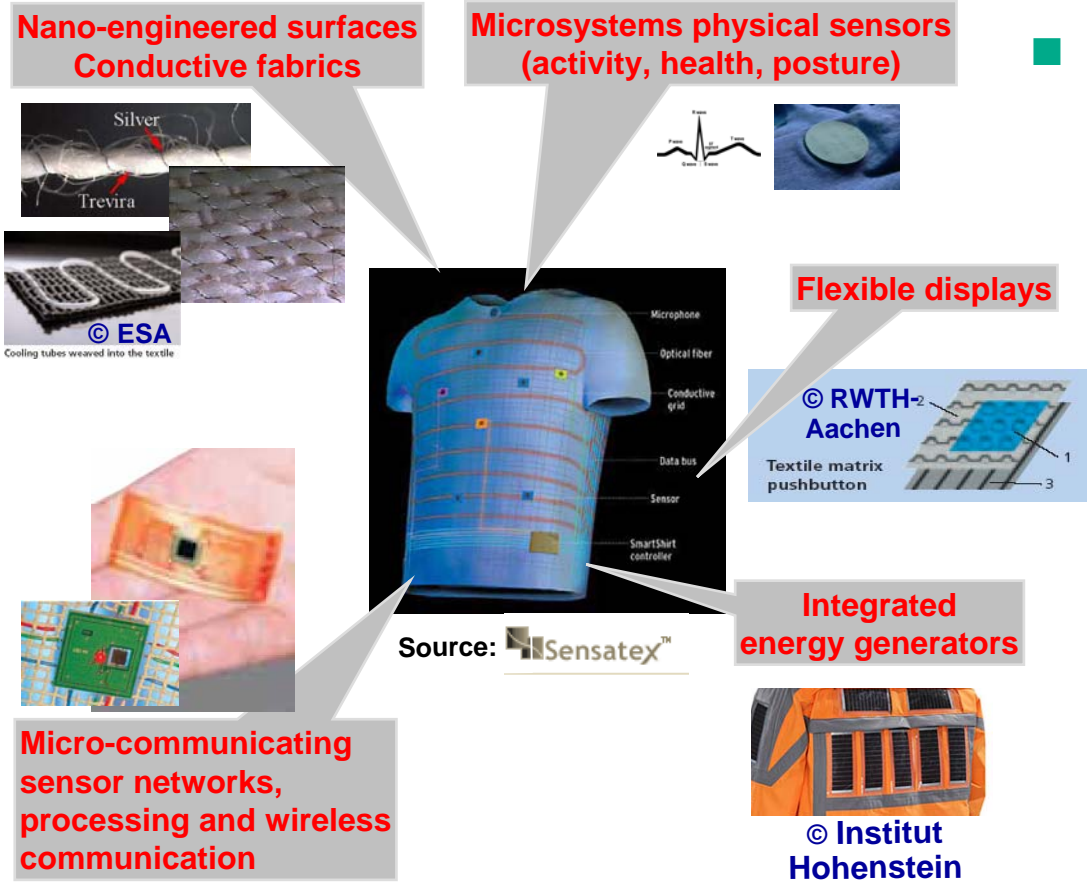


AMON Wrist Monitoring Device
© FP5 project Amon



© Fraunhofer Sensave

PHS and Physiological Health Wearable Solutions – Smart Clothes



- Technical challenges
 - ▶ **Smarter biotextiles** with embedded sensors and on body electronics
 - ▶ User friendly, non-stigmatising PHS, ‘disappearing’ hardware
 - ▶ More robust and reliable
 - ▶ Energy-saving, energy-generating
 - ▶ Multi parameter signal analysis, event detection
 - ▶ Integrated in healthcare process

PHS and Physiological Health Wearable Solutions – Smart Clothes



SmartShirt
© Sensatex



adiStar Fusion, © adidas / Polar

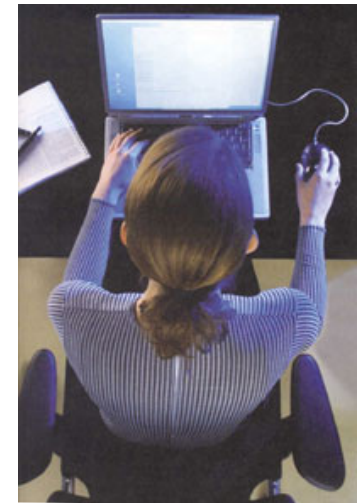


Know Where Jacket
© interactivewear



Sensor baby vest
© ITV Denkendorf

- EU research projects:
 - ▶ wealthy
 - ▶ myheart
 - ▶ wearit@work



Project Motion Aware Clothing
© Wearable Computing Lab, ETH Zürich

Future Needs for citizen centred healthcare: Technologies supporting a preventive life style

Approach - Proactive healthcare:

- ▶ Proactive assistance and early diagnosis (primary prevention), physiological and mental health status checks
- ▶ Well being and fitness monitoring and support (inactivity, stress, insomnia, obesity) for the prevention of cardiovascular diseases (dietary monitoring, fitness assistant)
- ▶ prevention of posture related diseases

Proactive, adaptive, intelligent **personal health assistants** integrated in clothes, mobile phones, PDA, always available, always online, networked (source ETH Zürich)

Multi parameter signal analysis with event detection and reaction strategy



 Wearable Computing Lab.
ETH Zürich

PHS for the Ageing Societies

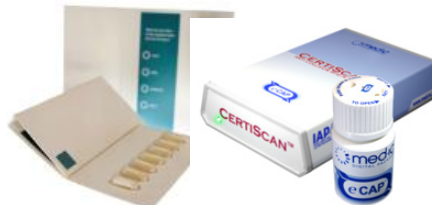
Technologies for independent living



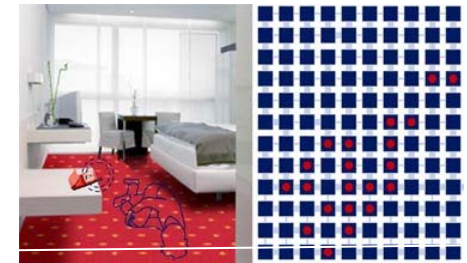
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- Enabling technologies
 - ▶ Ambient Intelligence: **context aware** devices/sensors that expose services
 - ▶ Convergence of computer/phone/TV and home automation/communication
 - ▶ RFID and wireless networks technology, localization technologies
 - ▶ Advanced robotics for care support

■ Smart objects



eCAP, © Med-ic

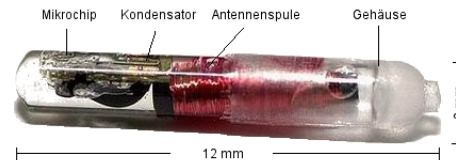


Smart Floor, © Infineon Technologies

PHS - Active Implants



Source: Biotronic



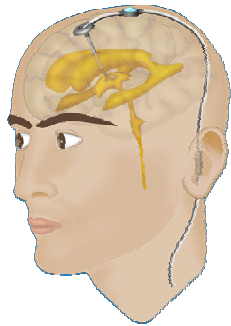
Source: VeriChip Inc.

- Remote monitoring of implants:
 - ▶ Defibrillators and pacemakers

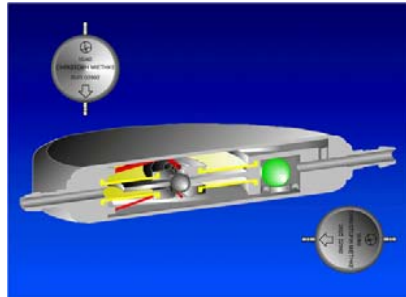
- Implantable RFID chip:
 - ▶ FDA approved implantable radio frequency identification chips from VeriChip Inc.; 2500 users
 - ▶ Application: Patient identification i.e. in emergency room with link to patient's EHR; access control; billing systems;
 - ▶ Strong ethical and security concerns (accessible by anyone, cloneable)
 - ▶ Generally accepted for use in animals

PHS - Intelligent Implants

- Active implants that are able to deliver information about healing process, state of implant and that can be reconfigured

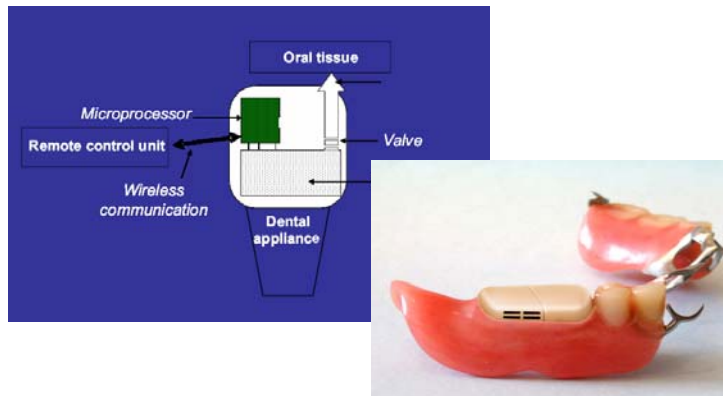


Source: Christoph Miethke GmbH



- Active brainshunt:
 - ▶ Electronic valve
 - ▶ Reprogrammable by telemetric link
 - ▶ Telemetric powering during reprogramming

Source: P. Walter, Köln



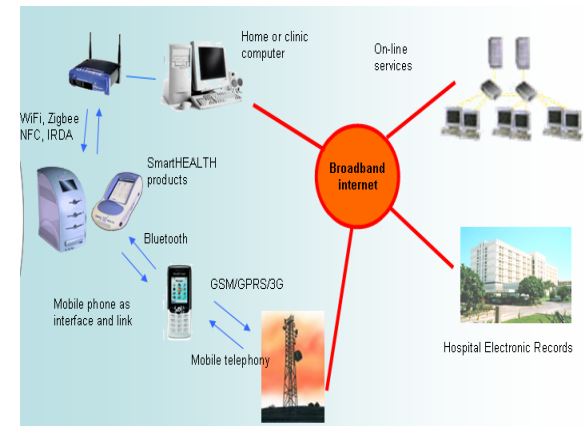
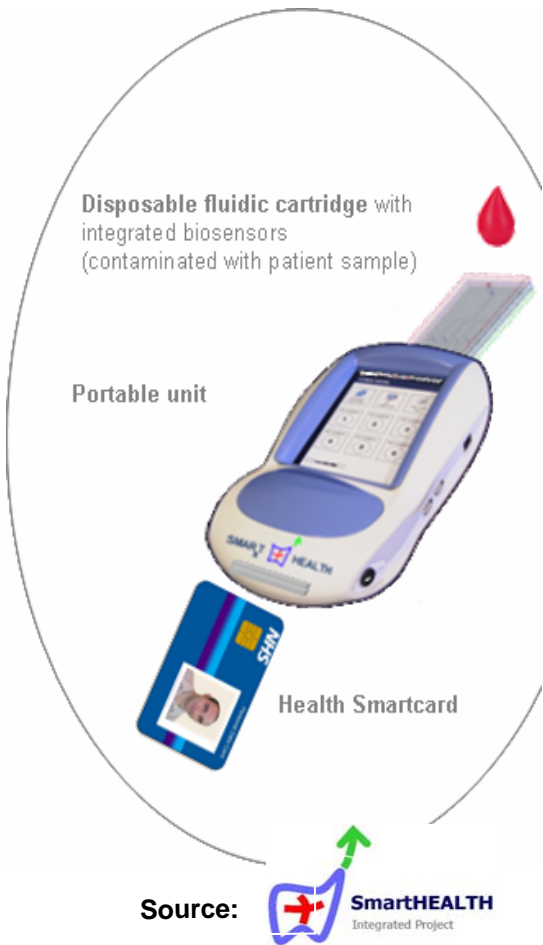
Source: FP6 Project Intellidrug

- Implantable drug delivery system “Intellidrug”:
 - ▶ Closed loop drug delivery system implanted in the tooth

Smart biodiagnostic systems for the point-of-care

Example: FP6 IP SmartHEALTH

- ▶ Medical applications: Cancer: Early detection and recurrence monitoring by multiparametric cancer marker analysis at the point of care
- ▶ Enabling technologies: Nanobiotechnology, biochips, microfluidics, ICT
- ▶ Multiple tests (at genome, proteome, metabolome level) in a single device
- ▶ Smart ambient health information management



**Thank you for your attention
and good luck!**

