

NFC – The Intuitive Link between People and eHealth

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Mobile phones and health

- Survey on the medical literature (Pubmed - Title containing „mobile phone“ AND „health“)*

- 4 out of 5 articles deal with adverse effects of mobile phones on health
 - Exposure to RF (cancer, headache, sleeplessness, ...)
 - Hazards of driving while using the mobile phone
 - Electromagnetic interference (EMI)

* Schreier G. The Mobile Phone and Health – a Survey on Technologies, Beneficial and Adverse Effects.
To be presented at Medinfo 2007, August 20th – 24th, 2007, Brisbane, Australia



Content

- Challenges in the healthcare system
 - A significant problem – chronic diseases

- A possible solution – telemonitoring
 - Application to Chronic Heart Failure (CHF) - the Mobitel Project

- NFC-based concept to simplify patient centered data acquisition

- Summary and Conclusions



Challenges in the healthcare system

- Challenges
 - Demographics
 - Increase of chronic diseases
 - New therapeutic options
 - → Costs

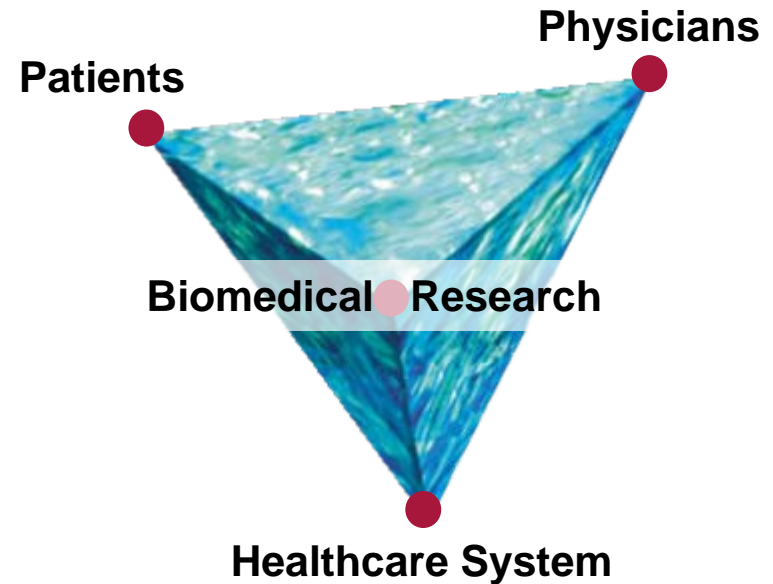
- Information is a central asset in the healthcare system and key to
 - Prevention, detection and diagnosis
 - Individualized and optimized therapy
 - Progress through research

- eHealth offers solutions ...



Mission

We develop ICT based solutions to provide new **links** between the partners in the biomedical research domain and in the **healthcare system**





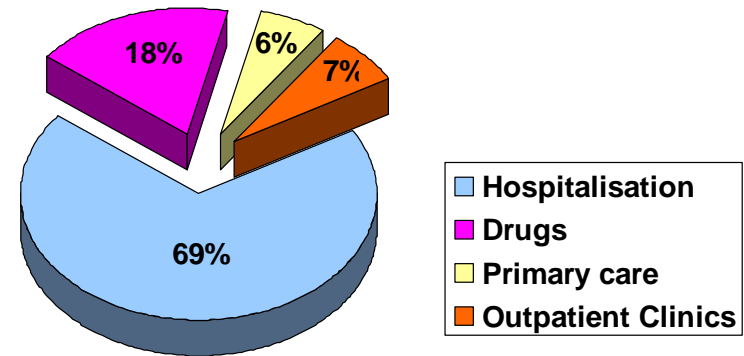
Chronic diseases

- Like
 - Hypertension
 - Diabetes
 - Chronic Heart Failure (CHF)
 -have increasing prevalence

- Mean
 - Life-long therapy
 - Severe long-term effects (stroke, myocardial infarction, ...)
 - Costs

Chronic Heart Failure (CHF)

- ~2-3% of the population in the developed countries have CHF
- CHF is a progressive disease often complicated by episodes of decompensation.
- 35% 1-year-mortality after acute decompensation
- 30-50% re-hospitalization rate within 6 months after hospitalization for HF
- 69% of overall expenditures for heart failure patients are spent for hospitalizations



Sources:

Alla F, Am Heart J 2000

Stewart S, Eur J Heart Fail 2000

Stewart S, Eur J Heart Fail 2002

AHA Statistics 2004



Cost estimation

- Austria
 - 25.680* Cases in the year 2003
 - 22.2* days in hospital on average
 - ~ 500.000 Hospital days
 - € 500 per hospital day
 - -----
 - **€ 250 Mio annual CHF hospitalization costs**

* Source: Jahrbuch der GESUNDHEITSSTATISTIK, Statistik Austria, Wien 2005



An application field for telemonitoring ...

- to actively involve the patient
→ Compliance
- to optimize the therapy (medication)
- reduce or postpone long-term effects by early intervention
- reduce costs for hospitalization and transport
- support integrated care
→ Collaboration of GP and specialist at the hospital

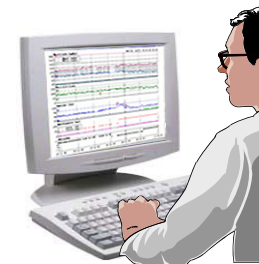
Telemonitoring ...

- To establish new connections between patients and physicians to provide for advanced therapy management

Pulse
Blood Sugar
Weight
Blood Pressure
Well being
Medication
etc.



Patient



Physician

Remote Monitoring Centre

- Technically most challenging part: patient terminal

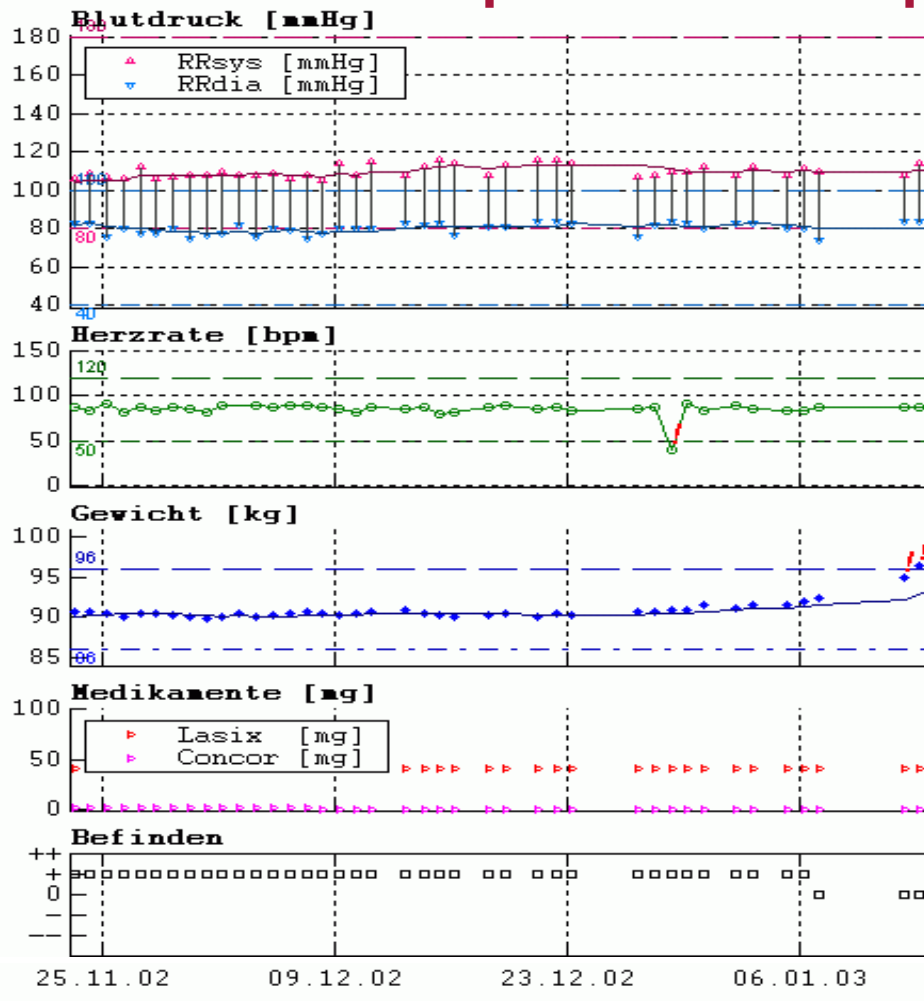


MOBile TELemonitoring for Heart Failure - MOBITEL

- Multicenter randomized clinical trial (ongoing)
- **Hypothesis:** mobile phone based telemonitoring leads to a tailored therapy, thereby
 - improving the cardiac functional state (as measured by NYHA class)
 - reducing the re-hospitalization rate (without telemonitoring typically 30% within 6 months upon discharge)
- Monitoring 6 months in the T group
- Telemedical (telephone based) interventions by the monitoring cardiologist in response to automatically detected events



Result - example from the pilot trial



WITHOUT telemonitoring

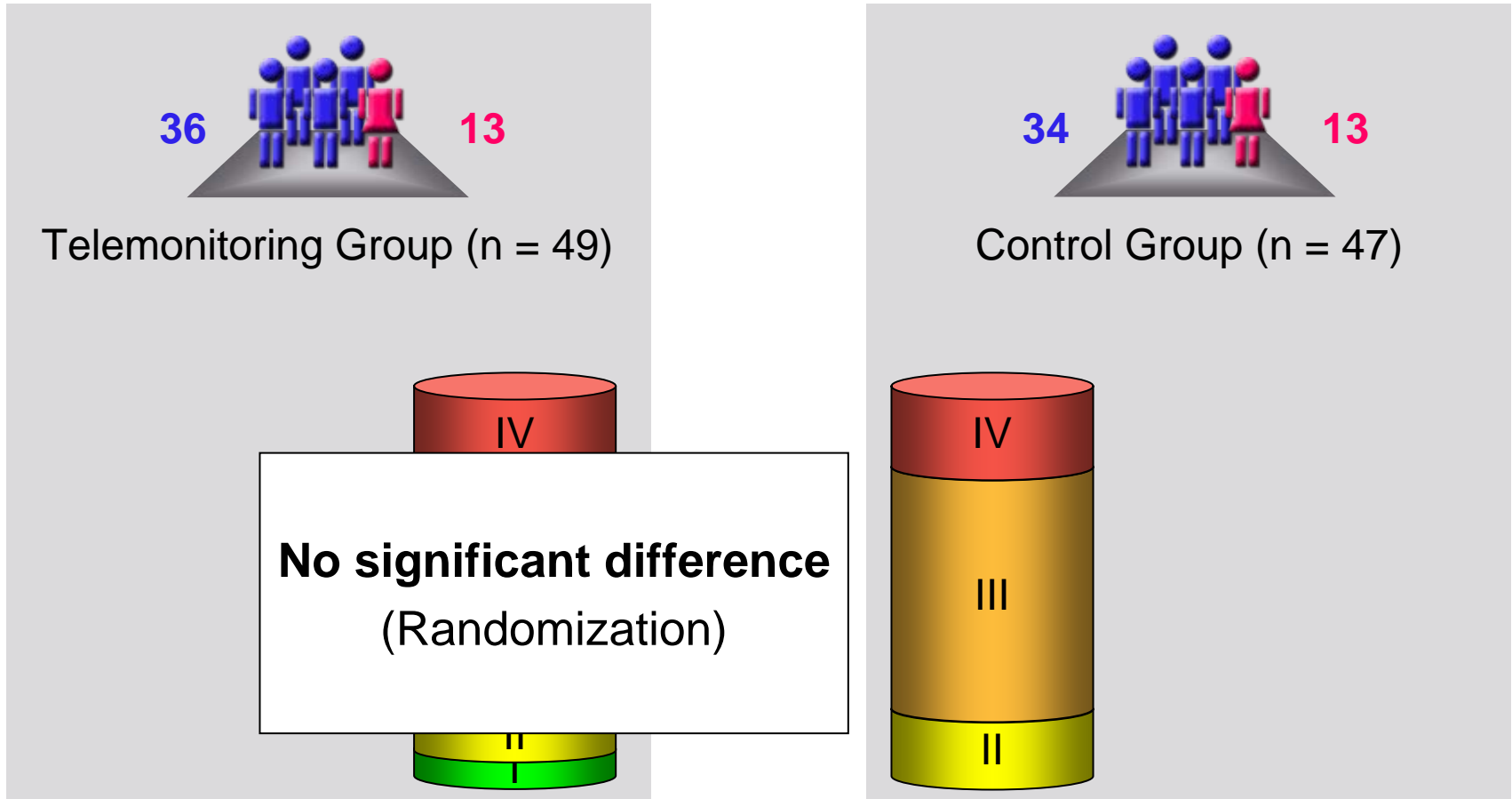
SUCCESSFUL INTERVENTION

CSMS/EU-Alerted physician

Adjustment of the medication

Hospitalization (emergency)

Intermediate results - NYHA classification

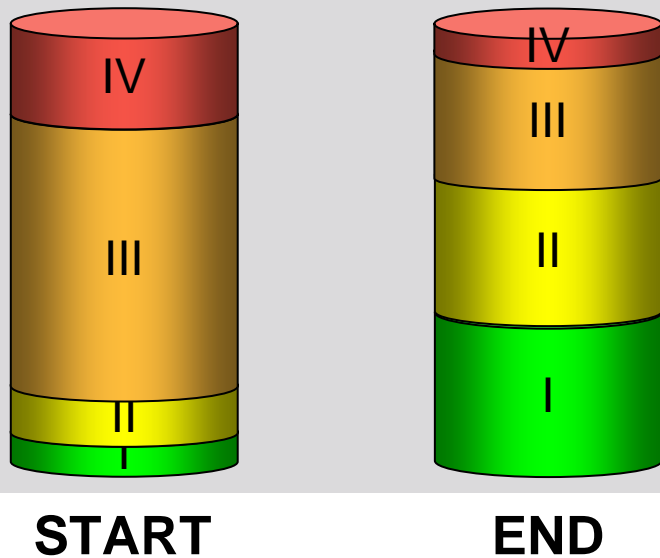


START

Intermediate results - NYHA classification

Significant improvement of the cardiac functional state after 6 months of follow-up

significant ($p < 0.005$)



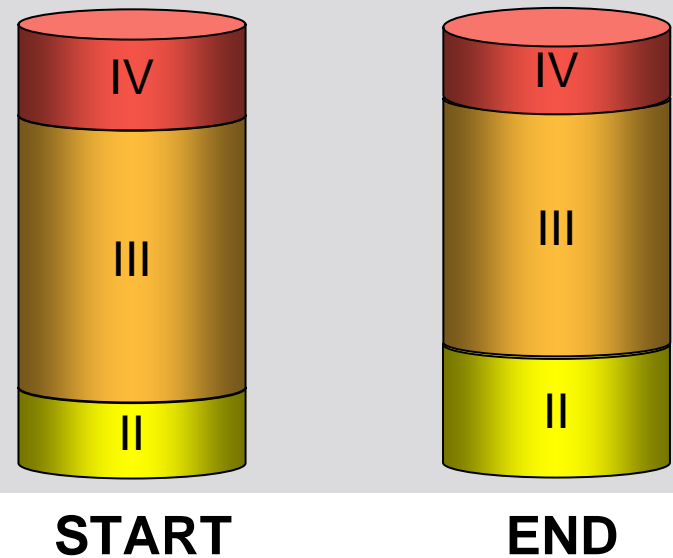
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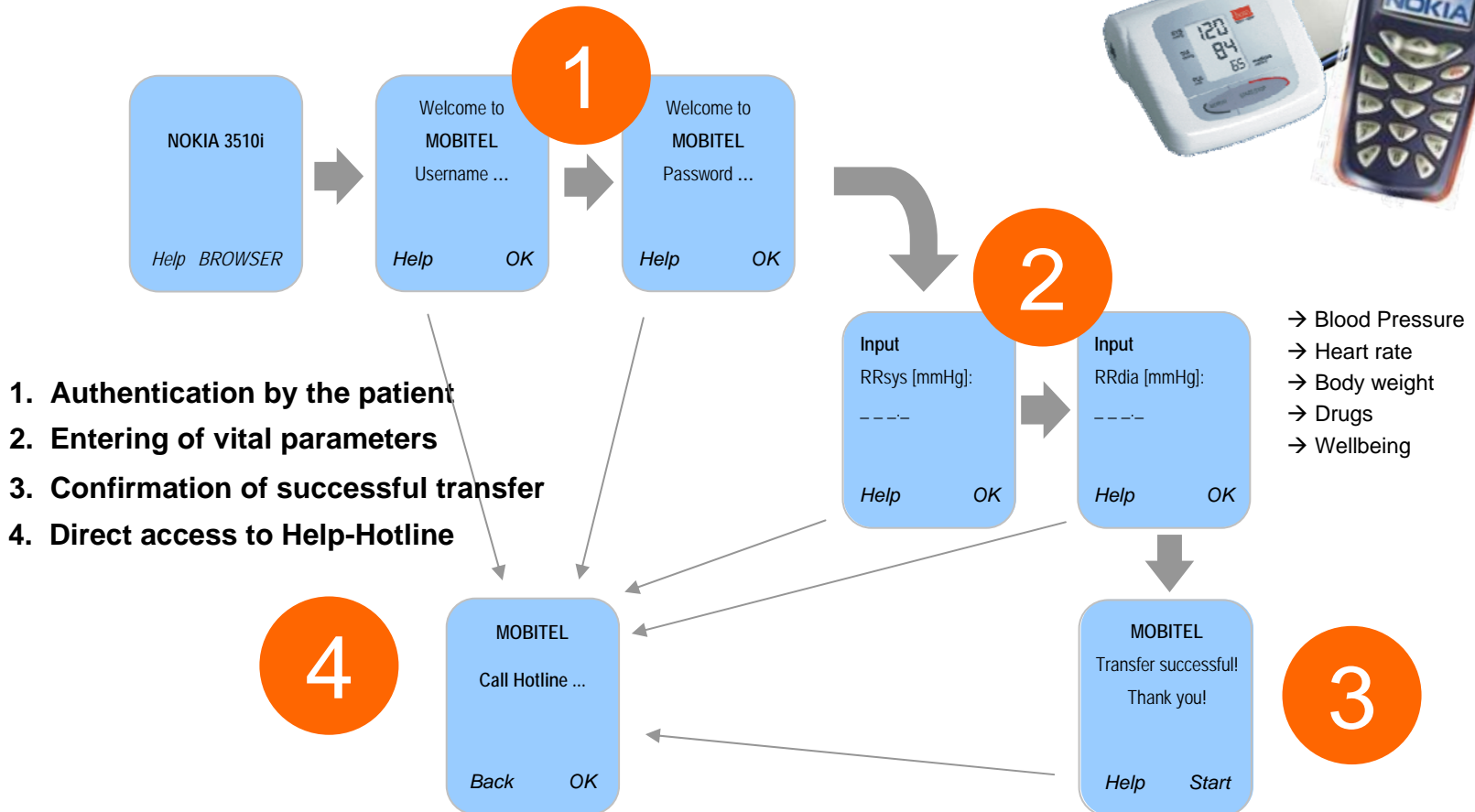
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Control Group (n = 47)

no significant difference



Data acquisition via WAP





Weaknesses

- no offline data entry
 - requires network connection

- usability
 - small keypad and display
 - many interactions (up to 94 keystrokes)
 - transcription errors

- extensive training procedure necessary for technically unskilled people

- 10% – 20% of patients are not able to start with data acquisition

Mobile phone based data acquisition



Mobile Phone
WAP-Browser



Smartphone / PDA
JAVA based on-/offline



Photo of the display is
sent via MMS



CONNY -
Connectivity Device



Bluetooth based
communication



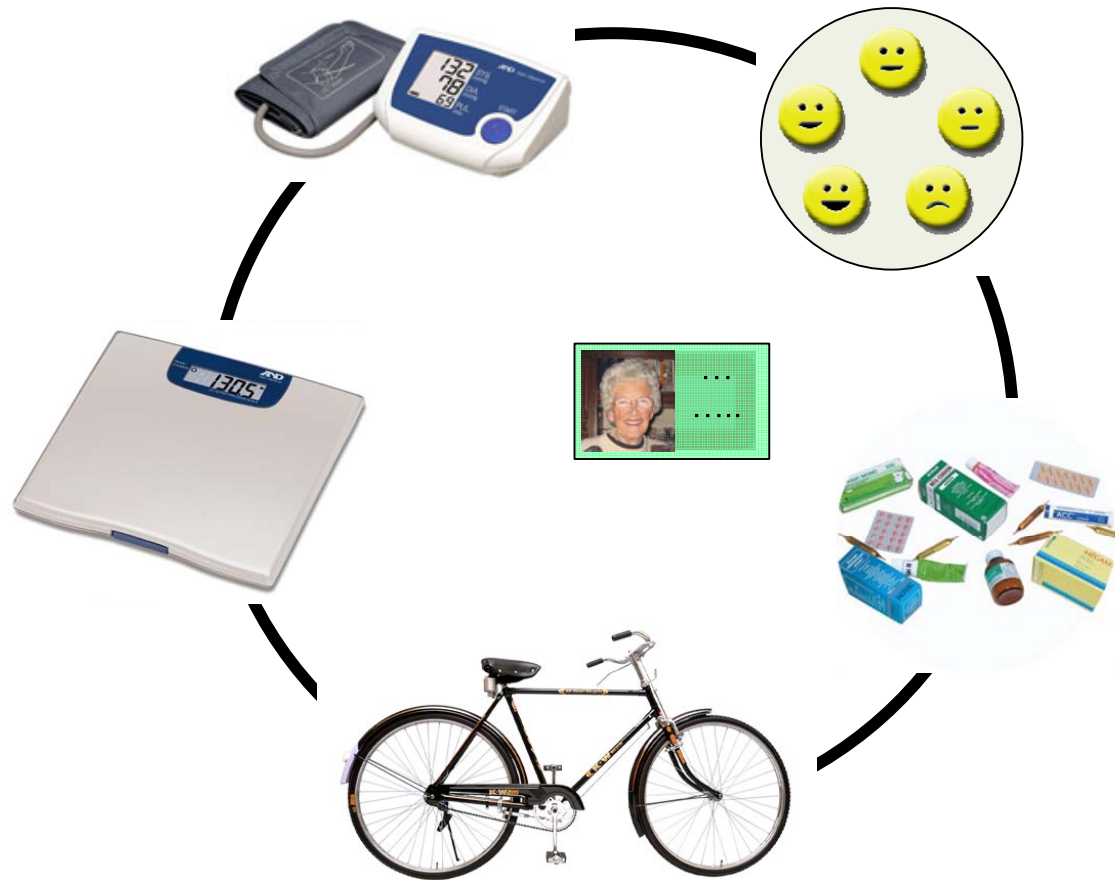
Magic
David ...field

Development of NFC enabled medical devices

- NFC enabled communication module
- module integration into
 - blood pressure meter
 - body weight scale
 - ...
- requirements
 - interface (UART..)
 - protocol



Simplifying the patient's task





Advantages of NFC

- Easy to set-up (“Out of the box”)
 - No special software (for simple scenarios)
 - No manual configuration and settings
 - No search and pair procedure

- Easy to learn and easy to use (intuitive)
 - User initiates the process (keeps control)
 - Simple data acquisition just by touching

- High level of flexibility, adaptability
 - Read data from medical devices (interface dependent)
 - Read data from passive (and cheap) RFID tags

- Built-in Security



Current drawbacks

- Not much choice in terms of handsets
- No choice in terms of NFC enabled medical devices
- Costs are comparably high

- ... will vanish in the near future



Summary & Conclusions

- A mobile **phone based telemonitoring** system has been developed
- Results of past and ongoing **clinical trials indicate that there are definite benefits for the health of patients** who use this concept
- The ideal method in terms of usability, flexibility, reliability and costs does not yet exist
- As a **new approach**, a concept **based on NFC technology** has been
 - Developed
 - Prototypically implemented
 - and comparedto previous methods for patient centered data acquisition



Summary & Conclusions (cont.)

- Initial assessment indicates that this NFC – based approach has the potential to be a **significant step towards the “ideal” method**
- Particularly elderly and **technically unskilled people** are expected to **benefit** from NFC technology
- NFC technology may provide patients with **powerful eHealth terminals** and an intuitive link to their caregivers
- ... and also help to make clear that **mobile phones can have a strong beneficial impact on health** for patients suffering from chronic disease



Development Partners



NXP Semiconductors
Gratkorn, Austria



A&D Company, Medical Division
Tokyo, Japan



Nokia Corporation - Mobile RFID Solutions,
Helsinki, Finland





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