A Home-Based Care Model for Outpatient Cardiac Rehabilitation Based on Mobile Technologies

Jukka Salminen  Nokia  Antti Särelä  CSIRO
Esa Koskinen  Nokia  Ilkka Korhonen  VTT
Ole Kirkeby  Nokia  Darren Walters  Queensland Health
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Burden of Cardiovascular Diseases on Healthcare

CVD is one of the largest health problems in Australia, Europe, and other western countries

- CVD is the most common cause of death in Australia, accounting for 34% of all deaths in 2006.
  
  Source: National Heart Foundation of Australia

- CVD is a major driver of cost to the community in terms of health care expenditure:
  - € 3.2 milliard (AUD 5.5 milliard) is spent annually on the acute and chronic management of these conditions
  - Total burden of this disease is likely to increase given the increase in obesity, diabetes and the growing number of elderly patients

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CVD Risk Factors

- Modifiable environmental and patient specific factors increase the chance of developing coronary heart disease including:
  - Physical inactivity
  - Smoking
  - High blood cholesterol
  - Diabetes
  - High blood pressure
  - Obesity
  - Depression
  - Social isolation and lack of social support.
- Outpatient cardiac rehabilitation has been proven to reduce cardiovascular risks

Rehabilitation Goal: Engage patients with permanent life-style change regarding their health behaviors, i.e. behavioral change
CVD Management Programmes- Underused?

Main Problem in Cardiac Rehabilitation:

- There is a significant underutilisation of Cardiac Rehabilitation programs. Only 16% of all the eligible patients complete a program in Queensland.

  I.A. Scott et al. “Utilisation of outpatient cardiac rehabilitation in Queensland”, MJA 2003; 179(7)

- In the USA 18.7% of the eligible patients participate in rehabilitation programs.

Reasons:

- **Patient barriers:**
  - self-care preferred
  - negative perception of gym-based group exercise
  - travel, work, cost, time issues and complex enrolment process

- Provider barriers: lack of referrals
- System barriers: competing demands, lack of support within the organization
- Community barriers: lack of community support and positive media messaging


Alternative care models are required
Design requirements

• Easy transferability to remote and rural sites
  • minimal or no technology installation at patient’s home

• Use of cost efficient technologies
  • possibilities for large scale roll out

• Primary focus of the program is on exercise
  • logging, monitoring and receiving feedback on walking and stepping activities should be as easy as possible, preferably automatic

• Other areas of health behavioral counseling should be supported
  • weight management, stress management, blood pressure and cholesterol monitoring, diet management

• Sharing of information content and motivational material in electronic form should be cost-efficient and easy

• Flawless communication between the Mentor and the patient

• Support patient empowerment
  • possibilities to follow up on self-progress and own health status
Solution: Care model main components

- Mentoring via tele- or videoconferencing
  - Home exercise planning, walking as the main exercise
  - Goal setting
  - Personal rewarding, education & discussion

- Efficient use of mobile phones and web services
  - Mobile phone is used for:
    - Health and exercise monitoring through measurements and diary entries
    - Intervention through various modalities: SMS, Video and Audio, Phone consultations
  - Web-portal:
    - Mentors can access measurement data and patients’ own self observations collected with phones.
    - Patients can get more elaborate feedback to support self-management.

- Other resources for the patient
  - ‘My Heart My Life’ booklet & multimedia CD
  - Technology training, telephone support and manuals
# Home-based program weekly schedule

## Home Program Overview

<table>
<thead>
<tr>
<th>Themes</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 7-&gt;</th>
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Entries twice/day

Continuous use

2/day

Every day
Technology: Wellness Diary & Step Counter software - mobile self management tools

- WellnessDiary supports entry of various health parameters:
  - Weight, exercise, steps, eating, stress level, working hours, sleeping hours, blood pressure…
  - Configurable according personal needs
- Physical activity (walking) measurement automatic through the in built accelerometer and Step Counter software.
- Uses built-in camera to associate images with the inputs
- Synchronizes all data to the Wellness Diary Connected web-portal.
- Supports limited Bluetooth connectivity to AND-Medical weight scales and Blood Pressure meters
Mobile phone software tools:

Wellness Diary

Step Counter

Handset with an embedded motion sensor

http://betalabs.nokia.com
Wellness Diary Connected web service

- **End User View**
  - Dashboard: a single view to all user data
  - Simple and clear feedback, target setting and motivation

- **Professional View, Interface for Mentors**, Functionalities:
  - managing groups
  - patient monitoring and analysis
  - news postings, system wide messaging with attachments.
  - create questionnaires
  - access the users’ data

- **Administrator View**
  - creation and managing user groups
  - providing admin rights
Technology integration

**Personal devices at home**
- PC
- Data display for self management
- Motivational SMS & Video
- Relaxation audio

**Measurement Devices**
- Bluetooth and manual entry
- Mobile Phone

**Data to server:**
- Movement activity
- Heart Rate
- Blood Pressure
- Weight

**Measurement**
- Data display for self management
- Treatment & mentoring feedback via phone

**Service Provider**
- Web portal
  - Diary data
  - Measurement data
  - Health Reports
  - Educational material
  - Discussion, messaging
- Server
  - Health Records

**Community Care Team**
- Web portal GUI

**Other Health Information Systems**
- Health Records

**Community Care Team**
- Health Information
- 3G

**Web portal access via internet**
- Diary, data & photo synchronisation via 3G

**Feedback Tools:**
- Videoconference
- Teleconference
- Multimedia & SMS

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Lessons learned

- WDC portal hosting within the health care provider’s infrastructure may require new IT policies.
- Need to standardise the patient’s phone plans.
- Business models and division of cost have to be solved.
  - Who pays for the services?
  - Who pays the devices?
- Training essential for user acceptance especially within the older age groups.
- Internet access & literacy not necessarily sufficient in older population to use the Wellness Diary Connected portal.

Definition of adequate business models essential for a long term and sustainable solution.
Conclusion & Future work

- Mobile phone technologies and related web services are potentially enabling tools for home-based care models.

- Patient recruitment has commenced for the pilot phase
  - Randomised Controlled Trial (N=180) within Queensland Health, Northside Health Services, Brisbane
  - Results available late 2009.

- Presented platform potentially offers an affordable and highly scalable solution for many home-based chronic care models.
  - The model is now designed for cardiac rehabilitation but could be extended to support also other chronic diseases.
  - The main benefit in using mobile phones and web services is in the affordability and wide spread use of these technologies.
Thank You

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http://betalabs.nokia.com
http://opensource.nokia.com
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